# Linguistic, behavioural, and neural correlates of evaluation of poetic creativity

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Offered to my parents—my steadfast support system

*"No matter how far we come, our parents are always in us."*

— *Brad Meltzer*

# ACKNOWLEDGEMENTS

*"No one can whistle a symphony. It takes a whole orchestra to play it."*

— *H.E. Luccock*

The journey of completing this thesis, especially after a long hiatus, has been both a profound challenge and a deeply rewarding experience. At the heart of this achievement are the individuals whose support and motivation have been my steadfast compass throughout.

# ABSTRACT

Poetry is among the most creative forms of expression, captivating readers and offering unique perspectives on thoughts and experiences. Assessing the creativity of poetic expression involves a complex interplay of subjective poetic qualities, readers' individual differences in psychological traits, and neural mechanisms. While creativity has been extensively studied in visual and auditory art forms, the neurocognitive foundations underlying judgments of poetic creativity remain largely unexplored. This thesis investigates how readers evaluate the creativity of poems through an integrative approach that combines behavioural and neuroscientific methods, along with computational linguistic analysis, to propose an implicit model for evaluating poetic creativity. Central to this research is the question: What makes a poem creative?

The thesis comprises four experiments: three behavioural and one neuroscientific. The first behavioural experiment develops a parsimonious model for evaluating poetic creativity, revealing that a poem's aesthetic appeal, surprise content, and readers' emotional valence are key predictors of creativity judgments, moderated by literary expertise. This study also examines how individual differences in readers' personality traits influence creativity judgments, with openness emerging as the strongest predictor of variability in preferences. The second behavioural study identifies distinct pathways for evaluating creativity and aesthetic appeal, showing minimal overlap—creativity assessment primarily aligns with originality, followed by usefulness and vivid imagery, while aesthetic appeal depends mainly on fluency, followed by emotions and vivid imagery, reflecting creativity's core traits of originality and usefulness. The third behavioural study investigates poetry's potential to generate ideas, demonstrating that reading poetry boosts associative thinking and enhances creative ideation, though it does not notably boost out-of-the-box problem-solving. The fourth experiment, a comprehensive neuroscientific investigation using electroencephalography (EEG), consists of two parts: a behavioural study exploring how genre-specific creativity is perceived in the brief, structured poetry genres like Haiku and Senryu, and a neuroscientific study examining the neural correlates underlying creativity perception in these genres. Power spectrum analysis revealed mid-frequency oscillations (theta, alpha, and beta) playing a central role in poetry processing, with genre-specific activity observed in distinct cortical regions, including frontal, fronto-temporal, and parieto-occipital areas. The final section of the thesis summarises all findings and discusses avenues for future research.

# LIST OF PUBLICATIONS

1. **Chaudhuri, S.**, Dooley, M., Johnson, D., Beaty, R., & Bhattacharya, J. (2024, February 8). Evaluation of Poetic Creativity: Predictors and the Role of Expertise—A Multilevel Approach. Psychology of Aesthetics, Creativity, and the Arts. https://dx.doi.org/10.1037/aca0000649

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6. **Chaudhuri, S**., Meshcheria, D., & Bhattacharya, J. The Neural Correlates of Creativity Judgments in Poetry: An EEG Study (Manuscript in preparation)

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# DECLARATION

I declare that this thesis was composed by myself, that the work contained herein is my own, and that this work has not been submitted for any degree or professional qualification elsewhere, except as specified.

Some of the chapters of this thesis, specifically Chapters 2, 3, and 4, have been published as individual papers. Chapter 5 is currently under "Revise and Resubmit" following journal feedback, Chapter 6 is under journal review, and Chapter 7, including ongoing analyses, is in preparation for journal submission.

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London, United Kingdom.

# CHAPTER 1

# EXPLORING POETIC CREATIVITY: A NEUROCOGNITIVE PERSPECTIVE

*"Philosophy begins in wonder."*
*— Plato*

## 1.1. Setting the Stage

Welcome to the journey of this PhD thesis—an exploration into the perception of poetry and the ways in which its creativity is judged. Far more than a mere arrangement of words, poetry is a captivating art form that uses language to convey the depths of human experience, emotions, and thoughts. Much like the saying, "Beauty is in the eye of the beholder," the perception of poetry is inherently subjective—what one person admires, another may not. Our individual perspectives shape this perception, influencing how we connect with literary works. While poetry is widely regarded as one of the most creative expressions of language, the specific qualities that lead a poem to be judged as creative remain elusive. Recognising poetry as creative may seem straightforward but understanding what truly defines and distinguishes poetic creativity requires a deeper and more nuanced exploration. When assessing a poem's creative potential, we draw upon personal experiences and knowledge, making the evaluation process inherently subjective. Yet, despite these idiosyncrasies, the question arises: Is there a shared, implicit model that defines the evaluation of poetic creativity? This investigation into "What makes a poem creative?" marks the beginning of this PhD thesis—a journey driven by the desire to uncover answers through empirical exploration. And so, the journey begins.

To begin, creativity is commonly defined as the ability to produce original and imaginative ideas, solutions, or products, according to the Oxford Dictionary of English (3rd ed., 2010, p. 414). For the past seven decades, researchers in psychology have consistently described creativity as the ability to generate something new, different, and innovative, often with practical or functional value (Guilford, 1950; Stein, 1953; Barron, 1955; Kaufman, 2016). The 4P model of creativity (Rhodes, 1961), a seminal theoretical framework of creativity, proposed that "The word creativity is a noun naming the phenomenon in which a person

communicates a new concept (which is the product). Mental activity (or mental process) is implicit in the definition and of course no one could conceive of a person living or operating in a vacuum, so the term press is also implicit. The definition begs the questions as to how new the concept must be and to whom it must be new" (Rhodes, 1961, p.305; see Gruszka & Tang, 2017). Among these 4P approaches, i.e., person, product, process, and press, the product or physical object, plays an important role. In common perceptions, creativity is often equated with its tangible outcome—the creative product. When asked to define creativity, many would instinctively describe it in terms of the final product (Gruszka & Tang, 2017). Literature suggests that a product-centred operational definition is the most useful for empirical research in creativity and presumably the most important feature of this definition is its reliance on subjective criteria (Amabile, 1982). Although creativity remains a debated and often nebulous concept, and despite the absence of a universally agreed-upon definition, the most widely accepted understanding is the "standard definition" (Runco & Jaeger, 2012). This definition asserts that for an idea or product to be considered creative, it must be both novel (or original) and useful (or effective), with both qualities being necessary. Neither originality nor usefulness is sufficient on its own. Further, building on the three criteria used by the United States Patent Office—new, useful, and nonobvious—a quantitative definition of creativity was proposed, adding "surprise" as the third ingredient (Simonton, 2012). This definition expresses creativity (C) as an all-or-nothing multiplicative game: $C=N*U*S$, where N, U, and S indicate novelty, utility, and surprise, respectively. A maximally creative idea, where $C=1$, occurs when all three attributes are maximized, that is, $N=U=S=1$. However, an idea lacks any creativity if one or more of the three attributes are zero.

The question then arises: how is creativity, as a holistic construct, judged? Any subjective judgment is inherently personal, so when it comes to evaluating a nebulous construct like creativity, the inherent subjectivity becomes even more pronounced. This subjectivity necessitates the consensual definition of assessment of creativity, which asserts that "a product or response is creative to the extent that appropriate observers independently agree it is creative" (Amabile, 1982, p.1001). The Consensual Assessment Technique (CAT), grounded in this definition, is often considered the gold standard for assessing creativity. In this method, multiple expert judges, given identical instructions but no guiding definition, independently rate the creativity of each product (or idea) based on their gut feelings. These ratings are then averaged across the judges (Amabile, 1982).

Creativity and aesthetics in art have been extensively studied, particularly in relation to paintings (Cupchik et al., 2009; Hagtvedt et al., 2008 ; Bhattacharya & Petsche, 2002;

Chatterjee, 2003; Bhattacharya & Petsche, 2005b; Bhattacharya, 2009; Augustin et al., 2011; Adamaszek et al., 2022; Luft et al., 2019),  music (Koelsch & Siebel, 2005; Koelsch, 2011; Koelsch, 2014; Bhattacharya et al., 2001;Bhattacharya & Petsche, 2005a;Strait et al., 2009; Marin & Bhattacharya, 2010; Bhattacharya & Lindsen, 2016; Ruiz et al., 2011; Jackendoff & Lerdahl, 2006; Zioga et al., 2020), and films (Hanich et al., 2014; Plucker et al., 2009). However, research on creativity in the perception of poetry, one of the fundamental verbal art forms, has been relatively underexplored. Figure 1.1 illustrates the trends in psychological research on four art forms—music, poetry, film, and painting—from 1990 to 2024. The figure shows that poetry has consistently received less attention compared to other art forms, particularly music, with a slower increase in research publications and lower overall volume throughout all periods. The search for this data was conducted in Google Scholar using combinations of each art form's name (e.g., "music," "poetry," "film," and "painting") along with the keywords "creativity" and "aesthetics.

**Figure 1.1**

*Trends in psychological research on creativity and aesthetics of music, poetry, film, and painting from 1990 to 2024*
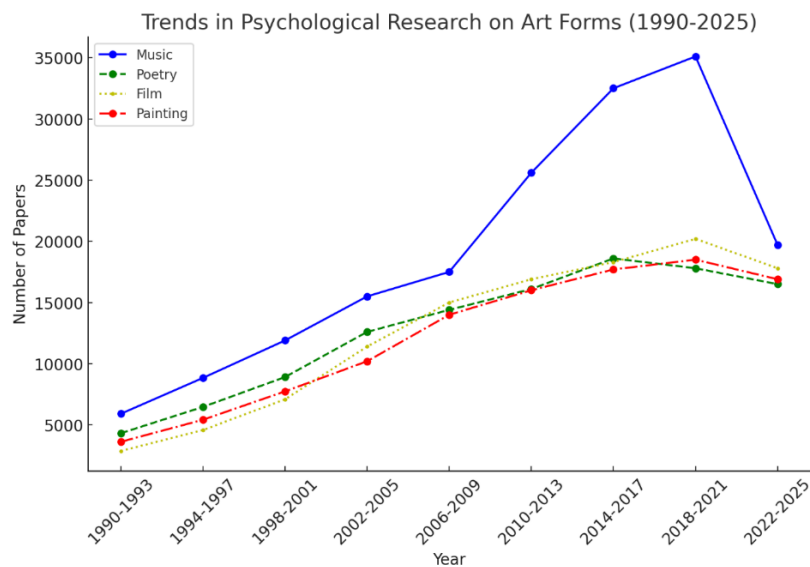


Research on poetry has primarily focused on evaluating its aesthetic appeal through two main approaches. The objective or feature-driven approach emphasizes the linguistic aspects of poems, including elements like content, rhyme, meter, phonological constructs, and metaphors (Lau et al., 2018; Obermeier et al., 2013; Obermeier et al., 2016; Aryani et al., 2016; Rasse et al., 2020; Menninghaus et al., 2015). In contrast, the subjective approach centres on readers' personal experiences, focusing on their psychological states, such as emotions, vivid imagery, and individual differences in personality traits (Belfi et al.,

2018;Frame et al., 2024; Hitsuwari & Nomura, 2022a; Hitsuwari & Nomura, 2022b; Hitsuwari & Nomura, 2023; Wassiliwizky et al., 2017). However, how the subjective qualities influence the judgment of a poem's creativity remains insufficiently understood.

Given the significant gap and the lack of clarity regarding the key predictors that influence judgments of a poem's creativity, there is a clear need for further exploration. This thesis seeks to address the outstanding questions regarding how various factors shape our understanding of poetic creativity and to develop an implicit model for evaluating it, despite the inherent subjectivity in poetry perception. In line with the 4P model, as discussed earlier, which encompasses person, process, product, and press, where the process typically involves two cognitive phases—generation and evaluation (Finke et al., 1996)—this research adopts a dual focus on both the product and the process, with particular emphasis on the evaluation phase. By using the poem as the product and its evaluation as the measure of creativity, the thesis operationalises the creativity of a poem as its creative potential. This approach aims to broaden the understanding of poetic creativity, shifting focus from the creator to the creation and its evaluation.

To broadly address the central inquiry, "What makes a poem creative?", this thesis will explore the following research questions (RQs). These questions aim to examine the various factors influencing creativity judgments in poetry, including the role of subjective qualities, individual differences in psychological traits, and neurocognitive processes. By investigating these areas, the thesis seeks to uncover the underlying mechanisms that shape how we perceive and evaluate creativity in poetic works. The following research questions guide this investigation:

RQ1. What are the key subjective qualities of a poem that predict the judgments of its creativity?

RQ2. How does domain-specific expertise in literature influence the role of subjective qualities in the evaluation of creativity in poetry?

RQ3. How do individual differences in readers' personality traits shape their judgments in evaluating a poem's creativity?

RQ4.  Do the assessments of aesthetics and creativity in a poem rely on identical criteria, or do they vary depending on underlying factors?

RQ5. Does reading poetry act as an effective incubator for creative ideation in readers?

RQ6. How is poetic creativity perceived within brief, structured poems?

RQ7. What are the neural correlates of the subjective judgments during poetry perception?

By adopting behavioural and neuroscientific approaches, bridged with computational methods, this thesis investigates the various facets of evaluation of poetic creativity. The following section outlines the structure of the thesis, highlighting the progression of each chapter in the exploration of poetic creativity.

## 1.2. Outline of the Thesis

The thesis consists of nine chapters: Chapters 2 through 7 present the studies, Chapter 8 provides a comprehensive discussion, and Chapter 9 outlines future directions and concluding remarks. Chapter 2 presents a study investigating the role of various subjective qualities—such as clarity, aesthetic appeal, felt valence, arousal, and surprise—in predicting creativity judgments of English poems, as well as the moderating influence of domain-specific expertise on these qualities. The study finds aesthetic appeal to be the strongest predictor, followed by surprise and felt valence. Additionally, expertise in English literature is found to significantly moderate the relationship between creativity and these three predictors. Chapter 3 investigates how certain personality traits—specifically openness, intellect, awe-proneness, and epistemic curiosity—influence creativity judgments of English-language poems. Openness emerges as the primary moderator in the creativity assessment, while aesthetic appeal is found to be moderated by all four personality traits studied. Chapter 4 explores whether judgments of aesthetic appeal and creativity in poetry rely on the same criteria or differ. The analysis reveals that these are distinct processes, with creativity driven by originality and usefulness, while aesthetic appeal is primarily influenced by reading fluency and perceived emotions. Chapter 5 investigates whether reading poetry can serve as an incubator to stimulate readers' creativity. The study finds that while poetry reading enhances associative thinking, enhancing free-flowing thoughts, it does not significantly boost divergent thinking or the generation of entirely novel ideas. Chapter 6 examines how readers evaluate genre-specific creativity in the minimalist poetic forms like haiku and senryu. The study finds that while creativity evaluations are driven by novelty, haiku's creativity is more strongly linked to aesthetic appeal, while senryu's creativity is influenced by emotional resonance, with readers' semantic memory networks shaping these judgments. Chapter 7 presents a neuroimaging study using electroencephalography (EEG) to investigate the neural mechanisms behind the perception of poems. Power spectrum analysis reveals mid-frequency oscillations (theta, alpha, and beta) playing a central role in poetry processing, with genre-specific activity observed in distinct cortical regions, including

frontal, fronto-temporal, and parieto-occipital areas. Chapter 8 synthesises the findings from the thesis, providing a comprehensive summary of key insights from the studies and reflecting on their broader implications for understanding poetic creativity. It also discusses how these results contribute to existing theories of creativity, offering new perspectives for psychology, literature, and cognitive science. Chapter 9 outlines potential avenues for future research, building on the findings from previous studies. It discusses further exploration into the cognitive, linguistic, and neural mechanisms of poetic creativity, addresses the limitations and challenges faced in the current research, and proposes new interdisciplinary approaches integrating psychology, literature, and computational methods to refine creativity evaluation models. The chapter ends with a closing remark on my experiences throughout this research journey. Overall, this thesis aims to provide a comprehensive exploration and understanding of evaluation of poetic creativity, integrating behavioural, neuroscientific, and computational approaches.

**CHAPTER 2**


# PREDICTORS OF CREATIVITY JUDGMENT AND

# THE ROLE OF EXPERTISE


*"Knowledge is the treasure, but judgment is the treasurer of a wise man."*
*– William Penn*


## 2.1. Introduction

Poetry, as one of the most creative expressions of language, uniquely captivates readers by evoking strong emotions and is often associated with aesthetic pleasure (Wassiliwizky et al., 2017; Menninghaus et al., 2017). As mentioned in chapter 1, the psychology of creativity and aesthetics has been extensively studied using stimuli like paintings (Cupchik et al., 2009; Hagtvedt et al., 2008 ; Bhattacharya & Petsche, 2002; Chatterjee, 2003; Bhattacharya & Petsche, 2005b; Bhattacharya, 2009; Augustin et al., 2011; Adamaszek et al., 2022; Luft et al., 2019),  music (Koelsch & Siebel, 2005; Koelsch, 2011; Koelsch, 2014; Bhattacharya et al., 2001;Bhattacharya & Petsche, 2005a;Strait et al., 2009; Marin & Bhattacharya, 2010; Bhattacharya & Lindsen, 2016; Ruiz et al., 2011; Jackendoff & Lerdahl, 2006;Zioga et al., 2020), and films (Hanich et al., 2014; Plucker et al., 2009). Research on poetry, by comparison, remains sparse. With an emphasis primarily on evaluating its aesthetic appeal, as mentioned in the previous chapter, most research on poetry has focused on its objective features, such as rhythm, rhyme, and meter (Lau et al., 2018; Obermeier et al., 2013; Obermeier et al., 2016; Aryani et al., 2016; Rasse et al., 2020; Menninghaus et al., 2015), and subjective features like expertise (Kaufman, Baer, et al., 2008) and individual differences (Belfi et al., 2018; Frame et al., 2024; Hitsuwari & Nomura, 2022a; 2022b; 2023). A study on haiku and sonnets has shown that vividness of imagery is the strongest predictor of aesthetic appeal, followed by perceived valence and arousal (Belfi et al., 2018). Similarly, another investigation has found that in haiku, felt valence and imagery vividness predict its aesthetic appeal, with felt valence partially mediating the effect of imagery vividness on aesthetic

appeal ( Hitsuwari & Nomura, 2022b). Brain imaging study on poetry appreciation, using functional magnetic resonance imaging (fMRI) has explored the emotional impact of poetic language and the associated aesthetic pleasure (Wassiliwizky et al., 2017). Kaufman et al. (2010) have explored overall creativity ratings using SciFaiku, a form of haiku based on science fiction, comparing the influence of sex and ethnicity on both writers and raters. Their findings suggest that poems written by females are judged as more creative, with female raters showing greater consistency in their judgments compared to their male counterparts. A comprehensive neuroimaging study examines the poetry composition and assessment process, including product and expertise, in a single experiment, proposing a multidimensional model for creative behaviour (Liu et al., 2015). The medial prefrontal cortex (mPFC) is activated during both phases, while the dorsolateral prefrontal cortex (dlPFC) and parietal cortex show phase-dependent activation. Experts exhibit higher deactivation in these regions. The findings highlight the dynamic interplay between motivation, cognitive control-related brain regions, and their connectivity with multiple brain areas during creative behaviour.

However, the potential factors predicting judgments of a poem's creativity remain largely unknown. In particular, the role of emotional responses and the associated aesthetic pleasure, in the context of assessing poetic creativity, have yet to be adequately explored. This chapter presents a study that aims to investigate how people evaluate poems and their creativity, which subjective qualities predict overall creativity judgments, and how expertise moderates the influence of these potential predictors. Five potential predictors were examined: three factors related to the poem—clarity, aesthetic appeal, and surprise—and two linked to the reader's emotional response—felt valence and arousal. The following sections briefly review the role of these contributory factors in predicting the creativity of literary art forms, with a focus on poetry and its evaluation.

### 2.1.1. Clarity, Aesthetic Appeal, and Creativity

Clarity of a text refers to a clear, understandable, comprehensible piece of writing which can effectively communicate with its readers. Clarity is perhaps the primary quality of a good style of any valued written communication, poetic, or transactional. In poetry, the poet must transfer their thoughts into words to effectively interact with readers. Given that clarity is one of the 14 dimensions in the judgment of poems, with a high loading in the 'style factor' (.89) (Amabile, 1982), and that stylistics is a key branch of linguistics, clarity in this study was expected to

positively influence judgments of poetic creativity. Specifically, greater comprehension of a poem was hypothesised to lead to higher creativity assessment scores (Hypothesis 1).

Aesthetics refers to the artistic features, styles, and concepts present in any form of artwork. Evaluating a piece of art involves aesthetic appreciation, frequently termed as aesthetic appeal. Aesthetic evaluation of art has been studied in the context of visual art (Hagtvedt et al., 2008), music (Belfi, 2019; Brattico et al., 2017), and poetry (Belfi et al., 2018; Hitsuwari & Nomura, 2022b; Hitsuwari & Nomura, 2023; Jacobs, 2017; Kraxenberger & Menninghaus, 2017; Scharinger et al., 2022). The aesthetic appreciation of poetry has primarily been explored in terms of how it depends on content (Scharinger, Wagner, et al., 2022), personality traits, and psychological states such as valence, arousal, and vivid mental imagery (Belfi et al., 2018; Hitsuwari & Nomura, 2022b). Specifically, previous empirical studies on poetry have investigated aesthetic appreciation focusing on two broad aspects: (i) the objective elements of a poem and (ii) the subjective experiences the poem evokes in readers. The first approach examines textual elements, e.g., rhythm, rhyme, meter (Obermeier et al., 2013; Kraxenberger & Menninghaus, 2017), metaphors (Jacobs & Kinder, 2017; 2018; Rasse et al., 2020; Steen, 2009), and phonological constructs such as words and phrases (Aryani et al., 2016; Jacobs, 2017). The second approach explores empathic reactions and emotional involvement (Lüdtke et al., 2014), perceived emotional valence and vividness in imagery (Belfi et al., 2018), cognitive and emotional ambiguity (e.g., awe and nostalgia) (Hitsuwari & Nomura, 2022b;  2022a), openness to experience, visual imagery abilities, felt valence (Hitsuwari & Nomura, 2022b), expertise (Kaufman et al., 2008), gender and ethnicity (Kaufman et al., 2010). However, how a poem's aesthetic appeal influences its creativity judgment remains unknown. Building on previous research and considering aesthetic appeal as a key parameter in artistic creativity judgment (Amabile, 1982), and poetry as one of the prominent verbal art forms, aesthetic appeal was hypothesised to be a significant predictor of poetic creativity. Specifically, poems with higher aesthetic appeal were expected to receive higher ratings for creativity (Hypothesis 2a). Furthermore, as the emotional content of verbal materials affects reading, and subjective emotional appraisal may play a critical role in aesthetic experience (Chatterjee & Vartanian, 2014; Leder et al., 2004), the relationship between aesthetic appeal and the creativity of a poem was hypothesised to be mediated by felt valence and arousal (Hypotheses 2b & 2c). Additionally, considering the close association between aesthetic appeal and surprise (Silvia, 2009)—with surprise being the third ingredient of creativity (Simonton, 2012; Acar et al., 2017)—it was hypothesised that surprise would partially mediate the relationship between aesthetic appeal and creativity (Hypothesis 2d).

### 2.1.2. Emotions and Creativity

The two-dimensional circumplex model of emotion, proposed by Russell (1980), conceptualises emotional states along two orthogonal dimensions: valence (a pleasure-displeasure continuum) and arousal or alertness (Figure 2.1: Posner et al., 2005; Russell, 1980), with each emotion represented as a linear combination of these dimensions.

**Figure 2.1**

*A graphical representation of the circumplex model of affect with the horizontal axis representing the valence dimension and the vertical axis representing the arousal or activation dimension (Russell, 1980)*
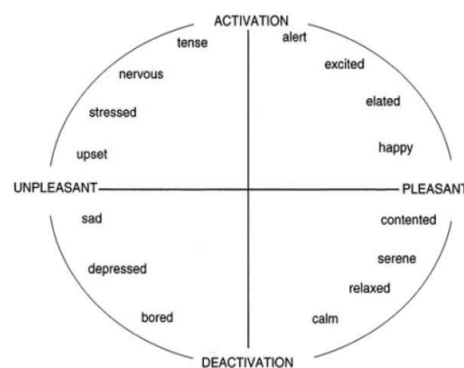
Poetry is known to evoke strong emotional experiences (Wassiliwizky et al., 2017). The celebrated American poet Robert Frost once said, "A complete poem is one where an emotion has found its thought, and the thought has found words" (Frost, 1963). A recent study by Johnson-Laird and Oatley (2022) suggests that the semantic contents of a poem, along with its prosodic cues like meter, rhyme, rhythm can evoke basic emotions, while a reader's intellectual evaluation of a poem can evoke a complex aesthetic emotion that combines a basic emotion with their assessment of the poem. The emotional response to poetry is both a process initiated by the poet and a reciprocal process undertaken by the reader—an active interaction between the evaluator and the product itself, influenced by the evaluator's emotional state (Mastria et al., 2019). Poetry has shown highly pleasurable emotional effects eliciting peak emotional experiences, including chills and goosebumps (Wassiliwizky et al., 2017). Of note, research in music has consistently shown that the perception of emotion involves both sensory and cognitive processes that do not always align with the actual feelings of the perceiver—meaning the emotion perceived or expressed by the stimuli may differ from the emotion felt by the perceiver (Gabrielsson, 2001; Marin & Bhattacharya, 2010). Perceived emotions can be described as the emotion a stimulus "expresses" or which is intended (Evans & Schubert,

2008; Gabrielsson, 2001; Kreutz et al., 2007), whereas felt emotions refer to the actual emotional response of a perceiver (Jacobsen, 2023). This study focused on felt emotions—those experienced by the reader while reading the poem, rather than perceived emotions, which are the emotions expressed by the poem. Felt valence here reveals the extent to which the readers felt positive or negative emotions while reading the poems, whereas felt arousal reveals how intense it was felt by the readers Here, both dimensions of felt emotion—valence and arousal—were expected to be significant predictors of poetic creativity (Hypotheses 3a & 3b).

### 2.1.3. Surprise and Creativity

Surprise is usually a short-lived emotion elicited by events that deviate from an established schema or expectations (Meyer et al., 1991,1997; Noordewier & Breugelmans, 2013), where a schema refers to a component of the organism's knowledge structure, activated by a specific stimulus (Rumelhart, 1984). Surprise has been found as a stronger predictor of creativity than value after controlling for originality (Acar et al., 2017). It supports the three-criterion definition of creativity (Simonton, 2012). Poetry provides readers with unexpected shifts of concepts or violations of expectations, creating elements of surprise. As surprise describes the reaction to unexpectedness (Meyer et al., 1991; Noordewier & Breugelmans, 2013; Pietras & Ganczarek, 2022; Reisenzein, 2013), the present study operationalised surprise as the extent to which the readers experienced a sudden and unexpected change in the context or theme of the poem. Notably, surprise is a key mechanism by which music induces emotion (Juslin & Västfjäll, 2008) and predicts musical pleasure (Cheung et al., 2019). Moreover, the way to understand the effect of music is to focus on this "kinetics" of expectation and surprise (Meyer, 1970). Therefore, the judgment of a poem's creativity was expected to depend on how readers experienced the expectancy violation within the context of the poem; specifically, the more surprising a poem was, the more creative it would be perceived to be (Hypothesis 4a).

In the present study, the subjectively chosen line(s) of surprise were identified, and the semantic relatedness of these surprise-evoking lines was computed in relation to the two preceding lines. To achieve this, SemDis, an automated scoring approach for verbal creativity, was employed, using natural language processing to quantify the semantic relatedness of texts. (Beaty & Johnson, 2021). In a semantic space, the more unrelated two concepts are, the more novel or creative the new concept is likely to be (Kenett, 2019). It was hypothesised that the semantic unrelatedness of the chosen lines would predict the surprise scores of the poems; specifically, the more unrelated the lines, the more surprising the content would be. In other words, the

subjectively chosen surprise-evoking lines in poems would demonstrate objective validation (Hypothesis 4b).

### 2.1.4. Role of Expertise

Art-trained and naïve participants perceptually explore artworks differently (Bhattacharya & Petsche, 2005b; Winston & Cupchik, 1992). Significant differences in aesthetic appreciation arise as a function of individuals' experience and knowledge of art (Cela-Conde et al., 2011). Neurophysiological studies suggest that nonexperts show a higher emotional reaction in terms of arousal, whereas experts are more cognitively engaged with the same stimuli (Cartocci et al., 2021). Physiological correlates of art appreciation, measured using facial electromyography (EMG), indicate that aesthetic expertise enhances a detached mode of engagement, promoting a reduction in the impact of emotional content (Leder et al., 2014). Literature suggests that expert raters evaluate poems as less creative than novice raters, with differential levels of interrater agreement  (Kaufman et al., 2008). This study expected a significant moderation of expertise on aesthetic appeal, valence, arousal, and surprise in predicting poetic creativity. Since aesthetics is a style-based perceptual construct of poetry, style-related processing was anticipated to be more prevalent among individuals with higher levels of expertise (Augustin & Leder, 2006). Experts, defined as individuals with formal knowledge of English literature, were expected to show a stronger positive influence of aesthetic appeal on creativity ratings compared to naïve participants (Hypothesis 5a). Furthermore, given that nonexperts tend to be more emotionally responsive to art (Cartocci et al., 2021),  it was hypothesised that nonexperts would prioritise the influence of felt emotions over experts when assessing the creativity of poems. Specifically, the positive influence of felt valence and arousal on creativity scores would be less pronounced in experts than in nonexperts, with the effect of felt valence being weaker for experts (Hypothesis 5b) and the impact of arousal similarly diminished (Hypothesis 5c).

Surprise functions as an interruption mechanism and is regarded as a short-lived mixed emotion (Meyer et al., 1997). It is triggered by unexpected events that disrupt ongoing thoughts, prompting individuals to shift their focus to the unforeseen stimulus (Noordewier & Breugelmans, 2013). In this study, experts were expected to be more familiar with the thematic shifts in poetry than nonexperts. As a result, nonexpert individuals were anticipated to be more intrigued by the unexpected elements within a poem, particularly when assessing its creativity, due to their less frequent exposure to such poetic nuances (Hypothesis 5d).

All hypotheses proposed in this study, as mentioned throughout this section, are consolidated below for clarity and ease of reference:

*Hypothesis 1: Greater comprehension of a poem would lead to higher creativity scores.*

*Hypothesis 2a: Poems with higher aesthetic appeal will receive higher creativity scores.*

*Hypothesis 2b: Felt valence would mediate the relationship between aesthetic appeal and creativity.*

*Hypothesis2c: Arousal would mediate the relationship between aesthetic appeal and creativity.*

*Hypothesis 2d: Surprise would mediate the relationship between aesthetic appeal and creativity.*

*Hypothesis 3a: Poems with higher felt valence would receive higher creativity scores.*

*Hypothesis 3b: Poems with higher felt arousal would receive higher creativity scores.*

*Hypothesis 4a: Poems with higher surprise receive higher creativity scores.*

*Hypothesis 4b: The subjectively chosen surprise-evoking lines in poems would exhibit objective validation.*

*Hypothesis 5a: Individuals with formal knowledge of English literature, classified as experts, would exhibit a more substantial positive influence of aesthetic appeal on creativity ratings in comparison to naïve participants.*

*Hypothesis 5b: The positive influence of felt valence on creativity scores would be less prominent in experts compared to nonexperts.*

*Hypothesis 5c: The positive influence of arousal on creativity scores would be less pronounced in experts compared to nonexperts.*

*Hypothesis 5d: The positive impact of surprise on creativity scores would be less pronounced in experts compared to nonexperts.*

## 2.2. Materials and Methods

### 2.2.1. Stimuli

Thirty-six original English language poems, varying widely in structure and content (see Table 2.1 for details), with an average of 11 lines (SD = 3.24) and a mean word count of

71.25 (SD = 28.99), were selected as stimuli. Previous studies on the aesthetic evaluation of poetry primarily focused on haiku and sonnets(Belfi et al., 2018; Hitsuwari & Nomura, 2022b) or specifically on Shakespeare's sonnets (Papp-Zipernovszky et al., 2021). Although these forms offer advantages such as brevity and structural consistency, they were deemed not to fully represent the variety of English poems. Therefore, the selection of stimuli was not restricted to a specific genre or form. Initially, 108 poems were chosen from various popular online poetry resources, including Poetry.org (https://www.poetry.org/), Poetry Foundation (https://www.poetryfoundation.org/), and the Academy of American Poets (https://poets.org/). These poems were then rated on a 7-point Likert scale for surprise and creativity by an award-winning poet and senior professor in English and creative writing. Based on these ratings, 36 poems were finally selected: 18 low-surprise poems (ratings of four or lower) and 18 high-surprise poems (ratings of six or higher).

The selected poems were both lexically and semantically diverse. Lexical diversity (LD) refers to the richness of vocabulary used in a text, indicating the variety of unique words (McCarthy & Jarvis, 2007). LD was calculated using the type-token ratio (TTR) method, which measures the ratio of unique words (types) to the total word count (tokens) (Chotlos, 1944). The TTR ranges from 0 to 1, with a higher value indicating greater lexical diversity. The poems had a mean (SD) lexical diversity of 0.77 (0.09), suggesting that, on average, 77% of the words were unique. Semantic diversity, on the other hand, captures the range of contexts in which words are used, reflecting the semantic richness of the text (Johnson et al., 2022). It was calculated using Divergent Semantic Integration (DSI) (http://semdis.wlu.psu.edu/), which computes the average semantic distance between all word pairs in a poem. A higher DSI score, ranging from 0 to 1, indicates a broader spread of divergent ideas. The poems exhibited an average (SD) semantic diversity of 0.80 (0.03), reflecting a high degree of variety in meaning (see Table 2.1 for details).

**Table 2.1**

*Details of the poems used in the study*

| Poem Title | Poet | Lines | W.C. | Form | Style | Genre | Theme | U. W. | Char | LD | DSI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Funeral Blues | W. H. Auden | 16 | 136 | Quatrain | Elegiac | Modernist | Grief | 101 | 708 | 0.74 | 0.81 |
| At the Same Time | W.S. Merwin | 10 | 39 | Free verse | Reflective | Contemporary | Transience of existence | 31 | 203 | 0.79 | 0.81 |
| The Supreme Moment | Charles Simic | 16 | 63 | Free verse | Lyrical | Contemporary | Powerlessness of humans | 54 | 350 | 0.89 | 0.84 |
| Peace | Langston Hughes | 8 | 26 | Quatrain | Direct | War poetry | Futility of war | 23 | 128 | 0.88 | 0.78 |
| A Peck of Gold | R. Frost | 12 | 86 | Quatrain | Lyrical | Modernist | Illusion | 45 | 406 | 0.57 | 0.76 |
| The Freedom of the Moon | R. Frost | 12 | 91 | Short lyric | Lyrical | Contemporary | Awe-inspiring nature | 68 | 493 | 0.77 | 0.81 |
| Stopping by Woods on a Snowy Evening | R. Frost | 16 | 108 | Quatrain | Lyrical | Modernist | Contemplation | 74 | 527 | 0.69 | 0.78 |
| When you Come to me | Maya Angelou | 10 | 41 | Free verse | Introspective | Contemporary | Nostalgia | 34 | 224 | 0.83 | 0.83 |
| Sonnet 116 | Shakespeare | 14 | 109 | Sonnet | Formal | Romantic | Eternity of love | 81 | 566 | 0.75 | 0.8 |
| Apparently with no Surprise | Emily Dickinson | 8 | 36 | Ballad | Narrative | Nature poetry | Transience of life | 33 | 203 | 0.92 | 0.83 |
| Will there really be a "Morning"? | Emily Dickinson | 12 | 76 | Lyric | Playful | Lyric | Wonder and curiosity | 53 | 377 | 0.71 | 0.78 |
| Unable are the Loved to die | Emily Dickinson | 6 | 26 | Tercet | Lyrical | Lyric | Immortality of love | 19 | 135 | 0.8 | 0.8 |
| How happy is the little Stone | Emily Dickinson | 10 | 46 | Quatrain | Lyrical | Nature | Independence and contentment | 40 | 271 | 0.87 | 0.84 |
| Ah! Sun-flower | W. Blake | 8 | 50 | Quatrain | Lyrical | Romantic | Individualism | 41 | 280 | 0.84 | 0.81 |
| The Smile | W. Blake | 16 | 106 | Quatrain | Lyrical | Romantic | Love and deceit | 54 | 473 | 0.53 | 0.75 |
| Love after Love | Derek Walcott | 15 | 98 | Free verse | Introspective | Contemporary | Self-love | 61 | 518 | 0.67 | 0.78 |
| The Last Laugh | Wilfred Owen | 15 | 90 | Free verse | onomatopoeic | War poem | Brutality of war | 71 | 570 | 0.83 | 0.84 |
| Clown in the Moon | Dylan Thomas | 8 | 48 | Quatrain | Lyrical | Lyric | Melancholy | 37 | 241 | 0.77 | 0.78 |

| Title | Author | | | Form | Style | | Theme | | | LD | DSI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Remember | Christina Rossetti | 14 | 111 | P. Sonnet | Lyrical | Lyric | Love, death, remembrance | 66 | 539 | 0.63 | 0.74 |
| When You Are Old | W. B. Yeats | 12 | 100 | Short lyric | Romantic | Romantic | True love | 68 | 506 | 0.7 | 0.79 |
| Aedh wishes for the Cloths of Heaven | W. B. Yeats | 9 | 60 | Free verse | Romantic | Romantic | Love and dreams | 35 | 320 | 0.7 | 0.78 |
| Memory | W.B. Yeats | 6 | 33 | Free verse | Lyrical | Lyric | Transience of youth and beauty | 25 | 163 | 0.82 | 0.79 |
| The Arrow and the Song | H. W. Longfellow | 12 | 88 | Free verse | Narrative | Lyric | Power of words and friendship | 47 | 412 | 0.61 | 0.76 |
| There Will Come Soft Rains | Sara Teasdale | 12 | 91 | Lyric | Lyrical | Lyric | War | 67 | 486 | 0.75 | 0.81 |
| Alone | Sara Teasdale | 12 | 80 | Quatrain | Romantic | Romantic | Solitude | 54 | 391 | 0.7 | 0.78 |
| Ozymandias | P. B. Shelley | 14 | 111 | Sonnet | Romantic | Romantic | Transience of power | 85 | 614 | 0.79 | 0.83 |
| Good-Night | P. B. Shelley | 12 | 75 | Short Quatrain | Romantic | Romantic | Longing for togetherness | 56 | 401 | 0.81 | 0.78 |
| A Lament | P. B. Shelley | 10 | 65 | Short lyric | Ethereal | Lyric | Nostalgia, sadness | 51 | 320 | 0.82 | 0.81 |
| Alas! This Is Not What I Thought Life Was | P. B. Shelley | 9 | 75 | lyric | Introspective | Lyric | Challenges of life | 60 | 366 | 0.82 | 0.8 |
| Fragment: A Wanderer | P. B. Shelley | 4 | 25 | Short Quatrain | Romantic | Romantic | Imagination | 22 | 167 | 0.88 | 0.84 |
| Fragment: Apostrophe to Silence | P. B. Shelley | 9 | 69 | lyric | Introspective | Romantic | Existential longing | 56 | 370 | 0.82 | 0.82 |
| MEDITATION XVII | John Donne | 13 | 81 | Free verse | Metaphysical | Romantic | Interconnectedness of humanity | 57 | 377 | 0.73 | 0.78 |
| Nothing Gold Can Stay | R. Frost | 8 | 40 | Octave | Lyrical | Nature | Impermanence of beauty | 32 | 194 | 0.85 | 0.81 |
| My Heart Leaps Up | W. Wordsworth | 9 | 61 | Quatrain | Lyrical | Nature | Ecstasy with nature's beauty | 42 | 247 | 0.7 | 0.75 |
| I taste a liquor never brewed – | Emily Dickinson | 16 | 81 | Lyric | Playful | Lyric | Joy of nature | 67 | 460 | 0.81 | 0.83 |
| If You Should Go | Countee Cullen | 8 | 44 | Quatrain | Lyrical | Romantic | Transience of love and life | 36 | 226 | 0.82 | 0.76 |

*Note:* W.C.= word count; U.W.= unique words; Char= character; LD= lexical diversity; DSI= divergent semantic integration score

### 2.2.2. Participants

Using the G*Power software (v. 3.1.9.4: Faul et al., 2007), a minimum sample size of 92 was calculated as necessary to detect a medium effect size ($f^2 = 0.15$) in a multiple linear regression, assuming a significance level of 0.05 and a statistical power of 80%. A multilevel model considering 92 cluster groups, with a small to medium effect size (Cohen's d) of 0.3 and 36 observations per cluster, was employed. The 'samplesize_mixed' function in R (https://strengejacke.github.io/sjstats/) determined that 965 total observations were required, corresponding to a minimum of 27 participants (965/36). A total of 129 adult participants were recruited via Prolific. Since the task required approximately one hour to complete, 30 participants were excluded for exceeding the 2-hour time limit. Additionally, three participants were excluded from the analyses due to providing identical responses on the subjective rating measures across the poems. The final sample size ($N$=96, Mean age=31.94 years, SD=13.09) with 3456 observations was deemed adequate in terms of statistical power. The sample consisted of 32 males, 63 females, and one participant who preferred not to specify gender. Considering that some formal training and experience in the target domain are necessary for judges (Amabile, 2018; see also Kaufman et al., 2009), participants with a formal academic degree in English literature were selected as experts. This expert-selection criterion was supported by research in other art domains, such as music and visual art, where experts were chosen based on formal degrees in relevant disciplines (Bhattacharya & Petsche, 2005b; Fudali-Czyż et al., 2018; Kottlow et al., 2011). Therefore, participants holding a formal degree (bachelor's or higher) in English literature were classified as experts, resulting in 39 participants being assigned to the expert group. The remaining 57 participants were classified as nonexperts. Informed consent was obtained from all participants before data collection, and they were compensated £7.50 per hour as a monetary incentive.

### 2.2.3. Procedure

The survey was created, and data were collected online through Qualtrics, with the link distributed via Prolific. Participants were first provided with a broad overview of the study, followed by instructions on how to rate the poems. A sample poem was presented at the outset to facilitate understanding of the evaluation process. Each poem was then shown for 30 seconds, with the titles and authors intentionally withheld to prevent potential bias. After viewing each poem, participants rated the poems on six dimensions: clarity, aesthetic appeal, felt valence, felt arousal, surprise, and creativity, using a 7-point Likert scale ranging from 1 (extremely low) to 7 (extremely high). Additionally, participants were asked to identify

the specific line(s) within each poem that they found most surprising or unexpected. Upon completing the ratings for 36 poems, demographic information was collected, including gender, age, ethnicity, highest educational qualifications, association with English poetry, and affinity toward reading and writing English poetry. The task took an average of 1 hour to complete. The study protocol was approved by the Ethics Committee of the Department of Psychology, Goldsmiths.

## 2.2.4. Analysis

The primary aim of the study was to investigate which of the five subjective ratings—clarity, aesthetic appeal, felt valence, arousal, and surprise—would best predict the overall creativity judgment of poems. General data visualisation and checks included descriptive statistics of the variables, normality checks for the outcome variable, multicollinearity assessments for the independent variables, and an internal consistency check. The results confirmed a normally distributed outcome variable with no concerns regarding multicollinearity among the independent variables (variation inflation factors [VIF] < 3). Internal consistency across items was supported by Cronbach's alpha (.87) and McDonald's omega (Omega hierarchical = .77).

The experimental data, consisting of 3,456 responses (96 participants × 36 poems × 6 ratings), had a common multilevel structure, with responses (Level 1) nested within participants (Level 2). A linear mixed-effects model was considered to explore the variability in between-subject evaluations and within-subject relationships. The null model demonstrated that 54% of the variance was explained by the grouping variable (participants), supporting the use of a linear mixed model over standard regression models to account for the multilevel structure of the data. Furthermore, the intraclass correlation coefficient (ICC = .28) indicated that the Level 1 dependent variable (creativity) was not independent of the Level 2 grouping variable (participants), justifying the use of linear mixed modelling. To identify the most effective predictors of overall creativity judgments of poems, five separate maximum likelihood linear mixed models were run on creativity scores using the *lme4* package (Bates et al., 2015) in R (v4.0.3). Five potential predictors were centred within each subject (i.e., group mean-centred) before being entered into the model to obtain an unambiguous estimate of the within-group effect (Enders & Tofighi, 2007). The five predictors and their interactions with expertise were considered as fixed effects, with intercepts for participants as random effects. The best model fit results identified the predictors of poetic creativity and their interactions with expertise. Additionally, the mediation

effect of variables on the relationship between the strongest predictor and creativity was investigated through a multilevel mediation analysis. This was performed using MLMED, a computational macro for SPSS (Hayes & Rockwood, 2020), with all variables measured at Level 1.

Finally, the objective validation of the subjectively chosen line(s) of surprise was explored using SemDis (Beaty & Johnson, 2021) to quantify the semantic unrelatedness of the chosen lines in relation to the preceding context. The two lines preceding the surprise-evoking line(s) selected by the participants were considered as the reference. The mean SemDis scores were computed using a multiplicative compositional model. This model creates a single vector for a phrase by taking the product of all word vectors, allowing shared semantic dimensions between the component words to receive higher scores and unshared dimensions to receive lower scores (Beaty & Johnson, 2021). The multiplicative model was chosen as it outperforms the additive model in correlating with human ratings of relatedness and creativity (Beaty & Johnson, 2021; Mitchell & Lapata, 2010). Additionally, it substantially mitigates the elaboration bias observed in previous research using semantic distance to capture creativity (Forthmann et al., 2019). All data and analysis code are available on the Open Science Framework repository (https://osf.io/rqxm5/).

# 2.3. Results

## 2.3.1. Descriptive Statistics

Descriptive statistics and bivariate correlations of the prospective predictors are presented in Tables 2.2 and 2.3 respectively. The variables exhibited a slightly left-skewed distribution, as indicated by their negative skewness values approaching zero. Additionally, the near-zero kurtosis values confirmed an approximate normal distribution. The Variance Inflation Factor (VIF < 3) indicated no significant issue of multicollinearity among the variables (Jacob Cohen et al., 2002). VIF is a measure of multicollinearity in a multiple regression model indicating whether there is a strong correlation between multiple independent variables in the regression model. The VIF for a variable is defined for a set of predictor variables by $1/[1-R^2]$ where $R^2$ represents the coefficient of determination for the model predicting the variable from all the other predictor variables.  If the largest VIF >10 then there is a cause for concern (Bowerman & O'connell, 1990; Myers & Myers, 1990; see also Field, 2013). Bivariate correlations showed that creativity was positively and significantly correlated (all $p < .01$) with all five predictor variables: clarity ($r = .42$), aesthetic appeal ($r = .66$), felt valence ($r = .60$), arousal ($r = .47$), and surprise ($r = .52$; Table 2.3).

**Table 2.2**

*Descriptive statistics of the variables, including means, medians, standard deviations,
skewness, kurtosis, standard errors (SE), and variance inflation factor (VIF)*

| Variable | $n$ | $M$ | $SD$ | $Mdn$ | Min | Max | Skewness | Kurtosis | $SE$ | VIF |
|---|---|---|---|---|---|---|---|---|---|---|
| Clarity | 3,456 | 4.82 | 1.58 | 5.0 | 1 | 7 | −0.46 | −0.57 | 0.03 | 1.58 |
| Aesthetic appeal | 3,456 | 4.80 | 1.44 | 5.0 | 1 | 7 | −0.48 | −0.23 | 0.02 | 2.13 |
| Felt valence | 3,456 | 4.50 | 1.62 | 5.0 | 1 | 7 | −0.41 | −0.48 | 0.03 | 2.59 |
| Felt arousal | 3,456 | 3.86 | 1.73 | 4.0 | 1 | 7 | −0.14 | −0.92 | 0.03 | 2.00 |
| Surprise | 3,456 | 3.78 | 1.68 | 4.0 | 1 | 7 | −0.17 | −0.92 | 0.03 | 1.63 |
| Creativity | 3,456 | 4.91 | 1.38 | 5.0 | 1 | 7 | −0.53 | 0.05 | 0.02 | — |

**Table 2.3**

*Bivariate correlations among variables showing the strongest correlation
between aesthetic appeal and creativity*

| Variable | $M$ | $SD$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Clarity | 4.82 | 1.58 | — | | | | |
| 2. Aesthetic appeal | 4.80 | 1.44 | .57* | — | | | |
| 3. Felt valence | 4.50 | 1.62 | .54* | .68* | — | | |
| 4. Felt arousal | 3.86 | 1.73 | .38* | .51* | .64* | — | |
| 5. Surprise | 3.78 | 1.68 | .31* | .43* | .53* | .59* | — |
| 6. Creativity | 4.91 | 1.38 | .42* | .66* | .60* | .47* | .52* |

* $p < .01$.

## 2.3.2. Predictor Model Selection

A forward selection method was used to include variables in the linear mixed model. The
variable with the highest correlation with the outcome variable (creativity) was entered first
into the null model (with no predictors), followed by other variables in descending order of
their correlations with creativity. Thus, the predictor variables were entered in the following
order: aesthetic appeal, felt valence, surprise, arousal, and clarity. Model comparisons
were based on information criteria (e.g., Akaike Information Criterion [AIC] and Bayesian
Information Criterion [BIC]), the proportion of variance explained by fixed effects ($R^2$), and
the likelihood-ratio test statistic ($\Delta\chi^2$). The results indicated that the model comprising
aesthetic appeal, felt valence, and surprise provided the most parsimonious fit ($\Delta\chi^2$ =
289.5, BIC = 9,081.5, $R^2$ = .34, p < .001). Comparison of models based on model-fit
criteria is presented in Table 2.4.

Aesthetic appeal was found to be the strongest predictor (b = 0.31, SE = 0.02, t = 15.16, p
< .001), followed by surprise (b = 0.25, SE = 0.02, t = 14.72, p < .001) and felt valence (b

= 0.20, SE = 0.02, t = 10.27, p < .001), supporting Hypotheses 2a, 4a, and 3a, respectively. A substantial increase in the intraclass correlation coefficient (ICC) for the best-fit model (0.43) was observed, compared to the null model (0.28).

Clarity was found to be a nonsignificant predictor (b = 0.02, SE = 0.02, t = 0.97, p = .33), which did not support Hypothesis 1. As a result, clarity was discarded as a potential predictor of creativity judgment. Although arousal was statistically significant (b = 0.10, SE = 0.02, t = 4.75, p < .001), its inclusion did not improve the model (see Model 4 in Table 2.4), leading to its exclusion as a viable predictor. This outcome did not support Hypothesis 3b. Before discarding clarity and arousal as potential predictors, partial correlation analyses were performed, treating these variables as confounding factors. The partial correlation between aesthetic appeal and creativity, controlling for clarity (r = .42) and arousal (r = .37), indicated a negligible effect of clarity and arousal on the strength of the relationship between aesthetic appeal and creativity. The linear mixed model results for the best-fitting model are presented in Table 2.5.

**Table 2.4**
*Comparison of models using model-fit criteria indicating that the most parsimonious model comprises aesthetic appeal, felt valence, and surprise*

| Model fit criteria | Null model | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|---|
| AIC | 11,160.3 | 9,586.0 | 9,305.5 | 9,020.0 | 9,000.8 | 8,999.5 |
| BIC | 11,178.7 | 9,622.8 | 9,354.7 | 9,081.5 | 9,074.6 | 9,085.5 |
| $R^2$ (m) | .00 | .27 | .30 | .34 | .34 | .34 |
| $\Delta\chi^2$ (df) | | 1,580.3* | 284.5* | 289.5* | 23.1* | 5.3 |

*Note.* Aesthetic appeal, felt valence, surprise, arousal, and clarity are sequentially added to Models 1 through 5. All models are compared hierarchically: Model 1 is compared to the null model, Model 2 is compared to Model 1, and so on. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; $R^2$(m) = proportion of variation explained by fixed effects $\Delta\chi^2$ = likelihood ratio test statistic for model comparison. * p < .001.

**Table 2.5**

*Linear mixed model results for the best model- fit comprising aesthetic appeal, surprise, and felt valence as potential predictors of creativity judgment of poems*

**Fixed effects**

| Predictors | Estimate | SE | df | t | p |
|---|---|---|---|---|---|
| (intercept) | 5.01 | 0.1 | 96 | 50.43 | <.001 |
| Expertise | −0.25 | 0.16 | 96 | −1.58 | .12 |
| Aesthetic appeal | 0.31 | 0.02 | 3,360 | 15.16 | <.001 |
| Felt valence | 0.20 | 0.02 | 3,360 | 10.27 | <.001 |
| Surprise | 0.25 | 0.02 | 3,360 | 14.72 | <.001 |
| Expertise * Aesthetic Appeal | 0.07 | 0.03 | 3,360 | 2.33 | .02 |
| Expertise * Felt Valence | −0.08 | 0.03 | 3,360 | −2.76 | .01 |
| Expertise * Surprise | −0.06 | 0.03 | 3,360 | −2.37 | .02 |

| **Random effects** Groups | Variance | SD |
|---|---|---|
| Participants (intercept) | 0.54 | 0.74 |
| Residual | 0.72 | 0.85 |
| ICC | 0.43 | |
| No. of participants | 96 | |
| Observations | 3,456 | |
| Marginal $R^2$/Conditional $R^2$ | .34/.62 | |

*Note.* ICC = intraclass correlation coefficient.

## 2.3.3. Mediation by Felt Valence and Surprise

Felt valence and surprise were examined as mediators in the same model using parallel (multilevel) mediation, with the assumption that neither mediator causally influences the other. Given that felt valence and surprise may have different implications, their pathways to creativity were independently analysed. It was hypothesised that both felt valence and surprise would mediate the relationship between aesthetic appeal and creativity (Hypotheses 2b and 2d, respectively). Notably, since arousal was no longer considered a potential predictor, it was not included as a mediator.

The within-level indirect effects of aesthetic appeal on creativity through felt valence (b = 0.12, SE = 0.01, z = 11.27, 95% CI [0.1, 0.14]) and surprise (b = 0.10, SE = 0.01, z = 14.62, 95% CI [0.08, 0.11]) were statistically significant, with a proportion of mediation at 26.15% and 21.91%, respectively. The between-level indirect effects of aesthetic appeal on creativity through felt valence (b = 0.01, SE = 0.01, z = 0.08, 95% CI [−0.17, 0.18]) and surprise (b = 0.12, SE = 0.05, z = 2.45, 95% CI [0.03, 0.23]) showed proportions of mediation at 0.88% and 13.29%, respectively. Thus, the relationship between aesthetic appeal and creativity was partially mediated by felt valence within levels and by surprise across levels (see Figure 2.2). The multilevel mediation analysis was conducted using the MLMED macro in SPSS (Rockwood & Hayes, 2017).

**Figure 2.2**

*Parallel multilevel mediation with felt valence and surprise as mediators on the relationship between aesthetic appeal and creativity demonstrates partial mediations by both mediators*
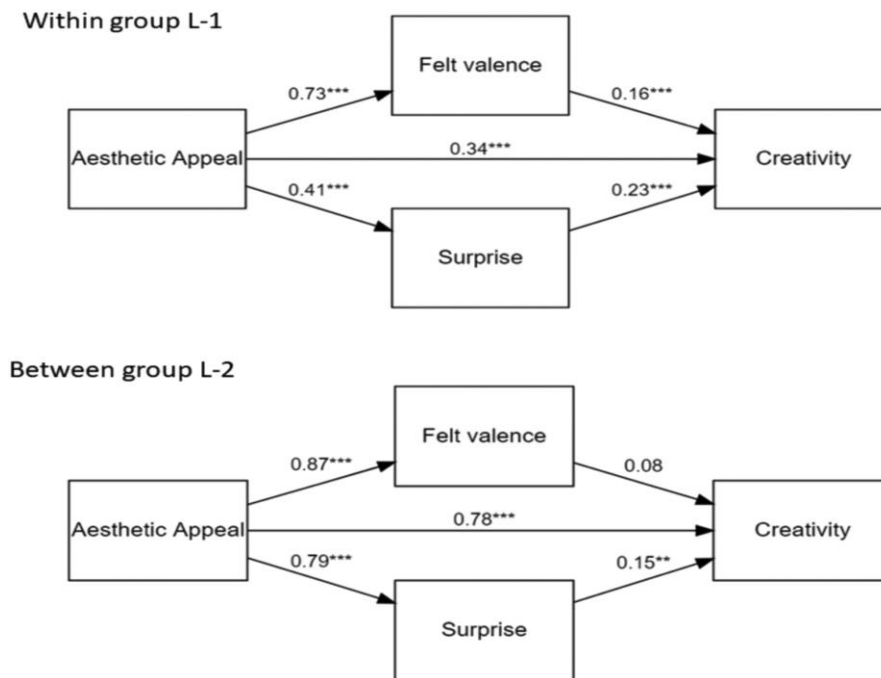


## 2.3.4. Moderating Role of Expertise

Considering a formal degree in English literature as the objective criterion for expertise, a statistically significant expertise-moderated effect was found on all three potential predictors of poetic creativity (see Figure 2.3). Simple slopes analyses (see Table 2.6) reveal that in the relationship between aesthetic appeal and creativity, the slope for nonexperts was $b = 0.31$, $SE = 0.02$, 95% CI [0.27, 0.35], and for experts it was $b = 0.38$, $SE = 0.02$, 95% CI [0.34, 0.43]. The nonoverlapping confidence intervals and the difference in slopes between nonexperts and experts ($b = -0.07$, z ratio = $-2.33$, $p = .02$) indicate a significant expertise-moderated effect.

For the relationship between felt valence and creativity, the slope for nonexperts was $b = 0.20$, $SE = 0.02$, 95% CI [0.16, 0.24], and for experts it was $b = 0.12$, $SE = 0.02$, 95% CI [0.08, 0.16]. The nonoverlapping intervals show a difference in slopes between nonexperts and experts ($b = 0.08$, z ratio = 2.80, $p = .01$), confirming a statistically significant expertise-moderated effect.

In the relationship between surprise and creativity, the slope for nonexperts was $b = 0.25$,

SE = 0.02, 95% CI [0.22, 0.29], and for experts it was b = 0.19, SE = 0.02, 95% CI [0.15, 0.23]. With almost no overlap in the intervals, the difference in slopes between nonexperts and experts (b = 0.06, z ratio = 2.40, p = .02) also indicated a statistically significant expertise-moderated effect.

**Table 2.6**

*The results of the simple slopes analyses for expertise-moderated creativity judgment considering participants (N = 39) with formal degree in English literature as experts*

| | Nonexperts (0) | | | | Experts (1) | | | | Slope difference Expert– Nonexpert | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | b | SE | 95% CI | | b | SE | 95% CI | | b | z-ratio | p-value |
| | | | LCL | UCL | | | LCL | UCL | | | |
| AA | .31 | .02 | .27 | .35 | .38 | .02 | .34 | .43 | .07 | 2.33 | .02 |
| FV | .20 | .02 | .16 | .24 | .12 | .02 | .08 | .16 | -.08 | -2.80 | .01 |
| Sur | .25 | .02 | .22 | .29 | .19 | .02 | .15 | .23 | -.06 | -2.40 | .02 |

*Note*. Degrees-of-freedom method: asymptotic; confidence level used: 0.95. CI = confidence interval; AA = aesthetic appeal; FV = felt valence; Sur = surprise; LCL = lower confidence level; UCL = upper confidence level.

**Figure 2.3**

*The expertise moderated creativity evaluation shows significant moderation by expertise on aesthetic appeal, felt valence, and surprise in judging creativity of poem*
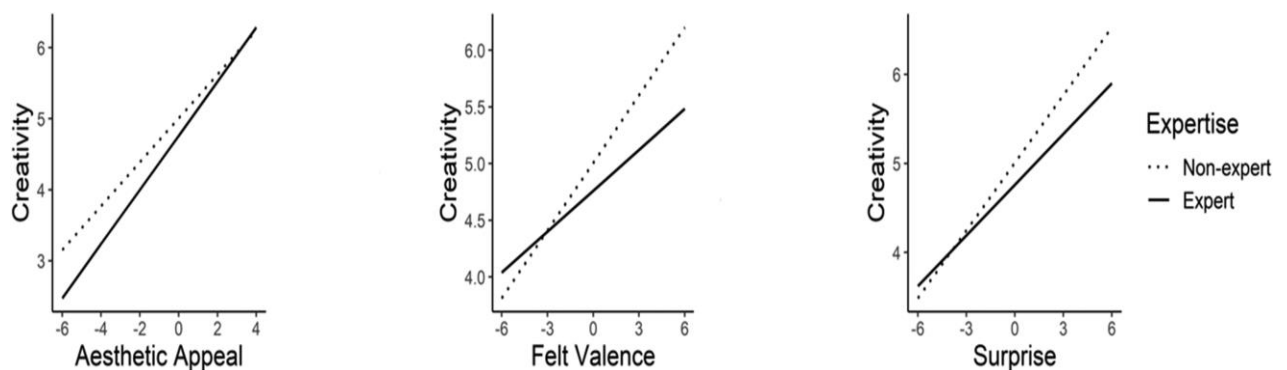


Further, considering a longer association with poetry as a potential subjective criterion for expertise, its influence on the assessment of poetic creativity was examined. Twenty-one participants who reported being associated with English poetry for 10 years or more were classified as experts. The slope analyses (see Table 2.7) indicated overlapping confidence intervals and no statistically significant differences in the slopes for the relationships between aesthetic appeal, felt valence, and surprise with creativity. A comparison of the expertise-moderated effects, based on the two expertise criteria for the judgment of poetic creativity, is presented in Table 2.8.

Furthermore, in the analysis, participants who took more than 2 hours to complete the task were excluded. However, it can be argued that deep contemplation of poems may require individualised, self-paced engagement depending on one's perceptive level. To accommodate this possibility and as a sanity check, the analyses were replicated with a larger sample of 126 participants, disregarding the time taken to complete the task, using both criteria for expertise. With the primary objective criterion of expertise (i.e., participants with a formal degree in English literature, $N = 49$), the best model-fit results were as follows: aesthetic appeal ($b = 0.32$, $SE = 0.02$, $t = 18.81$, $p < .001$), felt valence ($b = 0.20$, $SE = 0.02$, $t = 12.40$, $p < .001$), and surprise ($b = 0.24$, $SE = 0.01$, $t = 16.44$, $p < .001$) significantly predicted poetic creativity.

When long association with poetry was used as the expertise criterion ($N = 32$), the best model-fit results were as follows: aesthetic appeal ($b = 0.33$, $SE = 0.01$, $t = 22.97$, $p < .001$), felt valence ($b = 0.17$, $SE = 0.01$, $t = 12.74$, $p < .001$), and surprise ($b = 0.23$, $SE = 0.01$, $t = 17.68$, $p < .001$) were the significant predictors of poetic creativity. Statistically significant expertise-moderated effects on all predictors in the creativity judgment of poems were observed using the primary objective criterion of expertise (see Table 2.9).

**Table 2.7**

*The results of the simple slopes analyses for expertise-moderated creativity judgment considering participants (N= 21) with long association (>=10 Years) with English poetry as experts*

| | Nonexperts (0) | | | | Experts (1) | | | | Slope difference Nonexpert– Expert | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | *b* | *SE* | 95% CI | | *b* | *SE* | 95% CI | | *b* | *z-ratio* | *p-value* |
| | | | *LCL* | *UCL* | | | *LCL* | *UCL* | | | |
| AA | .34 | .02 | .31 | .38 | .33 | .03 | .26 | .40 | .01 | .34 | .74 |
| FV | .16 | .02 | .13 | .19 | .19 | .04 | .12 | .26 | -.04 | -.92 | .36 |
| Sur | .24 | .01 | .21 | .26 | .21 | .03 | .15 | .27 | .02 | .73 | .47 |

*Note.* Degrees-of-freedom method: asymptotic; Confidence level used: 0.95. Exp = Expertise, AA = Aesthetic appeal, FV = Felt valence, Sur = Surprise; LCL = Lower confidence level; UCL = Upper confidence level; Confidence level used: 0.95.

**Table 2.8**

*Comparison of moderation results (N=96) with two different criteria of expertise indicates that expertise in English literature significantly moderates aesthetic appeal, felt valence and surprise whereas long association with poetry (>= 10 years) does not moderate any of the predictors*

| | Expertise criteria (*N*=96) | | | | | | | |
| | Formal degree in English(*N*=39) | | | | >= 10 years of association(*N*=21) | | | |
| Model | b | SE | t-val | p-val | b | SE | t-val | p-val |
|---|---|---|---|---|---|---|---|---|
| Exp*AA | .07 | .03 | 2.33 | .02 | -.01 | .04 | .34 | .74 |
| Exp*FV | -.08 | .03 | -2.76 | .01 | .04 | .04 | -.92 | .36 |
| Exp*Sur | -.06 | .03 | -2.37 | .02 | -.02 | .03 | -.73 | .47 |

*Note.* Exp = Expertise, AA = Aesthetic appeal, FV = Felt valence, Sur = Surprise.

**Table 2.9**

*Comparison of moderation results (N=126) with two different criteria of expertise indicates that expertise in English literature significantly moderates aesthetic appeal, felt valence and surprise and long association with poetry (>=10 years) moderates aesthetic appeal and surprise*

| | Expertise criteria (*N* =126) | | | | | | | |
| Interaction (Fixed Effects) | Formal degree in English (*N* = 49) | | | | >= 10 years of association (*N* =32) | | | |
| | b | SE | t-value | p-value | b | SE | t-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Exp*AA | .06 | .03 | 2.22 | .03 | .07 | .03 | 2.16 | .03 |
| Exp*FV | -.05 | .02 | -2.19 | .03 | .04 | .03 | 1.17 | .24 |
| Exp*Sur | -.06 | .02 | -3.46 | <.001 | -.06 | .03 | -2.04 | .04 |

## 2.3.5. Objective validation of Subjective Ratings of Surprise

A linear mixed model revealed a significant relationship between surprise scores (outcome variable) and SemDis scores (independent variable), with participants as the grouping variable (b = 1.22, SE = 0.07, t = 17.43, p < .001). This result supported Hypothesis 4b, indicating that the subjectively chosen lines of surprise had significant objective validation. Additionally, a sensitivity analysis was conducted using an alternative scoring method, open creativity scoring (OCS: Organisciak & Dumas, 2020; Dumas et al., 2021), with the semantic model approach. The results confirmed that OCS scores significantly predicted surprise ratings (b = 2.18, SE = 0.10, t = 22.28, p < .001; see Table 2.10).

**Table 2.10**

*Linear mixed model results with surprise scores as outcome variable and mean semantic distance scores between subjectively chosen surprise-evoking line(s) and the two preceding lines as independent variables, showing significant prediction of surprise ratings by both SemDis and OCS scores.*

| | SemDis | | | | OCS | | | |
|---|---|---|---|---|---|---|---|---|
| Measure | *b* | *SE* | *t* | *p* | *b* | *SE* | *t* | *p* |
| Intercept | 3.78 | 0.11 | 33.22 | <.001 | 3.78 | 0.11 | 33.22 | <.001 |
| Scores | 1.22 | 0.07 | 17.43 | <.001 | 2.18 | 0.10 | 22.28 | <.001 |

*Note.* OCS = open creativity scoring (Organisciak & Dumas, 2020).

# 2.4. Discussion

In the present study, the evaluation of poetic creativity was investigated by examining the role of several subjective qualities—aesthetic appeal, clarity, felt valence, felt arousal, and surprise—in predicting overall creativity judgments across a broad range of English poems. The results revealed that aesthetic appeal emerged as the strongest predictor, followed by surprise and felt valence. Notably, clarity and arousal did not significantly contribute to predicting creativity beyond these three key predictors. Additionally, multilevel mediation analysis indicated that felt valence and surprise significantly and partially mediated the effect of aesthetic appeal on creativity, both within and between participant levels. Expertise in English literature also played a significant moderating role in the relationship between creativity and all three predictors. Moreover, the semantic unrelatedness between the surprise-evoking line(s) and the two preceding lines significantly predicted surprise scores, providing objective validation for the subjectively chosen lines of surprise. These findings, along with the study's limitations, are briefly discussed in the following sections.

## 2.4.1. Aesthetic Appeal, Surprise, and Felt Valence Predict Poetic Creativity

The most parsimonious model for predicting the creativity judgment of poems consisted of three key predictors: aesthetic appeal, surprise, and felt valence (in decreasing order of importance). Aesthetic appeal has been studied in the context of poetry, with research examining how it is predicted by psychological states such as valence, vividness of imagery, and arousal (Belfi et al., 2018; Mehl et al., 2023; Hitsuwari & Nomura, 2022b). In this study, aesthetic appeal was found to be the strongest predictor of poetic creativity

evaluation, demonstrating for the first time its robust predictive power in the judgment of poetic creativity. It is thus proposed that the subjective and intuitive perception of a poem's creative potential is primarily assessed through an appreciation of its aesthetic appeal. Surprise was the second-best predictor of poetic creativity, supporting the three-criterion definition of creativity, with surprise as a key component (Simonton, 2012). Surprise in a poem was operationalised as a violation of expectancy within the poem's concept or context. Sudden shift or twist in the theme may break the monotony of the poem, leading to greater cognitive engagement through interest and curiosity. In this context, surprise likely acts as a novelty-detecting and interest-evoking construct when evaluating poetic creativity. The abrupt change in context and/or theme of the poem may have cognitively engaged readers, sparking creative thinking in their judgment of the poem's creativity.

Hence, it is proposed that, similar to other creative products, the evaluation of poetic creativity can be predicted by its surprise content. Additionally, semantic unrelatedness as measured by SemDis (Beaty & Johnson, 2021), significantly predicted subjective surprise ratings, providing objective validation for the subjectively chosen surprise-evoking line(s). The results from analyses using another computational method, e.g., open creativity scoring (Dumas et al., 2021) further validated the results. Therefore, it is justifiable to state that the subjectively chosen lines were not selected randomly, and surprise ratings can be objectively verified based on semantic unrelatedness.

The third strong predictor in the most parsimonious model was felt valence, supporting our hypothesis. Poetry evokes emotion, and literature suggests that valence influences aesthetic appreciation (Leder & Nadal, 2014). The findings indicated that the feeling of positive or negative valence positively influences readers' judgment, cognition, and receptivity to the novel aspects of the poem, thereby enhancing the creativity evaluation process. The judgment of a poem's creativity is considered a higher-order interpretation that occurs during later stages of information processing and often relies on the poem's representational content (Leder et al., 2012). Positive emotional valence was found to enhance the appreciation of poems, particularly in relation to poetry-specific ideas, concepts, and potentially the abstractness of the poem. Thus, this emotional positivity plays a crucial role in shaping how poetic creativity is evaluated.

However, contrary to the hypothesis, although clarity exhibited a moderately high correlation with creativity ($r = .42$), it did not emerge as a significant predictor of creativity. Additionally, the partial correlation between aesthetic appeal and creativity, while controlling for clarity, supported the redundancy of clarity as a contributory factor in judging the creativity of a poem. Clarity, distinct from readability, decreases with

abstraction, technical language, and passive writing, while knowledge increases the use of these parameters (Warren et al., 2021). Thus, it may be argued that the creative evaluation of poetry, as a high-level cognitive construct, necessitates the inclusion of abstraction, technicality, and passive writing in its assessment. Nevertheless, the way clarity was included in this study suggested it to be a relatively low-level construct for judging the creativity of poetry. However, it remains unclear whether a sense of understanding or comprehension is essential for such judgment.

Furthermore, despite having a reasonably high correlation with creativity (r = .47) and showing statistically significant results in the model building, arousal did not substantially improve the model. In short, arousal did not noticeably enhance the explanatory or predictive power. The aim of the model selection was to minimise the number of predictors while accounting for maximum variance in the criterion. The higher unexplained variance associated with arousal indicated a weaker strength of its relationship with creativity.

## 2.4.2. Felt Valence, Surprise Partially Mediate Aesthetic Appeal–Creativity Link

The multilevel mediation analysis revealed that the relationship between aesthetic appeal and poetic creativity was partially mediated by felt valence and surprise, particularly at the within-participant level. The significant partial mediation by valence aligns with earlier studies, emphasising the crucial role of subjective emotional appraisal in the aesthetic experience (Chatterjee & Vartanian, 2014; Leder et al., 2004). The partial mediation by surprise indicated that surprise, as an interest-evoking construct operationalised through expectancy violation, influenced the link between aesthetic appeal and creativity. Both mediators exhibited stronger partial mediation effects at the within-participant level, demonstrating variations in felt valence and surprise evaluations within the population. However, felt valence showed a higher mediation effect than surprise, suggesting that aesthetic appeal predicted poetic creativity primarily through the influence of valence. In other words, as the aesthetic appeal increased, individuals experienced more positive valence when evaluating a poem's creativity.

## 2.4.3. Expertise Moderates Creativity Judgment

A significant moderating effect of expertise on the creativity ratings of poems was observed. Expertise, defined by formal education in English literature, significantly

moderated all three predictors' influence on poetic creativity, supporting the hypotheses. The positive effect of aesthetic appeal on creativity was stronger for experts, suggesting a more pronounced impact on their creativity judgments compared to naïve readers, likely due to their greater ability to process style-based information, including aesthetics. However, the effect size of the interaction was small, potentially due to two factors. Firstly, a relatively narrow range of expertise was tested in this study. Inclusion of participants with higher levels of expertise, such as eminent poets, poetry critics, or English literature academics, might have resulted in stronger effects. Secondly, experts were more likely to hold an art bias compared to nonexperts (Glăveanu, 2014), which may explain why the contemplative appreciation of the aesthetic appeal of the chosen poems did not show significant differences between the two groups. These findings suggest a possible overlap between domain-specific and domain-general factors in the aesthetic appreciation of poetry when evaluating its creativity.

A significant moderating effect of expertise on felt valence was observed, supporting the hypothesis. The positive influence of felt valence on creativity was more subdued for experts. The steeper gradient of the impact of felt valence on creativity ratings among nonexperts indicated that felt valence had a more pronounced influence on their creativity judgments compared to experts. This finding aligns with previous research showing that experts tend to display an attenuated response to valence compared to laypeople (Leder et al., 2014), further supporting the notion that poetry engages the minds of experts more intellectually while evoking stronger emotional responses in nonexperts (Cartocci et al., 2021). Considering that emotion is a strong predictor of preference across various art forms (Leder et al., 2012), it could be argued that nonexperts' judgments of emotional valence might involve their personal liking or preference. In contrast, experts, driven by their knowledge-based skills, appeared to judge the creativity of poems from a more intellectual and cognitively nuanced perspective. This highlights a clear interplay between cognitive and emotional processes in both experts and nonexperts when evaluating poetic creativity. Although emotional experience is recognised as playing a central role in aesthetic viewing (Chatterjee, 2003), it was found in this study to negatively influence the creativity judgment of experts in high-level literary domains like poetry, compared to nonexperts. It should be noted that felt valence, rather than perceived valence, was rated by participants in this study. Had perceived emotion been measured, it is possible that experts would have considered it more as a poetic construct rather than a self-representing one in their judgment of poetic creativity.

A significant moderating effect of expertise on surprise was observed, supporting the hypothesis. The positive effect of surprise on creativity was increasingly dampened for

experts compared to nonexperts. As an interruption mechanism and short-lived emotion (Meyer et al., 1997), surprise may disrupt the flow of thoughts in experts when evaluating poetry. Evidence from the field of music suggests that, strictly deterministic and ordered patterns are perceived as boring, while random patterns are perceived as unstructured and featureless (Abdallah & Plumbley, 2009). Therefore, this study could speculate that an excessive increase in entropy and surprisingness within a poem may appear disorganised and less engaging to experts, reducing the impact of surprise on their creativity judgment. In contrast, surprise had shown a more favorable impact on creativity judgment for nonexperts than experts. This result may seem somewhat incongruent with the three-criterion definition of creativity (Simonton, 2012). While surprise emerged as the second-most significant predictor of poetic creativity, indicating a positive linear relationship that aligns with the 3-criterion definition of creativity, the expertise-moderated effects on surprise showed that this positive relationship was considerably stronger for nonexperts than experts. Nonexperts perceived surprise as a more impactful and influential parameter for evaluating poetic creativity than experts. Therefore, these findings would not undermine the consistency of the three-criterion definition of creativity but suggest that the experimental design of the study exhibited greater consistency with this definition among nonexperts compared to experts.

Therefore, this study suggests that the perception of poetry varies among readers with varying levels of expertise. Experts tended to prioritise the processing of aesthetic appeal, focusing on skill-dependent artistic features of poetry. On the other hand, nonexperts placed greater emphasis on the emotional valence and surprise experienced while judging the creativity of the poem. Considering poetry and music are known to evoke emotions and create aesthetic appeal for readers and listeners (Juslin & Västfjäll, 2008; Wassiliwizky et al., 2017), it is plausible to speculate that readers' experiences with poetry may share some similarities with the experiences of listeners. Studies suggest that even basic listening can lead to the development of musical knowledge and the emergence of 'experienced' listeners (Bigand & Poulin-Charronnat, 2006; Koelsch, 2014). Drawing on this idea, while interpreting the modest interaction of expertise, it can be argued that nonexperts in this study might have had a basic habit of reading, which could have enabled them to evaluate the aesthetic appeal of poetry at par with the experts while judging poetic creativity. In line with previous research (Bhattacharya & Petsche, 2005b; Fudali-Czyż et al., 2018; Kottlow et al., 2011), a formal degree in English literature was considered the primary objective criterion for expert selection. However, extended familiarity with poetry was also explored as a potential subjective criterion for expertise, but no expertise-moderated effect was observed. It should be noted that the generalisability of these findings may be limited, as

age could have been an influencing factor, given that longer association with poetry is more common among older individuals. Additionally, the imbalance in group sizes, with a much smaller number of experts (N = 21) compared to nonexperts (N = 75), may have reduced the statistical power to detect differences in slopes, that is, the moderation effect. Nevertheless, a broader sample of 126 participants, which enhanced ecological validity, substantiated the predictor model of poetic creativity and the expertise criterion, confirming the robustness of these findings.

### 2.4.4. Limitations and Future Scope of Work

The present study is subject to several potential limitations. First, felt emotions were measured, referring to the emotions participants experienced while reading a poem. This contrasts with previous studies, which measured perceived emotions—the emotions evoked by the stimuli, or the emotional content of a poem (Aryani et al., 2016; Belfi et al., 2018). Since perceived and felt emotions may differ (Gabrielsson, 2001; Marin & Bhattacharya, 2010), future research could investigate whether perceived emotion would serve as a predictor of a poem's creativity. Since experts were more focused on the content and style of a poem rather than on felt emotions, it would be valuable to explore whether experts consider poetry-elicited or perceived emotions as the key factor in judging poetic creativity. Second, the model did not include any trait-level components or personality features. Research suggests a kind of "taste typicality" of the aesthetic experience of ordinary scenes and objects (Chen et al., 2022); on the other hand, substantial individual differences exist in the aesthetical evaluation of poems. For example, for haiku and sonnets, individual differences in visual imagery abilities were found to moderately predict their aesthetic appeal (Belfi et al., 2018) and visual imagery ability, awe-proneness, and nostalgia-proneness were shown to predict haiku's aesthetic appeal (Hitsuwari & Nomura, 2022b). Future research could explore how individual differences in personality traits might influence the evaluation of poetic creativity, potentially offering deeper insights into the variability of creativity judgments across readers. Third, this model focused on the influence of context or appeal-based characteristics of poetry without specifically exploring morphological structure such as, rhythm, rhyme, meter, form, genre, or other aspects that set poetry apart from other forms of writing. The experimental stimuli were also not restricted regarding length, rhythmic pattern, or specific forms, such as the sonnet, haiku, or limerick. The number of poems in this study was insufficient to explore the genre and form-specific effects. However, it is important to acknowledge that such poem-based aspects may affect the evaluation of poetic creativity. Fourth, the order of ratings was not randomised. As each participant had to provide six ratings for each of the 36 poems, that is, 216 responses in total,

the decision was made to maintain a consistent order to keep participants in a flow and avoid confusion caused by randomization. However, the potential for an order effect could not be ruled out. Finally, "familiarity" was not addressed in this study. Familiarity could be a potential bias in judgment as it enhances processing fluency, leading to preferences (Reber et al., 1998) and influencing perceptual characteristics (Goldinger et al., 1999). However, greater processing fluency also contributes to a better understanding of an art- work's meaning (Lindell & Mueller, 2011). Future studies could consider investigating the moderating role of familiarity in predicting creativity judgment of poetry.

### 2.4.5. Conclusion

The evaluation of creative potential of a poem is recognised as a multifaceted process, influenced by subjective qualities such as aesthetic appeal, surprise, and emotional valence. The present study contributes to the field of creativity research by addressing the relatively understudied areas of domain specificity and evaluation, which have often been overlooked in favour of domain-general creative generation. To our knowledge, this is the first study to investigate potential predictors of creativity judgments for poems. Moreover, the study highlights the clear interplay between cognitive and emotional processes in both experts and nonexperts within the evaluation mechanism.

### 2.4.6. Looking Ahead: Individual Differences in Creativity Evaluation

While the findings of this study shed light on how specific factors contribute to the evaluation of poetic creativity, a deeper understanding of these judgments must also account for individual differences among readers, acknowledging the inherent subjectivity of art evaluation. Moving beyond general predictors of creativity, it is crucial to explore how cognitive and emotional processes are shaped by individual personality traits. The next chapter extends the analysis of the same dataset to investigate how individual differences influence the evaluation of poetic creativity. By examining the interplay between cognitive and emotional processes across diverse personality dimensions, it aims to provide a more detailed understanding of the variability in creativity judgments.

# CHAPTER 3


# INDIVIDUAL DIFFERENCES IN CREATIVITY JUDGMENT


*"Strength lies in differences, not in similarities."*

*– Stephen Covey*


## 3.1. Introduction

In the previous chapter, the discussion centred on identifying subjective predictors of poetic creativity, such as aesthetic appeal, the element of surprise, and the emotional valence experienced by readers. While these factors provide valuable insights into the parameters that influence creativity judgments, they do not fully account for the significant variability in how individuals perceive and evaluate poetry. The essence of a poem's impact lies in its ability to connect with readers on a deeply personal level we appreciate poetry most when it resonates with our thoughts and emotions (Christina Ribeiro, 2012). As the saying goes, *"Beauty is in the eye of the beholder"*(Hungerford, 1878), highlighting the inherently subjective nature of aesthetic appreciation—a principle that applies equally to creativity judgment of poetry. The creative value attributed to a poem varies significantly among individuals, influenced by their unique life experiences, knowledge, and interpretive abilities, which contribute to the variability in creativity judgments. While one reader may find a poem creative and captivating, another might perceive it as ordinary or unremarkable. In general, when assessing creativity of any product or concept, individuals often rely on personal mental rubrics shaped by their knowledge, references, and personality traits (Bejar, 2012). In the realm of poetry also, these individual differences are likely to affect readers' overall judgments of a poem's creativity.

Building on the findings discussed in the previous chapter, this study investigates how readers' internal frameworks, shaped by their personality traits, influence their subjective experiences and judgments of poetic creativity. Specifically, it examines the role of personality traits in shaping both readers' engagement with poetry and their evaluations of its creative merit. This exploration seeks to bridge the gap between general predictors of creativity and the nuanced, personal ways in which poetry is experienced, interpreted, and

judged.

Personality traits are basic dimensions on which individuals differ, reflecting their characteristic patterns of thoughts, feelings, and behaviours with consistency and stability (Diener & Lucas, 2019; Matthews et al., 2003). Several studies have explored the link between personality traits and creativity (Barron & Harrington, 1981; Feist, 1998; Feist & Barron, 2003; Batey & Furnham, 2006). Significant positive correlations have been observed between different measures of creativity and Big Five personality traits (DeYoung, 2015; Kaufman et al., 2016; Silvia et al., 2009), especially with openness to experience (McCrae, 1987; Tan et al., 2019; Dollinger et al., 2004). A meta-analysis by Feist (1998) identified openness to experience as the predominant personality trait consistently positively correlated with the creative potential of individuals in both the Arts and Sciences. Research also suggests that openness to experience is positively correlated with rater discernment ability to distinguish creative from uncreative responses - open people do not merely rate all responses as more creative rather, they are better at identifying genuinely creative ideas, thereby demonstrating higher overall discernment (Ceh et al., 2022; Silvia, 2008). Another recent study highlights how an individual's consideration of the novelty and usefulness of creativity task responses is influenced by contextual factors and individual differences, such as openness and intellect, in overall creativity judgment (Lloyd-Cox et al., 2022). Additionally, positive emotions, such as curiosity—defined as the desire to know (Berlyne,1954;Loewenstein,1994)—have consistently demonstrated a significant correlation with creativity across multiple studies, as evidenced by their weighted effect sizes (Schutte & Malouff, 2020a). Awe, another positive emotion, has been linked to creative thinking (Chirico et al., 2018). These studies focused primarily on the relationship between personality traits and various creative idea-generation processes, such as divergent thinking, everyday creative behaviour, creative achievement, and self-rated creativity. However, the influence of personality traits on the evaluation of creativity of poetry has not been adequately explored. Notably, some studies have found that individual differences in visual imagery abilities, ambiguity tolerance, awe-proneness, and nostalgia-proneness predict the aesthetic appeal of specific forms of poems like haiku and sonnets (Belfi et al., 2018; Hitsuwari & Nomura, 2022b; Hitsuwari & Nomura, 2023).

In previous chapter, aesthetic appeal, felt valence, and surprise were identified as key predictors of poetic creativity. Building on these findings and consistent with prior literature, the current chapter focuses on how four specific personality traits—openness, intellect, awe-proneness, and epistemic curiosity—moderate the influence of these predictors on creativity judgments and shape the evaluation process. In the following sections, a brief

overview of the personality traits under consideration and their potential roles in evaluating creativity is provided.

### 3.1.1. Openness and Intellect

Openness to experience is a broad range of traits, from intellectual abilities to aesthetic and artistic interests (Oleynick et al., 2017; DeYoung et al., 2012; Chamorro-Premuzic et al., 2009), and is most robustly associated with measures of creativity (McCrae, 1996). It influences a variety aspects of art domains, including vivid fantasy (Sánchez-Bernardos & Avia, 2004), artistic sensitivity, novelty in artworks, aesthetic emotions (Fayn et al., 2015), intellectual curiosity (Silvia & Christensen, 2020), and unconventional attitudes (McCrae, 1996). Openness and intellect, though characterised as a unified dimension of personality, can be differentiated into two major aspects: openness and intellect (DeYoung et al., 2007, 2009). Based on different styles of cognitive exploration, openness reflects the tendency to engage with aesthetic and sensory information, both in perception and imagination. On the other hand, intellect is a dispositional individual difference variable related to intellectual performance, such as problem-solving, thinking, information search, learning, or creativity (Oleynick et al., 2017; Mussel, 2013). Further, openness has been identified as a predictor of creative accomplishments in the arts, whereas intellect predicts creative achievements in the sciences (Kaufman et al., 2016). Therefore, in this study, openness and intellect were expected to have separate impacts on the relationship between aesthetic appeal and creativity ratings of a poem. Research consistently demonstrates that individuals with higher levels of openness are drawn to art in general and exhibit greater appreciation for unconventional artistic expressions (Chamorro-Premuzic et al., 2009; Furnham & Walker, 2001a, 2001b). Considering high openness as a characteristic of the "artistic personality" (Chamorro-Premuzic et al., 2009), it was predicted that individuals with greater openness would prioritise aesthetic appeal while assessing creativity of a poem compared to those with lower level of openness. Considering intellect's association with abstract or semantic information processing (DeYoung et al., 2009), and recognising that the underlying meaning or message conveyed through a poem's language contributes to its overall aesthetic quality, it was expected that individuals with higher intellect would place greater emphasis on aesthetic appeal when assessing poetic creativity.

Individuals with higher openness are known to be more sensitive and attuned to their feelings (Costa & McCrae, 1992), yet intense emotional engagement can sometimes

inhibit higher cognitive functions in these individuals (Siegel, 2020). Neurological studies suggest that heightened emotional states can inhibit the brain's reflective processes, affecting intellectual openness (Siegel, 2020; see also Jarvinen & Paulus, 2017). Hence, it was expected that the relationship between felt emotions (both valence and arousal) and creativity would be moderated by openness. Specifically, the positive impact of felt emotions on creativity ratings was anticipated to be perceived as less pronounced by individuals with higher levels of openness compared to those with lower levels of openness. Considering intellect's link to complex information processing (DeYoung et al., 2014, 2015), it was further expected that intellect would not moderate the relationship between felt emotions and creativity evaluations, suggesting that the influence of emotions on creativity judgments would remain consistent, regardless of individuals' levels of intellect.

Surprise, often triggered by unexpected or schema-discrepant events, requires significant cognitive engagement to assess violations of expectancy in poetry (Berlyne, 1961; Meyer et al.,1991, 1997). It was predicted that both openness and intellect would moderate the relationship between surprise and creativity. Specifically, individuals high in open-mindedness and intellectual curiosity were expected to exhibit heightened receptivity and interest in unexpected elements within poems. This inclination was anticipated to lead them to prioritize surprise when assessing the creativity of poems, in contrast to those with lower levels of openness and intellect.

### 3.1.2. Awe-proneness

Awe, classified as an epistemic emotion, is a distinct emotional response to encountering something vast, both literally and figuratively, and requires cognitive accommodation (Keltner & Haidt, 2003). Poetry is likely to elicit awe due to its rich informational content, and dispositional awe-proneness has been significantly correlated ($r = 0.49$) with openness to experience (Shiota et al., 2007). Further, higher dispositional awe has been positively associated with aesthetic engagement and a tendency to experience aesthetic chills (Williams et al., 2022), which are transient emotional responses to aesthetical stimuli, manifesting as chills or waves of excitement when engaging with poetry or art (Costa & McCrae, 2008).  Since awe is linked to surprise and amazement, and interpreted as a passive, receptive mode of attention in response to the unexpected (Keltner & Haidt, 2003), it was predicted that dispositional awe-proneness would moderate the effect of aesthetic appeal and surprise on a poem's creativity scores. Specifically, it was anticipated

that the impact of aesthetic appeal and surprise on creativity ratings would be more pronounced in individuals with higher levels of awe-proneness. Due to their disposition, these individuals were expected to be more open and responsive to a poem's aesthetic qualities and unexpected elements, leading them to attribute higher creativity to such poems.

### 3.1.3. Epistemic Curiosity

Curiosity is a motivating positive emotion (Fredrickson, 1998) and an intense desire to explore novel, complex and uncertain events (Berlyne, 1966). It is associated with learning and thinking processes and linked to various constructs such as interest, surprise, confusion, and awe (Keltner & Shiota, 2003; Kashdan & Silvia, 2009). Curiosity can be categorised into two broad types: perceptual curiosity and epistemic curiosity ; perceptual curiosity leads to increased perception of stimuli, and epistemic curiosity is defined as a "drive to know" (Berlyne, 1954). Epistemic curiosity motivates individuals to engage in exploratory behaviours to bridge the gap between their existing knowledge and their desire for further understanding (Loewenstein, 1994; Litman & Spielberger, 2003; Litman et al., 2005). Also, highly open individuals tend to be curious about the world (McCrae & Costa, 1997; Kashdan et al., 2004, 2009, 2018). It was therefore predicted that epistemic curiosity would significantly moderate the relationship between aesthetic appeal and creativity, as well as between surprise and creativity. Specifically, the positive impact of aesthetic appeal and surprise on creativity scores was expected to be more pronounced in individuals with higher levels of epistemic curiosity. Driven by their curiosity, these individuals were anticipated to be more inclined to appreciate the aesthetic qualities and unexpected elements in a poem, thereby attributing higher levels of creativity to such poems.

## 3.2. Materials and Methods

### 3.2.1. Experimental Stimuli

This study utilised the same set of 36 poems as in the previous study. For ease of reference, the selection method is briefly outlined again here. Initially, 108 English poems spanning various genres, themes, and periods were sourced from online platforms such as Poetry.org

(http://www.poetry.org/), the Poetry Foundation (https://www.poetryfoundation.org/), and the Academy of American Poets (https://poets.org/).  These poems were evaluated for their level of "surprise" by an award-winning poet and senior professor of English and creative writing, using a 7-point scale (1 = "absolutely not surprising" to 7 = "absolutely surprising"). Based on these evaluations, 36 poems were selected as experimental stimuli: 18 with low surprise ratings (4 or lower) and 18 with high surprise ratings (6 or above). The final set of poems varied in structure, content, line count, and word count (mean lines = 11, SD = 3.24; mean word count = 71.25, SD = 28.99). The detailed information about the poems, including their genre, theme, structure, lexical diversity (TTR), and semantic diversity (DSI), is provided in Table 3.1.

**Table 3.1**

*Details of the poems used in the study*

| Poem Title | Poet | Lines | W.C. | Form | Style | Genre | Theme | U. W. | Char | LD | DSI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Funeral Blues | W. H. Auden | 16 | 136 | Quatrain | Elegiac | Modernist | Grief | 101 | 708 | 0.74 | 0.81 |
| At the Same Time | W.S. Merwin | 10 | 39 | Free verse | Reflective | Contemporary | Transience of existence | 31 | 203 | 0.79 | 0.81 |
| The Supreme Moment | Charles Simic | 16 | 63 | Free verse | Lyrical | Contemporary | Powerlessness of humans | 54 | 350 | 0.89 | 0.84 |
| Peace | Langston Hughes | 8 | 26 | Quatrain | Direct | War poetry | Futility of war | 23 | 128 | 0.88 | 0.78 |
| A Peck of Gold | R. Frost | 12 | 86 | Quatrain | Lyrical | Modernist | Illusion | 45 | 406 | 0.57 | 0.76 |
| The Freedom of the Moon | R. Frost | 12 | 91 | Short lyric | Lyrical | Contemporary | Awe-inspiring nature | 68 | 493 | 0.77 | 0.81 |
| Stopping by Woods on a Snowy Evening | R. Frost | 16 | 108 | Quatrain | Lyrical | Modernist | Contemplation | 74 | 527 | 0.69 | 0.78 |
| When you Come to me | Maya Angelou | 10 | 41 | Free verse | Introspective | Contemporary | Nostalgia | 34 | 224 | 0.83 | 0.83 |
| Sonnet 116 | Shakespeare | 14 | 109 | Sonnet | Formal | Romantic | Eternity of love | 81 | 566 | 0.75 | 0.8 |
| Apparently with no Surprise | Emily Dickinson | 8 | 36 | Ballad | Narrative | Nature poetry | Transience of life | 33 | 203 | 0.92 | 0.83 |
| Will there really be a "Morning"? | Emily Dickinson | 12 | 76 | Lyric | Playful | Lyric | Wonder and curiosity | 53 | 377 | 0.71 | 0.78 |
| Unable are the Loved to die | Emily Dickinson | 6 | 26 | Tercet | Lyrical | Lyric | Immortality of love | 19 | 135 | 0.8 | 0.8 |
| How happy is the little Stone | Emily Dickinson | 10 | 46 | Quatrain | Lyrical | Nature | Independence and contentment | 40 | 271 | 0.87 | 0.84 |
| Ah! Sun-flower | W. Blake | 8 | 50 | Quatrain | Lyrical | Romantic | Individualism | 41 | 280 | 0.84 | 0.81 |
| The Smile | W. Blake | 16 | 106 | Quatrain | Lyrical | Romantic | Love and deceit | 54 | 473 | 0.53 | 0.75 |
| Love after Love | Derek Walcott | 15 | 98 | Free verse | Introspective | Contemporary | Self-love | 61 | 518 | 0.67 | 0.78 |
| The Last Laugh | Wilfred Owen | 15 | 90 | Free verse | onomatopoeic | War poem | Brutality of war | 71 | 570 | 0.83 | 0.84 |
| Clown in the Moon | Dylan Thomas | 8 | 48 | Quatrain | Lyrical | Lyric | Melancholy | 37 | 241 | 0.77 | 0.78 |

| | | | W.C. | | | | | U.W. | Char | LD | DSI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Remember | Christina Rossetti | 14 | 111 | P. Sonnet | Lyrical | Lyric | Love, death, remembrance | 66 | 539 | 0.63 | 0.74 |
| When You Are Old | W. B. Yeats | 12 | 100 | Short lyric | Romantic | Romantic | True love | 68 | 506 | 0.7 | 0.79 |
| Aedh wishes for the Cloths of Heaven | W. B. Yeats | 9 | 60 | Free verse | Romantic | Romantic | Love and dreams | 35 | 320 | 0.7 | 0.78 |
| Memory | W.B. Yeats | 6 | 33 | Free verse | Lyrical | Lyric | Transience of youth and beauty | 25 | 163 | 0.82 | 0.79 |
| The Arrow and the Song | H. W. Longfellow | 12 | 88 | Free verse | Narrative | Lyric | Power of words and friendship | 47 | 412 | 0.61 | 0.76 |
| There Will Come Soft Rains | Sara Teasdale | 12 | 91 | Lyric | Lyrical | Lyric | War | 67 | 486 | 0.75 | 0.81 |
| Alone | Sara Teasdale | 12 | 80 | Quatrain | Romantic | Romantic | Solitude | 54 | 391 | 0.7 | 0.78 |
| Ozymandias | P. B. Shelley | 14 | 111 | Sonnet | Romantic | Romantic | Transience of power | 85 | 614 | 0.79 | 0.83 |
| Good-Night | P. B. Shelley | 12 | 75 | Quatrain | Romantic | Romantic | Longing for togetherness | 56 | 401 | 0.81 | 0.78 |
| A Lament | P. B. Shelley | 10 | 65 | Short lyric | Ethereal | Lyric | Nostalgia, sadness | 51 | 320 | 0.82 | 0.81 |
| Alas! This Is Not What I Thought Life Was | P. B. Shelley | 9 | 75 | Short lyric | Introspective | Lyric | Challenges of life | 60 | 366 | 0.82 | 0.8 |
| Fragment: A Wanderer | P. B. Shelley | 4 | 25 | Quatrain | Romantic | Romantic | Imagination | 22 | 167 | 0.88 | 0.84 |
| Fragment: Apostrophe to Silence | P. B. Shelley | 9 | 69 | Short lyric | Introspective | Romantic | Existential longing | 56 | 370 | 0.82 | 0.82 |
| MEDITATION XVII | John Donne | 13 | 81 | Free verse | Metaphysical | Romantic | Interconnectedness of humanity | 57 | 377 | 0.73 | 0.78 |
| Nothing Gold Can Stay | R. Frost | 8 | 40 | Octave | Lyrical | Nature | Impermanence of beauty | 32 | 194 | 0.85 | 0.81 |
| My Heart Leaps Up | W. Wordsworth | 9 | 61 | Quatrain | Lyrical | Nature | Ecstasy with nature's beauty | 42 | 247 | 0.7 | 0.75 |
| I taste a liquor never brewed – | Emily Dickinson | 16 | 81 | Lyric | Playful | Lyric | Joy of nature | 67 | 460 | 0.81 | 0.83 |
| If You Should Go | Countee Cullen | 8 | 44 | Quatrain | Lyrical | Romantic | Transience of love and life | 36 | 226 | 0.82 | 0.76 |

*Note:* W.C.= word count; U.W.= unique words; Char= character; LD= lexical diversity; DSI= divergent semantic integration score

### 3.2.2. Participants

Ninety-six participants (N=96, Mean age = 31.94 years, SD = 13.09; 32 males, 63 females, and one participant who preferred not to specify gender) took part in this study, the same sample as described in Chapter 2. This sample size was deemed adequate in terms of statistical power, as outlined in the previous study. All participants were fluent in English (self-reported) and held at least a bachelor's degree in any discipline. Informed consent was obtained from all participants before data collection, and they were compensated £7.50 per hour as a monetary incentive. The study protocol was approved by the Ethics Committee of the Department of Psychology, Goldsmiths.

### 3.2.3. Procedure

The experiment was designed using Qualtrics® and disseminated through Prolific®, a platform for participant recruitment. Participants received a general overview of the study along with detailed instructions for completing the ratings. To ensure clarity, a sample poem was provided at the beginning of the experiment to familiarize participants with the process. Participants were given a minimum of 30 seconds to read each poem before proceeding to the rating task. They rated the poems across various constructs, including clarity, aesthetic appeal, felt valence, arousal, surprise, and overall creativity. Following the poem ratings, participants completed a series of personality questionnaires including Ten Item Personality Inventory (TIPI: Gosling et al., 2003), openness/intellect (DeYoung et al., 2007), awe-proneness (Shiota et al., 2007), and epistemic curiosity (Litman & Spielberger, 2003). All personality questionnaires utilised a 7-point scale, with 1 representing "disagree strongly" and 7 representing "agree strongly". Participants were assured of the full confidentiality and anonymity of their data, ensuring that all responses remained secure and non-identifiable in compliance with the General Data Protection Regulation and clarified that any published results would be non-identifiable. All participants provided informed consent before starting the experiment and were compensated £7.50 per hour for their participation. As mentioned, the study protocol was approved by the local Ethics Committee of the Department of Psychology, Goldsmiths University. It took an hour on average to finish the whole experiment.

### 3.2.4. Analysis

As outlined earlier, this chapter builds upon the findings presented in Chapter 2, where aesthetic appeal, felt valence, and surprise were identified as key predictors of creativity judgments. This part of the study focuses on investigating how four personality traits—openness, intellect, awe-proneness, and epistemic curiosity—moderate the influence of these predictors on creativity judgments. To achieve this, four separate linear mixed models were developed using the *lme4* package (Bates et al., 2015) in R (version 4.0.3). Personality traits and their interactions with the predictors were included as fixed effects, creativity served as the response variable, and participants were treated as the grouping variable. Interaction effects were visualised following the classical convention outlined by Cohen et al. (2002), with the moderator's mean value and one standard deviation above and below the mean plotted to observe how each moderator influences the relationship between predictors and creativity. To maintain consistency, the original 7-point scale for the measurements was used. The five predictors were group mean-centred  (Enders & Tofighi, 2007) before being entered into the models to provide a clearer estimate of the within-group effect. For interaction plots, the X-axis reflects the original scale (ranging from -7 to +7) for improved interpretability, while the Y-axis represents the uncentered outcome variable (creativity), ranging from 1 to 7. All data supporting these analyses are publicly available on the Open Science Framework:

https://osf.io/9mw7r/?view_only=07137f4871d146c790501f22bc7743d5.

## 3.3. Results

### 3.3.1. Descriptive Statistics

Descriptive statistics of the variables related to ratings on poems and personality trait scores of participants are shown in Table 3.2 (this table is same as the Table 2.2 in the previous chapter) and Table 3.3 respectively, including the mean and standard deviation (SD) for each variable. The distributions of personality trait variables are marginally left-skewed (excepting openness with skewness of 0.12), with low kurtosis values. Of note, throughout the chapter, epistemic curiosity is referred to as curiosity for the sake of clarity and ease of comprehension.

**Table 3.2**

*Descriptive statistics of the creativity and its potential predictors including mean, standard deviation (SD), skewness, kurtosis, standard error (SE), and variance inflation factor (VIF)*

| Variable | N | Mean | SD | Median | Min | Max | Skewness | Kurtosis | SE | VIF |
|---|---|---|---|---|---|---|---|---|---|---|
| Clarity | 3456 | 4.82 | 1.58 | 5 | 1 | 7 | -0.46 | -0.57 | 0.03 | 1.58 |
| Aesthetic Appeal | 3456 | 4.8 | 1.44 | 5 | 1 | 7 | -0.48 | -0.23 | 0.02 | 2.13 |
| Felt Valence | 3456 | 4.5 | 1.62 | 5 | 1 | 7 | -0.41 | -0.48 | 0.03 | 2.59 |
| Felt Arousal | 3456 | 3.86 | 1.73 | 4 | 1 | 7 | -0.14 | -0.92 | 0.03 | 2 |
| Surprise | 3456 | 3.78 | 1.68 | 4 | 1 | 7 | -0.17 | -0.92 | 0.03 | 1.63 |
| Creativity | 3456 | 4.91 | 1.38 | 5 | 1 | 7 | -0.53 | 0.05 | 0.02 | - |

**Table 3.3**

*Descriptive statistics of the personality trait variables including mean, standard deviation (SD), skewness, kurtosis, and standard error (SE)*

| Personality Traits | N | Mean | SD | Median | Min | Max | Skewness | Kurtosis | SE |
|---|---|---|---|---|---|---|---|---|---|
| Openness | 96 | 5.02 | 0.74 | 4.9 | 3 | 6.4 | 0.12 | -0.82 | 0.01 |
| Intellect | 96 | 4.7 | 0.9 | 4.7 | 2.7 | 6.4 | -0.04 | -0.59 | 0.02 |
| Awe-proneness | 96 | 5.11 | 1.14 | 5.17 | 1.83 | 7 | -0.48 | -0.04 | 0.02 |
| Curiosity | 96 | 5.58 | 0.86 | 5.6 | 3.5 | 7 | -0.19 | -0.67 | 0.01 |

Table 3.4 shows the bivariate correlations between the poem related predictor variables, personality traits, and creativity. Creativity was positively and significantly (all $p<.01$) correlated with five predictor variables: clarity ($r = 0.52$), aesthetic appeal ($r = 0.81$), felt valence ($r = 0.69$), arousal ($r = 0.44$), surprise ($r = 0.57$). Creativity was also significantly correlated (all $p<.01$) with four personality traits: openness ($r = 0.31$), intellect ($r = 0.31$), awe-proneness ($r = 0.36$), and curiosity ($r = 0.41$). Openness showed no significant correlation with felt valence ($r = 0.08$, $p = 0.46$), arousal ($r = 0.03$, $p = 0.79$), and surprise ($r = -0.15$, $p = 0.15$). Intellect showed no significant correlation with felt valence ($r = 0.01$, $p = 0.34$), and arousal ($r = 0.05$, $p = 0.66$), and surprise ($r = -0.03$, $p = 0.15$). . Felt valence was significantly correlated with both awe-proneness ($r = 0.29$, $p = 0.27$) and curiosity ($r = 0.27$, $p = 0.27$). Within personality measures, all were significantly correlated with each other, and the strongest correlation was observed between curiosity and awe-proneness ($r = 0.57$, $p<.01$).

**Table 3.4**

*Bivariate correlation coefficients for creativity, its predictors, and the personality measures of the readers*

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Clarity | 4.82 | 0.66 | | | | | | | | | |
| 2. Aesthetic appeal | 4.8 | 0.69 | 0.68** | | | | | | | | |
| 3. Felt valence | 4.5 | 0.79 | 0.44** | 0.76** | | | | | | | |
| 4. Felt arousal | 3.86 | 1.19 | 0.25* | 0.47** | 0.64** | | | | | | |
| 5. Surprise | 3.78 | 1.12 | 0.31** | 0.48** | 0.70** | 0.71** | | | | | |
| 6. Creativity | 4.91 | 0.76 | 0.52** | 0.81** | 0.69** | 0.44** | 0.57** | | | | |
| 7. Openness | 5.02 | 0.74 | 0.22* | 0.26** | 0.08 | 0.03 | -0.15 | 0.31** | | | |
| 8. Intellect | 4.7 | 0.9 | 0.27** | 0.35** | 0.1 | 0.05 | -0.03 | 0.31** | 0.43** | | |
| 9. Awe-proneness | 5.11 | 1.15 | 0.25* | 0.31** | 0.29** | 0.13 | 0.13 | 0.36** | 0.47** | 0.36** | |
| 10. Curiosity | 5.58 | 0.87 | 0.30** | 0.35** | 0.27** | 0.11 | 0.12 | 0.41** | 0.33** | 0.47** | 0.57** |

*Note.* *M* and *SD* are used to represent mean and standard deviation, respectively. * Indicates $p < .05$. ** indicates $p < .01$. The means and standard deviations are calculated for N = 96 participants, with the ratings for variables 1–6 first averaged over the 36 poems for each participant, and then averaged across all participants.

### 3.3.2. Moderating Role of the Personality Traits

The interaction of the four personality traits—openness, intellect, awe-proneness, and curiosity—with the three significant predictors of poetic creativity—aesthetic appeal, surprise, and felt valence—was examined. The main effects of these personality traits as moderators, along with their interactions with the predictors, are summarised in Table 3.5. Figures 3.1 through 3.4 provide visual representations of the interaction plots, with openness, intellect, awe-proneness, and curiosity depicted as moderators, respectively.

**Table 3.5**

*Moderation results: main effects and interactions between personality traits and predictors*

| Model | Estimate | SE | t | p | Fit [R^2] |
|---|---|---|---|---|---|
| **Openness Model** | | | | | |
| Intercept | 3.32 | 0.5 | 6.58 | <0.001 | |
| Openness | 0.32 | 0.1 | 3.18 | <0.001 | |
| Aesthetic Appeal | -0.15 | 0.1 | -1.46 | 0.14 | |
| Felt Valence | 0.47 | 0.1 | 4.89 | <0.001 | |
| Surprise | 0.66 | 0.09 | 7.2 | <0.001 | |
| Openness*Aesthetic Appeal | 0.1 | 0.02 | 4.83 | <0.001 | |
| Openness*Felt Valence | -0.06 | 0.02 | -3.27 | <0.001 | |
| Openness*Surprise | -0.08 | 0.02 | -4.76 | <0.001 | 0.36** |
| | | | | | |
| **Intellect Model** | | | | | |
| Intercept | 3.67 | 0.39 | 9.35 | <0.001 | |
| Intellect | 0.26 | 0.08 | 3.21 | <0.001 | |
| Aesthetic Appeal | -0.03 | 0.08 | -0.35 | 0.72 | |
| Felt Valence | 0.22 | 0.08 | 2.8 | 0.01 | |
| Surprise | 0.31 | 0.08 | 3.92 | <0.001 | |
| Intellect*Aesthetic Appeal | 0.08 | 0.02 | 4.51 | <0.001 | |
| Intellect*Felt Valence | -0.01 | 0.02 | -0.74 | 0.46 | |
| Intellect*Surprise | -0.02 | 0.02 | -1 | 0.32 | 0.36** |
| | | | | | |
| **Awe-proneness Model** | | | | | |
| Intercept | 3.69 | 0.33 | 11.1 | <0.001 | |
| Awe-proneness Model | 0.24 | 0.06 | 3.77 | <0.001 | |
| Aesthetic Appeal | 0.17 | 0.06 | 2.71 | 0.01 | |
| Felt Valence | 0.18 | 0.06 | 2.96 | <0.001 | |
| Surprise | 0.37 | 0.06 | 6.32 | <0.001 | |
| Awe-proneness*Aesthetic Appeal | 0.03 | 0.01 | 2.67 | 0.01 | |
| Awe-proneness*Felt Valence | 0 | 0.01 | -0.3 | 0.76 | |
| Awe-proneness*Surprise | -0.03 | 0.01 | -2.48 | 0.01 | 0.37** |

**Curiosity Model**

| | | | | | |
|---|---|---|---|---|---|
| Intercept | 2.9 | 0.46 | 6.29 | <0.001 | |
| Curiosity | 0.36 | 0.08 | 4.39 | <0.001 | |
| Aesthetic Appeal | 0.06 | 0.1 | 0.63 | 0.53 | |
| Felt Valence | 0.03 | 0.09 | 0.37 | 0.71 | |
| Surprise | 0.5 | 0.08 | 5.99 | <0.001 | |
| Curiosity*Aesthetic Appeal | 0.05 | 0.02 | 2.96 | <0.001 | |
| Curiosity*Felt Valence | 0.02 | 0.02 | 1.43 | 0.15 | |
| Curiosity*Surprise | -0.05 | 0.01 | -3.27 | <0.001 | 0.38** |

Openness exhibited significant moderation effect on aesthetic appeal (b = 0.10, SE = 0.02, $t$ = 4.83, $p$ < .001), felt valence (b =-0.06, SE = 0.02, $t$ =-3.27, p < .001), and surprise (b =-0.08, SE = 0.02, t =-4.76, $p$ < .001) (Fig 3.1). A significant moderation of intellect was observed on aesthetic appeal (b = 0.08, SE = 0.02, $t$ = 4.51, $p$ < .001) with valence (b =-0.01, SE = 0.02, $t$ =-0.74, $p$ = 0.46) and surprise (b =-0.02, SE = 0.02, $t$ =-1.00, $p$ = 0.32) being unmoderated (Fig 3.2). Awe-proneness was found to be a significant moderator on the relationship between creativity and aesthetic appeal (b = 0.03, SE = 0.01, $t$ = 2.67, $p$ = 0.01), and surprise (b =-0.03, SE =0.01, $t$ =-2.48, $p$ = 0.01), whereas no significant moderation with valence was observed (b =-0.00, SE = 0.01, $t$ =-0.30, $p$ = 0.76) (Fig 3.3). Finally, curiosity was found to significantly moderate aesthetic appeal (b = 0.04, SE = 0.02, $t$ = 2.46, $p$ = 0.01), and surprise (b =-0.05, SE = 0.01, $t$ =-3.72, $p$ <.001), leaving felt valence unmoderated (b = 0.01, SE = 0.02, $t$ = 0.84, $p$ = 0.40) (Fig 3.4).

**Figure 3.1**

*Simple slopes illustrating significant interactions between openness as the moderator and aesthetic appeal, felt valence, and surprise as the predictors*

**Figure 3.2**

*Simple slopes illustrating significant interaction between intellect as the moderator and aesthetic appeal as the predictor*
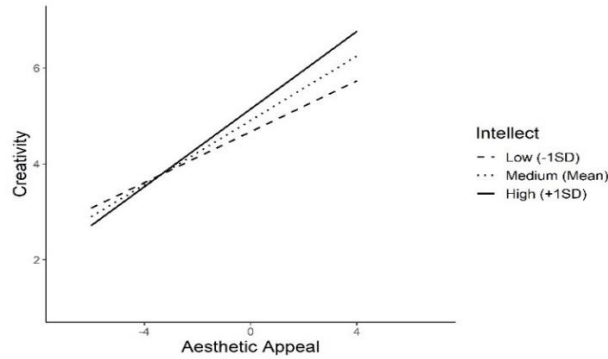


**Figure 3.3**

*Simple slopes illustrating interactions between awe-proneness as the moderator and aesthetic appeal and surprise as the predictors*
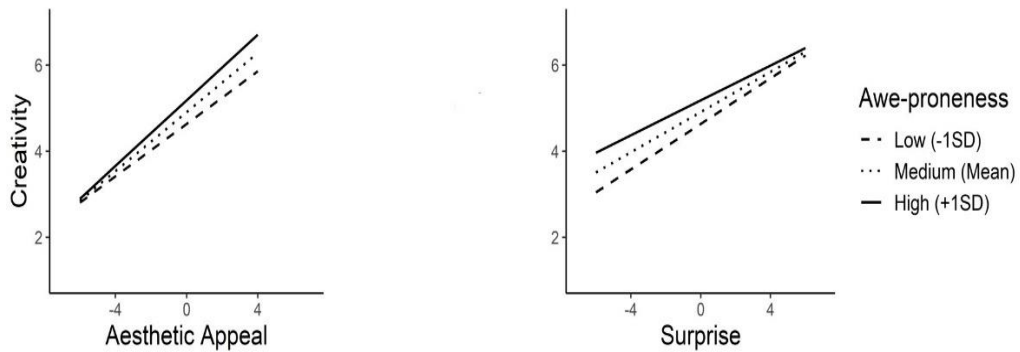


**Figure 3.4**

*Simple slopes illustrating interactions between curiosity as the moderator and aesthetic appeal and surprise as the predictors*
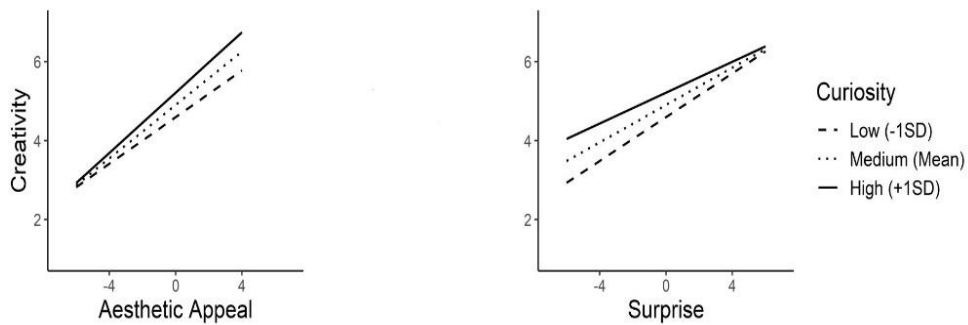
Consequently, all four personality traits exhibited significant moderation effects on both aesthetic appeal and surprise. However, distinct moderation patterns were observed in these two predictors. The linear positive impact of aesthetic appeal on creativity was strengthened to a greater extent for higher values of the moderators. In contrast, the positive effect of surprise on creativity was attenuated for the higher moderator values.

As discussed in Chapter 2, arousal was not included in the parsimonious model as a potential predictor of creativity judgment of poetry. However, it was considered that arousal might interact with other factors even if it did not demonstrate a main effect. To explore this, the interaction effects of arousal with four moderators—openness, intellect, awe-proneness, and curiosity—were examined. The interaction results were as follows: openness interaction: ($b$ =-0.01, SE = 0.02, $t$ =-0.46, $p$ = 0.64); intellect interaction: ($b$=0.03, SE=0.02, $t$=1.86, $p$=0.06); awe-proneness interaction: ($b$=0.01,SE=0.01, $t$=0.99, $p$=0.32); curiosity interaction: ($b$=0.00, SE=0.02, $t$=0.17, $p$=0.86). These findings suggest that the influence of arousal on creativity was not significantly affected by any of the four moderators. The results of the simple slopes analyses are presented in Table 3.6.

**Table 3.6**

*Results of simple slopes analyses for the high and low levels of the moderators and differences in slopes*

| Predictor | Moderator | High [+1 SD] | | | | Low [-1SD] | | | | Contrast [High-Low] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | SE | t-value | p-value | Estimate | SE | t-value | p-value | Estimate | SE | t. ratio | p-value |
| Aesthetic Appeal | Openness | 0.42 | 0.02 | 20.37 | <0.001 | 0.27 | 0.02 | 12.54 | <0.001 | 0.15 | 0.03 | 5.15 | <.0001 |
| Felt Valence | Openness | 0.12 | 0.02 | 6.62 | <0.001 | 0.2 | 0.02 | 9.72 | <0.001 | -0.08 | 0.03 | -3.08 | 0.0021 |
| Surprise | Openness | 0.17 | 0.02 | 10.61 | <0.001 | 0.3 | 0.02 | 15.68 | <0.001 | -0.13 | 0.03 | -5.25 | <.0001 |
| Aesthetic Appeal | Intellect | 0.41 | 0.02 | 20.07 | <0.001 | 0.27 | 0.02 | 12.15 | <0.001 | 0.14 | 0.03 | 4.7 | <.0001 |
| Aesthetic Appeal | Awe-proneness | 0.39 | 0.02 | 18.24 | <0.001 | 0.31 | 0.02 | 15.9 | <0.001 | 0.07 | 0.03 | 2.73 | 0.0063 |
| Surprise | Awe-proneness | 0.19 | 0.02 | 11.56 | <0.001 | 0.27 | 0.02 | 14.34 | <0.001 | -0.07 | 0.02 | -3 | 0.0027 |
| Aesthetic Appeal | Curiosity | 0.39 | 0.02 | 18.78 | <0.001 | 0.31 | 0.02 | 14.59 | <0.001 | 0.08 | 0.03 | 2.95 | 0.0032 |
| Surprise | Curiosity | 0.19 | 0.02 | 11.52 | <0.001 | 0.28 | 0.02 | 14.69 | <0.001 | -0.09 | 0.02 | -3.63 | 0.0003 |

## 3.4. Discussion

The present study, building on the findings discussed in Chapter 2, investigated how four personality traits—openness, intellect, awe-proneness, and epistemic curiosity—influenced the evaluation of creativity in English language poems. Specifically, it examined the interaction between these personality traits and the three key predictors of poetic creativity—aesthetic appeal, felt valence, and surprise—identified in the previous chapter from a pool of five potential factors. The results revealed that individuals with higher levels of openness, intellect, awe-proneness, and curiosity placed greater emphasis on aesthetic appeal when judging the creativity of poems. Interestingly, felt valence's relationship with creativity was moderated exclusively by openness, with no significant moderating effects observed for the other traits.

Distinct moderation effects of openness and intellect were observed in the assessment of poetic creativity. Individuals with higher levels of these traits placed greater emphasis on a poem's aesthetic appeal when evaluating its creativity, compared to those with lower levels of openness and intellect. Despite being distinct traits (DeYoung et al., 2007), openness and intellect shared a common tendency in appreciating a poem's aesthetic appeal. Since aesthetic experience is both style-related and art-specific, engaging cognitive and affective processing (Leder et al., 2004), individuals with higher levels of openness and intellect may have been more attuned to these cognitive and emotional aspects during their evaluation of the poems. The study postulates that this heightened engagement led to the assignment of greater significance to the aesthetic appeal of poems in their creativity assessments. Consistent with prior research (Fayn et al., 2015), this study revealed a distinct connection between openness, intellect, and aesthetic appeal.  Both openness and intellect seem to reflect a general inclination towards aesthetic experiences—whether it involves processing sensory and aesthetic information (linked to openness) or abstract and complex semantic information (linked to intellect)(Oleynick et al., 2017). Open and intellectual individuals, i.e., who were assumed to be more unconventional, imaginative, information-seeking, and creative (Leder et al., 2004;  McCrae, 1987) exhibited a more pronounced preference for aesthetic appeal in their evaluation of poetic creativity than those with lower levels.

Interestingly, individuals with lower levels of openness appeared to be more influenced by felt valence in their evaluations of poems' creativity compared to those with higher levels of openness. This suggests that readers with higher openness did not weigh their emotional experience during poem reading as heavily as their less open counterparts while judging a poem's creativity. Processing of any artwork, including literature, includes a component called "aesthetic emotion" (Leder et al., 2004; Chatterjee & Vartanian, 2014; Jacobs, 2015;

Menninghaus et al., 2019). Aesthetic emotions are the discrete emotions that always include an aesthetic evaluation/appreciation and are further associated with subjectively felt pleasure or displeasure, i.e., felt valence, during any emotional episode (Menninghaus et al., 2019). The present study indicates that individuals with higher levels of openness may be less influenced by aesthetic emotions compared to those with lower levels of openness while assessing creativity of poems. On the flip side, higher open individuals seem to be more positively impacted by the overall aesthetic appeal of poems compared to those with lower levels of openness. This notion aligns with the understanding that aesthetic appeal appreciation and evaluation of artwork, beyond aesthetic emotions, involves processing of other inherent features of art, such as styles, experience of pleasure of generalisation (Leder et al., 2004; Hartley & Homa, 1981; Gordon & Holyoak, 1983), and knowledge (Silvia, 2010; Lachapelle et al., 2003; Cupchik & László, 1992).  Notably, this study demonstrates that levels of intellect have no influence on the positive impact of felt valence on the assessment of creativity of poems.

Individuals with lower levels of openness were found to be more influenced by surprise in their creativity ratings of poems than their higher counterparts. Surprise is often recognised as an interruption mechanism and a short-lived emotion with an unclear positive or negative valence (Meyer et al., 1997).  The statistically significant difference in the simple slopes for individuals with high and low openness indicated that more open individuals, who tend to be more motivated to learn, were less influenced by the surprise in the content of the poems compared to their less open counterparts when judging poetic creativity. The transient and ambiguous nature of surprise may have disrupted their affective states, leading to a reduced impact of surprise on their creativity judgments. In contrast, less open individuals perceived surprise as a more significant factor in their evaluation of poetic creativity than their higher counterparts, contradicting our initial prediction. It is noteworthy that the interaction does not indicate that high openness readers were less surprised by the poems compared to low openness readers. Rather it suggests that their judgments of a poem's creativity were less influenced by the surprise element of the poem compared to those with lower openness. Furthermore, the focus of this study was not on whether individuals with higher openness rated surprise more highly on average than those with lower openness, but rather on the differential impact of surprise on creativity judgments for individuals with varying levels of openness. The objective was to investigate whether surprise was prioritized differently as a predictor of creativity judgment between the two openness levels.

It is worth mentioning that to reach a consensus on how best to define the creativity phenomenon, the 3-criterion definition of creativity (Simonton, 2012) is proposed which is

based on the three criteria used by the United States Patent Office to evaluate applications for patent protection. This modified definition uses the criteria of novelty or originality, utility or usefulness, and surprise to judge creativity of a product or idea. Findings in this study indicate that the traditional 3-criterion definition of creativity within the context of poetry may align better with readers who possess lower levels of openness. This supports the notion that openness/intellect is an aesthetically sensitive personality domain (Fayn et al., 2015) and consistently serves as a predictor of both artistic creativity and aesthetic appreciation (Feist, 1998; Silvia et al., 2015; Vessel & Rubin, 2010) across a diverse range of the arts (Chamorro-Premuzic et al., 2009, 2010; Furnham & Walker, 2001b). Further, this study reveals that, individuals with higher openness and intellect placed particular emphasis on the positive impact of aesthetic appeal of poems when evaluating their creativity. However, findings indicate distinct differences in the moderation effects of openness and intellect when assessing felt valence and surprise in poems during creativity evaluation, emphasising the nuanced distinction between openness and intellect (DeYoung et al., 2007).

Awe-proneness, in this study, demonstrated significant interactions with aesthetic appeal and surprise, but not with felt valence. Awe, a specific emotional response often triggered by beauty, is considered a key member of the self-transcendent emotions (Haidt et al., 2004). The findings support the model of appreciation of beauty and excellence (Peterson & Seligman, 2004), which suggests that the ability to perceive and appreciate beauty involves the experience of self-transcendent emotion like awe (Haidt et al., 2004). Specifically, individuals with higher levels of awe-proneness placed greater emphasis on the aesthetic appeal of a poem when evaluating its creative potential, aligning with the principles of this model. This suggests that readers predisposed to feeling awe might be more sensitive to the artistic and moral beauty of the poems (Diessner et al., 2008), thereby linking dispositional awe to creativity judgment and appreciation for beauty (Peterson & Seligman, 2004; Güsewell & Ruch, 2012). Interestingly, it was observed that individuals with lower levels of awe-proneness were more influenced by surprise in their judgments of creativity. Previous research suggests that awe experiences do not require intensive effortful, controlled processing (Shiota et al., 2006), and further, dispositional awe is inversely correlated with the need for cognitive closure (Shiota et al., 2007). Therefore, the results indicate that in the evaluation of poetic creativity, individuals with higher awe-proneness prioritised aesthetic appeal while adopting a more passive and receptive stance towards unexpected elements in poetry (Frijda, 1986).

Curiosity exhibited significant moderating effects on both aesthetic appeal and surprise, mirroring the interaction patterns of awe-proneness. Individuals with heightened curiosity,

driven by a desire for new knowledge and experiences (Gross et al., 2020), demonstrated a stronger influence of a poem's aesthetic appeal on their creativity judgments. This finding reinforces the idea that curiosity facilitates aesthetic experiences and drives the pursuit of understanding complex, abstract, and intellectually challenging stimuli (Kenett et al., 2023). Additionally, these results align with previous research indicating that individuals with high trait curiosity tend to find artistically intricate or complex poems more comprehensible and engaging (Silvia, 2008b). The tendency of highly curious readers to explore unfamiliar aspects of poems may have enhanced their appreciation of aesthetic appeal, thereby contributing to their creativity judgments. Contrary to the initial prediction, surprise had a stronger impact on creativity judgment among individuals with lower levels of curiosity. This finding contradicts the expectation that the positive effect of surprise on creativity scores would be more prominent in those with higher levels of epistemic curiosity. Although literature suggests that surprise can stimulate curiosity (Berlyne, 1954, 1960; Loewenstein, 1994), this study indicates that the way surprise appeared in the poems did not engage the knowledge-seeking behaviour of individuals with higher levels of epistemic curiosity. Rather than facilitating creativity judgment, the unexpected elements in the poems may have been perceived as disruptions, hindering the exploratory and inquisitive mindset of individuals.

Moreover, the similar interaction patterns between openness and curiosity highlight the well-established link between openness and curiosity (Kashdan et al., 2004; Mussel, 2010; Silvia, 2006). This indicates that individuals with high openness were more motivated to learn, inclined to explore, and interested in acquiring information. These tendencies might enhance their semantic knowledge (Christensen et al., 2018), and subsequently, their aesthetical experiences (Kenett et al., 2023), and the judgment of poetic creativity. Furthermore, the similarity in the interaction patterns of awe-proneness and curiosity suggests that awe-prone individuals tend to exhibit higher levels of curiosity, and that awe itself can stimulate curiosity, consistent with previous research (Anderson et al., 2020; Izard, 1977). This finding further indicates that higher levels of awe-proneness and curiosity may enhance individuals' perceived ability to comprehend complex stimuli, such as poetry (Silvia, 2008b).

Finally, it is important to acknowledge that this study did not aim to determine whether individuals with higher personality traits tended to rate the predictors of creativity more positively or negatively compared to those with lower traits. Instead, the focus was on examining the differential influence of predictor ratings for readers with high and low levels of these traits. The study sought to investigate whether differences existed in how these predictors were prioritised between individuals with varying levels of personality traits when assessing a poem's creativity.

### 3.4.1. Limitations

The present study is subject to several limitations. First, the focus was placed on felt emotions, i.e., the emotions experienced by participants while reading the poems, rather than perceived emotions, which reflect the emotional quality attributed to the poems. Perceived and felt emotions are not necessarily identical, as highlighted in studies on music (Gabrielsson, 2001; Marin & Bhattacharya, 2010; Schubert, 2013), and this is likely to apply to poetry as well. For instance, a poem with a 'sad' theme may not necessarily induce sadness in the reader. It is worth noting that previous research has reported an association between perceived valence and the aesthetic appeal of poetry (Belfi et al., 2018). Therefore, future studies could explore the predictive power of perceived emotions on a poem's creativity and the potential moderating role of traits such as intellect. Second, various structural elements of the poems, such as rhythm, form, and genre, were not controlled in this study. No restrictions were imposed on the poems in terms of length, rhythmic patterns, or adherence to specific forms or genres, such as sonnets, haikus, or limericks. However, due to the limited number of poems included, exploring the specific effects of genres and forms was not feasible. Therefore, the potential influence of these objective features on the creativity assessment cannot be entirely ruled out. Third, the representativeness of the selected poems may have been limited, which could affect the generalisability of the findings. Fourth, regarding the diversity measures of the stimuli, it is important to note that the small word count of some poems and their restricted vocabulary may have impacted the reliability of the Type-Token Ratio (TTR) method. With shorter texts, the TTR might not capture meaningful variability in word usage, thus limiting the accuracy of lexical diversity estimates (Malvern & Richards, 1997; McCarthy & Jarvis, 2010). Finally, single-item measures were used to assess the variables, a common approach in evaluating aesthetics across various art forms, including visual art (Hassenzahl, 2004; Chamberlain et al., 2018, poetry (Belfi et al., 2018; Hitsuwari & Nomura, 2022b; Papp-Zipernovszky et al., 2021; Frame et al., 2023; Mehl et al., 2023), and music (Zhang & Schubert, 2019). However, the potential variability in how individuals interpreted the questions remains unexplored. While this approach is efficient, it may overlook the multidimensionality of constructs like aesthetic appeal. For example, aesthetic appeal could be evaluated through multiple dimensions such as beauty, ambiguity, complexity, aesthetic emotions and others. Utilising multiple-item measures could have provided psychometric advantages, especially in enhancing the reliability and validity of the assessments (Bergkvist & Rossiter, 2007).

### 3.4.2. Conclusion

This chapter examined how personality traits—openness, intellect, awe-proneness, and curiosity—moderate creativity judgments in poetry. Among these traits, openness exerted the most significant moderating effect on all three predictors—aesthetic appeal, surprise, and felt valence. Notably, aesthetic appeal was significantly moderated by all personality traits in assessing the creativity of poems. These findings highlight how specific personality traits shape the underlying model of creativity judgment for English poems, explaining the variability in individual preferences and evaluations. The implications suggest that personality-driven differences play a critical role in creative judgments, particularly in art forms like poetry, where subjective engagement is central. This highlights the importance of incorporating individual differences into models of creativity evaluation to achieve a more comprehensive understanding of artistic appreciation.

### 3.4.3. Looking Ahead: Aesthetic vs Creativity Judgments

Aesthetic appreciation plays a central role in art evaluation. In the previous chapters, it was found that aesthetic appeal is the primary predictor of poetic creativity and is significantly moderated by personality traits in the assessment of poems. This raises a crucial question: are creativity and aesthetic judgments guided by the same evaluative processes, or do they rely on distinct mechanisms? This distinction is vital for understanding poetic assessment, as aesthetic pleasure and creativity often overlap in the appreciation of poetry. To explore this, the next chapter examines whether creativity and aesthetic judgments share common predictors or operate through independent pathways, offering deeper insights into their interplay within the context of poetry evaluation.

**CHAPTER 4**


# CREATIVITY AND AESTHETIC APPEAL EVALUATION— DISTINCT OR CONNECTED?


*"It's not what you look at that matters, it's what you see."*
— *Henry David Thoreau*


## 4.1. Introduction

The two previous chapters examined the key predictors of creativity judgments in poetry, and how expertise and individual differences in readers' personality traits shape these assessments. In this chapter, a new study is introduced, which shifts the focus toward exploring the relationship between two types of assessment: aesthetic appeal and creativity—two aspects that are often confused or used interchangeably, particularly in the evaluation of poetry. This study addresses a fundamental question: do these two assessments rely on identical criteria, or do they differ based on distinct underlying factors?

The appreciation of any art is inherently subjective, involving a complex interaction between stimuli, individuals, and contextual factors (Leder et al., 2012). Poetry, as one of the finest forms of verbal art, excels in diction and captures both emotive and interpretative elements (Whitcomb-Hess, 1944). Poetic words are said to pierce the reader, leaving a lasting impression (Robinson, 2002), making it an expression of intense personal experience, perceived from a unique perspective (Furniss & Bath, 2013). However, different readers interpret the same poem differently, drawing from their own subjective experiences, knowledge, and perceptual skills. This idiosyncrasy in poetry perception results in distinctiveness in the assessment of both the creativity and aesthetic appeal of poems. When individuals contemplate a poem and evaluate its creativity and aesthetic appeal based on their subjective perceptions and personal definitions, a critical question arises: Are these two evaluative processes the same or different? More specifically, what factors contribute to the assessment of a poem's creativity and its aesthetic appeal, and do these assessments align or differ in terms of their underlying predictors? Furthermore, how are these

assessments influenced by individual differences in readers' personality traits? This chapter will investigate whether aesthetic and creative judgments of poetry function as distinct or overlapping processes.

The standard definition of creativity asserts that the creativity of any product or idea requires both originality and usefulness (Runco & Jaeger, 2012). Given the highly subjective nature of creativity assessments of poems (Amabile, 1982), interpretations of nebulous concepts such as the originality and usefulness of a poem may vary among different readers. The impact of these two fundamental ingredients - originality and usefulness - on the evaluation of a poem remains largely uncharacterized. On the other hand, earlier studies have indicated that the perceived beauty and subsequent aesthetic appreciation of a poem predominantly rely on its structural elements, such as phonological constructs (Aryani et al., 2016), rhyme, meter, rhythm, prosodic fluency (Reber et al., 2004; Greene et al., 2010 ; Lau et al., 2018; Obermeier et al., 2013), metaphors (Rasse et al., 2020), as well as various subjective attributes such as ambiguity (Margulis et al., 2017), vivid imagery, perceived emotions (Belfi et al., 2018, Mehl et al., 2023), readers' expertise, psychological states and traits of readers (Hitsuwari & Nomura, 2022b), and affective responses and feelings (Lüdtke et al., 2014). Literature suggests that although the fields of creativity and aesthetics are often viewed separately, there is a notable correspondence between the aspects of art creation and a perceiver's aesthetic experience of that artwork (Tinio, 2013). This highlights the bridge between creative ideation and the aesthetical evaluation of art.  However, the relationship between how individuals evaluate a poem's creativity, and its aesthetic appeal has not been thoroughly explored, particularly in terms of the specific factors that influence these judgments and whether they operate under similar or distinct evaluative criteria. In this study, the process of evaluation of perceived creativity and aesthetic appeal of poems were investigated.


### 4.1.1. Present Study

The study was conducted with 96 participants who read and evaluated 25 contemporary English poems across nine dimensions: reading fluency, vividness of imagery, surprise, perceived emotions (valence and arousal), originality, usefulness, aesthetic appeal, and creativity. Separate linear mixed models were used to predict the ratings of creativity and aesthetic appeal based on the ratings of the remaining seven dimensions. Additionally, the relationships between the predictors and creativity or aesthetic appeal were examined for potential moderation by specific personality traits: openness, intellect, curiosity, vividness of

visual imagery, and vividness of auditory imagery. The selection of predictors and moderators was informed by prior empirical research (Amabile, 1982; Belfi et al., 2018; Frame et al., 2024; Hitsuwari & Nomura, 2022b; Chamorro-Premuzic et al., 2010; Furnham & Chamorro-Premuzic, 2004; Kraxenberger & Menninghaus, 2017; Wassiliwizky et al., 2017; Johnson-Laird & Oatley, 2022; Reisenzein, 2013; Silvia & Christensen, 2020, Mussel, 2010; Furnham & Walker, 2001; Miall & Kuiken, 1994; Lloyd-Cox et al., 2022).

# 4.2. Materials and Methods

## 4.2.1. Stimuli

Twenty-five contemporary English poems, spanning from the early 20th Century onwards, were selected in their entirety from reputable online poetry repositories, such as Poetry.org (http://www.poetry.org/), Poetry Foundation (https://www.poetryfoundation.org/), and the Academy of American Poets (https://poets.org/). Short poems were chosen deliberately for their structured brevity and completeness. All poems were original English compositions (see Table 4.1), each consisting of 8 lines (mean word count = 49.4, SD = 14.12), and exhibiting both semantic and lexical diversity. Lexical diversity (LD) of a text, often interchangeably used as lexical richness, was originally used to refer to the number of words in a person's mental lexicon (Yule, 1944), or subsequently to the number or variety of words encountered in a language sample (Daller et al., 2003; see also Jarvis, 2013). In this study, LD was assessed using the vocabulary-to-text ratio method (McCarthy & Jarvis, 2010), which measures the ratio of vocabulary size to the total word count. LD values range from 0 to 1, with higher scores indicating greater lexical richness. Semantic diversity refers to the degree of semantic variability in the contexts in which a particular word is used (Hoffman et al., 2022). In this study, semantic diversity was operationalised using divergent semantic integration (DSI) scores (Johnson et al., 2022), which quantify the extent to which a narrative connects divergent ideas by integrating concepts from creativity theory and distributional semantics theory. Distributional semantics theory provides a computational framework for testing both classical and new theories on the role of semantics in creative thinking. DSI represents how well a text integrates divergent ideas from diverse contexts, offering a precise quantitative measure. Mean DSI scores were computed using five distributional semantic spaces: cbowukwac, cbowsubtitle (Mandera et al., 2017), cbowBNC (Baroni et al., 2014), GLoVe (Pennington et al., 2014), and TASA (Günther et al., 2019; Prabhakaran et al.,

2014; see also Beaty & Johnson, 2021). Higher DSI scores, ranging from 0 to 1, indicate that a text connects more divergent ideas. The mean (± SD) LD and DSI scores of the selected poems were 0.78 (0.03) and 0.77 (0.09), respectively. The mean (± SD) LD and DSI scores of the selected poems were 0.78 (0.03) and 0.77 (0.09), respectively. Additionally, sentiment analysis was performed using the 'sentimentr' package (v 2.9.1) in R, utilizing the NRC sentiment lexicon (Rinker, 2021). This analysis was conducted to examine the variability in emotional tone across the selected poems, providing a broader understanding of the diversity in emotional content. While the sentiment scores were not directly used in the main analysis, they offer valuable insight into the emotional range of the stimuli, ensuring a diverse set of poems in terms of tone. The analysis revealed that 14 poems had an overall positive tone, 7 had a negative, and 4 exhibited a neutral tone. Table 4.1 provides the key details of the poems utilised in this research.

**Table 4.1**

*Details of the poems used in the study*

| Poem No. | Poem Name | Poet | Period | No. of Lines | Word Count | Style/Genre | Theme | Overall tone | LD | Mean DSI |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Dust of Snow | Robert Frost | 1874-1963 (1920) | 8 | 34 | Lyric | Nature | Positive | 0.82 | 0.78 |
| 2 | Biscuit | Jane Kenyon | 1947-1995 (1993) | 8 | 47 | Narrative | Trust and betrayal | Positive | 0.79 | 0.79 |
| 3 | Corner Seat | Louis MacNiece | 1907- 1963 | 8 | 51 | Lyric | Loneliness and isolation | Negative | 0.71 | 0.77 |
| 4 | I Didn't Go To Church Today | Ogden Nash | 1902-1971 | 8 | 54 | Lyric | Nature and spirituality | Positive | 0.72 | 0.79 |
| 5 | An Eastern Ballad | Allen Ginsberg | 1926-1997 | 8 | 55 | Lyric | Love | Positive | 0.8 | 0.78 |
| 6 | Delay | Elizabeth Jennings | 1926-2001 | 8 | 67 | Lyric | Beauty and love | Positive | 0.79 | 0.78 |
| 7 | Be Frugal | Richard Church | 1893-1972 | 8 | 55 | Lyric | Love and relationship | Positive | 0.82 | 0.79 |
| 8 | In Innocence | J.V. Cunningham | 1911-1985 | 8 | 32 | Lyric | Uncertainty | Neutral | 0.88 | 0.79 |
| 9 | Snow | Edward Thomas | 1878-1917 (1913) | 8 | 55 | Lyric | Tragedy | Neutral | 0.73 | 0.78 |
| 10 | Hedges Freaked With Snow | Robert Graves | 1895-1985 | 8 | 51 | Lyric | Acceptance and detachment | Negative | 0.86 | 0.82 |
| 11 | Mentor | Timothy Murphy | 1951-2018 | 8 | 35 | Lyric | Regret | Negative | 0.77 | 0.76 |
| 12 | The Traveller | Maya Angelou | 1928-2014 | 8 | 31 | Lyric | Human loneliness | Positive | 0.68 | 0.82 |
| 13 | I shall imagine life | E E Cummings | 1894-1962 | 8 | 32 | Lyric | Joy of life | Negative | 0.97 | 0.8 |
| 14 | Antimatter | Russell Edson | 1935-2014 | 8 | 69 | Narrative | Duality of joy and sorrow | Positive | 0.74 | 0.78 |
| 15 | A Birthday Poem | James Simmons | 1933-2001 | 8 | 48 | Narrative | Inevitability of aging and death | Positive | 0.79 | 0.78 |
| 16 | Kyrie | Tomas Transtromer | 1931-2015 | 8 | 72 | Dramatic | Solitude | Negative | 0.81 | 0.79 |

| No. | Title | Author | Dates | | | Type | Theme | Sentiment | LD | DSI |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Love Comes Quietly Passing | Robert Creeley | 1926-2005 | 8 | 26 | Lyric | Subtlety of love | Positive | 0.92 | 0.74 |
| 18 | Remark | William Stafford | 1914-1993 | 8 | 61 | Narrative | Relationship | Positive | 0.78 | 0.78 |
| 19 | All You Who Sleep Tonight | Vikram Seth | 1952- | 8 | 44 | Lyric | Loneliness and longing for loved ones | Positive | 0.81 | 0.76 |
| 20 | Solitude | A.A. Milne | 1882-1956 (1927) | 8 | 49 | Narrative | Solitude and solace | Neutral | 0.5 | 0.67 |
| 21 | I Remember You Because Of A Grassy Hill | Muna Lee | 1895-1965 | 8 | 71 | Lyric | Recalling memories | Negative | 0.71 | 0.79 |
| 22 | Imagination | James Baldwin | 1924-1987 | 8 | 26 | Lyric | Imagination and reality | Positive | 0.81 | 0.78 |
| 23 | The Night Will Never Stay | Eleanor Farjeon | 1881-1965 (Early 20th) | 8 | 46 | Lyric | Transient life | Negative | 0.65 | 0.76 |
| 24 | Running Water | Alfonsina Storni | 1892-1938 | 8 | 60 | Lyric | Exploration of life | Neutral | 0.73 | 0.8 |
| 25 | Song in Space | Adrian Mitchell | 1932-2008 | 8 | 64 | Lyric | Humanity and the Earth | Positive | 0.72 | 0.78 |

*Note.* LD= lexical diversity; DSI= divergent semantic integration score

## 4.2.2. Participants

The experiment was designed using Qualtrics® software, and participants were recruited through Sona Systems®, receiving 2.5 course credits as compensation. Using the G*Power software (v. 3.1.9.4) (Faul et al., 2007), we found that a minimum sample size of 103 was required for multiple linear regression, to detect a medium effect ($f^2 = 0.15$) at a significance level of 5% and a statistical power of 80%. Further, by considering a multilevel model with 103 cluster groups, assuming a small to medium effect size (Cohen's d) of 0.3, and considering 25 observations per cluster group, the 'samplesize_mixed' function in R (https://strengejacke.github.io/sjstats/) calculated that a total of 772 observations was required, equating to a minimum of 31 participants (772/25). We recruited 96 participants (12 males, 79 females, 4 non-binary, 1 preferred not to disclose gender) with a mean (SD) age of 20.54 (4.97) years, resulting in a total of 2400 observations. This ensured sufficient statistical power for our study.

## 4.2.3. Procedure

Each poem was displayed for 2 minutes for reading and contemplation. The titles of the poems were provided for potential anchoring, while the names of the poets were deliberately omitted to mitigate any potential bias towards specific poets. On the next page, participants were asked to evaluate the poem across nine dimensions in the following order: reading fluency ("How easy is it to read this poem?"), aesthetic appeal ("How aesthetically appealing is this poem?"), perceived valence ("How positive (higher scores) or negative (lower scores) is the content of thepoem?"), arousal ("How stimulating (higher scores) or relaxing (lower scores) is this poem?"), surprise ("How surprising is this poem? By "Surprise" we mean a contrast to expectation in the concept of the poem."), vividness in imagery ("How vivid is the imagery evoked from this poem?"), originality ("How original do you find this poem?"), usefulness ("How useful to you do you find this poem?"), and overall creativity ("How creative is this poem?"). Of note, participants were not provided with explicit definitions for originality, usefulness, creativity, and aesthetic appeal. Instead, they were instructed to rely on their intuitive and subjective understanding of these constructs. This approach is similar to Consensual Assessment Technique (Amabile, 1982), recognised as the "gold standard" of creativity assessment (Kaufman et al., 2008), where the judges are not provided with predefined definitions of creativity and other constructs including aesthetic appeal, novelty, and appropriateness, but are instead instructed to apply their own subjective interpretations of the constructs. Prior research on the perception of poetry also adopts this technique of employing nonrestrictive definitions for such constructs (Belfi et al., 2018).  In this study, the

aim was to identify which of the selected constructs predicted judgments of creativity and aesthetic appeal, despite differences in decontextualised dimensions like originality and usefulness of poems. Finally, participants completed questionnaires on demographic information and five personality traits, namely openness, intellect (DeYoung et al., 2007), Vividness of Visual Imagery Questionnaire (VVIQ) (Marks, 1973a;1973b) , The Bucknell Auditory Imagery Scale—Vividness (BAIS-V, termed here as AVIQ, auditory vividness imagery questionnaire, for clarity) (Halpern, 2015), and Curiosity and Exploration Inventory II (Kashdan et al., 2009).

## 4.2.4. Analysis

No noteworthy multicollinearity was observed among the independent variables: the variance inflation factor (VIF) < 3.  The VIF assesses multicollinearity by indicating if a predictor exhibits a strong linear relationship with other predictors and is defined as $1/(1-R^2)$ where $R^2$ represents the coefficient of determination for the model predicting the variable from all the other predictor variables.  VIF values greater than 10 indicate potential multicollinearity concerns (Bowerman & O'connell, 1990). Additionally, the measurement's reliability was affirmed by evaluating the internal consistency across items (Cronbach's alpha = 0.76; McDonald's Omega Total = 0.82, Omega H asymptotic = 0.8; Omega Hierarchical = 0.66)  (Cronbach, 1951; McDonald, 2014). Linear mixed-effects models were employed, with group mean-centred predictors as fixed effects, participants as the grouping variable, and intercepts for participants set as random effects. The inclusion of predictors was determined using a forward selection approach, where the order of inclusion was based on the strength of their correlations with the respective outcome variables—creativity and aesthetic appeal—in descending order. For predicting creativity, the hierarchical order of fixed effects was as follows: originality, vividness in imagery, usefulness, surprise, arousal, reading fluency, and valence. For predicting aesthetic appeal, the order was: reading fluency, arousal, vividness in imagery, originality, valence, usefulness, and surprise. In predicting each outcome variable—creativity and aesthetic appeal—seven linear mixed models were compared using various criteria, including the Akaike information criterion (AIC: Akaike, 1974), Schwarz Bayesian information criterion (BIC: Schwarz, 1978), the proportion of variance explained by fixed effects ($R^2$), and the likelihood ratio test statistic ($\Delta\chi^2$). The best-fitting model was identified, providing insights into the potential predictors of both creativity and aesthetic appeal.

Finally, the moderating effects of five personality traits (e.g., openness, intellect, curiosity, vividness in visual imagery, and vividness in auditory imagery) on the potential predictors of

poetic creativity and aesthetic appeal were examined. Five separate linear mixed models were established for each personality trait, with creativity and aesthetic appeal as the outcome variables, to assess the interactions between the predictors and the corresponding personality trait.

# 4.3. Results

Table 4.2 presents descriptive statistics for all nine variables related to poem ratings provided by the readers. The data exhibits slightly negative skewness and mild negative kurtosis, indicating a distribution that approaches normality. Table 4.3 presents descriptive statistics for the reader's five personality traits. Table 4.4 shows the bivariate correlations, where the means and standard deviations are over $N$=96 but the ratings being averaged for the predictor variables (variables 1-9 in Table 4.4) are first each averaged over the 25 poems before being averaged over the participants. Creativity was significantly and positively correlated with all predictors ($p<0.01$), except valence ($r = 0.19$, $p = 0.07$). Aesthetic appeal showed significant and positive correlations with all predictors ($p<0.01$). Of note, creativity and aesthetic appeal were significantly correlated as well ($r =0.62$, $p <.01$). Utilising the *qgraph* package in R (Epskamp et al., 2012), the network diagram (Figure.4.1) displays variables as nodes and partial correlations as edges highlighting robust connections among creativity, originality, and usefulness, alongside strong associations between aesthetic appeal and reading fluency.

**Table 4.2**
*Descriptive statistics of the poem-related variables including mean, standard deviation (SD), skewness, kurtosis, standard error (SE), and variance inflation factor (VIF)*

| Variable | N | Mean | SD | Median | Skewness | Kurtosis | SE | VIF |
|---|---|---|---|---|---|---|---|---|
| Reading Fluency | 2400 | 4.9 | 1.56 | 5 | —0.42 | —0.56 | 0.03 | 1.46 |
| Aesthetic Appeal | 2400 | 4.6 | 1.45 | 5 | —0.18 | —0.5 | 0.03 | 1.79 |
| Valence | 2400 | 3.96 | 1.45 | 4 | 0.08 | —0.41 | 0.03 | 1.26 |
| Arousal | 2400 | 4.0 | 1.49 | 4 | —0.1 | —0.39 | 0.03 | 1.77 |
| Surprise | 2400 | 3.95 | 1.52 | 4 | —0.06 | —0.42 | 0.03 | 1.6 |
| Vividness in Imagery | 2400 | 4.72 | 1.57 | 5 | —0.46 | —0.42 | 0.03 | 1.57 |
| Originality | 2400 | 4.79 | 1.36 | 5 | —0.36 | —0.1 | 0.03 | 1.62 |
| Usefulness | 2400 | 3.92 | 1.36 | 4 | 0.04 | —0.03 | 0.03 | 1.41 |
| Creativity | 2400 | 4.8 | 1.41 | 5 | —0.37 | —0.21 | 0.03 | |

**Table 4.3**

*Descriptive statistics of readers' personality trait variables including mean,*
*standard deviation (SD), skewness, kurtosis, and standard error (SE)*

| Variable | N | Mean | SD | Median | Min | Max | Skewness | Kurtosis | SE |
|---|---|---|---|---|---|---|---|---|---|
| Openness | 96 | 4.78 | 0.74 | 4.6 | 3.1 | 6.4 | 0.25 | —0.44 | 0.02 |
| Intellect | 96 | 4.4 | 0.81 | 4.5 | 2.1 | 6.1 | —0.27 | —0.36 | 0.02 |
| Curiosity | 96 | 4.55 | 1.06 | 4.4 | 2.4 | 7.0 | 0.25 | —0.61 | 0.02 |
| VVIQ | 96 | 5.16 | 1.0 | 5.31 | 1.0 | 6.81 | —1.23 | 2.88 | 0.02 |
| AVIQ | 96 | 4.49 | 1.16 | 4.46 | 1.0 | 6.64 | —0.75 | 0.71 | 0.02 |

*Note.* VVIQ = vividness of visual imagery scores; AVIQ = vividness of auditory imagery scores.

**Table 4.4**

*Bivariate correlation coefficients for poetry-related variables and the personality measures of the readers*

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Reading Fluency | 4.9 | 0.72 | | | | | | | | | | | | | |
| 2. Aesthetic Appeal | 4.6 | 0.62 | 0.58** | | | | | | | | | | | | |
| 3. Valence | 3.96 | 0.62 | 0.14 | 0.30** | | | | | | | | | | | |
| 4. Arousal | 4.00 | 0.79 | 0.16 | 0.46** | 0.37** | | | | | | | | | | |
| 5. Surprise | 3.95 | 0.68 | 0.11 | 0.40** | 0.24* | 0.62** | | | | | | | | | |
| 6. Vividness Imagery | 4.72 | 0.59 | 0.49** | 0.53** | 0.22* | 0.26* | 0.39** | | | | | | | | |
| 7. Originality | 4.79 | 0.65 | 0.44** | 0.59** | 0.15 | 0.27** | 0.41** | 0.65** | | | | | | | |
| 8. Usefulness | 3.92 | 0.56 | -0.01 | 0.23* | 0.08 | 0.36** | 0.64** | 0.25* | 0.36** | | | | | | |
| 9. Creativity | 4.80 | 0.68 | 0.43** | 0.62** | 0.19 | 0.30** | 0.48** | 0.70** | 0.90** | 0.43** | | | | | |
| 10. Openness | 4.78 | 0.75 | 0.17 | 0.38** | -0.03 | 0.21* | 0.19 | 0.37** | 0.27** | 0.29** | 0.30** | | | | |
| 11. Intellect | 4.40 | 0.82 | 0.21* | 0.08 | 0.09 | 0.11 | 0.03 | 0.22* | 0.21* | 0.03 | 0.17 | 0.28** | | | |
| 12. Curiosity | 4.55 | 1.06 | 0.09 | 0.12 | 0.08 | 0.21* | 0.13 | 0.12 | 0.18 | 0.15 | 0.22* | 0.05 | 0.39** | | |
| 13. VVIQ | 5.16 | 1.00 | 0.18 | -0.04 | -0.02 | -0.15 | -0.14 | 0.14 | 0.11 | -0.02 | 0.09 | 0.06 | 0.27** | 0.29** | |
| 14. AVIQ | 4.49 | 1.17 | 0.14 | -0.10 | 0 | -0.14 | -0.10 | 0.04 | -0.01 | 0.01 | -0.01 | -0.01 | 0.18 | 0.10 | 0.54** |

*Note.* M and SD are used to represent mean and standard deviation, respectively. The means and SD are over N = 96 but the ratings being averaged for variables 1–9 are first each averaged over the 25 poems before being averaged over the participants; AVIQ = Vividness of auditory imagery trait scores; VVIQ = Vividness of visual imagery trait scores. *Indicates $p < .05$. **Indicates $p < .01$.

**Figure 4.1**

*Network diagram illustrating the partial correlations among the studied variables. Nodes represent variables, and edges indicate the magnitude of partial correlations between pairs of variables. The values on the edges reflect the magnitude of these partial correlations with positive correlations in green and negative correlations in red. Edge thickness reflects correlation strength.*
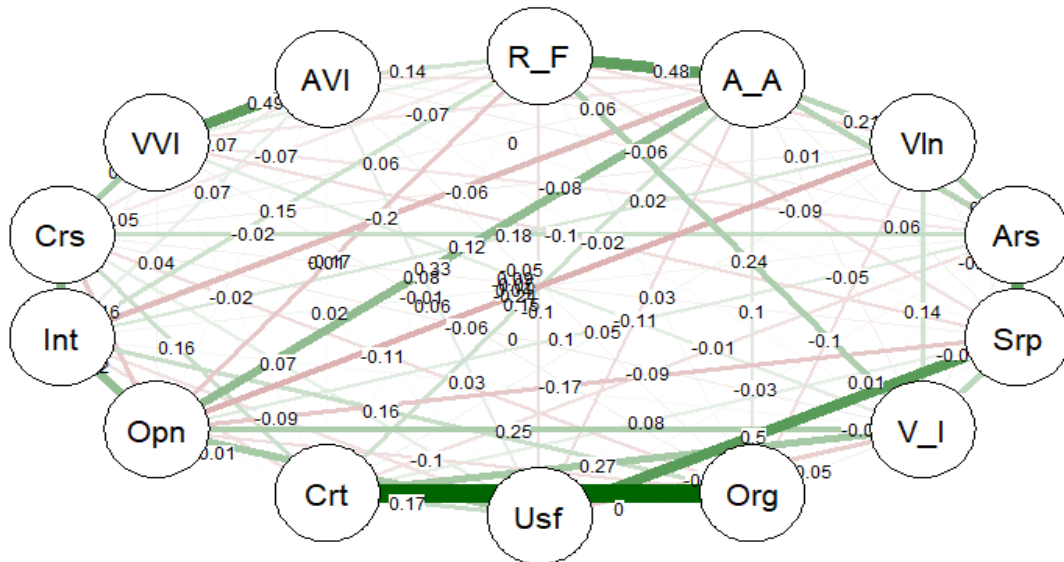


Table 4.5 reveals the model comparison results for both creativity and aesthetic appeal evaluation. Table 4.6 shows the linear mixed model results for the best-fitting models predicting the creativity and aesthetic appeal of the poems. For predicting creativity, the most parsimonious model fit was achieved with a model comprising originality, appeal, usefulness, and vividness in imagery ($\Delta\chi^2$= 211.11, BIC= 6462.1, $R^2$ = 0.40, $p<.001$). Specifically, originality was the strongest predictor ($b$ = 0.49, $SE$ = 0.02, $t$ =27.01, $p<.001$), followed by usefulness ($b$ = 0.24, $SE$ = 0.02, $t$ =14.87, $p<.001$) and vividness in imagery ($b$ = 0.15, $SE$ = 0.01, $t$ =10.40, $p<.001$). For predicting aesthetic appeal, the model comprising reading fluency, arousal, valence, vividness imagery, and originality was the most parsimonious fit ($\Delta\chi^2$= 79.3, BIC= 7185.7, $R^2$= 0.34, $p<.001$). Specifically, reading fluency was the strongest predictor ($b$ = 0.32, $SE$ = 0.02, $t$ =19.08, $p<.001$), followed by arousal ($b$ = 0.20, $SE$ = 0.02, $t$ =9.90, $p<.001$), valence ($b$ = 0.16, $SE$ = 0.01, $t$ =8.98, $p<.001$), vividness in imagery ($b$ = 0.13, $SE$ = 0.02, $t$ =7.16, $p<.001$), and originality ($b$ = 0.09, $SE$ = 0.02, $t$ =4.24, $p<.001$). Figure 4.2 and Figure 4.3 display the network diagrams for the best-fit models predicting creativity and aesthetic appeal, respectively.

**Table 4.5**

*Model comparison results for predicting creativity and aesthetic appeal*

| Predicting Creativity | | | | Models | | | | |
|---|---|---|---|---|---|---|---|---|
| Information Criteria | Null | M1 | M2 | M3 | M4 | M5 | M6 | M7 |
| AIC | 8120.2 | 6793.3 | 6636.5 | 6427.4 | 6402.6 | 6360.6 | 6358.5 | 6360.3 |
| BIC | 8137.5 | 6816.5 | 6665.4 | 6462.1 | 6443.1 | 6406.9 | 6410.6 | 6418.1 |
| R²(marginal) | 0 | 0.34 | 0.37 | 0.4 | 0.41 | 0.41 | 0.41 | 0.41 |
| Δ χ² | | 1328.84*** | 158.82*** | 211.11*** | 26.8*** | 44*** | 4.1* | 0.22 |
| | | | | | | | | |
| **Predicting Aesthetic Appeal** | | | | | | | | |
| AIC | 8368.6 | 7630.4 | 7318.7 | 7235.4 | 7216.8 | 7139.4 | 7132.8 | 7134.5 |
| BIC | 8385.9 | 7653.6 | 7347.6 | 7270.1 | 7257.2 | 7185.7 | 7184.9 | 7192.3 |
| R²(marginal) | 0 | 0.22 | 0.3 | 0.32 | 0.32 | 0.34 | 0.34 | 0.34 |
| Δ χ² | | 740.1*** | 313.7*** | 85.2*** | 20.7*** | 79.3*** | 8.6** | 0.38 |

*Note.* *Indicates $p < .05$. **Indicates $p < .01$. ***Indicates $p < .001$.

**Table 4.6**

*The linear mixed model results for the best model fit in predicting creativity and aesthetic appeal: creativity prediction model shows originality as the best predictor; aesthetic appeal prediction model shows reading fluency as the best predictor*

**Best model fit for predicting creativity.**

MODEL INFO:
Observations: 2400
Dependent Variable: Creativity
Type: Mixed effects linear regression

MODEL FIT:
AIC = 6427.4, BIC = 6462.1
Pseudo-$R^2$ (fixed effects) = 0.40
Pseudo-$R^2$ (total) = 0.62

Random effects:

| Groups | Name | Variance | Std. Dev. |
|---|---|---|---|
| Participants | (Intercept) | 0.43 | 0.65 |
| Residual | | 0.76 | 0.87 |

Number of observations: 2400, grouping variable: Participants, number of groups:96, ICC:0.36

Fixed effects:

| | Estimate | SE | d.f. | *t*-value | *p*-value |
|---|---|---|---|---|---|

| | Estimate | S.E. | d.f. | t-value | p-value |
|---|---|---|---|---|---|
| (Intercept) | 4.80 | 0.07 | 95.99 | 69.54 | <0.001 |
| Originality | 0.49 | 0.02 | 2303.99 | 27.01 | <0.001 |
| Vividness Imagery | 0.15 | 0.01 | 2303.99 | 10.40 | <0.001 |
| Usefulness | 0.24 | 0.02 | 2303.99 | 14.87 | <0.001 |

**Best model fit for predicting aesthetic appeal.**

MODEL INFO:
Observations: 2400
Dependent Variable: Aesthetic Appeal
Type: Mixed effects linear regression

MODEL FIT:
AIC = 7139.4, BIC = 7185.7
Pseudo-$R^2$ (fixed effects) = 0.34
Pseudo-$R^2$ (total) = 0.50

Random effects:

| Groups | Name | Variance | Std. Dev. |
|---|---|---|---|
| Participants | (Intercept) | 0.34 | 0.59 |
| Residual | | 1.04 | 1.02 |

Number of observations: 2400, grouping variable: Participants, number of groups:96, ICC:0.25

Fixed effects:

| | Estimate | S.E. | d.f. | t-value | p-value |
|---|---|---|---|---|---|
| (Intercept) | 4.60 | 0.06 | 95.99 | 72.53 | <0.001 |
| Reading Fluency | 0.32 | 0.02 | 2303.99 | 19.08 | <0.001 |
| Arousal | 0.20 | 0.02 | 2303.99 | 9.90 | <0.001 |
| Vividness-Imagery | 0.13 | 0.02 | 2303.99 | 7.16 | <0.001 |
| Originality | 0.09 | 0.02 | 2303.99 | 4.24 | <0.001 |
| Valence | 0.16 | 0.02 | 2303.99 | 8.98 | <0.001 |

**Figure 4.2**

*Network diagram illustrating the model for predicting the creativity of a poem. The diagram demonstrates how originality, usefulness, and vivid imagery contribute to the prediction of creativity. The numeric values on the edges represent the estimated coefficients of the predictor variables from the linear mixed model for creativity*
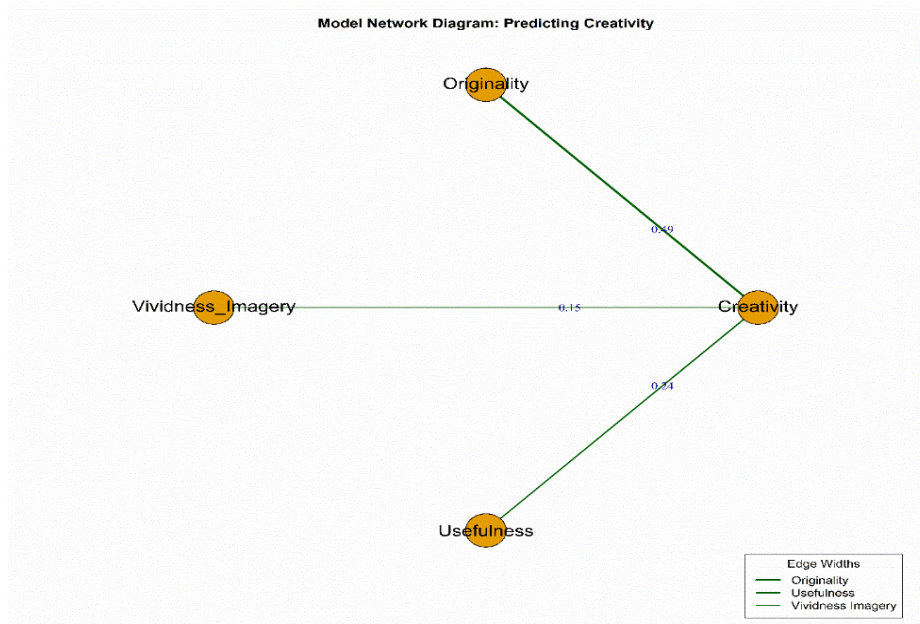


**Figure. 4.3**

*Network diagram illustrating the model for predicting the aesthetic appeal of a poem. The diagram depicts how reading fluency, arousal, valence, and vivid imagery contribute to the prediction of aesthetic appeal. The numeric values on the edges represent the estimated coefficients of the predictor variables from the linear mixed model for aesthetic appeal*



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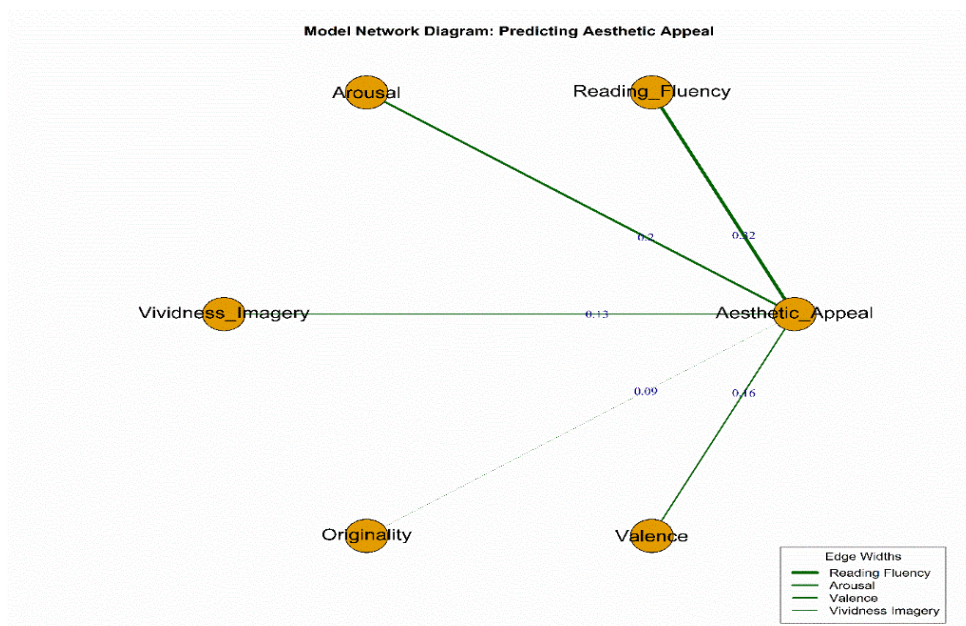
Finally, the moderating influence of the five personality traits—openness, intellect, epistemic curiosity, vividness of visual imagery (VVIQ), and vividness of auditory imagery (AVIQ)—was separately explored in relation to the predictors of creativity and aesthetic appeal. The results of moderation analyses are presented in Table 4.7 and visually depicted in Figures 4.4(a)-(e). Originality, identified as the strongest predictor of creativity, was significantly moderated by openness (b = -0.11, SE = 0.03, $t$ = -4.37, $p$<.001), vividness of visual imagery (VVIQ) (b = 0.06, SE = 0.02, $t$ = 2.98, $p$<.001), curiosity (b = -0.04, SE = 0.02, $t$ = -2.39, $p$ = .02), and marginally by intellect (b = -0.05, SE = 0.02, $t$ = -2.0, $p$ = 0.05). Usefulness was marginally moderated by VVIQ (b = -0.03, SE = 0.02, $t$ = -1.95, $p$ = 0.05). A simple slopes analysis (Table 4.8) indicated that readers with lower scores in openness, intellect, and curiosity showed a stronger influence on originality when predicting creativity, compared to their higher-scoring counterparts (See Figures 4.4 (a), (b), and (c)). Readers with higher visual imagery ability (VVIQ scores) demonstrated a stronger influence on originality (See Figure 4.4(d)) but a weaker influence on usefulness in predicting creativity (See Figure 4.4(e)). Notably, auditory imagery ability (AVIQ scores) did not significantly moderate any of the predictors of creativity, suggesting that vivid auditory imagery ability did not impact creativity judgments.

The analysis was repeated with aesthetic appeal as the response variable, and it was found that reading fluency, identified as the best predictor of aesthetic appeal, was significantly influenced only by AVIQ (b = -0.03, SE = 0.01, $t$ = -2.28, $p$ = 0.02). Arousal was influenced by VVIQ (b = -0.05, SE = 0.02, $t$ = -2.25, $p$ = 0.02), vividness in imagery by openness (b = 0.05, SE = 0.02, $t$ = 2.11, $p$ = 0.03), originality by AVIQ (b = 0.05, SE = 0.02, $t$ = 2.84, $p$ < .001), and valence by intellect (b = 0.07, SE = 0.02, $t$ = 3.10, $p$ < .001). The results of moderation analyses are presented in Table 4.7 and visually depicted in Figures 4.4(f)-(j). A simple slopes analysis (Table 4.8) revealed that the relationship between vivid imagery and aesthetic appeal was more prominent in readers with higher openness (Figure 4.4(f)), and the valence-aesthetic appeal relationship was more pronounced in individuals with higher intellect (Figure 4.4(g)). The arousal-aesthetic appeal connection was found to be stronger in readers with lower VVIQ scores (Figure 4.4(h)). Additionally, participants with higher AVIQ scores exhibited a stronger connection between originality and aesthetic appeal (Figure 4.4(i)), while the association between reading fluency and aesthetic appeal was more pronounced in individuals with lower AVIQ scores (Figure 4.4(j)).

**Table 4.7.**

*Moderating effects of personality traits on the predictors of Creativity and Aesthetic Appeal. This table presents the estimated coefficients (b), standard errors (SE), t-values, and p-values for the interactions between potential predictors and the personality traits (openness, intellect, curiosity, vividness of visual imagery (VVIQ), vividness of auditory imagery (AVIQ)).*

| Predicting Creativity<br>Model | Estimate | SE | t | p | Fit (R^2) |
|---|---|---|---|---|---|
| **Openness Model** | | | | | |
| Intercept | 3.45 | 0.43 | 8.12 | <0.001 | |
| Openness | 0.28 | 0.09 | 3.22 | <0.001 | |
| Originality | 1.01 | 0.12 | 8.37 | <0.001 | |
| Usefulness | 0.09 | 0.11 | 0.84 | 0.4 | |
| Vividness in Imagery | 0.02 | 0.09 | 0.16 | 0.87 | |
| Openness*Originality | -0.11 | 0.03 | -4.37 | <0.001 | |
| Openness*Usefulness | 0.03 | 0.02 | 1.38 | 0.17 | |
| Openness*Vividness in Imagery | 0.03 | 0.02 | 1.43 | 0.15 | 0.43** |
| | | | | | |
| **Intellect Model** | | | | | |
| Intercept | 4.13 | 0.37 | 11.18 | <0.001 | |
| Intellect | 0.15 | 0.08 | 1.86 | 0.07 | |
| Originality | 0.69 | 0.1 | 6.74 | <0.001 | |
| Usefulness | 0.22 | 0.09 | 2.39 | 0.02 | |
| Vividness in Imagery | 0.04 | 0.08 | 0.52 | 0.61 | |
| Intellect*Originality | -0.05 | 0.02 | -2 | 0.05 | |
| Intellect*Usefulness | 0 | 0.02 | 0.19 | 0.85 | |
| Intellect*Vividness in Imagery | 0.02 | 0.02 | 1.3 | 0.19 | 0.41** |
| | | | | | |
| **Curiosity Model** | | | | | |
| Intercept | 4.19 | 0.3 | 14.13 | <0.001 | |
| Curiosity | 0.13 | 0.06 | 2.12 | 0.04 | |
| Originality | 0.68 | 0.08 | 8.42 | <0.001 | |
| Usefulness | 0.22 | 0.07 | 3.14 | <0.001 | |
| Vividness in Imagery | 0.08 | 0.06 | 1.26 | 0.21 | |
| Curiosity*Originality | -0.04 | 0.02 | -2.39 | 0.02 | |
| Curiosity*Usefulness | 0 | 0.01 | 0.3 | 0.77 | |
| Curiosity*Vividness in Imagery | 0.01 | 0.01 | 1.07 | 0.28 | 0.41** |
| | | | | | |
| **VVIQ Model** | | | | | |
| Intercept | 4.47 | 0.36 | 12.46 | <0.001 | |
| VVIQ | 0.07 | 0.07 | 0.95 | 0.34 | |
| Originality | 0.2 | 0.1 | 2 | 0.05 | |
| Usefulness | 0.41 | 0.09 | 4.7 | <0.001 | |
| Vividness in Imagery | 0.07 | 0.08 | 0.85 | 0.39 | |
| VVIQ*Originality | 0.06 | 0.02 | 2.98 | <0.001 | |
| VVIQ*Usefulness | -0.03 | 0.02 | -1.95 | 0.05 | |

| | | | | | |
|---|---|---|---|---|---|
| VVIQ*Vividness in Imagery | 0.01 | 0.01 | 0.91 | 0.36 | 0.41** |
| | | | | | |
| **AVIQ Model** | | | | | |
| Intercept | 4.79 | 0.27 | 17.62 | <0.001 | |
| AVIQ | 0 | 0.06 | 0.04 | 0.97 | |
| Originality | 0.39 | 0.08 | 5.17 | <0.001 | |
| Usefulness | 0.27 | 0.07 | 4 | <0.001 | |
| Vividness in Imagery | 0.2 | 0.07 | 3.05 | <0.001 | |
| AVIQ*Originality | 0.02 | 0.02 | 1.29 | 0.2 | |
| AVIQ*Usefulness | -0.01 | 0.01 | -0.44 | 0.66 | |
| AVIQ*Vividness in Imagery | -0.01 | 0.01 | -0.8 | 0.42 | 0.4** |
| | | | | | |
| **Predicting Aesthetic Appeal** | | | | | |
| **Openness Model** | | | | | |
| Intercept | 3.11 | 0.38 | 8.18 | <.001 | |
| Openness | 0.31 | 0.08 | 3.95 | <.001 | |
| Reading Fluency | 0.51 | 0.11 | 4.7 | <.001 | |
| Arousal | -0.01 | 0.14 | -0.09 | 0.93 | |
| Vividness in Imagery | -0.11 | 0.11 | -0.98 | 0.33 | |
| Originality | 0.09 | 0.14 | 0.68 | 0.5 | |
| Valence | 0.24 | 0.12 | 2.09 | 0.04 | |
| Openness*Reading Fluency | -0.04 | 0.02 | -1.78 | 0.07 | |
| Openness*Arousal | 0.04 | 0.03 | 1.54 | 0.12 | |
| Openness*Vividness in Imagery | 0.05 | 0.02 | 2.11 | 0.03 | |
| Openness*Originality | 0 | 0.03 | -0.05 | 0.96 | |
| Openness*Valence | -0.02 | 0.02 | -0.69 | 0.49 | 0.37** |
| | | | | | |
| **Intellect Model** | | | | | |
| Intercept | 4.34 | 0.34 | 12.59 | <.001 | |
| Intellect | 0.06 | 0.08 | 0.77 | 0.44 | |
| Reading Fluency | 0.47 | 0.1 | 4.85 | <.001 | |
| Arousal | 0.08 | 0.12 | 0.69 | 0.49 | |
| Vividness in Imagery | 0.19 | 0.1 | 1.86 | 0.06 | |
| Originality | -0.05 | 0.12 | -0.43 | 0.67 | |
| Valence | -0.15 | 0.1 | -1.49 | 0.14 | |
| Intellect*Reading Fluency | -0.03 | 0.02 | -1.56 | 0.12 | |
| Intellect*Arousal | 0.03 | 0.03 | 1.03 | 0.3 | ` |
| Intellect*Vividness in Imagery | -0.01 | 0.02 | -0.6 | 0.55 | |
| Intellect*Originality | 0.03 | 0.03 | 1.2 | 0.23 | |
| Intellect*Valence | 0.07 | 0.02 | 3.1 | <.001 | 0.34** |
| | | | | | |
| **Curiosity Model** | | | | | |
| Intercept | 4.28 | 0.28 | 15.43 | <.001 | |
| Curiosity | 0.07 | 0.06 | 1.15 | 0.25 | |
| Reading Fluency | 0.24 | 0.07 | 3.28 | <.001 | |
| Arousal | 0.18 | 0.09 | 1.85 | 0.06 | |
| Vividness in Imagery | 0.11 | 0.08 | 1.42 | 0.16 | |

| | | | | | |
|---|---|---|---|---|---|
| Originality | 0.03 | 0.09 | 0.33 | 0.74 | |
| Valence | 0.13 | 0.08 | 1.68 | 0.09 | |
| Curiosity *Reading Fluency | 0.02 | 0.02 | 1.06 | 0.29 | |
| Curiosity *Arousal | 0.01 | 0.02 | 0.26 | 0.8 | |
| Curiosity *Vividness in Imagery | 0 | 0.02 | 0.15 | 0.88 | |
| Curiosity *Originality | 0.01 | 0.02 | 0.62 | 0.54 | |
| Curiosity *Valence | 0.01 | 0.02 | 0.39 | 0.69 | 0.34** |
| | | | | | |
| **VVIQ Model** | | | | | |
| Intercept | 4.73 | 0.33 | 14.27 | <.001 | |
| VVIQ | -0.03 | 0.06 | -0.43 | 0.67 | |
| Reading Fluency | 0.35 | 0.08 | 4.17 | <.001 | |
| Arousal | 0.45 | 0.11 | 4 | <.001 | |
| Vividness in Imagery | 0.08 | 0.1 | 0.73 | 0.47 | |
| Originality | 0.09 | 0.12 | 0.73 | 0.47 | |
| Valence | 0.04 | 0.09 | 0.46 | 0.65 | |
| VVIQ*Reading Fluency | -0.01 | 0.02 | -0.36 | 0.72 | |
| VVIQ*Arousal | -0.05 | 0.02 | -2.25 | 0.02 | |
| VVIQ*Vividness in Imagery | 0.01 | 0.02 | 0.48 | 0.63 | |
| VVIQ*Originality | 0 | 0.02 | 0.03 | 0.98 | |
| VVIQ*Valence | 0.02 | 0.02 | 1.39 | 0.16 | 0.34** |
| | | | | | |
| **AVIQ Model** | | | | | |
| Intercept | 4.83 | 0.25 | 19.34 | <.001 | |
| AVIQ | -0.05 | 0.05 | -0.96 | 0.34 | |
| Reading Fluency | 0.47 | 0.07 | 6.85 | <.001 | |
| Arousal | 0.28 | 0.09 | 3.25 | <.001 | |
| Vividness in Imagery | 0.15 | 0.08 | 1.88 | 0.06 | |
| Originality | -0.15 | 0.09 | -1.75 | 0.08 | |
| Valence | 0.24 | 0.07 | 3.39 | <.001 | |
| AVIQ*Reading Fluency | -0.03 | 0.01 | -2.28 | 0.02 | |
| AVIQ*Arousal | -0.02 | 0.02 | -0.97 | 0.33 | |
| AVIQ*Vividness in Imagery | 0 | 0.02 | -0.28 | 0.78 | |
| AVIQ*Originality | 0.05 | 0.02 | 2.84 | <.001 | |
| AVIQ*Valence | -0.02 | 0.01 | -1.12 | 0.26 | 0.34** |

**Table 4.8**

*Results of the simple slopes analysis for significant moderation effects on the predictors of creativity and aesthetic appeal at high and low levels of the five personality traits.*

| Predicting Creativity | | High (+1 SD) | | | | Low (-1 SD) | | | | Slope Difference (High-Low) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moderator | Predictor | Est | SE | t-value | p-value | Est | SE | t-value | p-value | Est | SE | t-value | p-value |
| Openness | Originality | 0.4 | 0.03 | 15.3 | <.001 | 0.57 | 0.03 | 22.26 | <.001 | -0.17 | 0.04 | -4.36 | <.0001 |
| Intellect | Originality | 0.46 | 0.03 | 18.5 | <.001 | 0.53 | 0.03 | 19.6 | <.001 | -0.07 | 0.04 | -2 | 0.05 |
| Curiosity | Originality | 0.45 | 0.02 | 18.91 | <.001 | 0.54 | 0.03 | 20.02 | <.001 | -0.08 | 0.04 | -2.39 | 0.02 |
| VVIQ | Originality | 0.55 | 0.03 | 20.87 | <.001 | 0.44 | 0.03 | 16.7 | <.001 | 0.11 | 0.04 | -2.98 | 0.0029 |
| VVIQ | Usefulness | 0.21 | 0.02 | 9.03 | <.001 | 0.27 | 0.02 | 11.8 | <.001 | -0.06 | 0.03 | -1.95 | 0.05 |
| | | | | | | | | | | | | | |
| **Predicting Aesthetic Appeal** | | | | | | | | | | | | | |
| Openness | Vividness in Imagery | 0.16 | 0.03 | 6.49 | <.001 | 0.09 | 0.02 | 3.75 | <.001 | 0.08 | 0.04 | 2.1 | 0.04 |
| Intellect | Valence | 0.21 | 0.02 | 8.73 | <.001 | 0.1 | 0.03 | 3.58 | <.001 | 0.11 | 0.04 | 3.1 | 0.002 |
| VVIQ | Arousal | 0.16 | 0.03 | 5.96 | <.001 | 0.25 | 0.03 | 8.15 | <.001 | -0.09 | 0.04 | -2.24 | 0.02 |
| AVIQ | Originality | 0.15 | 0.03 | 4.99 | <.001 | 0.02 | 0.03 | 0.84 | 0.4 | 0.12 | 0.04 | -2.84 | 0.005 |
| AVIQ | Reading Fluency | 0.28 | 0.02 | 11.63 | <.001 | 0.36 | 0.02 | 14.93 | <.001 | -0.08 | 0.03 | -2.28 | 0.02 |

**Figure 4.4**

*Simple slopes illustrating the moderation effects of five personality traits (openness, intellect, curiosity, vividness of visual imagery (VVIQ), and vividness of auditory imagery (AVIQ)) on the prediction of creativity and aesthetic appeal of poems. Each subplot, (a) to (j), represents how these personality traits moderate the relationship between a predictor (originality, usefulness, vividness in imagery, valence, arousal, or reading fluency) and the outcomes (creativity or aesthetic appeal). The slopes are displayed for three levels of the moderator: low (-1 SD), medium (mean), and high (+1 SD).*
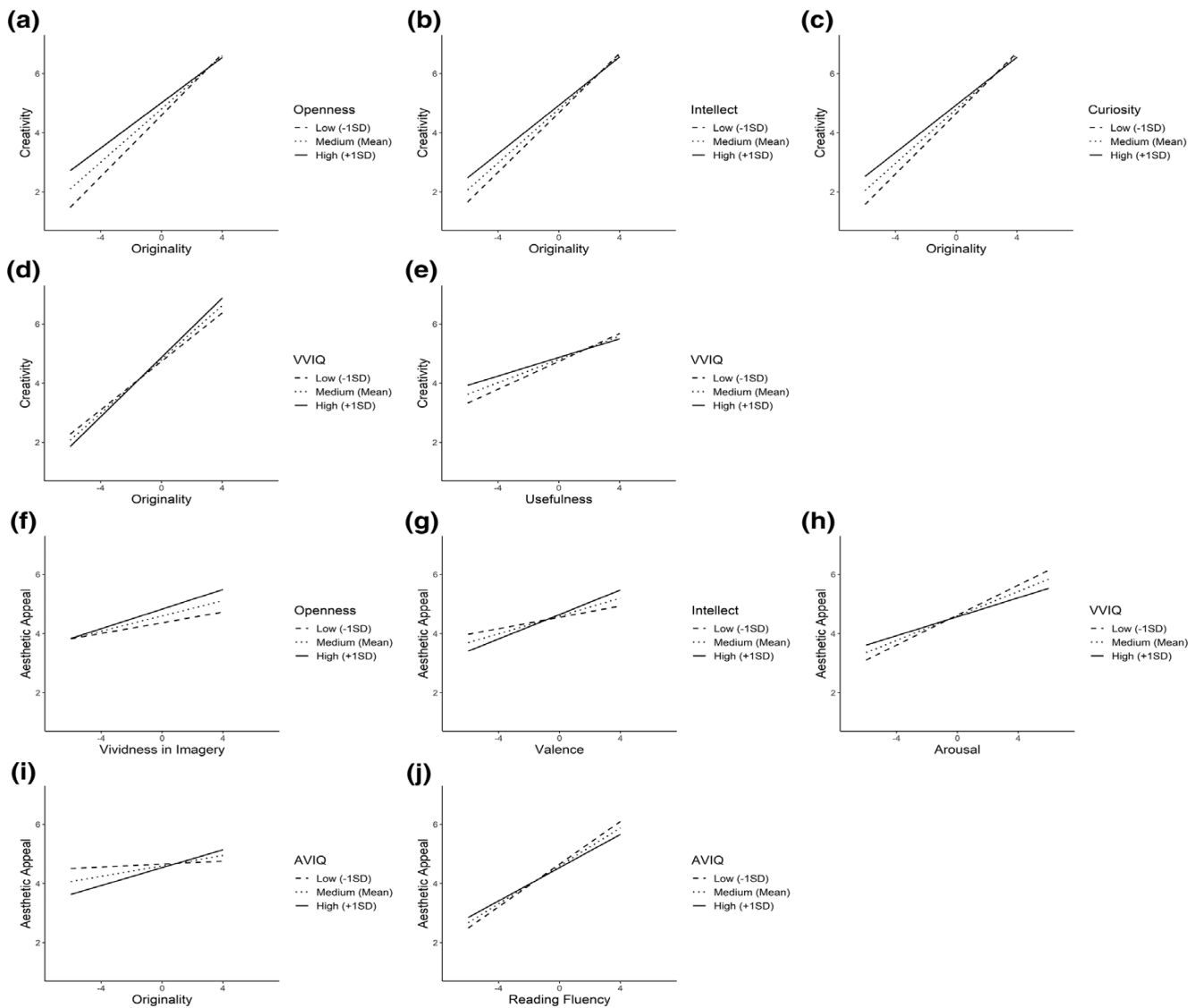
# 4.4. Discussion

The study unveils two crucial facets of poetry evaluation. First, it differentiates between the evaluation of a poem's creativity and its aesthetic appeal, demonstrating that these are distinct processes with minimal overlap. The assessment of a poem's creativity is primarily based on its originality, usefulness and vivid imagery. In contrast, the evaluation of its aesthetic appeal relies on its reading fluency, perceived arousal, perceived valence, and vivid imagery. Second, the study aligns the evaluation of poetic creativity with the standard definition of creativity (Runco & Jaeger, 2012), which emphasises both originality and usefulness.

Consistent with traditional criteria for evaluating creative products, findings in this study highlight originality as the foremost determinant of a poem's creativity. Nevertheless, originality alone is not sufficient; usefulness emerges as the second-most important predictor of creativity, reinforcing the notion that creative poems must be both original and useful (Runco, 1988). This highlights that, despite idiosyncratic subjective interpretations, the judgment of a poem's creativity fundamentally depends on these two essential components: originality and usefulness. Furthermore, the study reveals that vivid imagery significantly enhances perceived creativity, as poems with rich and evocative imagery were consistently judged as more creative.

Conversely, the assessment of a poem's aesthetic appeal follows a different route, with reading fluency emerging as the primary predictor. This corresponds with the notion that faster reading speed, indicative of enhanced processing fluency (Lea et al., 2008), is pivotal for the aesthetic appreciation of a poem. Further, this finding is consistent with prior research suggesting that aesthetic experience is positively influenced by the processing dynamics of the perceiver (Reber et al., 2004). Therefore, this study proposes that the more fluently the reader can comprehend the poem, the higher their aesthetic evaluation of it. Following reading fluency, arousal emerges as the next strongest predictor, followed by perceived valence and vivid imagery. This finding somewhat contrasts with earlier research that highlighted the predictive role of vivid imagery over emotional valence in specific poetry forms, such as haiku and sonnets (Belfi et al., 2018). Haiku is a genre of poetry commonly associated with seasons, often emphasising nature imagery as its most important feature (Addiss, 2022). Similarly, Petrarchan sonnets prominently feature the 'volta' or 'turn', which often leads to visual imagery (Whissell, 2018). In contrast to these structurally constrained genres of poetry, the poems selected for this study were from diverse styles and themes. It was observed that perceived arousal and valence were more influential than vivid imagery in

predicting a poem's aesthetic appeal. Hence, despite individual variations in responses, poems that were stimulating and capable of evoking positive emotions were generally perceived as more aesthetically appealing, highlighting the strong connection between emotional valence and aesthetic appeal (Leder et al., 2012). In this context, the perceived emotions in this study can be referred to as "aesthetic emotions", associated with a special type of perceived aesthetic appeal that predicts the subjectively felt pleasure or displeasure and the liking or disliking connected with this type of appeal (Menninghaus et al., 2019). This finding aligns with earlier research suggesting that, unlike the negativity bias in classical emotions, the emotion terms used for the appraisal of intrinsic pleasantness predominantly include more positive than negative emotions (Scherer, 2005; Menninghaus et al., 2019). Moreover, the higher predictive power of arousal suggests that aesthetic emotions are typically pursued and enjoyed intrinsically, where the subjectively perceived intensity and/or emotional arousal serve as rewards in themselves (Menninghaus et al., 2019).

Interestingly, vivid imagery emerges as a predictor of both creativity and aesthetic appeal, acting as a key factor in the minimal overlap between these two evaluative processes. Poetic imagery defined as "the sensory and figurative language used in poetry" (https://www.britannica.com/art/poetic-imagery), is a universally recognised central dimension in poetic meaning production (Brandt & Brandt, 2005). The results corroborate earlier research suggesting that figurative languages evoke aesthetic experiences at the phonological and prosodic levels eliciting pleasurable feelings associated with the perception of beauty (Citron & Zervos, 2018; Menninghaus et al., 2015; Van Peer, 1990). Additionally, the findings are consistent with prior studies that vivid imagery tends to enhance the aesthetic appeal of poems, like haiku and sonnets (Belfi et al., 2018). Notably, vivid imagery significantly predicts the assessment of poems' creativity.  This further aligns with the notion that the creative interplay of language and though is particularly evident in figurative language which helps construct a high-order linkage between the entities referred to (Katz et al., 1998; Cacciari, 1998), manipulating implicit meaning in poems (Miall & Kuiken, 1994). The use of vivid imagery evoked by figures of speech likely enhances readers' engagement, comprehension, and interpretation, promoting deeper critical thought and appreciation of a poem's creativity alongside its aesthetics. Hence, the results of this study imply that poems evoking vivid imagery not only enhance aesthetic appreciation but also stimulate creative contemplation during poetry evaluation. Of note, perceived emotions were found to play a more effective influence on the aesthetic appeal compared to vivid imagery.

In relation to the impact of individual differences in readers' personality traits on shaping these two assessment processes, a significant distinction was evident between the two

evaluation models. Specifically, the findings that visual imagery abilities (as measured by VVIQ scores) positively influence the weighting of originality in creativity judgments is particularly noteworthy.  This suggests that individuals with stronger mental visualisation abilities may assess creativity through a lens that prioritises originality as a key criterion. In contrast, traits such as openness, intellect, and curiosity appear to reduce the emphasis on originality, potentially indicating a broader or more integrative evaluative framework. Even a slight increase in the assessment of originality had a more significant impact on the perception of poetry creativity for individuals with lower levels of openness and intellectual curiosity. Conversely, those scoring higher on these traits seemed less influenced by originality in their creativity judgments. These findings challenge conventional assumptions about the role of openness and intellectual curiosity in creativity evaluation. While these traits are typically associated with flexible thinking and a preference for novelty, the results suggest they may diminish the relative importance of originality in judgments of creativity. For individuals with lower scores in these traits, originality may function as a more salient and straightforward metric for evaluating creativity. This counterintuitive result calls for further research to explore this phenomenon in greater detail, particularly to better understand how personality traits shape evaluative frameworks in creative assessments.

For aesthetic appeal, the results showed that openness, intellect, and auditory imagery trait (AVIQ) positively influenced the predictive roles of vividness in imagery, valence, and originality, respectively. Conversely, auditory and visual imagery abilities negatively impacted the roles of reading fluency and arousal, respectively. Specifically, readers with higher auditory imagery abilities were less influenced by reading fluency, while those with higher visual imagery abilities were less affected by arousal during aesthetic evaluations. Interestingly, reading fluency, the primary predictor of aesthetic appeal, was not positively influenced by any of the selected personality traits. This could be attributed to the focus of fluency assessment in this experiment, which emphasised perceptual fluency rather than conceptual fluency or the poem's meaningfulness. Given the brevity and inherent readability of the poems used, prior research suggests that conceptual fluency might serve as a stronger predictor of aesthetic appeal (Martindale et al., 1990). If participants had been asked to evaluate how easily they conceptualised the poems, personality traits might have shown a stronger influence on conceptual fluency in their aesthetic judgments. This would support the notion that "beauty is in the processing experiences of the beholder" (Reber et al., 2004, p.378) and suggest that aesthetic appreciation extends beyond surface-level perceptual ease, being deeply rooted in meaningful cognitive engagement.

Therefore, this study proposes a clear distinction in the cognitive mechanisms underlying the evaluation of creativity and aesthetic appeal, both at the predictor level and in terms of individual differences. At the predictor level, creativity is primarily driven by originality, emphasising novelty of ideas. In contrast, aesthetic appeal is largely influenced by reading fluency, vivid imagery, and emotional valence, highlighting ease of engagement and sensory engagement. Therefore, while creativity emphasises higher-order cognitive processing, aesthetic appeal focuses on experiential engagement, relying more on sensory and emotional dimensions. At the individual difference level, the findings reveal a stark contrast: aesthetic appeal evaluation benefits from a broader trait-based influence, whereas creativity judgments are more selectively shaped by specific cognitive traits like visualisation.

### 4.4.1. Limitations

It is important to acknowledge certain limitations of the present study. Firstly, the diversity of the poems might complicate the comparison of disparate aspects of creativity. Despite the thematic, periodic, and stylistic diversity of the selected poems, they exhibit structural uniformity, each being 8 lines long and containing, on average, 50 words. Further, both the lexical and semantic diversity analysis suggested small standard deviations across the poems, implying a narrower range of vocabulary and semantic variation. This uniformity facilitated a more focused comparison of creativity and aesthetic appeal by providing some homogeneity among the selected poems. However, this also might limit the ability to draw generalized inferences, which would require a much larger set of poems with diverse content. Thus, we acknowledge a nuanced trade-off between subjective diversity and objective uniformity in assessing poetic creativity in our study. Secondly, our participants were not given explicit definitions for constructs such as originality, usefulness, and creativity. Instead, in line with earlier research (Amabile, 1982; Belfi et al., 2018), they were instructed to rely on their own subjective understanding of these constructs. Providing explicit context and definitions for each dimension might enhance the interpretation of findings. Alternatively, employing a semi-structured grounded theory approach could offer a more nuanced understanding of these constituent nebulous predictors (e.g., by exploring how and in what context a poem becomes useful).

### 4.4.2. Conclusion

This study addresses a fundamental question in poetry evaluation: are judgments of a poem's creativity and aesthetic appeal aligned? The findings reveal distinct evaluation mechanisms: creativity is driven by originality, usefulness, and vivid imagery, reflecting higher-order cognitive processing, while aesthetic appeal relies on reading fluency, perceived emotions, and vivid imagery, emphasising sensory and emotional engagement. This distinction highlights that creativity adheres to the standard bipartite definition, valuing both originality and usefulness, whereas aesthetic appeal involves broader experiential dimensions. At the individual difference level, aesthetic appeal is influenced by a wider range of personality traits, while creativity judgments are more narrowly shaped by cognitive traits like visualization. These findings provide valuable insights into the intricate interplay of cognitive, sensory, and emotional factors underlying the evaluation of poetry, shedding light on the multifaceted processes that define artistic appreciation.

### 4.4.3.  Looking Ahead: Poetry's Role in Idea Generation

Until now, the focus has been on how we judge the creative and aesthetic dimensions of poetry and how expertise and individual differences shape these processes. However, the journey does not end here. In the next chapter, the lens shifts intriguingly—from evaluating poetry to understanding its potential role in enhancing creative cognition itself. Specifically, this transition shifts the focus to examining poetry's dynamic influence beyond mere appreciation: can reading poetry enhance creative thinking in individuals? Creative thinking often flourishes during periods of incubation, when attention is temporarily diverted from the main task, often through mind-wandering. To investigate this, the upcoming chapter presents a behavioural study examining whether poetry reading can serve as an effective incubator for creativity. By extending the exploration of poetry's role from a passive subject of evaluation to an active catalyst for creativity, this shift highlights poetry's broader impact on the creative mind.

# CHAPTER 5


# DOES POETRY FACILITATE CREATIVE IDEATION?


*"If you want something new, you have to stop doing something old."*
— *Peter F. Drucker*


## 5.1. Introduction

Stepping away from a problem and letting the mind wander can sometimes boost creativity. Creative thinking often thrives not in periods of intense focus, but rather when attention shifts away from the task at hand—allowing the mind to wander in a phase known as incubation (Smith & Blankenship, 1989; Baird et al., 2012; Tan et al., 2015). Incubation allows ideas to be processed unconsciously, potentially leading to fresh insights or creative ideation. Julio Florencio Cortázar (1914–1984), a famous French novelist known for his innovative and original style, aptly said, "All profound distraction opens certain doors. You have to allow yourself to be distracted when you are unable to concentrate."

The previous chapters explored how the evaluation of creative potential of poetry is shaped by linguistic properties, as well as the psychological states, expertise, and traits of readers. This chapter investigates whether poetry, with its rich imagery and open-ended interpretations, can serve as an effective incubator to stimulate the creative process and enhance readers' creativity. Specifically, the study in this chapter examines poetry's role as an incubator, focusing on both associative and divergent thinking, and whether it encourages free-flowing ideas or leads to the generation of truly novel thoughts in readers.

Creativity, typically defined as the capacity to produce work that is both original and useful (Runco & Jaeger, 2012), is a driver of human progress. Given its significance, researchers have long sought to understand the cognitive mechanisms that facilitate creative thought (Runco & Chand, 1995; Sweller, 2009; Beaty et al., 2014; Heilman et al., 2003; Haase et al., 2023; Lloyd-Cox et al., 2023). One intriguing area of exploration is the potential role of incubation – a period when a person takes a break from direct problem-solving and allows the unconscious mind to work on the problem leading to enhancing creativity (Ritter &

Dijksterhuis, 2014; Gilhooly et al., 2013; Hélie & Sun, 2010). This study investigates whether reading poetry, known for its rich linguistic expressions and emotional depth, can serve as an effective incubation to enhance creative cognition. Specifically, it examines how poetry reading and evaluation influence the incubation process and subsequent creative performance, exploring the underexplored intersection between poetry engagement and creative thinking. In particular, it investigates whether engaging with poetic texts stimulates mind-wandering, a form of spontaneous thought linked to creative cognition (Christoff et al., 2016; Preiss et al., 2020), and acts as a catalyst for generating new solutions to old problems.

In the following subsections, prior research on the interplay between mind-wandering, incubation, and creativity, is reviewed, establishing the background for understanding their potential connections with poetry reading.

### 5.1.1. Creativity and Incubation

The concept of incubation, as theorised by (Wallas, 1926), represents the second stage of creative problem solving, following preparation and preceding illumination and verification. During incubation, conscious attention is shifted away from the problem at hand, often leading to fresh insights upon re-engagement with the task. Incubation studies typically use either interpolated tasks, where participants work on a problem, take an incubation break, and then return to it, or multiple-trial designs incorporating optional incubation periods between problem-solving trials (Ritter & Dijksterhuis, 2014; Dodds et al., 2003). While some studies suggest that high-demanding tasks (e.g., mental rotation, counting backwards, visual memory tests) during incubation may boost creativity (Patrick, 1986; Segal, 2004), others favour low-demanding tasks (e.g., reading, relaxation) (Browne & Cruse, 1988; Baird et al., 2012). In their meta-analysis, Sio & Ormerod (2009) found that the benefits of incubation are more pronounced when individuals engage in undemanding tasks, compared to demanding tasks or no tasks at all. In an influential study, Baird et al. (2012) demonstrated that low-demanding tasks, such as a 0-back task —requiring sustained attention but no working memory demand (Miller et al., 2009, p.712) — lead to better creative outcomes. Specifically, these tasks were associated with higher originality in solving repeated-exposure problems compared to more cognitively demanding tasks or rest. Building on this foundation, this study explores whether poetry reading, an emotionally evocative yet low-demand task, can serve as a means of incubation to enhance creative thinking.

### 5.1.2. Mind wandering, Daydreaming, and Incubation

One cognitive mechanism by which incubation could facilitate creativity is postulated to be mind-wandering, which is defined as "a shift in the contents of thought away from an ongoing task and/or from events in the external environment to self-generated thoughts and feelings" (Smallwood & Schooler, 2015) and is characterised by spontaneous, unguided thinking and has been shown to promote creative problem-solving (Baird et al., 2012; Christoff et al., 2011; Yamaoka & Yukawa, 2016; Tan et al., 2015). When people engage in mind wandering, their attention drifts away from the current task, making it easier to temporarily leave the problem and gain a new perspective (Smith & Blankenship, 1989). Neuroimaging studies have established the role of default mode network (DMN) in mind wandering (Andrews-Hanna et al., 2014; Mason et al., 2007; Christoff et al., 2009), while DMN is also shown to be linked to creativity (Jung et al., 2010; Kühn et al., 2014).

Daydreaming, a related construct, refers to an internally generated, spontaneous shift in conscious thought unrelated to the task at hand (Giambra, 1980). Individual differences in daydreaming frequency have been associated with creative thinking and problem-solving (Zedelius et al., 2021). In this study, both state-level mind-wandering during the incubation task and trait-level daydreaming were assessed to explore their relationships with creative task performance.

Previous studies have employed various undemanding tasks during incubation, including a choice reaction time task (Baird et al., 2012), sustained attention response task (Tan et al., 2015), and engaging with creative materials such as rating aesthetic stimuli (Welke et al., 2023), copying painting (Okada & Ishibashi, 2017; Kazemian et al., 2024), and geometric shapes (Browne & Cruse, 1988). While these tasks provide insights into the effects of undemanding activities on creativity, the role of text reading—particularly poetry—as an incubation task remains unexplored. This highlights a critical gap in understanding how poetry reading, while seemingly relaxing yet emotionally and cognitively rich, might contribute to creative ideation in readers.

### 5.1.3. Present Study

Poetry, with its capacity to evoke deep emotions (Wassiliwizky et al., 2017) and engage readers in reflective thinking (Moran, 2024), offers a unique context for studying creativity. Poetic language encourages readers to suspend conventional interpretations and explore alternative meanings through various qualities, including its originality, imagery, aesthetic

appeal, and surprise (Chaudhuri et al., 2024a, 2024b). However, little is known about the impact of poetry reading on creative thinking or idea generation. This study aimed to examine whether reading poetry could serve as an effective incubation task to enhance creativity. Participants were assigned to one of three conditions based on different incubation conditions: a reading condition (reading a poem), a rating condition (reading and rating the poem), or a control condition (reading a non-poetic text). Creativity was assessed using the Forward Flow (FF) task, measuring associative cognition (Gray et al., 2019), and the Alternate Uses Task (AUT), measuring divergent thinking (Guilford, 1967), both before and after incubation.  Associative thinking was chosen because creativity often involves exploring semantic memory networks, with highly creative individuals making broader associations and shifts between semantic categories (Beaty & Kenett, 2023). Divergent thinking, as measured by AUT, is a well-established indicator of creativity (Runco & Acar, 2012; Baer, 2014). Each condition completed two FF and two AUT tasks, with one problem repeated post-incubation. Participants also reported their levels of state mind-wandering after the incubation task and, at the end, completed a measure of their daydreaming trait.

Drawing on previous research suggesting that undemanding tasks can improve performance on classic creativity measures (Baird et al., 2012; Sio & Ormerod, 2009), it was hypothesised that higher levels of mind-wandering in the poetry reading condition—engaged in a less cognitively intensive task compared to the poetry rating condition—would lead to enhanced creativity, particularly in associative thinking. Poetry, with its vivid imagery, metaphorical language, and open-ended themes, has a clear potential to stimulate free-flowing associative thoughts, making it well-suited to enhance the semantic processes captured by FF.  However, the effect of poetry reading on AUT was treated as exploratory, with no strong expectations regarding its impact, leaving room to investigate the nuanced relationship between poetry and divergent thinking. Additionally, it was anticipated that the poetry rating condition would show some creativity gains, albeit to a lesser extent, due to the more cognitively engaging nature of evaluating poetry.

# 5.2. Materials and Methods

### 5.2.1. Stimulus Selection

*Poem*

To select an English language poem as the stimulus for the incubation task, an online pilot study was conducted via Qualtrics using five experimenter-selected English poems: (1) "The Road Not Taken" by Robert Frost; (2) "A Psalm of Life" by Henry Wadsworth Longfellow; (3) "The Builders" by Henry Wadsworth Longfellow; (4) "The Mistake" by James Fenton; (5) "If" by Rudyard Kipling. These poems were chosen based on their themes of life and experience, as well as their length (20-40 lines), to ensure the selected poem would evoke self-relatedness, stimulate imagination, and convey a sense of transcendence. Semantic diversity ($M$ = 0.78, $SD$ = 0.02), measured by divergent semantic integration (DSI: Johnson et al., 2022) and lexical diversity ($M$ = 0.66, $SD$ = 0.05), assessed using the type-token ratio method (McCarthy & Jarvis, 2010), served as consistent selection criteria to ensure the poems were comparable in linguistic richness and conceptual breadth.

For the pilot study, 100 participants (N=100; 43 male, 54 female, 3 non-binary/third gender, and 1 undisclosed) were recruited, with 20 participants assigned to each of the five conditions. In each condition, participants read one poem for 3 minutes and rated their experience on a 7-point Likert scale (1=strongly disagree to 7=strongly agree) in response to following three statements: (i) "I was able to connect myself with the poem" (self-connectedness) (adapted from Cohen, 2018), (ii) "I was able to imagine diverse situations" (imagination) (Green & Brock, 2000), and (iii) "I forgot that I was in the middle of an experiment" (transcendence)(Busselle & Bilandzic, 2009). The poem *"If"* by Rudyard Kipling received the highest scores across individual items and overall, making it the selected experimental stimulus for the main study. Table 5.1 provides a summary of the pilot study.

*Control Text*

The control stimulus used in this study consisted of a neutral, prose-based, non-emotive passage that matched the experimental poem in terms of word count (words: 283) and structure (four paragraphs corresponding to the four stanzas of the poem). The text was designed to provide a non-poetic alternative while maintaining a similar structure as that of the poem. Unlike the poem, which aimed to evoke emotional and imaginative engagement, the control text focused on factual information about the role of technology in various

industries and its societal implications. This passage was collected from AI-generated sources and edited to ensure that it adhered to the same word count as the poem, creating a comparable reading experience in terms of time and effort. The content was deliberately crafted to remain neutral and non-emotive, avoiding poetic or figurative language that might stimulate imaginative or emotional responses. Details regarding the stimuli are available in the Open Science Framework (OSF) repository: (https://osf.io/gcx7s/?view_only=ffa01200343b47d988567a230a85e81a).

**Table 5.1**

*Pilot study results for poem selection*

| Poem | Poet | No. of Lines | Sem Div | LD | Self-Connectedness | Imagination | Transcendence | Mean Score |
|---|---|---|---|---|---|---|---|---|
| 1.The Road Not Taken | Robert Frost | 20 | 0.76 | 0.67 | 4.9 | 5.7 | 3.4 | 4.67 |
| 2.A Psalm of Life | Henry Wadsworth Longfellow | 36 | 0.8 | 0.69 | 4.5 | 4.65 | 3.5 | 4.22 |
| 3.The Builders | Henry Wadsworth Longfellow | 36 | 0.8 | 0.72 | 4.4 | 4.8 | 3.55 | 4.25 |
| 4.The Mistake | James Fenton | 24 | 0.79 | 0.67 | 4.6 | 4.5 | 3.65 | 4.25 |
| 5.If | Rudyard Kipling | 32 | 0.76 | 0.58 | 5.75 | 5.8 | 4.1 | 5.22 |

*Note.* SemDiv = Semantic diversity; LD = Lexical diversity

### 5.2.2. Participants

The G*Power software (v 3.1; Faul et al., 2007) was used to calculate the minimum sample size required for an 80% power to detect a medium effect size (partial eta squared, $\eta_p^2 =$ 0.05) with an alpha level of 0.05, for three conditions and two measurements (pre/post). A sample size of 42 participants was determined to be necessary. To ensure the study was well-powered, 153 participants (51 per condition) were recruited via Prolific. Eligibility criteria included a Prolific approval rating of 90% or above and fluency in English, as the task involved reading and evaluating an English poem along with verbal creativity. Participants were assigned to one of three conditions based on the incubation task type: the poetry reading condition (N = 51, 37 females, mean age ± SD: 29.35 ± 7.16 years) involved reading a poem; the poetry rating condition (N = 51, 35 females, mean age ± SD: 29.19 ± 7.21 years) required reading and evaluating the same poem; and the control condition (N = 51, 17 males and 34 females, mean age ± SD: 30.75 ± 8.17 years) involved reading a non-poetic

English text. Participants were compensated £3.50 at a rate of £7 per hour. The study protocol was approved by the Ethics Committee of the Department of Psychology at Goldsmiths, University of London.

### 5.2.3. Creativity Tasks

*Forward Flow (FF)*

Every individual experiences a continuous stream of thoughts that shapes their mental processes. While this natural flow is difficult to fully grasp, it has been studied using free association, a method where individuals sequentially report their thoughts. Creativity has long been linked to free association—the mind's ability to spontaneously connect concepts to form ideas (Beaty et al., 2021). Latent semantic analysis (LSA) (Deerwester et al., 1990) provides a way to quantify the conceptual content of naturalistic thought. LSA computes the semantic distance between two words by examining how often they appear together within texts. Forward flow (FF) is a metric to quantify the forward motion of naturalistic thought by computing the average semantic distance between any given thought and all previous thoughts (Gray et al., 2019). The FF is based on Mednick's associative theory of creativity (Mednick, 1962), which suggests that creative thinking involves linking distant concepts within semantic memory (Kenett & Faust, 2019; Kenett, 2019; see also Beaty et al., 2021). Forward flow quantifies how much current thoughts semantically depart from previous thoughts within free association. It is based on a "chained free association" task, or simply "free association" task , which gives a rich picture of dynamic subjective experience, revealing how a person's stream of thoughts evolve over time (Marron et al., 2018; Gray et al., 2019). This task involves participants starting with a seed word and generating the first word that comes to mind, then continuing this process to produce a series of subsequent words. The forward flow score is then calculated as the average semantic distance between consecutive words as given by the formula:

$$\left( \sum_{i=2}^{n} \frac{\sum_{j=1}^{i-1} D_{i,j}}{i-1} \right) / (n-1)$$

Where, D is the semantic distance between thoughts, and n is the total number of thoughts within a stream. Across multiple studies, Gray and his colleagues (2019) showed a robust relationship between forward flow and ratings of creativity as assessed by both well-validated tasks and real-world career trajectories. According to Gray et al.(2019), people with higher forward flow give more creative answers to standard creativity tasks, and those with

creative careers (e.g., actors, entrepreneurs) have higher forward flow than the general population. The FF score is shown to be correlated, albeit moderately, with the originality score of divergent thinking tasks (Gray et al., 2019).

Poetry contains vivid imagery, metaphorical language, and open-ended themes that encourage readers to form connections between distant concepts within their semantic memory. This aligns closely with Mednick's associative theory of creativity (Mednick, 1962), which proposes that creative thinking involves linking semantically distant ideas. As a cognitively and emotionally rich stimulus, poetry is likely to evoke a complex trajectory of associations, making Forward Flow (FF) an ideal measure for capturing this dynamic thought process. Moreover, poetry evokes deeply subjective experiences that are often challenging to quantify. FF provides a systematic way to measure the semantic distance between associations, serving as an objective metric that bridges the gap between subjective engagement with the poem and its cognitive impact. Thus, the rationale for selecting the Forward Flow task in this study lies in its ability to measure the dynamic nature of thought processes and its well-established relationship with creativity (Gray et al., 2019; Kenett & Faust, 2019; Kenett, 2019; see also Beaty et al., 2021). This approach allows for capturing nuanced changes in thought patterns, providing valuable insights into how poetry influences creative thinking. Figure 5.1 illustrates an example of a "Thought Plot" generated using an arbitrary seed word *toaster* and nine associative thoughts: bread, school, friend, nostalgia, old age, memory, brain, cognition, and EEG. The average forward flow score, 0.885, is calculated using the Forward Flow computing tool (forwardflow.org: Gray et al., 2019). The Thought Plot here depicts the forward flow of associations generated from the seed word *toaster,* demonstrating how each successive thought connects to the previous ones based on semantic distance. Peaks and dips in the plot represent moments of greater or lesser semantic distance between thoughts, capturing the varying degrees of forward motion in the stream of consciousness. Notably, the seed word *toaster* is chosen arbitrarily for illustrative purposes and does not pertain to the current study.

**Figure 5.1**

*An example of a Thought Plot with an arbitrarily chosen seed word "toaster"*
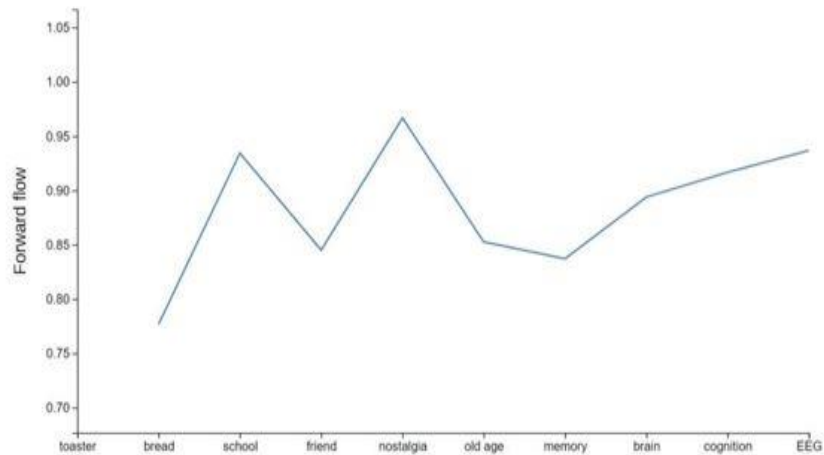


In the present study, three seed words were used for the Forward Flow (FF) task: "Sun" (a repeated-exposure word across both pre- and post-incubation sessions), "Bread" (a new-exposure word introduced during the pre-incubation session), and "Towel" (a new-exposure word introduced during the post-incubation session). The seed words were chosen based on their high imageability scores—639, 619, and 570, respectively, from the MRC Psycholinguistic Database (Coltheart, 1981). Imageability, often described as the ease or difficulty with which "words arouse a sensory experience" (Paivio et al., 1968, p.4; see also Dellantonio et al., 2014), , was a key selection criterion. High imageability ensures that words can evoke vivid mental imagery, facilitating richer associative thinking. By selecting such words, the study aimed to enhance the potential for generating diverse and semantically meaningful associations, making these seed words particularly appropriate for the Forward Flow (FF) task. FF scores were computed using the open-access online tool http://forwardflow.org (Gray et al. 2019).

*Alternate Uses Task (AUT)*

Alternate Uses Task (AUT) is the most widely used task of divergent thinking that requires participants to generate creative or unusual uses for everyday objects (Guilford, 1967), such as a brick, within a set time. Divergent thinking responses are usually scored on two dimensions: fluency, i.e., the total number of responses and originality, i.e., the creative

quality of responses (Silvia et al., 2008; Reiter-Palmon et al., 2019; Acar & Runco, 2015; Cotter et al., 2020; Dumas & Dunbar, 2014; Beaty & Johnson, 2021). The originality of the responses is taken as an index of creative thinking (Milgram & Milgram, 1976; Torrance, 1966). Of note, AUT is widely used in previous studies on incubation (Ellwood et al., 2009; Sio & Ormerod, 2009; see also Baird et al., 2012).

In this study, three objects were used for the Alternate Uses Task (AUT): "Book" (the repeated-exposure object across pre- and post-incubation sessions), "Jar" (new-exposure during the pre-incubation session), and "Hat" (new-exposure during the post-incubation session). These objects were selected based on their high concreteness scores—4.90, 5.00, and 4.88, respectively, as reported by Brysbaert et al. (2014). Concreteness refers to the extent to which a word's meaning is grounded in sensory perception and physical interaction, with higher scores indicating greater tangibility and ease of mental representation. High-concreteness objects were chosen to ensure participants could easily visualise and engage with the items, facilitating the generation of diverse and meaningful alternate uses without being hindered by abstract or ambiguous stimuli. Originality scoring of the AUT responses was computed using SemDis, an open platform for computing automated creativity assessment tool for computing semantic distance in texts (Beaty & Johnson, 2021). For each participant, the mean semantic distance (SemDis) for each response to a particular cue word was calculated using five different semantic spaces: cbowukwacsubtitle, cbowsubtitle (Mikolov et al., 2013; Mandera et al., 2017), cbowBNCwikiukwac (Baroni et al., 2014), GloVe (Pennington et al., 2014), and TASA (Günther et al., 2015). Then, the average of these mean SemDis values across all responses for that specific cue word was computed. This final average represented the participant's AUT score for that particular cue word. The multiplicative compositional model was used to calculate semantic distances. This model works by multiplying the vectors of all the words in a phrase to create a single composite vector. As a result, shared semantic dimensions among the component words are given higher values, while dimensions that are not shared between the words receive lower values. In simpler terms, words with similar meanings are emphasised (boosted) in the final vector, while words with different meanings are downplayed (reduced). Notably, this multiplicative model has been shown to outperform the additive model and other, more complex models in its ability to correlate with human ratings of relatedness and creativity (Mitchell & Lapata, 2010; Beaty & Johnson, 2021).

Keeping in mind poetry's ability to stimulate non-linear and metaphorical thinking, this study aimed to capture whether reading poetry enhances divergent thinking. To achieve this, AUT

was chosen as it is a well-established and widely accepted method for measuring divergent thinking, making it particularly suitable for this purpose.

### 5.2.4. Procedure

All data was collected online using Qualtrics® software. At the beginning, participants completed two creativity tasks, FF and AUT, with two trials each. In the FF task, participants were provided with a seed word and instructed to type the first word that came to mind, repeating this process for 19 consecutive words in a chained manner. In the AUT, participants were provided with a word representing an object and asked to generate as many creative uses for the object as possible within 3 minutes.

Following these initial tasks, participants engaged in a 3-minute incubation period. Participants in the reading condition read and contemplated a poem, whereas participants under the rating condition read the same poem and were additionally asked to evaluate the poem on three constructs, including aesthetic appeal, vivid imagery, and self-relatedness on a 3-point scale (low to high). Participants in the control group read a control text—an English passage matched in line count to the poem but devoid of emotive words and expressions. Immediately following the incubation task, participants reported their state of mind wandering using the Dundee Stress State Questionnaire (DSSQ) (Matthews et al., 2013). This assessed their task engagement, such as how often their determination and attention strayed from the task and how frequently they were occupied with worries, such as reflecting on past events and personal concerns, on a 1-5 scale, with higher scores indicating greater levels of mind wandering. After incubation, participants completed the same two creativity tasks, each with two trials, where the first seed word from the pre-incubation session was reused as the second seed word in the post-incubation session. Finally, they completed the 12-item Daydreaming Frequency subscale of the Imaginal Process Inventory (IPI), measuring individuals' overall tendency to engage in mind-wandering (Singer & Antrobus, 1972; see also Giambra, 1993), rated on a 1-5 scale, with higher scores indicating greater daydreaming frequency. Daydreaming was explained to the participants as an unintended, spontaneous shift of attention during any work, involving thoughts unrelated to a task at hand (Giambra, 1993). Participants also provided their demographic information, including gender, age, qualification, liking of poetry, years of association with poetry, and poetry-writing habits. Figure 5.2 outlines the experimental design.

**Figure 5.2.**

*Experimental design*



Pre-Incubation Forward Flow

Sun    Bread

+

Book    Jar

Pre-Incubation AUT

Incubation    Mind-wandering

Post-Incubation Forward Flow

Towel    Sun

+

Hat    Book

Post-Incubation AUT

Daydreaming Trait
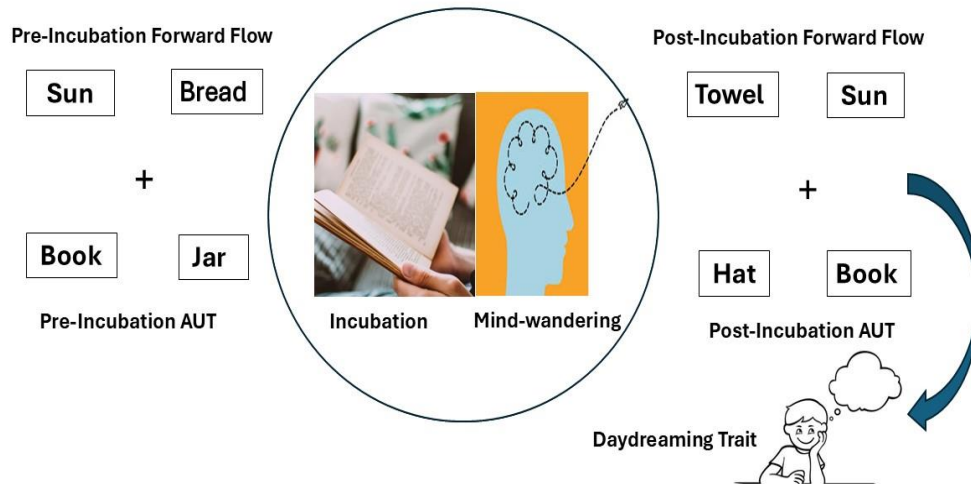
## 5.2.5. Analysis

Three participants from both the reading and rating conditions, and one participant from the control condition, were excluded due to repeated responses in the forward flow tasks, leaving a total of 146 participants:  Reading condition ($N$ = 48, female = 35, mean ± s.d. age: 29.58 ± 7.30 years), rating condition ($N$ = 48, female = 33, mean ± s.d. age: 29.23 ± 7.38 years), and the control condition ($N$ = 50, female = 34, mean ± s.d. age: 30.92 ±  8.16 years). The open-access online tool (http://www.forwardflow.org/, Gray et al., 2019) was used for FF scoring, and *SemDis* (http://semdis.wlu.psu.edu/: Beaty & Johnson, 2021) for the originality scoring of the AUT responses.

The average forward flow (FF) score for each cue word per participant was calculated using the "Get Flow Summary" function in the online tool (http://www.forwardflow.org/, Gray et al., 2019). Additionally, the average of the mean semantic distance (SemDis) values across all of a participant's responses for a specific cue word was computed to represent that participant's Alternate Uses Task (AUT) score for that particular cue word. Mind-wandering scores were computed based on participants' self-reported responses using the Dundee Stress State Questionnaire (DSSQ:  Matthews et al., 2013), administered immediately after the incubation period. Participants were then divided into high and low state mind-wandering

conditions through a median split of their respective scores within each condition Similarly, daydreaming trait scores from the Imaginal Process Inventory (IPI: Singer & Antrobus, 1972) were used to divide participants into high and low daydreaming groups through a median split.

A 3x2x2 mixed ANOVA was conducted to examine the effects of incubation conditions on creative task performance, with condition (3 levels: reading, rating, control) and mind-wandering (2 levels: high, low) as between-subjects factors, and session (2 levels: pre-incubation, post-incubation) as a within-subject factor. The percentage improvement in repeated-exposure and new-exposure FF and AUT scores was also analysed. Additionally, the influence of daydreaming as a dispositional trait on incubation effects was investigated. All statistical analyses were performed using Jamovi (Version 2.5) and IBM SPSS (Version 27.0:IBM Corp, 2020).

# 5.3. Results

The mean (SD) mind-wandering scores for the poetry reading, poetry rating, and control condition were 2.11 (.83), 2.16 (.60), and 1.99 (.79), respectively. A one-way ANOVA of the three incubation conditions showed no significant differences between the conditions in participants' self-reports on state mind-wandering ($F_{(2,143)}$=0.65, $p$=0.524). To assess the effects of incubation on forward flow, a 3 (condition: reading, rating, and control) x 2 (state mind-wandering: high vs low) x 2 (session: pre-incubation vs post-incubation) mixed ANOVA was conducted on the FF scores (Table 5.2). This analysis revealed a significant main effect of session ($F_{(1,140)}$=9.08, $p$=.003, partial-$\eta^2$=.06), indicating a moderate effect size. The interaction between session and condition was significant ($F_{(2,140)}$=4.16, $p$=.018, partial-$\eta^2$=.06), suggesting a moderate effect of condition differences over sessions. The interaction between session and state mind-wandering was also significant ($F_{(1,140)}$=5.26, $p$=.023, partial-$\eta^2$=.04), with a small effect size, indicating that mind-wandering during incubation influenced changes in FF scores. Further, a three-way interaction between condition, mind-wandering and session was also significant ($F_{(2,140)}$=4.21, $p$=.017, partial-$\eta^2$=.06), suggesting that the interplay of condition (i.e. condition), the extent of mind-wandering (i.e. state mind-wandering) affects FF scores across sessions. However, no significant between-subjects effects were observed for condition ($F_{(2,140)}$=.29, $p$ =.75) or state mind-wandering ($F_{(1,140)}$=.19, $p$=.66), nor was there a significant condition x state mind-wandering interaction ($F_{(2,140)}$=.25, $p$=.77). Table 5.2 reveals the ANOVA results. Post-hoc comparisons showed significant post

- pre incubation differences in the following conditions: the reading condition (low state mind-wandering, $t_{(20)}$= -2.23, $p$=.037; high state mind-wandering, $t_{(26)}$= 2.26, $p$=.032), the rating condition (high state mind-wandering, $t_{(27)}$= 2.56, $p$=.016) and the control condition (low state mind-wandering, $t_{(19)}$= 2.58, $p$=.018; high state mind-wandering, $t_{(29)}$= 2.40, $p$=.023). No significant difference was observed for the rating condition with low state mind-wandering ($t_{(19)}$= 1.51, p = .147). Importantly, similar analysis on the AUT scores showed no significant effects of condition, state mind-wandering, session and their interactions ($p$>.3, n.s.). Figure 5.3 illustrates the estimated marginal means of pre- and post-incubation FF scores across three conditions for high and low state mind-wandering levels.

**Table 5.2**

*Results of the 3x2x2 Mixed ANOVA examining the effects of time, group, and state mind-wandering (MW) on Forward Flow (FF)and AUT*

| Source of Variation | Sum of Squares | df | Mean Square | F | *p* | $\eta^2$ |
|---|---|---|---|---|---|---|
| **Forward Flow Session** | | | | | | |
| *Within-Subjects Effects* | | | | | | |
| Session | 0.048 | 1 | 0.048 | 9.08 | 0.003 | 0.061 |
| Session*Group | 0.044 | 2 | 0.022 | 4.16 | 0.018 | 0.056 |
| Session*MW | 0.028 | 1 | 0.028 | 5.26 | 0.023 | 0.036 |
| Session*Group*MW | 0.044 | 2 | 0.022 | 4.21 | 0.017 | 0.057 |
| Residual | 0.738 | 140 | 0.005 | | | |
| *Between-Subjects Effects* | | | | | | |
| Group | 0.008 | 2 | 0.004 | 0.291 | 0.748 | 0.004 |
| MW | 0.003 | 1 | 0.003 | 0.191 | 0.663 | 0.001 |
| Group*MW | 0.007 | 2 | 0.003 | 0.252 | 0.777 | 0.004 |
| Residual | 1.884 | 140 | 0.013 | | | |
| | | | | | | |
| **AUT Session** | | | | | | |
| *Within-Subjects Effects* | | | | | | |
| Session | 0.001 | 1 | 0.000613 | 0.091 | 0.763 | 0.001 |
| Session*Group | 0.000 | 2 | 0.000197 | 0.029 | 0.971 | 0 |
| Session*MW | 0.004 | 1 | 0.004 | 0.628 | 0.429 | 0.004 |
| Session*Group*MW | 0.016 | 2 | 0.008 | 1.199 | 0.305 | 0.017 |
| Residual | 0.943 | 140 | 0.007 | | | |
| *Between-Subjects Effects* | | | | | | |
| Group | 0.077 | 2 | 0.038 | 1.369 | 0.258 | 0.019 |
| MW | 0.011 | 1 | 0.011 | 0.395 | 0.531 | 0.003 |
| Group*MW | 0.019 | 2 | 0.009 | 0.330 | 0.719 | 0.005 |
| Residual | 3.930 | 140 | 0.028 | | | |

**Figure 5.3**

*Estimated marginal means of pre- and post-incubation Forward Flow scores across three conditions for high and low state mind-wandering. Error bars represent standard errors*
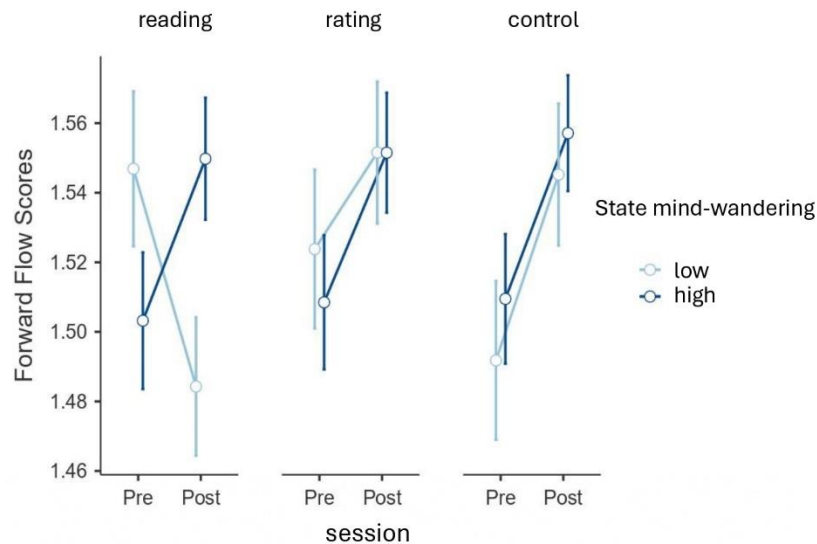


Subsequently, percentage improvements on the creativity tasks were calculated separately for each problem type (repeated exposure, new exposure) and compared across the three conditions, with participants categorized by high and low levels of state mind-wandering. This improvement score was calculated as [(post-incubation score – pre-incubation score)/ (pre-incubation score)] × 100, (Cai et al., 2009; Baird et al., 2012). In repeated-exposure FF, a significant main effect of state mind-wandering was observed ($F_{(1,140)}$=4.35, $p$=.039, partial-$\eta^2$=.03) (see Table 5.3 and Figure 5.4). Post hoc contrasts revealed that this improvement was primarily driven by participants in the reading condition with high levels of mind-wandering. These participants showed significantly greater improvements in their post-incubation repeated-exposure FF scores compared to those with low mind-wandering (mean difference=8.55, $p$=.002). No statistically significant differences were found between state mind-wandering levels in the rating condition or the control condition. Moreover, no significant interaction between condition and state mind-wandering ($F_{(2,140)}$=1.88, $p$=.156, partial-$\eta^2$=.03) was observed. Repeating the same analysis with improvement for repeated-exposure AUT revealed no significant effects. Additionally, no significant main effects of condition, state mind-wandering, or their interaction were found for new-exposure FF and AUT, indicating no incubation effect for new-exposure problems in any condition.

**Table 5.3**

*Results of the Two-Way ANOVA on Percentage Improvement in Repeated-Exposure Forward Flow (FF)*

| | Sum of Squares | df | Mean Square | F | p | η²p |
|---|---|---|---|---|---|---|
| Group | 552.19 | 2 | 276.09 | 2.48 | 0.088 | 0.03 |
| MW_Group | 484.41 | 1 | 484.41 | 4.35 | 0.039 | 0.03 |
| Group ✳ MW_Group | 419.33 | 2 | 209.67 | 1.88 | 0.156 | 0.03 |
| Residuals | 15595.64 | 140 | 111.4 | | | |

*Note.* Group = incubation task type: reading only, reading plus rating, and control; MW_Group = the level of mind-wandering, categorised as high or low.

**Figure 5.4**

*Improvement in forward flow (FF) scores (post incubation performance relative to pre-incubation performance) for repeated exposure problems. Error bars indicate standard errors of the mean*
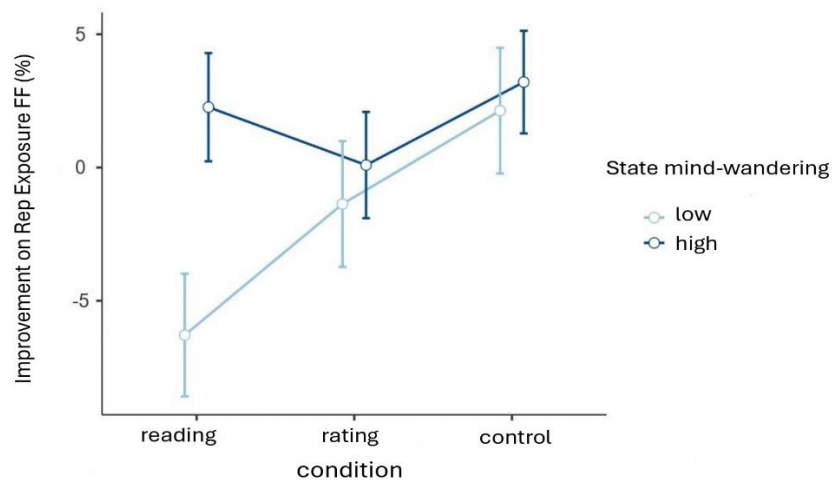


For repeated-exposure AUT fluency, there was a significant main effect of condition ($F_{(2,139)}$= 4.73, p = .01, partial-$\eta^2$ = .06), but no significant main effect of state mind-wandering ($F_{(1,139)}$ = 0.35, p = .557, partial-$\eta^2$ = .00) or the interaction between condition and state mind-wandering ($F_{(2,139)}$= 0.05, p = .953, partial-$\eta^2$ = .00). Post hoc analysis using Bonferroni correction revealed that the reading condition showed significantly higher improvement in fluency than the rating condition with a mean difference of 22.87 (p = 0.022) but did not differ significantly from the control condition (p >.9, n.s.). Additionally, the rating condition had

significantly lower scores than the control condition ($p$ = 0.031). Hence, the results showed significant differences in repeated-exposure AUT fluency between conditions, which may contribute to the observed differences in AUT scores. However, further analysis is needed to determine whether these differences reflect genuine effects on fluency or confound fluency with creativity.

In both repeated-exposure and new-exposure problems, no significant correlations were found between trait daydreaming and improvement in either FF (repeated-exposure: $r$ =.11, $p$=.18; new-exposure: $r$ =-.15, $p$=.07) or AUT (repeated-exposure: $r$ =.02, $p$=.85; new-exposure: $r$ =.03, $p$=.69). These results suggest that, at least within the scope of this study, there was no clear relationship between individuals' propensity to mind-wander in their daily lives and their creativity. Furthermore, ANOVA results revealed no significant main effects of condition, daydreaming trait, or their interaction on percentage improvements in both FF and AUT tasks for repeated- and new-exposure problems. All data are available in the Open Science Framework (OSF) repository:

https://osf.io/gcx7s/?view_only=ffa01200343b47d988567a230a85e81a.

# 5.4. Discussion

While previous research supports the idea that creative incubation, characterised by breaks from focused problem-solving, can enhance creativity (Patrick, 1986; Segal, 2004; Browne & Cruse, 1988; Baird et al., 2012), this study extends the exploration by examining poetry reading, a seemingly relaxing and low-demand task, to explore whether it can boost creative thinking, particularly in individuals exhibiting high levels of mind-wandering. The results reveal that poetry reading, via mind-wandering, facilitates the forward flow of naturalistic thought - a cognitive process intimately tied to associative creativity. Notably, this effect was most pronounced in repeated-exposure problems, indicating that the cognitive drift induced by poetry may act as a catalyst for novel associative connections. Importantly, the interaction between mind-wandering and creativity appeared to be moderated by the type of incubation task. In the poetry reading condition, participants with higher levels of mind-wandering showed greater improvement in associative thinking, while those with lower levels showed a decline in forward flow scores. In contrast, the poetry rating and control conditions showed consistent gains, independent of mind-wandering levels, indicating that the cognitive demands of the task can modulate the creative outcomes associated with mind-wandering. Divergent thinking, however – central to generating novel and original ideas – was unaffected by poetry reading, highlighting the specificity of the incubation effect of poetry

reading on associative rather than divergent thought processes. Consequently, while poetry reading may facilitate free-flowing thoughts, it does not necessarily lead to the emergence of entirely novel or original ideas. Additionally, daydreaming traits did not correlate with divergent thinking, indicating the lack of a relationship between general tendencies for mind-wandering and poetry-induced creative incubation.

The observed increase in post-incubation Forward Flow (FF) scores in individuals with high mind-wandering aligns with previous research suggesting that distraction can enhance creativity (Dijksterhuis & Meurs, 2006) and that high levels of mind-wandering may be conducive to creative cognition (Shaw & Giambra, 1993; White & Shah, 2006; Baird et al., 2012). This supports the initial level prediction that both poetry reading and rating conditions would experience post-incubation creativity gains, mediated by mind wandering. However, the distinct moderating effect of state mind-wandering in the poetry reading-only condition, compared to the poetry-rating condition, suggests that high mind-wandering is particularly effective in enhancing associative thinking during less cognitively engaging tasks, such as reading poetry. Moreover, the significant improvements observed in repeated-exposure FF tasks among individuals with high mind-wandering scores in the poetry reading condition further corroborate the idea that high mind-wandering, coupled with undemanding tasks, enhances associative thinking. These results are consistent with earlier research that has shown the beneficial effects of mind-wandering on creative problem-solving (Baird et al., 2012; Sio & Ormerod, 2009; Ruby et al., 2013; Gilhooly et al., 2012; Yamaoka & Yukawa, 2016). Crucially, the lack of significant differences in pre-incubation FF scores across conditions suggests that the incubation process itself drives the observed increases in FF scores via mind-wandering.

Conversely, neither the poetry rating condition nor the control condition demonstrated significant post-incubation differences in FF scores between high and low mind-wandering individuals. Interestingly, while the poetry rating condition reported the highest average mind-wandering scores, it did not experience the same facilitative effects of mind-wandering on associative thinking as the poetry reading condition. These findings challenge the notion that higher levels of mind-wandering always enhance creative incubation and suggest that the cognitive nature of the incubation task may modulate the effectiveness of mind-wandering in boosting associative creativity.

Regarding divergent thinking, none of the incubation conditions significantly influenced AUT scores, whether in terms of fluency or originality. Although Baird et al. (2012) reported that undemanding tasks during incubation enhanced performance on repeated-exposure AUT problems, similar improvements in originality scores were not observed in this study for

either repeated- or new-exposure AUT problems across the conditions. One potential explanation for this discrepancy may lie in the differing levels of mind-wandering across this study's experimental conditions. In contrast to the findings of Baird et al. (2012), which reported higher mind-wandering in undemanding tasks compared to demanding ones, this study did not show a similar pattern. Instead, the null-effects of incubation on AUT fluency scores for repeated-exposure problems align with previous studies (Baird et al., 2012; Frith et al., 2021; Kazemian et al., 2024; Yamaoka & Yukawa, 2019).

Furthermore, no significant effects of individual differences in trait mind-wandering were found on creative ideation across the three conditions. Specifically, there were no correlations between trait mind-wandering scores and performance on either the FF or AUT tasks for both repeated- and new-exposure problems. Thus, this study does not support a direct relationship between individual differences in mind-wandering and creativity, as suggested by Baird et al. (2012). Future research should further explore this relationship.

In summary, the present study identifies poetry reading as a promising incubation task that can enhance the semantic diversity of thought streams, influencing the dynamic unfolding of ideas in associative creativity (Gray et al., 2019) and mental progression (Mason & Bar, 2012). Poetry, as a form of creative linguistic expression, may encapsulate spontaneous thoughts and emotions, facilitating a free-flowing stream of associations. Neurocognitive research supports the role of associative (Beaty et al., 2014; Volle, 2018) and controlled executive processes (Beaty et al., 2017; Beaty et al., 2021; Lloyd-Cox et al., 2021) in creative thinking. According to the associative theory of creativity (Mednick, 1962), creativity involves spontaneous propagation through semantic memory, operating within a network structure (Kenett, 2019; Beaty & Kenett, 2023). However, no significant effects of mind-wandering were observed on divergent thinking, highlighting the distinction between associative and divergent creative processes. While mind-wandering may engage the brain's default mode network (Mason et al., 2007; Smallwood et al., 2021; Andrews-Hanna et al., 2010, 2014), it does not appear to significantly influence executive functions mediated by the brain's executive control network, which are critical for generating novel ideas (Christensen et al., 2019). Future neuroimaging research could explore the interaction between these two large-scale brain networks during poetry reading and its potential role during creative incubation.

### 5.4.1. Limitations

While this study offers novel insights, several limitations must be acknowledged. First, the 3-minutes incubation task duration may have been insufficient to adequately capture mind wandering, as prior studies have employed longer (12-20 min) durations to observe its effects (Baird et al., 2012; Murray et al., 2021; Rummel et al., 2021; Smeekens & Kane, 2016; Steindorf et al., 2021). Second, the experimental conditions – poetry reading and rating – were not as distinct as they could have been, potentially obscuring the cognitive demands of the incubation activities. Future research should explore more nuanced differences in incubation tasks and examine the interaction of various forms of mind-wandering, including deliberate and spontaneous mind-wandering (Schooler et al., 2011; Seli et al., 2015, 2016, 2017 ; see also Agnoli et al., 2018). Finally, the poetic stimulus could have been more deliberately chosen to evoke tranquillity and introspection, potentially maximising participants' mind-wandering.

### 5.4.2. Conclusion

This study offers a subtle understanding of poetry reading as an incubation task within the associative framework of creativity. While poetry boosts associative thinking, particularly when paired with high levels of mind-wandering, it does not significantly enhance divergent thinking. These findings highlight the role of both cognitive load and mind-wandering in shaping how incubation tasks influence creative processes. In a world increasingly saturated with distractions, the subtle power of poetry may not lie in generating completely new ideas but in rearranging the familiar, allowing the mind to forge unexpected connections within our mental landscape. On a lighter note, the next time during a break, we may consider immersing in poetry—it may help our thoughts flow more freely, enhancing unexpected connections.

### 5.4.3.  Looking Ahead: Creativity in Minimalist Poetic Forms

While this chapter suggests poetry reading as a catalyst for associative creativity, the investigation now shifts to evaluating poetic creativity within the constraints of brevity and minimalist forms. The next chapter, as part of a broader neuroimaging project using EEG,

explores how cognitive, emotional, and genre-specific factors shape perceptions of creativity in brief, structured poetry. In a society increasingly valuing concise and impactful communication, this exploration bridges artistic insights with practical applications. Additionally, the study employs network analysis to examine how semantic memory networks among genre-specific preference groups influence creativity evaluations.

# CHAPTER 6

# CREATIVITY IN BREVITY: EVALUATING SHORT POETRY

*"To see a World in a Grain of Sand and a Heaven in a Wild Flower*

*Hold Infinity in the palm of your hand And Eternity in an hour."*

— *William Blake*

## 6.1. Introduction

In today's fast-paced world, where attention spans are increasingly limited and judgments made quickly, the art of communicating complex ideas through concise forms has become more significant than ever. This quote from Blake beautifully illustrates the power of "smallness" to evoke a "bigger" reality, a theme that resonates deeply in the realm of poetry. Shakespeare echoed this sentiment in his observation that "brevity is the soul of wit" (Shakespeare, 1603/1992, 2.2.90). In poetry, brevity is not merely a constraint but a creative force, requiring precision and intentionality, where every word must contribute meaningfully to the whole. As modern life accelerates, poetry, especially in its shortest forms, offers a unique lens through which to study how creativity is perceived within strict constraints. This chapter presents the behavioural component of a larger neuroscientific study employing electroencephalography (EEG) to explore how readers evaluate creativity in these constrained poetic forms. It investigates the cognitive processes and personality traits that shape these evaluations, offering insight into the assessment of creativity in brief poetry. Additionally, it examines the influence of semantic memory networks among genre-specific preference groups on creativity evaluations.

The key question driving this study is: How is the creativity of brief, structured texts with distinct thematic focuses evaluated? To address this, two genres of short poetry were considered: Haiku and Senryu. These brief yet powerful minimalist Japanese poetic forms challenge both poets and readers to convey and interpret complex ideas and emotions using a limited number of words. Haiku traditionally consists of three lines, arranged in a 5-7-5 syllabic structure, and typically contains a *kigo* (seasonal word) and a *kireji* (cutting word), which add emotional depth and structure to the poem (Ueda, 1963; Ross, 2007; Iida, 2008; Cuddon, 2012; Trumbull, 2012). Senryu, which evolved from Haiku in the 18th century,

mirrors the same form but diverges in content. Importantly, Senryu generally lacks *kigo* and *kireji*. While Haiku often reflects nature, Senryu focuses on human nature. Unlike the delicate and refined tone of Haiku, Senryu adopts a tone, more humorous, satirical, and light-hearted (Opler & Obayashi, 1945; Giroux, 1989). Both genres exemplify structured brevity in poetic form, making them ideal subjects for cognitive research on the creativity and evaluation of short poems.

Research on poetry has illuminated how it shapes reader's cognitive and emotional states, mediated by contextual and individual differences (Jacobs, 2015a, 2015b; Thomas et al., 2017).  Short-form poetry, such as Haiku, particularly English Language Haiku (ELH), has become a preferred focus in empirical research due to its structural simplicity and ability to evoke profound emotional engagement (Thomas et al., 2017; Belfi et al., 2018; Mehl et al., 2023; Hitsuwari & Nomura, 2022b; Hitsuwari et al., 2023; Hitsuwari & Nomura, 2022a). An ELH maintains the essence of traditional Haiku, employing  imagistic language to convey natural or seasonal experiences (Higginson & Harter, 1985; Rowland, 2013), offering a structured yet flexible medium ideal for studying the reception of poetic texts. The Haiku format – with its concise 3-lined, 5-7-5 syllabic structure – allows for controlled experimentation. Its structural uniformity contrasts with its content variability, making it suitable for systematic analysis (Thomas et al., 2017; Geyer et al., 2020). Furthermore, Haiku's minimal use of linguistic resources, reliance on common language, and focus on vivid imagery rather than poetic jargon engage a rich array of mental functions, making it ideal for empirical psychological studies (Geyer et al., 2020; Hitsuwari & Nomura, 2022b; Pierides et al., 2017).

Creativity judgments in Haiku and Senryu were examined in this study to investigate how thematic content influences creative evaluation. Using non-poetic control texts as a baseline, this study investigated the influence of aesthetic appeal, emotional responses such as being moved, vivid imagery, and originality on creativity judgments. Additionally, this study analysed the influence of individual differences in personality traits, including openness, intellect, curiosity, vivid visual and auditory imageries, mindfulness, and aesthetic responsiveness on creativity judgments. Furthermore, the role of semantic memory, which is key to how creative texts are interpreted and evaluated (Shi et al., 2017; Hua et al., 2015), was also explored in participants who favoured one genre over the other. Specifically, the structural organisation of semantic memory and its contribution to genre-specific creativity judgments was analysed, providing insights into the cognitive processes underlying the perception of creativity in these brief, structured poetic genres.

The following section will outline the potential predictors of creativity selected for this study, as well as the personality traits chosen for analysis.

### 6.1.1. Potential Predictors

*Aesthetic Appeal and Emotions*

Aesthetic appeal is a critical dimension in evaluating creative works, influencing perceptions of beauty, elegance, and style (Besemer & Treffinger, 1981; Besemer & O'Quin, 1986; Leder et al., 2004; Leder et al., 2012). Research has shown that aesthetic appeal plays a pivotal role in judging creativity across various forms of art, including paintings and visual art (Tinio, 2013; Cupchik et al., 2009; Bao et al., 2016; Hagtvedt et al., 2008), music (Silvia et al., 2015; Koelsch, 2014; Reybrouck & Brattico, 2015; Müller et al., 2010; Zioga et al., 2020; Belfi, 2019), films (Hanich et al., 2014; Silvia & Berg, 2011; Plucker et al., 2009;, and poetry (Belfi et al., 2018; Hitsuwari & Nomura, 2022b; Hitsuwari & Nomura, 2023; Kraxenberger & Menninghaus, 2017; Obermeier et al., 2013; Obermeier et al., 2016; Scharinger et al., 2022; Jacobs, 2017; Hitsuwari & Nomura, 2022a; Mehl et al., 2023; Chaudhuri et al., 2024a, 2024b, 2024c). Studies suggest that Haiku's vivid imagery and felt emotion strongly predict its aesthetic appeal (Belfi et al., 2018; Hitsuwari & Nomura, 2022b). Given Haiku's focus on nature—often associated with inherent beauty and aesthetics (Parsons, 2002; Carlson, 1984)— aesthetic appeal was predicted to have a stronger impact on creativity judgments in Haiku than in Senryu.

Poetry evokes deeply pleasurable emotional responses, such as chills and goosebumps (Wassiliwizky et al., 2017). The evaluation of ideas involves an active interaction between the evaluator and the product, influenced by the evaluator's emotional state (Mastria et al., 2019). Literature suggests that emotional appraisals influence aesthetic experiences (Chatterjee & Vartanian, 2014; Leder et al., 2004; Lüdtke et al., 2014), particularly for Haiku, both felt and perceived valence and arousal predict its aesthetic appeal (Hitsuwari & Nomura, 2022b; Belfi et al., 2018). In the present study, emotional engagement (measured as the distinct construct *"being moved"* after Menninghaus et al., 2015) was expected to predict creativity judgments in both Haiku and Senryu. Given the themes of nature in Haiku and human nature in Senryu, a stronger impact was anticipated for Senryu, as it is more grounded in human nature and emotions.

*Vivid Imagery*

Reading is an imaginative process, where mental imagery mirrors perception (Collins, 1991). Research has shown that vivid mental imagery across sensory domains enhances both aesthetic and emotional evaluations (Holmes & Mathews, 2005; Holmes et al., 2006). A recent study has found vivid imagery significantly boosts perceived poetic creativity, with poems rich in evocative imagery judged as more creative (Chaudhuri et al., 2024b). In Haiku specifically, vivid imagery has been identified as the strongest predictor of aesthetic appeal (Belfi et al., 2018), further mediated by felt emotion (Hitsuwari & Nomura, 2022b). Given Haiku's distinct use of imagery, sound, and nature-themed focus (Ross, 2007), it was expected that vivid imagery would predict creativity judgments for Haiku.

*Originality*

The "standard definition" of creativity asserts that for an idea to be considered creative, it must be both novel or original and useful or appropriate (Runco & Jaeger, 2012). Originality, more than usefulness, is consistently linked to perceived creativity across domains, including ideas (Runco & Charles, 1993; Diedrich et al., 2015; Acar et al., 2017; Lloyd-Cox et al., 2022), product designs (Han et al., 2021), advertisements (Storme & Lubart, 2012), and poetry (Chaudhuri et al., 2024b). In line with previous research, in this study, it was expected that originality would predict creativity judgment for both Haiku and Senryu.

## 6.1.2. Personality Traits

The essence of a poem's impact lies in its ability to connect with readers on a deeply personal level. Readers comprehend the same poem differently, based on their knowledge and perceptual abilities which further introduces variability in the evaluation process. This variability can be attributed to differences in personality traits underscoring the importance of individual differences in the creative evaluation process (McCrae, 1987; Feist, 1998; Batey & Furnham, 2006; Tan et al., 2019). Openness and intellect, in particular, have shown robust associations with almost all forms of creativity assessment (Feist, 1998; Batey & Furnham, 2006; Ivcevic & Brackett, 2015; Kaufman et al., 2016; Karwowski & Lebuda, 2016; Puryear et al., 2017; Lloyd-Cox et al., 2022; Chaudhuri et al., 2024c). In this study, both openness and intellect were expected to significantly influence creativity judgments of Haiku and Senryu. Openness, often linked to a greater emphasis on originality in creativity judgments (Lloyd-Cox et al., 2022), is a key trait of the "artistic personality" (Chamorro-Premuzic et al.,

2009; Furnham & Walker, 2001a, 2001b). It was predicted that higher openness would enhance the relationship between both originality and aesthetic appeal with creativity, across both genres. Intellect, which is associated with abstract thinking and semantic processing (Oleynick et al., 2017; Mussel, 2013), was expected to be more strongly linked with emotionality in Senryu, as this genre often incorporates humour, wit, and irony (Worcester, 1940; Ruch et al., 2018).

Curiosity, the desire to explore and acquire new knowledge (Berlyne, 1966; Litman, 2005; Litman & Spielberger, 2003), is another trait associated with creativity (Gross et al., 2020; Schutte & Malouff, 2020a , 2020b). While no specific prediction was made regarding the influence of curiosity on creativity judgments of such short poems, this study wanted to explore whether higher levels of curiosity might strengthen the relationship between aesthetic appeal and creativity (Chaudhuri et al., 2024c) in one or both genres.

Mental imagery plays a key role in visual creativity (Finke, 1996). Visual imagery, often described as "seeing with the mind's eye,"  allows individuals to generate mental representations in the absence of external visual stimuli (Moulton & Kosslyn, 2009; Kosslyn et al., 2001, p.635). Visual imagery vividness refers to the aspect of visual imagery that captures individual differences in the ability to generate clear and detailed mental pictures (Marks, 1973), and is most commonly measured by the Vividness of Visual Imagery Questionnaire (VVIQ -Marks, 1973). The VVIQ has been linked to creativity (Finke, 1996; Palmiero et al., 2011; Kozhevnikov et al., 2013), though the findings on this relationship have been mixed (LeBoutillier & Marks, 2003). Auditory imagery, defined as "the introspective persistence of an auditory experience" (Intons-Pererson, 1980, p.46), has been linked to silent reading, where inner speech simulates the perceptual aspects of actual speech (Abramson & Goldinger, 1997). Vividness in auditory imagery ability is measured by the Bucknell Auditory Imagery Scale—Vividness (BAIS-V)(Halpern, 2015),  referred to throughout this thesis as the Auditory Vividness Imagery Questionnaire (AVIQ) for clarity and to align with the terminology used for the Vividness of Visual Imagery Questionnaire (VVIQ). Given Haiku's nature-oriented focus and Senryu's expressive depiction of human nature, it was anticipated that both visual and auditory imagery traits would influence creativity assessment for both genres.

Mindfulness, the ability to remain attentive to the present moment (Brown & Ryan, 2003), has also been linked to creativity, both directly and indirectly (De Dreu et al., 2012; Chiesa et al., 2011; Langer, 2020; Lebuda et al., 2016). Given that Haiku allows readers to experience a "haiku moment" through minimalistic words, a process that inherently requires

mindfulness, and that the satire and humour in Senryu also demand mindful attention, it was expected that trait mindfulness would influence the creativity judgment of both genres.

Finally, aesthetic responsiveness, a trait reflecting an individual's capacity to respond to aesthetic stimuli, has been linked to higher engagement with art (Schlotz et al., 2021). Given Haiku's connection to both nature and beauty, it was expected that aesthetic responsiveness would moderate the creativity prediction for Haiku more than Senryu.

### 6.1.3. Semantic Memory Network

Network science, an emerging field within complexity science, employs mathematical techniques to study intricate systems across diverse domains, including the human brain (Barabási, 2009; Newman, 2003; Strogatz, 2001; see also Siew, 2019). In particular, it has been increasingly utilised in cognitive and psychological sciences to explore the structure of semantic memory (De Deyne & Storms, 2008; De Deyne et al., 2013; Steyvers & Tenenbaum, 2005).

Semantic memory encompasses our general knowledge of the world, including concepts, facts, and word meanings (Tulving, 1972; Rogers et al., 2004; Patterson et al., 2007; Jones & McRae, 2013). Semantic networks represent this knowledge as interconnected nodes (concepts) and edges (relationships between concepts) (Kenett et al., 2014; Zemla et al., 2020). Network science employs various metrics to analyse and describe a network's structure. Key parameters include average shortest path length (ASPL), which measures connectivity, clustering coefficient (CC), which reflects the tendency of nodes to form tightly knit clusters, and modularity (Q), which assesses the division of a network into distinct modules or communities. Networks with a low-average path length and high-average CC, especially when compared to similarly sized random networks, are said to possess a "small-world" structure—a feature common to many real-world networks, including the human brain (Watts & Strogatz, 1998).

According to the associative theory of creativity (Mednick, 1962), differences in semantic memory structure influence creative thought. Creative individuals have a richer, more flexible associative network, characterised by flat hierarchies with numerous weakly related associations. In contrast, less creative individuals have steep hierarchies with fewer, more common associations (Mednick, 1962; Kenett et al., 2014 ; Benedek et al., 2017). Literature suggests that higher creativity is associated with higher CC, lower ASPL, and lower Q,

indicating a more interconnected and flexible network (Kenett et al., 2014; Ovando-Tellez et al., 2022; Benedek et al., 2017).

The study examined semantic network metrics to compare the semantic structures of participants with a preference for one genre over another. Variations in the organisation of these semantic networks may indicate different cognitive styles, which could play a role in shaping individuals' preferences when making creativity judgments specific to each genre.

# 6.2. Materials and Methods

## 6.2.1. Stimuli

Seventy Haiku, seventy Senryu, and seventy non-poetic control texts were selected as experimental stimuli for the study. To ensure authenticity and high literary quality, all Haiku and Senryu selected for this study were award-winning pieces from reputable and established sources. These poems were drawn from prestigious competitions, including the Haiku Society of America Haiku Award (in memory of Harold G. Henderson, 1976-2022), the British Haiku Society Awards (BHS) (2002-2021), and the Haiku Society of America Senryu Award (in memory of Gerald Brady, 1988-2022). This careful selection process ensures that the poems maintain their original essence and structure, adhering strictly to the authentic characteristics of Haiku and Senryu. The control texts, structurally matched to the Haiku and Senryu with a 3-line, 5-7-5 syllabic pattern, were carefully selected from AI-generated text repositories. These texts were neutral in tone, deliberately devoid of emotional depth, figurative language, or poetic elements. This lack of aesthetic and emotional engagement allowed for a clear baseline comparison, ensuring that any differences in creativity judgments could be attributed to the unique qualities of Haiku and Senryu, rather than the structural format alone. All Haiku, Senryu, and control texts, are available on the Open Science Framework (OSF) at:

https://osf.io/sm864/?view_only=47eabba4c3764461964c048c3adc682c.

Here is one example for each type of stimulus used in the study:

| Haiku | Senryu | Control |
|---|---|---|
| harvest festival<br>jars of fig jam<br>full of galaxies | refugee—<br>where to bury<br>his child | Laptop powers up<br>Display glowing<br>Ready for use |

## 6.2.2. Participants

A priori power analysis using G*Power (v 3.1, Faul et al., 2007) was conducted for a repeated measures ANOVA with one group and three measurements (Haiku, Senryu, control). Assuming an effect size of 0.229 (partial-$\eta^2$ = 0.05, "Direct" method), α = 0.05, a correlation among repeated measures of 0.5, and desired power of 0.80, the analysis indicated a minimum sample size of 33 participants. Fifty-one participants (N=51; 16 male, 28 female, 7 non-binary; Age M = 27.14, SD = 4.55) took part in the experiment, providing an actual power of 0.95, ensuring robust results. All participants provided written consent to take part in the experiment and were provided with monetary compensation of £30. Ethical approval was granted by the Ethics Committee of the Department of Psychology, Goldsmiths, University of London.

## 6.2.3. Procedure

The present study was part of a larger neuroscientific experiment involving EEG, with the EEG analysis results reported in the next chapter. Before the EEG recording, 51 participants completed self-reported questionnaires on demographics and personality traits including openness and intellect (DeYoung et al., 2007), curiosity (Litman & Spielberger, 2003), vividness of visual (Marks, 1973) and auditory imagery (Halpern, 2015), mindfulness (Brown & Ryan, 2003), and aesthetic responsiveness (AReA: Schlotz et al., 2021). Additionally, participants performed a verbal fluency task, writing as many animal names as possible within 3 minutes (Zemla & Austerweil, 2018), which was further used to compute semantic networks.

During the main experimental task, participants silently read 210 trials (70 Haiku, 70 Senryu, 70 control) presented in 7 blocks, each block containing 30 trials. Both the block order and the order of trials within each block were randomized across participants. Each trial consisted of a 4-second fixation cross, followed by the visual presentation of a stimulus that lasted on the screen for 10 seconds – 5 seconds for reading and 5 seconds for contemplation, with a prompt for the latter shown on the screen. After this, participants were asked to rate the poem on five parameters: aesthetic appeal ("How aesthetically appealing is the poem?"), vivid imagery ("How vivid is the imagery?"), being moved ("How moved are you?"), originality ("How original is the poem?"), and creativity ("How creative is the poem?") using a 7-point Likert scale (1 = very low to 7 = very high).   Instead of the traditional two-dimensional affective states, i.e., valence and arousal, participants assessed their emotional state of being moved (termed as "Being Moved" throughout the paper), a distinct

psychological construct which is "intensely felt responses" (Menninghaus et al., 2015, p.12; see also Cullhed, 2019). Of note, participants were not provided with explicit definitions of originality and creativity but were asked to rely on their own subjective experience (Amabile, 1982). After each block, optional breaks were provided. Figure 6.1 illustrates the schematic representation of a single experimental trial. Of note, the stimuli were presented to participants without any identifying information, such as the poets' names, the award status of the poems, or the specific genre (Haiku or Senryu). This anonymity was intended to minimise potential bias in creativity judgments, ensuring that evaluations were based solely on the content of the texts. Additionally, by removing all contextual clues, this approach eliminated preconceived notions, familiarity bias, and expectations that might arise from recognising certain poets or prestigious accolades, allowing for a more objective assessment of creativity.

**Figure 6.1**

*Schematic representation of the experimental trial structure. Each trial consists of a 4-second fixation cross display, a 5-second reading phase, a 5-second contemplation phase, and an evaluation phase with no time limit. This sequence is repeated for 30 texts per block across 7 blocks, with the order of blocks and trials randomized for each participant*
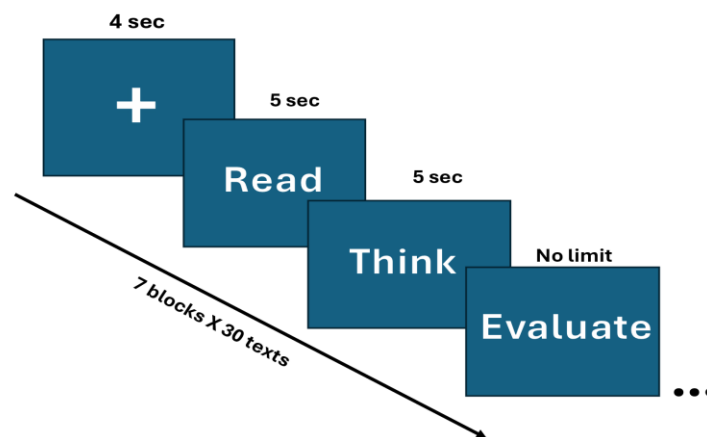


### 6.2.4. Analysis

All statistical analyses were performed in R (v 4.0.3 ; Bates et al., 2015). Following general data visualisation, including descriptive statistics and internal consistency assessments, maximum likelihood linear mixed models (LMM) were conducted using the *lme4* package in

R to identify the most significant predictors of creativity scores for Haiku, Senryu, and Control texts separately. Four potential predictors (aesthetic appeal, vivid imagery, being moved, and originality) were group-mean centred prior to hierarchical entry into the model to obtain clear estimates of within-group effects (Enders & Tofighi, 2007). Predictors were entered in decreasing order of their partial correlation with the outcome variable, creativity. The predictors were treated as fixed effects, while participant intercepts were modelled as random effects. Model comparisons using model-fit criteria including the Akaike information criterion (AIC), Bayesian information criterion (BIC), the proportion of variation explained by fixed effects ($R^2(m)$), Chi-squared statistic, and corresponding *p*-values were used to identify the best-fitting models and the most significant predictors of creativity for each genre (Haiku, Senryu, and Control). To examine the moderating effects of personality traits on the significant predictors, separate linear mixed-effects models were conducted for each personality trait across Haiku, Senryu, and Control conditions. The interaction between predictors and personality traits was treated as fixed effects, with participant intercepts modelled as random effects. Data, including the R code, are available on the Open Science Framework (OSF) at:

https://osf.io/sm864/?view_only=47eabba4c3764461964c048c3adc682c

Additionally, semantic networks were estimated based on participants' verbal fluency responses. Semantic Network Analysis (SemNA) protocol in R (Christensen & Kenett, 2023) was followed for preprocessing, estimating, and analysing semantic networks. For group-based semantic networks, the Euclidean norms of response ratings were calculated for Haiku and Senryu using the following formula:

$$E_p = sqrt \sum_{i=1}^{70} \sum_{j=1}^{5} R_{ij}^2$$

Where $E_p$ represents the comprehensive response of a participant for a particular genre. For each participant, the difference score was computed between Haiku and Senryu: H($E_p$) – S($E_p$). Then semantic networks for the low and high difference scores, (H-S), was estimated, representing groups that either preferred Haiku or Senryu.  For a visual comparison of the two networks, compare.nets function in *SemNet* was used in R, based on Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991), a force-directed graph method, widely used in psychological and network science literature for aesthetically pleasing visualization of  complex networks (Jones et al., 2018; Christensen & Kenett, 2023). Of note,  the purpose of force-directed algorithms is to provide easy viewing of the network edges and clustering

structures by minimising the number of crossing edges and by positioning nodes so that edges have approximately equal length (Jones et al., 2018).

Considering semantic memory as a small world structure (Watts & Strogatz, 1998), the global network measures, including average shortest path length (ASPL), clustering coefficient (CC), and modularity (Q) were computed to quantify the structural properties of the semantic networks. To statistically assess differences between these network measures, tests against random networks and bootstrap method were performed. Tests against random networks determined whether the network measures observed in the Haiku-and Senryu-dominated groups were different from what would expected from a random network with the same number of nodes and edges (Steyvers & Tenenbaum, 2005; Beckage et al., 2011; Christensen & Kenett, 2023). Using the bootstrap method (Efron, 1992), a subset of nodes (e.g., 50%) was randomly selected in the network, all compared networks for this subset of nodes were estimated, and the network measures were computed (Kenett et al., 2014; Christensen & Kenett, 2023). This process was repeated 1000 times, allowing us to statistically estimate and compare the partial network measures, providing a robust and comprehensive comparison between the Haiku-preferred and Senryu-preferred networks. These iterated partial networks formed a sampling distribution of the global network measures for both Haiku- and Senryu-dominated groups, which further statistically compared using a $t$-test (as there were only two groups) to determine whether the global network measures were different between the compared networks. In this approach, a gradation of nodes (50%, 60%, 70%, 80%, and 90%; Christensen et al., 2018) was retained, allowing trends in the distributions to be observed.

Of note, the semantic network estimation and analyses adhered to the protocols detailed in the SemNA tutorial by Christensen & Kenett (2023).

## 6.3. Results

Descriptive statistics for the variables are shown in Table 6.1. The variables exhibited a slightly left-skewed distribution, as indicated by negative skewness, which was close to zero. Additionally, the near-zero kurtosis values suggested an approximate normal distribution. The variance inflation factors (VIF < 4) indicated no concern of significant multicollinearity among the variables. The high values of Cronbach's Alpha (0.93) and McDonald's Omega (Omega total = 0.95; Omega hierarchical = 0.84) confirmed a high level of internal consistency across the items. Tables 6.2 (A) through (C) display the means, standard deviations, and bivariate correlations for the variables within the Haiku, Senryu, and Control

groups, respectively. All correlations were statistically significant ($p < .01$). In Haiku, creativity showed the strongest correlation with originality ($r = .85$), followed by being moved ($r = .67$) and aesthetic appeal ($r = .65$); vivid imagery ($r = .56$) showed the lowest correlation with creativity. Similarly, for Senryu, creativity was most strongly correlated with originality ($r = .86$), followed by being moved ($r = .70$) and aesthetic appeal ($r = .65$), with vivid imagery ($r = .54$) again showing the lowest correlation. For Control texts, creativity was most strongly correlated with originality ($r = .89$), followed by being moved ($r = .73$), aesthetic appeal ($r = .68$) and vivid imagery ($r = .53$).

**Table 6.1**

*Descriptive statistics of the variables, including means, standard deviations, skewness, kurtosis, standard errors, and variance inflation factor (VIF)*

| Variables | n | M | SD | Median | Min | Max | Skewness | Kurtosis | SE | VIF |
|---|---|---|---|---|---|---|---|---|---|---|
| Aesthetic Appeal | 10710 | 4.04 | 1.63 | 4 | 1 | 7 | -0.29 | -0.65 | 0.02 | 2.96 |
| Vivid Imagery | 10710 | 4.65 | 1.68 | 5 | 1 | 7 | -0.68 | -0.34 | 0.02 | 2.32 |
| Being Moved | 10710 | 3.69 | 1.74 | 4 | 1 | 7 | -0.1 | -1.01 | 0.02 | 3.02 |
| Originality | 10710 | 3.94 | 1.66 | 4 | 1 | 7 | -0.33 | -0.76 | 0.02 | 2.48 |
| Creativity | 10710 | 3.91 | 1.75 | 4 | 1 | 7 | -0.24 | -0.91 | 0.02 | |

*Note.* M=mean; Min=minimum; Max=maximum; SD= standard deviation; VIF=variance inflation factor.

**Table 6.2A**
*Means, standard deviations, and bivariate correlations among variables for Haiku*

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Aesthetic Appeal | 4.68 | 1.4 | - | | | | |
| 2. Vivid Imagery | 5.12 | 1.42 | .70** | - | | | |
| 3. Being Moved | 4.16 | 1.55 | .64** | .66** | - | | |
| 4. Originality | 4.5 | 1.34 | .58** | .53** | .65** | - | |
| 5. Creativity | 4.54 | 1.44 | .65** | .56** | .67** | .85** | - |

**Table 6.2B**
*Means, standard deviations, and bivariate correlations among variables for Senryu*

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Aesthetic Appeal | 4.4 | 1.45 | - | | | | |
| 2. Vivid Imagery | 5 | 1.47 | .64** | - | | | |
| 3. Being Moved | 4.18 | 1.63 | .68** | .63** | - | | |
| 4. Originality | 4.52 | 1.44 | .61** | .52** | .68** | - | |
| 5. Creativity | 4.53 | 1.52 | .65** | .54** | .70** | .86** | - |

**Table 6.2C**

*Means, standard deviations, and bivariate correlations among variables for Control*

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Aesthetic Appeal | 3.04 | 1.54 | - | | | | |
| 2. Vivid Imagery | 3.81 | 1.81 | .68** | - | | | |
| 3. Being Moved | 2.73 | 1.63 | .74** | .62** | - | | |
| 4. Originality | 2.79 | 1.55 | .65** | .54** | .71** | - | |
| 5. Creativity | 2.65 | 1.55 | .68** | .53** | .73** | .89** | - |

Figure 6.2 illustrates the mean ratings of four variables for three stimulus categories. Haiku received the highest mean rating for aesthetic appeal (M=4.68), followed by Senryu (M=4.40), while Control texts were rated significantly lower (M=3.04). Haiku was also rated highest for vivid imagery (M=5.12), slightly above Senryu (M=5.00), with Control texts scoring noticeably lower (M=3.81). Senryu slightly outperformed Haiku in the 'being moved' category, with a mean rating of 4.18 compared to Haiku's 4.16, while Control texts again scored the lowest (M=2.73). Ratings for originality were close between Haiku (M=4.50) and Senryu (M=4.52), both of which surpass Control texts (M=2.79). These results suggested that while Haiku was more aesthetically appealing, Senryu was perceived as slightly more emotionally moving, with both poetic forms being rated highly for vividness and originality.

**Figure 6.2**

*Mean ratings for Haiku, Senryu, and Control across four measures: aesthetic appeal, vivid imagery, being moved, and originality. Error bars represent the standard errors of the mean, indicating the variability of ratings across participants.*
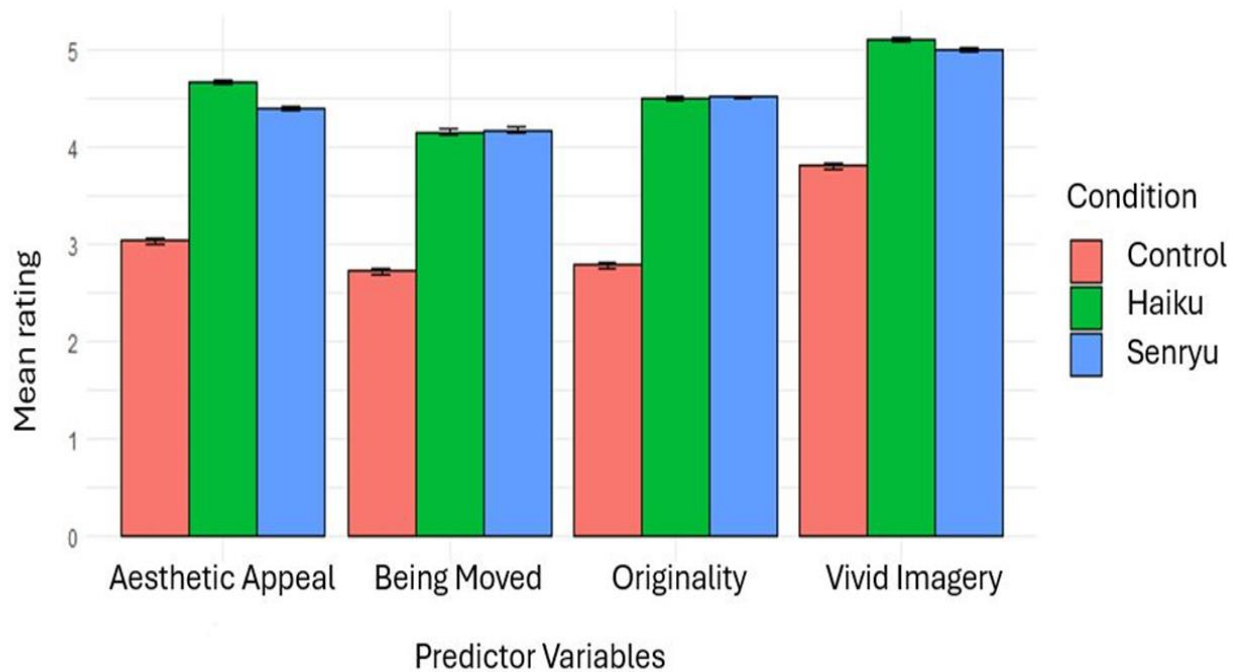


Figures 6.3(A) through (C) illustrate the partial correlation networks for Haiku, Senryu, and the Control group, respectively. Each node in the network represents the prospective predictors, while the edges indicate the strength and direction of the partial correlations between nodes. For predicting creativity, prospective predictors were entered into the model hierarchically based on their partial correlation with creativity, in descending order.

**Figure 6.3**

*Partial correlation networks of the variables in Haiku (A), Senryu (B), and the Control (C) representing the partial correlations among aesthetic appeal (A_A), vivid imagery (V_I), being moved (Mvd), originality (Org), and creativity (Crt). Each node represents the variables, and the edges between nodes illustrate the strength and direction of the partial correlations. The thickness and intensity of the green edges indicate the strength of these correlations, with darker green reflecting stronger positive correlations and lighter green representing weaker ones.*



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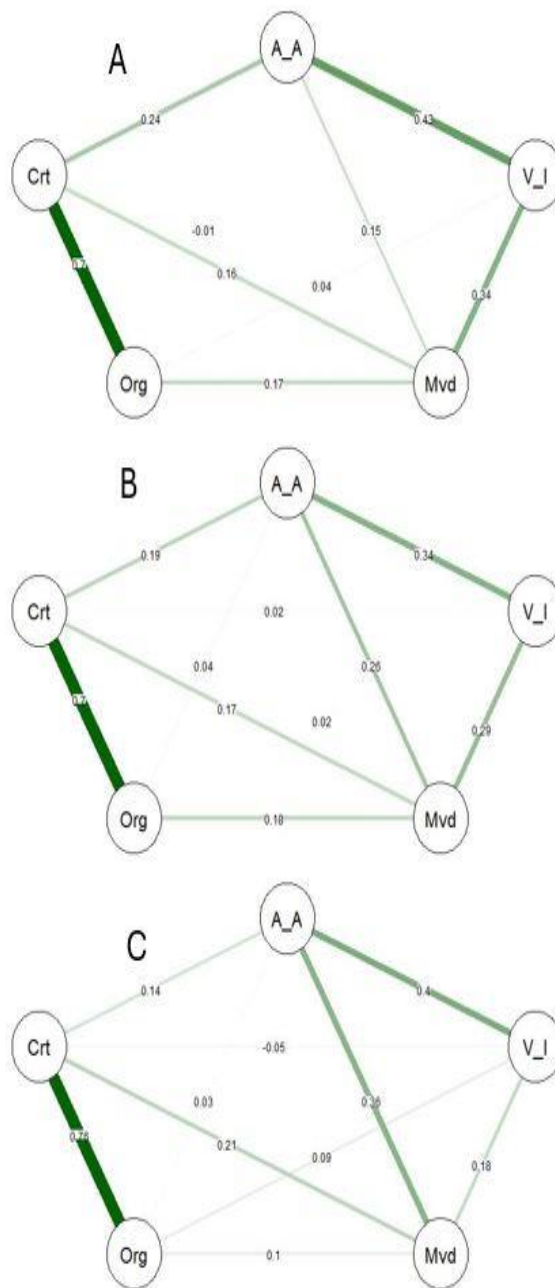
### 6.3.1. Predicting Creativity

*Haiku*

The null model for Haiku, which included no predictors, revealed an intraclass correlation coefficient (ICC) of 0.32, indicating that 32% of the variance in creativity ratings was due to differences between participants, justifying the use of LMM. The predictors were entered in the following order according to the descending order of their partial correlation with creativity: originality ($r$ = 0.70), aesthetic appeal ($r$ = 0.24), being moved ($r$ = 0.16), and vivid imagery ($r$ = 0.00).  Model comparison showed that vivid imagery did not emerge as a significant predictor (see Table 6.3 for model comparison). The best-fitting model (see model 3 in Table 6.3) explained 47% of the variance in creativity ratings (pseudo-$R^2$ for fixed effects) and 79% of the total variance, with substantial between-participant variability in the random effects (ICC = 0.61).   The best-fitting model identified originality (Estimate = 0.69, SE = 0.01, $t$ (3519) = 54.9, $p$ < .001) as the strongest predictor, followed by aesthetic appeal (Estimate = 0.15, SE = 0.01, $t$ (3519) = 12.36, $p$ < .001) and being moved (Estimate = 0.14, SE = 0.01, $t$ (3519) = 11.83, $p$ < .001). Table 6.4 provides details on the best-fitting model for creativity ratings in Haiku condition.

*Senryu*

The null model for Senryu, which included no predictors, revealed an intraclass correlation coefficient (ICC) of 0.29, indicating that 29% of the variance in creativity ratings was due to differences between participants, justifying the use of LMM. The predictors were entered in the following order according to the descending order of their partial correlation with creativity: originality ($r$ = 0.70), aesthetic appeal ($r$ = 0.19), being moved ($r$ = 0.17), and vivid imagery ($r$ = 0.02). Model comparison showed that vivid imagery did not emerge as a significant predictor (see Table 6.3 for model comparison). The best model (see model 3 in Table 6.3), including originality, aesthetic appeal, and being moved explained 50% of the variance in creativity ratings and 80% of the total variance.  The best-fitting model identified originality (Estimate = 0.69, SE = 0.01, $t$ (3519) = 55.18, $p$ < .001) as the strongest predictor, followed by being moved (Estimate = 0.15, SE = 0.01, $t$ (3519) = 12.44, $p$ < .001) and aesthetic appeal (Estimate = 0.12, SE = 0.01, $t$ (3519) = 9.38, $p$ < .001). See Table 6.4 for details on the best-fitting model for creativity ratings in Senryu condition.

*Control*

The null model for Control texts revealed an intraclass correlation coefficient (ICC) of 0.49, indicating that nearly half of the variance in creativity ratings was due to differences between participants, justifying the use of LMM. The predictors were entered in the following order according to the descending order of their partial correlation with creativity: originality ($r$ = 0.76), being moved ($r$ = 0.21), aesthetic appeal ($r$ = 0.14), and vivid imagery ($r$ = -0.05). Model comparison showed that vivid imagery did not emerge as a significant predictor (see Table 6.3 for model comparison). The best-fitting model (see model 3 in Table 6.3), which included originality, being moved, and aesthetic appeal, explained 35% of the variance in creativity ratings (pseudo-R² for fixed effects) and 84% of the total variance, with substantial between-participant variability. originality (Estimate=0.68, SE= 0.01, $t$ (3519) = 56.75, $p$<.001) was the strongest predictor, followed by being moved (Estimate=0.13, SE= 0.01, $t$ (3519) = 11.04, $p$<.001) and aesthetic appeal (Estimate=0.13, SE= 0.01, $t$ (3519) = 10.67, $p$<.001. See Table 6.4 for the best-fit model for Control condition.

**Table 6.3**

*Model comparison for linear mixed effects models on creativity ratings across genres (Haiku, Senryu, and Control), including key statistics such as AIC, BIC, and marginal R². Model 3 was the best-fitting model for all genres.*

| Condition | Model | npar | AIC | BIC | R²(m) | Chisq | Pr(>Chisq) |
|---|---|---|---|---|---|---|---|
| Haiku | null | 3 | 11546 | 11564.6 | 0 | | |
| | model 1 | 4 | 7813.2 | 7837.9 | 0.44 | 3734.828 | <.001 |
| | model 2 | 5 | 7473.6 | 7504.5 | 0.46 | 341.5836 | <.001 |
| | model 3 | 6 | 7338.5 | 7375.5 | 0.47 | 137.1467 | <.001 |
| | model 4 | 7 | 7340.5 | 7383.7 | 0.47 | 0.0029 | 0.96 |
| | | | | | | | |
| Senryu | null | 3 | 12086.4 | 12104.9 | 0 | | |
| | model 1 | 4 | 8086.5 | 8111.2 | 0.48 | 4001.898 | <.001 |
| | model 2 | 5 | 7833.5 | 7864.4 | 0.49 | 254.987 | <.001 |
| | model 3 | 6 | 7684 | 7721 | 0.5 | 151.532 | <.001 |
| | model 4 | 7 | 7683.1 | 7726.4 | 0.51 | 2.826 | 0.09 |
| | | | | | | | |
| Control | null | 3 | 11078 | 11096.6 | 0 | | |
| | model 1 | 4 | 7361.6 | 7386.3 | 0.33 | 3718.411 | <.001 |
| | model 2 | 5 | 7061.9 | 7092.8 | 0.34 | 301.7629 | <.001 |
| | model 3 | 6 | 6951.9 | 6989 | 0.35 | 111.9862 | <.001 |
| | model 4 | 7 | 6953.9 | 6997.1 | 0.35 | 0.0149 | 0.9 |

Of note, predictors were added sequentially to Models 1 through 4 in decreasing order of partial correlation coefficients for each genre. Models were compared hierarchically: Model 1

against the null model, Model 2 against Model 1, and so on. AIC refers to Akaike Information Criterion; BIC, Bayesian Information Criterion; R²(m), the proportion of variation explained by fixed effects (Nakagawa & Schielzeth, 2013); and Chisq, the likelihood ratio test statistic for model comparisons.

**Table 6.4**

*Best-fit mixed-effects models for creativity ratings across Haiku, Senryu, and Control. Includes model fit indices, fixed and random effects, and intraclass correlation coefficients (ICC). Originality emerged as the strongest predictor, with other predictors varying by genre*

**Haiku**
**Model-Info**
Observations: 3570
Dependent Variable:   Creativity
Type:  Mixed effects linear regression

**Model-Fit**

| | | | | | |
|---|---|---|---|---|---|
| AIC | 7338.46 | | | | |
| BIC | 7375.54 | | | | |
| Pseudo-R² (fixed effects) | 0.47 | | | | |
| Pseudo-R² (total) | 0.79 | | | | |

| Fixed Effects | Est | SE | t-value | df | p-value |
|---|---|---|---|---|---|
| (Intercept) | 4.54 | 0.12 | 39.2 | 51 | <.001 |
| Originality | 0.69 | 0.01 | 54.9 | 3519 | <.001 |
| Aesthetic Appeal | 0.15 | 0.01 | 12.36 | 3519 | <.001 |
| Being Moved | 0.14 | 0.01 | 11.83 | 3519 | <.001 |

**Random Effects**

| Group | Parameter | Std Dev |
|---|---|---|
| Participant | (Intercept) | 0.82 |
| Residual | | 0.65 |

**Grouping Variables**

| Group | Groups | ICC |
|---|---|---|
| Participant | 51 | 0.61 |

**Senryu**
**Model Info**
Observations: 3570
Dependent Variable:   Creativity
Type:  Mixed effects linear regression

| Model Fit | Values |
|---|---|
| AIC | 7683.96 |

| Model-Fit | Value | | | | |
|---|---|---|---|---|---|
| BIC | 7721.05 | | | | |
| Pseudo-R² (fixed effects) | 0.5 | | | | |
| Pseudo-R² (total) | 0.8 | | | | |

| Fixed Effects | Estimate | S.E. | t-value | df | p-value |
|---|---|---|---|---|---|
| (Intercept) | 4.53 | 0.12 | 39.21 | 51 | <.001 |
| Originality | 0.69 | 0.01 | 55.18 | 3519 | <.001 |
| Aesthetic Appeal | 0.12 | 0.01 | 9.38 | 3519 | <.001 |
| Moved | 0.15 | 0.01 | 12.44 | 3519 | <.001 |

**Random Effects**

| Group | Parameter | Std Dev |
|---|---|---|
| Participant | (Intercept) | 0.82 |
| Residual | | 0.69 |

**Grouping Variables**

| Group | Groups | ICC |
|---|---|---|
| Participant | 51 | 0.59 |

**Control**

**Model-Info**

Observations: 3570

Dependent Variable:   Creativity

Type:  Mixed effects linear regression

| Model-Fit | Value | | | | |
|---|---|---|---|---|---|
| AIC | 6951.88 | | | | |
| BIC | 6988.96 | | | | |
| Pseudo-R² (fixed effects) | 0.35 | | | | |
| Pseudo-R² (total) | 0.84 | | | | |

| Fixed Effects | Est. | S.E. | t-value | d.f. | p-value |
|---|---|---|---|---|---|
| (Intercept) | 2.65 | 0.15 | 17.3 | 51 | <.001 |
| Originality | 0.68 | 0.01 | 56.75 | 3519 | <.001 |
| Being Moved | 0.13 | 0.01 | 11.04 | 3519 | <.001 |
| Aesthetic Appeal | 0.13 | 0.01 | 10.67 | 3519 | <.001 |

**Random Effects**

| Group | Parameter | Std Dev |
|---|---|---|
| Participant | (Intercept) | 1.09 |
| Residual | | 0.62 |

**Grouping Variables**

| Group | Groups | ICC |
|---|---|---|
| Participant | 51 | 0.76 |

### 6.3.2. Impact of Personality Traits

The influence of individual differences in readers' personality traits on creativity judgments across Haiku and Senryu was examined, excluding the Control texts from this analysis. The Control texts were excluded from this analysis to ensure that the moderation effects of personality traits were examined specifically within the structured and emotive context of Haiku and Senryu, avoiding variability introduced by neutral, non-poetic texts. The interactions between seven personality traits—openness, intellect, curiosity, visual imagery (VVIQ), auditory imagery (AVIQ), mindfulness, and aesthetic responsiveness (AReA)—and the key predictors of creativity judgments, including originality, being moved, and aesthetic appeal, were analysed. The results of the moderation analyses are presented in Table 6.5, while

In Haiku, the significant interaction between AVIQ and being moved showed a significant slope difference (estimate = 0.06, SE = 0.02, $t$ = 2.76, $p$ = 0.01), indicating that individuals with higher levels of auditory imagery vividness (AVIQ) placed greater importance on the emotional impact (being moved) of Haiku when making creativity judgments compared to those with lower auditory imagery vividness. Notably, significant negative slope differences were observed for the interaction between AVIQ and originality (estimate = -0.06, SE = 0.02, $t$ = -2.59, p = 0.01) and between AReA and originality (estimate = -0.06, SE = 0.03, $t$ = -2.11, $p$ = 0.03) suggesting that individuals with higher auditory imagery vividness and aesthetic responsiveness valued originality less when evaluating the creativity of Haiku.

In Senryu, the moderation analyses revealed a considerable number of significant interactions between personality traits and key predictors of creativity judgments. This indicates that individual differences in personality traits strongly influenced the evaluation process for Senryu. For instance, the interaction between openness and aesthetic appeal showed a negative slope difference (estimate = -0.06, SE = 0.02, $t$ = -2.36, $p$ = 0.02), suggesting that individuals with lower levels of openness placed more importance on aesthetic appeal in their creativity judgments of Senryu compared to those with higher openness. In contrast, a significant positive slope difference was found for the interaction between openness and originality (estimate = 0.08, SE = 0.02, $t$ = 3.15, $p$ = 0.002), suggesting that individuals with higher levels of openness placed greater emphasis on originality when judging the creativity of Senryu, compared to those with lower levels of openness. The positive slope difference between intellect and being moved (estimate = 0.06, SE = 0.02, $t$ = 2.62, $p$ = 0.01) indicates that individuals with greater intellectual engagement emphasised the emotional resonance of Senryu more heavily in their creativity assessments than those with lower intellectual engagement. Additionally, the interaction between VVIQ

and being moved revealed a positive slope difference (estimate = 0.08, SE = 0.02, *t* = 4.07, *p* < .001), indicating that individuals with more vivid visual imagery prioritised the emotional impact of Senryu in their creativity judgments. The interaction between AVIQ and being moved showed a positive slope (estimate = 0.10, SE = 0.02, *t* = 4.48, *p* < .001), indicating that individuals with more vivid auditory imagery placed greater emphasis on the emotional impact of Senryu when evaluating creativity. In contrast, the interaction between AVIQ and originality demonstrated a negative slope (estimate = -0.09, SE = 0.02, *t* = -3.85, *p* < .001), suggesting that those with more vivid auditory imagery were less likely to weigh originality in their creativity assessments compared to those with less vivid auditory imagery. The interaction between mindfulness and originality, with a significant negative slope difference (estimate = -0.07, SE = 0.03, *t* = -2.63, *p* = 0.01), suggesting that individuals with lower mindfulness prioritised originality more in their creativity judgment of Senryu, in contrast to those with higher mindfulness levels.

**Table 6.5**

*Moderation analysis of personality traits on creativity judgments in Haiku and Senryu*

| Moderation Model Haiku | Fixed Effects | Estimate | SE | t-value | p-value | R^2 |
|---|---|---|---|---|---|---|
| Openness Model | Intercept | 3.67 | 0.81 | 4.56 | <.001 | 0.48 |
| | Aesthetic Appeal | 0.19 | 0.08 | 2.33 | 0.02 | |
| | Openness | 0.16 | 0.14 | 1.09 | 0.28 | |
| | Being Moved | 0.09 | 0.09 | 1.06 | 0.29 | |
| | Originality | 0.51 | 0.09 | 5.56 | <.001 | |
| | Openness*Aesthetic Appeal | -0.01 | 0.01 | -0.46 | 0.65 | |
| | Openness*Being Moved | 0.01 | 0.02 | 0.58 | 0.56 | |
| | Openness*Originality | 0.03 | 0.02 | 1.97 | 0.05 | |
| Intellect Model | Intercept | 4.03 | 0.68 | 5.95 | <.001 | 0.47 |
| | Aesthetic Appeal | 0.07 | 0.07 | 0.98 | 0.33 | |
| | Intellect | 0.1 | 0.13 | 0.77 | 0.45 | |
| | Being Moved | 0.2 | 0.07 | 2.83 | <.001 | |
| | Originality | 0.75 | 0.07 | 10.05 | <.001 | |
| | Intellect*Aesthetic Appeal | 0.02 | 0.01 | 1.21 | 0.23 | |
| | Intellect* Being Moved | -0.01 | 0.01 | -0.84 | 0.4 | |
| | Intellect*Originality | -0.01 | 0.01 | -0.77 | 0.44 | |
| Curiosity Model | Intercept | 4.77 | 0.77 | 6.19 | <.001 | 0.47 |
| | Aesthetic Appeal | 0.05 | 0.08 | 0.68 | 0.5 | |
| | Curiosity | -0.04 | 0.14 | -0.3 | 0.77 | |
| | Being Moved | 0.23 | 0.08 | 2.73 | 0.01 | |
| | Originality | 0.58 | 0.09 | 6.63 | <.001 | |
| | Curiosity*Aesthetic Appeal | 0.02 | 0.01 | 1.26 | 0.21 | |
| | Curiosity* Being Moved | -0.01 | 0.01 | -1.02 | 0.31 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Curiosity*Originality | 0.02 | 0.02 | 1.26 | 0.21 | |
| VVIQ Model | Intercept | 3.6 | 0.63 | 5.7 | <.001 | 0.48 |
| | Aesthetic Appeal | 0.19 | 0.06 | 3.35 | <.001 | |
| | VVIQ | 0.18 | 0.12 | 1.51 | 0.14 | |
| | Being Moved | 0.1 | 0.06 | 1.67 | 0.09 | |
| | Originality | 0.62 | 0.07 | 9.58 | <.001 | |
| | VVIQ*Aesthetic Appeal | -0.01 | 0.01 | -0.65 | 0.52 | |
| | VVIQ* Being Moved | 0.01 | 0.01 | 0.63 | 0.53 | |
| | VVIQ*Originality | 0.01 | 0.01 | 1.04 | 0.3 | |
| AVIQ Model | Intercept | 3.47 | 0.45 | 7.73 | <.001 | 0.5 |
| | Aesthetic Appeal | 0.21 | 0.04 | 4.74 | <.001 | |
| | AVIQ | 0.22 | 0.09 | 2.45 | 0.02 | |
| | Being Moved | 0.05 | 0.05 | 0.99 | 0.32 | |
| | Originality | 0.8 | 0.05 | 16.51 | <.001 | |
| | AVIQ*Aesthetic Appeal | -0.01 | 0.01 | -1.4 | 0.16 | |
| | AVIQ* Being Moved | 0.02 | 0.01 | 2.13 | 0.03 | |
| | AVIQ*Originality | -0.02 | 0.01 | -2.37 | 0.02 | |
| Mindfulness Model | Intercept | 4.3 | 0.51 | 8.48 | <.001 | 0.47 |
| | Aesthetic Appeal | 0.2 | 0.06 | 3.57 | <.001 | |
| | Mindfulness | 0.06 | 0.13 | 0.48 | 0.64 | |
| | Being Moved | 0.12 | 0.06 | 2.2 | 0.03 | |
| | Originality | 0.67 | 0.06 | 11.33 | <.001 | |
| | Mindfulness*Aesthetic Appeal | -0.01 | 0.01 | -0.88 | 0.38 | |
| | Mindfulness* Being Moved | 0.01 | 0.01 | 0.36 | 0.72 | |
| | Mindfulness*Originality | 0.01 | 0.01 | 0.35 | 0.73 | |
| AReA Model | Intercept | 3.88 | 0.52 | 7.53 | <.001 | 0.48 |
| | Aesthetic Appeal | 0.11 | 0.06 | 1.94 | 0.05 | |
| | AReA | 0.14 | 0.11 | 1.3 | 0.2 | |
| | Being Moved | 0.05 | 0.06 | 0.85 | 0.39 | |
| | Originality | 0.81 | 0.06 | 12.96 | <.001 | |
| | AReA*Aesthetic Appeal | 0.01 | 0.01 | 0.65 | 0.52 | |
| | AReA* Being Moved | 0.02 | 0.01 | 1.7 | 0.09 | |
| | AReA*Originality | -0.03 | 0.01 | -1.97 | 0.05 | |
| **Senryu** | | | | | | |
| Openness Model | Intercept | 3.28 | 0.79 | 4.14 | <.001 | 0.52 |
| | Aesthetic Appeal | 0.33 | 0.09 | 3.82 | <.001 | |
| | Openness | 0.22 | 0.14 | 1.59 | 0.12 | |
| | Moved | 0.17 | 0.09 | 1.91 | 0.06 | |
| | Originality | 0.4 | 0.09 | 4.54 | <.001 | |
| | Openness*Aesthetic Appeal | -0.04 | 0.01 | -2.45 | 0.01 | |
| | Openness*Moved | 0 | 0.02 | -0.22 | 0.83 | |
| | Openness*Originality | 0.05 | 0.02 | 3.3 | <.001 | |
| Intellect Model | Intercept | 4.18 | 0.68 | 6.18 | <.001 | 0.51 |
| | Aesthetic Appeal | 0.07 | 0.07 | 1.03 | 0.3 | |
| | Intellect | 0.07 | 0.13 | 0.52 | 0.61 | |
| | Moved | -0.02 | 0.07 | -0.33 | 0.74 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Originality | 0.77 | 0.07 | 10.72 | <.001 | |
| | Intellect*Aesthetic Appeal | 0.01 | 0.01 | 0.65 | 0.52 | |
| | Intellect*Moved | 0.03 | 0.01 | 2.56 | 0.01 | |
| | Intellect*Originality | -0.02 | 0.01 | -1.12 | 0.26 | |
| Curiosity Model | Intercept | 4.49 | 0.77 | 5.83 | <.001 | 0.5 |
| | Aesthetic Appeal | 0.19 | 0.09 | 2.2 | 0.03 | |
| | Curiosity | 0.01 | 0.14 | 0.06 | 0.95 | |
| | Moved | 0.08 | 0.08 | 0.95 | 0.34 | |
| | Originality | 0.64 | 0.09 | 7.18 | <.001 | |
| | Curiosity*Aesthetic Appeal | -0.01 | 0.02 | -0.82 | 0.41 | |
| | Curiosity*Moved | 0.01 | 0.01 | 0.86 | 0.39 | |
| | Curiosity*Originality | 0.01 | 0.02 | 0.56 | 0.58 | |
| VVIQ Model | Intercept | 3.43 | 0.63 | 5.48 | <.001 | 0.52 |
| | Aesthetic Appeal | 0.12 | 0.06 | 2.05 | 0.04 | |
| | VVIQ | 0.21 | 0.12 | 1.79 | 0.08 | |
| | Moved | -0.08 | 0.06 | -1.28 | 0.2 | |
| | Originality | 0.71 | 0.06 | 11.42 | <.001 | |
| | VVIQ*Aesthetic Appeal | 0 | 0.01 | 0.03 | 0.98 | |
| | VVIQ*Moved | 0.04 | 0.01 | 3.82 | <.001 | |
| | VVIQ*Originality | -0.01 | 0.01 | -0.45 | 0.65 | |
| AVIQ Model | Intercept | 3.36 | 0.44 | 7.6 | <.001 | 0.54 |
| | Aesthetic Appeal | 0.16 | 0.05 | 3.54 | <.001 | |
| | AVIQ | 0.24 | 0.09 | 2.72 | 0.01 | |
| | Moved | -0.03 | 0.05 | -0.73 | 0.47 | |
| | Originality | 0.86 | 0.05 | 18.29 | <.001 | |
| | AVIQ*Aesthetic Appeal | -0.01 | 0.01 | -1 | 0.32 | |
| | AVIQ*Moved | 0.04 | 0.01 | 4.11 | <.001 | |
| | AVIQ*Originality | -0.04 | 0.01 | -3.85 | <.001 | |
| Mindfulness Model | Intercept | 4.4 | 0.51 | 8.68 | <.001 | 0.5 |
| | Aesthetic Appeal | 0.07 | 0.06 | 1.31 | 0.19 | |
| | Mindfulness | 0.03 | 0.13 | 0.26 | 0.8 | |
| | Moved | 0.2 | 0.06 | 3.52 | <.001 | |
| | Originality | 0.84 | 0.06 | 14.27 | <.001 | |
| | Mindfulness*Aesthetic Appeal | 0.01 | 0.01 | 0.89 | 0.37 | |
| | Mindfulness*Moved | -0.01 | 0.01 | -0.87 | 0.38 | |
| | Mindfulness*Originality | -0.04 | 0.01 | -2.6 | 0.01 | |
| AReA Model | Intercept | 3.85 | 0.51 | 7.5 | <.001 | 0.51 |
| | Aesthetic Appeal | 0.14 | 0.06 | 2.38 | 0.02 | |
| | AReA | 0.15 | 0.11 | 1.35 | 0.18 | |
| | Moved | 0.05 | 0.06 | 0.91 | 0.36 | |
| | Originality | 0.79 | 0.06 | 13.23 | <.001 | |
| | AReA*Aesthetic Appeal | -0.01 | 0.01 | -0.41 | 0.68 | |
| | AReA*Moved | 0.02 | 0.01 | 1.77 | 0.08 | |
| | AReA*Originality | -0.02 | 0.01 | -1.65 | 0.1 | |

Table 6.6 provides the simple slopes analyses for Haiku and Senryu at high (+1 SD) and low (-1 SD) levels of the moderators. Figures 6.4 (A)-(C) and 6.5 (A)-(G) illustrate how creativity judgments vary across predictor levels moderated by these traits for Haiku and Senryu, respectively.

**Table 6.6**

*Results of simple slopes analyses of moderations of personality traits on creativity judgments across Haiku and Senryu.*

| Interaction | High(+1SD) | | | | Low(-1SD) | | | | Slope Difference (High-Low) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimate | SE | t-value | p-value | Estimate | SE | t-value | p-value | Estimate | SE | t-value | p-value |
| **Haiku** | | | | | | | | | | | | |
| Openness * Originality | 0.71 | 0.02 | 42.41 | <.001 | 0.67 | 0.02 | 35.31 | <.001 | 0.05 | 0.03 | 1.88 | 0.06 |
| AVIQ * Being Moved | 0.18 | 0.02 | 10.31 | <.001 | 0.11 | 0.02 | 7.16 | <.001 | 0.06 | 0.02 | 2.76 | 0.01 |
| AVIQ * Originality | 0.66 | 0.02 | 36.95 | <.001 | 0.72 | 0.02 | 43.37 | <.001 | -0.06 | 0.02 | -2.59 | 0.01 |
| AReA * Originality | 0.67 | 0.02 | 37.15 | <.001 | 0.72 | 0.02 | 38.24 | <.001 | -0.06 | 0.03 | -2.11 | 0.03 |
| | | | | | | | | | | | | |
| **Senryu** | | | | | | | | | | | | |
| Openness * Aesthetic Appeal | 0.1 | 0.02 | 6.26 | <.001 | 0.16 | 0.02 | 8.3 | <.001 | -0.06 | 0.02 | -2.36 | 0.02 |
| Openness * Originality | 0.73 | 0.02 | 42.7 | <.001 | 0.65 | 0.02 | 36.19 | <.001 | 0.08 | 0.02 | 3.15 | 0.002 |
| Intellect * Being Moved | 0.18 | 0.02 | 10.71 | <.001 | 0.12 | 0.02 | 7.03 | <.001 | 0.06 | 0.02 | 2.62 | 0.01 |
| VVIQ * Being Moved | 0.2 | 0.02 | 11.67 | <.001 | 0.11 | 0.02 | 6.95 | <.001 | 0.08 | 0.02 | 4.07 | <.0001 |
| AVIQ * Being Moved | 0.21 | 0.02 | 11.93 | <.001 | 0.11 | 0.02 | 6.7 | <.001 | 0.1 | 0.02 | 4.48 | <.0001 |
| AVIQ * Originality | 0.64 | 0.02 | 35.83 | <.001 | 0.73 | 0.02 | 45.22 | <.001 | -0.09 | 0.02 | -3.85 | <.0001 |
| Mindfulness * Originality | 0.65 | 0.02 | 36.13 | <.001 | 0.72 | 0.02 | 39.75 | <.001 | -0.07 | 0.03 | -2.63 | 0.01 |

**Figure 6.4**

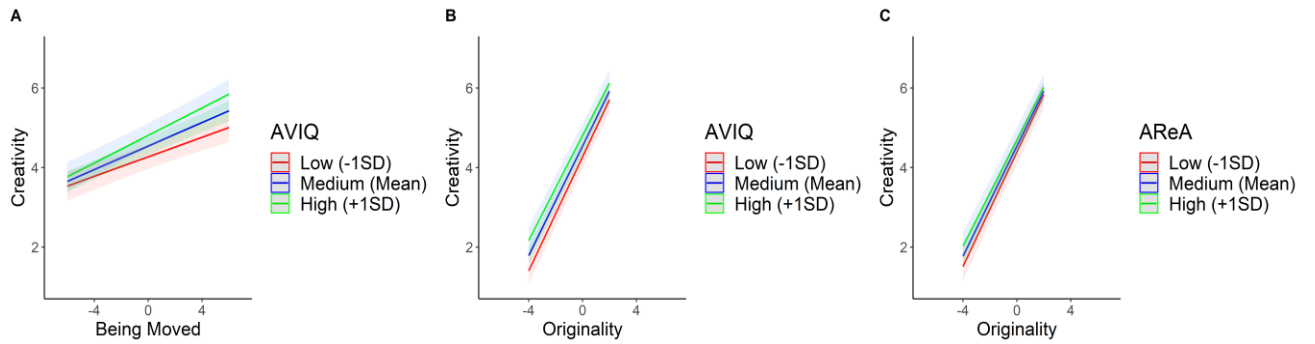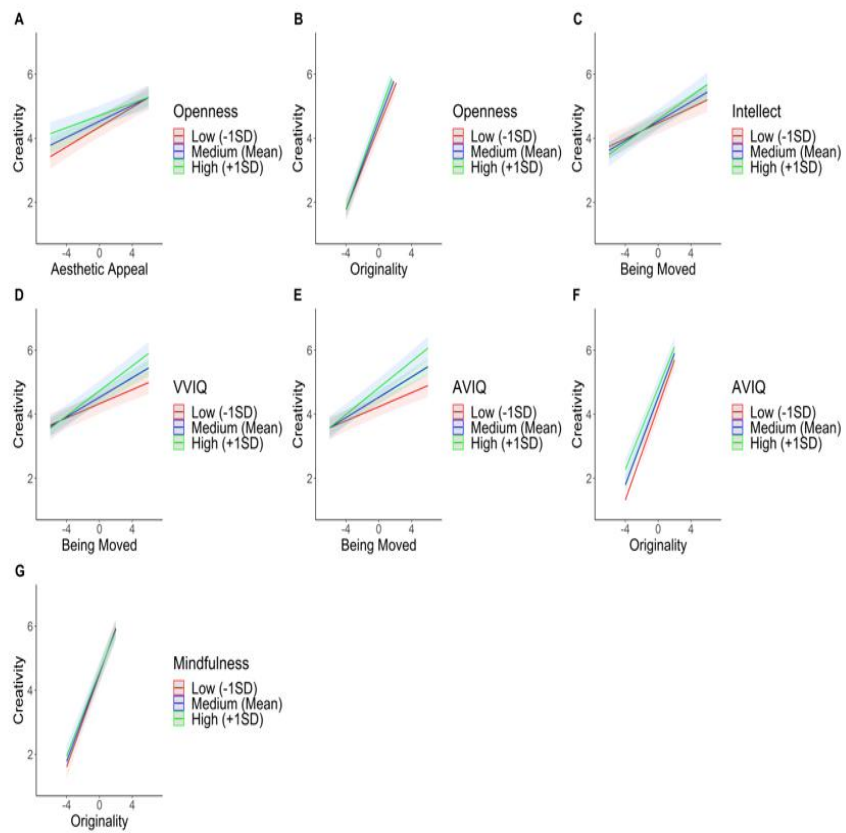*Interaction plots showing the moderation effects of personality traits on creativity judgments in Haiku*



**Figure 6.5**

*Interaction plots (A to G) illustrating the moderation effects of various personality traits on creativity judgments in the Senryu*

### 6.3.3. Impact of Semantic Memory Networks

The results of the semantic network analysis reveal differences between the groups that preferred Haiku and those that preferred Senryu. Figure 6.6 illustrates the Senryu-dominant (left) and Haiku-dominant (right) networks for the Senryu-preferred and Haiku-preferred groups respectively, using the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991). Each node represents a unique animal response given by participants during verbal fluency task, and the edges reflect the magnitude of association between these responses. The networks were specified to have weighted undirected edges, with the strength of the relationship between nodes represented by the thickness and colour density of the connecting edges. Thicker and more densely coloured lines indicated stronger relationships., The edges were undirected, suggesting mutual relationships without indicating the direction of effect. Figure 6.6 qualitatively illustrates that the Senryu-dominant (or preferred) network appeared more tightly clustered and compartmentalised compared to the Haiku-dominant network, indicating denser associations among the nodes within the Senryu-dominant (or preferred) group.

**Figure 6.6**

*Semantic networks of Haiku-dominant (right) and Senryu-dominant (left) groups, visualized using the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991). Nodes represent unique responses, and edges indicate association strength.*
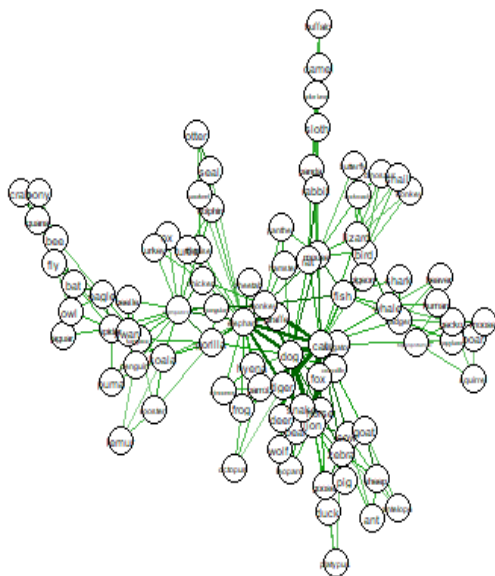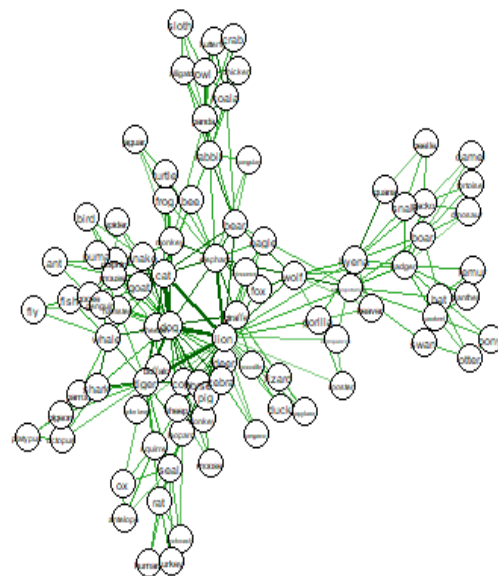
Table 6.7 summarises the global network measures of the two networks, including average shortest path length (ASPL), clustering coefficient (CC), and modularity (Q). The Haiku-dominant network showed lower ASPL (5.21), indicating that this semantic network was more efficient and might demand higher creative ability (Kenett & Faust, 2019), compared to the Senryu-dominant network (ASPL=5.45). However, this network appeared to be less clustered (CC = 0.42) and less modular (Q = 0.59) compared to the Senryu-preferred network (CC = 0.44; Q =0.60).

**Table 6.7**

*Global network metrics for Senryu- and Haiku-dominant groups, showing ASPL, clustering coefficient (CC), and modularity (Q). The Senryu network has higher ASPL and CC, indicating tighter clustering, while the Haiku network shows lower modularity, reflecting greater integration*

| Group | ASPL | CC | Q |
|---|---|---|---|
| Senryu dominant | 5.45 | 0.44 | 0.6 |
| Haiku dominant | 5.21 | 0.42 | 0.59 |

The results of statistical tests for differences in these network measures across networks are depicted in Table 6.8 and Table 6.9.  Table 6.8 provides results of statistical tests to determine whether the network measures observed in the Haiku-and Senryu-dominant groups were different from what would expected from a random network with the same number of nodes and edges (Steyvers & Tenenbaum, 2005; Beckage et al., 2011; Christensen & Kenett, 2023). The *p*- values were reported for each network compared to the random network values and the values below "Random" are the mean (M) and standard deviation (SD) of the global network measures for the random network distribution. Table 6.9 displays the results of the partial bootstrapped network comparison between the Haiku and Senryu dominant networks. Statistical comparisons across different percentages of retained nodes (from 90% down to 50%) were performed using the bootstrap method (Efron, 1992), and following the protocol provided by the SemNA tutorial  (Christensen & Kenett, 2023). For each subset of nodes, network measures such as ASPL, CC, and Q were calculated, and this process was repeated 1000 times for each percentage. T-statistics and Cohen's d values were provided for each comparison, with negative t-statistics indicating that the Haiku-dominant network exhibited lower values than the Senryu-dominant network for the

given measure. All *p*-values were < .001, with effect sizes interpreted as follows: Cohen's d = 0.50 (moderate), 0.80 (large), 1.10 (very large).

**Table 6.8**

*Comparison of network measures (ASPL, CC, Q) between Haiku- and Senryu-dominant groups and random networks. Observed measures differ significantly from random networks (p < .001). "Random (M)" and "Random (SD)" show the mean and standard deviation for random networks.*

| Group | Measures | *p*-values | Random(M) | Random (SD) |
|---|---|---|---|---|
| Senryu dominant | ASPL | <.001 | 2.63 | 0.02 |
| Senryu dominant | CC | <.001 | 0.11 | 0.02 |
| Senryu dominant | Q | <.001 | 0.35 | 0.01 |
| Haiku dominant | ASPL | <.001 | 2.61 | 0.02 |
| Haiku dominant | CC | <.001 | 0.13 | 0.02 |
| Haiku dominant | Q | <.001 | 0.34 | 0.01 |

**Table 6.9**

*Partial bootstrapped network results*

| | Network Measures | | | | | |
|---|---|---|---|---|---|---|
| | ASPL | | CC | | Q | |
| Nodes Remaining | *t* | *d* | *t* | *d* | *t* | *d* |
| 90%(*df*=1998) | 21.55** | 0.96 | -11.57** | 0.52 | 17.62** | 0.79 |
| 80%(*df*=1998) | 9.39** | 0.42 | -8.51** | 0.38 | 8.58** | 0.38 |
| 70%(*df*=1998) | 3.10* | 0.14 | -6.80** | 0.3 | 5.26** | 0.24 |
| 60%(*df*=1998) | -0.34 | 0.02 | -2.96* | 0.13 | 2.18 | 0.1 |
| 50%(*df*=1998) | -1.63 | 0.07 | -3.54** | 0.16 | 1.1 | 0.05 |

*Note.*1000 samples were generated for each percentage of nodes remaining. T-statistics and Cohen's d values are presented (Cohen, 1992). Negative t-statistics denote the high (H-S) group having lower values than the low (H-S) group. All p's<.001. Cohen's d effect sizes: 0.50, moderate; 0.80, large; 1.10, very large. ASPL, average shortest path length; CC, clustering coefficient; Q, modularity.

Figure 6.7 illustrates the results of the bootstrap node-drop analysis, comparing the structural properties of the Haiku- and Senryu- preferred semantic networks across varying proportions of retained nodes (ranging from 90% to 50%). For each proportion, 1000 samples were generated, and network measures such as ASPL, CC, and Q were computed. The density plots above each box plot depict the distribution of these measures across

samples, while the scatterplots below show individual sample values, with the black dot representing the mean for each group. This visual representation highlights how the structural differences between the networks are maintained even when subsets of nodes are considered (Christensen & Kenett, 2023).

**Figure 6.7.**

*Plots of the bootstrapped partial network measures (1000 samples per percentage of nodes remaining). Each panel shows density plots above the box plots and scatterplots, where individual dots represent single samples. The black dot in each scatterplot indicates the mean value for the respective group and percentage of nodes retained (Christensen & Kenett, 2023)*
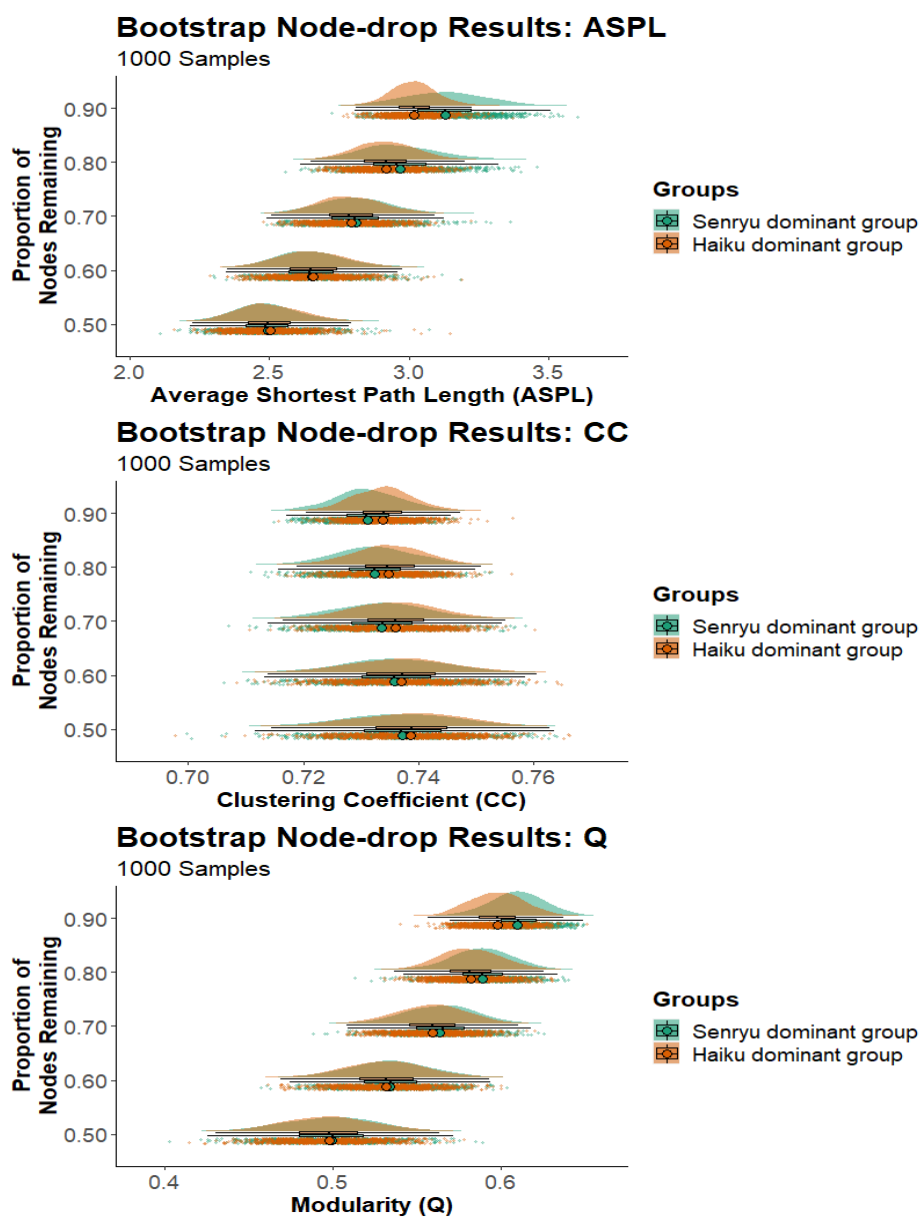
# 6.4. Discussion

In today's world of rapid communication, understanding how we judge the creative potential of brief and structured texts is critical for grasping aesthetic appreciation and creative evaluation. Haiku and Senryu—two thematically distinct yet structurally similar forms of Japanese poetry – serve as appropriate mediums to explore how thematic focus shapes creativity judgments. While Haiku reflects nature and seasons, Senryu explores human nature and social experiences, providing thematic contrasts within structurally similar formats. This study leveraged these contrasts to investigate genre-specific creativity assessments, showing that originality, aesthetic appeal, and the emotional state of being moved significantly influence creativity judgments of English language Haiku and Senryu. While originality emerged as the most crucial factor, the combination of aesthetic appeal and emotional engagement significantly played distinct roles in each genre. Individual differences, such as openness, curiosity, and vivid visual and auditory imagery, were also examined in relation to how they interact with these subjective qualities to influence creative evaluations. Additionally, the contribution of the reader's semantic memory network efficiency to genre-specific preferences in creativity judgments of brief, structured texts like Haiku and Senryu was explored, offering deeper insights into the cognitive processes underlying these evaluations. Even within the constraints of structured brevity, Haiku's refined simplicity and Senryu's emotional depth demonstrate powerful creative potential. These insights may extend beyond poetry to fields such as advertising, social media, and education, where concise, impactful communication is paramount. This study thus explores the importance of structured brevity in creative evaluation, offering a framework for understanding how brief yet thematically rich texts enhance impactful creative experiences.

## 6.4.1. Creativity Judgment

Although Haiku and Senryu share structural features, they differ significantly in thematic focus – Haiku captures moments of nature and seasons, while Senryu reflects human conditions and emotions (Ueda, 1999). Despite these differences, the results of this study showed that originality consistently emerged as the strongest predictor of creativity in both genres, supporting the initial hypothesis and aligning with prior research that emphasises originality as a core component of creativity (Stein, 1953; Amabile, 1982; Plucker et al., 2004; Diedrich et al., 2015; Acar et al., 2017; Lloyd-Cox et al., 2022). Although participants were not guided by formal definitions of creativity or originality, their implicit understanding highlighted the significance of originality in both Haiku and Senryu. This suggests that

readers' creativity evaluations are primarily driven by the novelty of poetic expression (Chaudhuri et al., 2024b), irrespective of thematic context, in line with the standard definition of creativity (Runco & Jaeger, 2012). The minimalist form of these genres provides a canvas for novel associations, whether evoking nature in Haiku or reflecting human affairs in Senryu.

A more nuanced distinction between the two genres arises when examining the contrasting roles of aesthetic appeal and the emotional state of being moved. In Haiku, aesthetic appeal was a more significant predictor of creativity, reflecting readers' appreciation for the form's elegance and its ability to evoke beauty through sparse language. This aligns with the initial hypothesis that aesthetic appeal would have a stronger influence on creativity judgments in Haiku than in Senryu. This reconfirms Haiku's focus on nature and seasonal elements, often associated with the appreciation of beauty (Brady, 2019; Parsons, 2007), encouraging a reflective, contemplative state, emphasising aesthetic beauty over emotionality (Belfi et al., 2018; Frame et al., 2024). In contrast, Senryu's focus on human nature led to creativity judgments being more influenced by emotional resonance. This genre engages readers through a  more personal and emotionally evocative lens (Opler & Obayashi, 1945). This supports the initial hypothesis that emotionality, measured as the distinct construct "Being Moved" after Menninghaus et al., 2015), would predict creativity judgments in both Haiku and Senryu, with a stronger impact anticipated in Senryu than in Haiku. The role reversal in the influence of aesthetic appeal and *being moved* on creativity judgments across these two genres highlights the distinct psychological pathways through which Haiku and Senryu engage readers: Haiku encourages aesthetic contemplation, while Senryu evokes emotional engagement.

Although vivid imagery is central to both poetic forms, it did not emerge as a significant predictor of creativity in either genre. This contrasts with the hypothesis, which anticipated that vivid imagery would predict creativity judgments, particularly for Haiku. This might seem counterintuitive given Haiku's traditional reliance on vivid imagery to evoke deep emotional responses (Blasko & Merski, 1998; Ross, 2007). A plausible interpretation is that vivid imagery is a foundational expectation in these genres, setting the stage for creative qualities, such as originality or emotional engagement. Readers may assess creativity based on how imagery enhances other qualities, such as originality or emotional impact, rather than on the imagery itself. In this context, vivid imagery may function implicitly, enhancing the poem's overall aesthetic appeal and emotional appeal (Hitsuwari & Nomura, 2022b), but without directly influencing creativity judgments. Readers might assess creativity based on how imagery supports originality or emotional engagement, rather than on the vividness of the

imagery itself. However, further studies are needed to explore this relationship in greater depth.

In the Control condition, the relatively low explanatory power of the fixed effects, accounting for only 35% of the variance in creativity ratings, highlights the difficulty in predicting the creativity of non-poetic or neutral texts. In contrast, the total model explained 84% of the variance, indicating a substantial contribution from random effects. This suggests that non-poetic texts, lacking the structured conventions and thematic elements of Haiku and Senryu, present a greater challenge for consistent creativity evaluation. Without these poetic cues, participants likely relied more on personal experiences, leading to greater variability in creativity judgments. Despite this variability, predictors such as originality, being moved, and aesthetic appeal remained significant, with originality being the strongest predictor. This indicates that while poetic structure enhances the predictability of creativity, the brevity of even non-poetic texts does not hinder participants' ability to make implicit judgments. Core elements like originality and emotional resonance continue to play a crucial role in creativity judgments, even in less structured, non-poetic contexts.


## 6.4.2. Impact of Personality Traits

The influence of individual differences on creativity judgments (Feist, 1998; Batey & Furnham, 2006; Batey & Hughes, 2017) of Haiku and Senryu revealed genre-specific subtleties. Compared to Haiku, creativity assessments in Senryu were more positively influenced by individual differences. Supporting our hypothesis, higher openness was linked to a greater emphasis on originality in both genres (Lloyd-Cox et al., 2022) in both genres, though this effect was more pronounced in Senryu. This suggests that open-minded readers connect more deeply with the minimalist and evocative nature of these poetic forms. Intellect, typically associated with abstract thinking and intellectual engagement (DeYoung et al., 2009) was found to be strongly linked to the emotional impact of *being moved* in Senryu but not in Haiku, supporting our expectation. This suggests that intellectually oriented readers might use their reflective capacity to guide their judgments of emotional engagement (Van der Veer & Valsiner, 1991; Smagorinsky, 2021), thereby enhancing their overall creativity assessments of this genre. The lack of influence of intellect on Haiku's creativity judgments highlights its direct, simple, and non-intellectual appeal, in contrast to Senryu's more intricate portrayal of human experiences.  Similarly, higher AVIQ scores were associated with a stronger emotional impact in both genres, though more pronounced in Senryu. Haiku's simplicity and its use of concrete natural images, along with Senryu's focus on human nature and experiences, appear to

engage the reader's auditory faculties. Further, in Senryu, vivid visual imagery (VVIQ) trait was strongly linked to the emotional impact of *being moved*—a relationship not observed in Haiku. Initial predictions regarding the influence of imagery ability traits were, therefore, only partially supported. This indicates that individuals with vivid sensory imagination were more attuned to the creative aspects of both forms, particularly in Senryu.

Overall, these findings suggest that the positive influence of individual differences on creativity judgments was more evident in Senryu than in Haiku. This could be attributed to Senryu's focus on human nature and personal, emotionally evocative themes, which may resonate more strongly with the traits. The genre's emphasis on emotional engagement provides a broader platform for individual cognitive and personality traits to influence how creativity is perceived and evaluated. In contrast, Haiku's reliance on structured elegance and reflective beauty may leave less room for the variability introduced by such traits, leading to a more uniform pattern of judgments across individuals.

### 6.4.3. Impact of Semantic Networks

The investigation of semantic memory networks provides additional insights into the cognitive mechanisms underlying preferential judgments of creativity in Haiku and Senryu. Individuals who preferred Haiku exhibited a more efficient semantic memory network, characterised by a lower average shortest path length (ASPL), lower clustering coefficient (CC), and lower modularity (Q). This suggests a more interconnected and effective network structure (Anderson, 1983; Wang et al., 2023). Previous research has associated lower shortest path length and greater network efficiency with higher creative ability (Benedek et al., 2017; Kenett et al., 2016; Kenett & Faust, 2019; Kenett et al., 2014). In this study, the minimalist form of Haiku may resonate with individuals who possessed a more integrated and flexible semantic network. Such readers were likely more adept at forming novel associations between concepts—a key aspect of creative thinking. Appreciating Haiku, compared to preferring Senryu, might require a more efficient semantic network structure that enables the seamless integration of diverse ideas into a cohesive experience.

Conversely, a higher CC in the Senryu-preferred group of readers suggests that concepts in the semantic network were more tightly clustered, indicating a more rigid or compartmentalized structure. This may lead to a preference for familiar and relatable themes in Senryu, as readers were more likely to draw connections within closely related clusters. Consequently, while Senryu's focus on human experiences resonated emotionally, it might limit the exploration of more diverse or novel associations compared to the more flexible and

fluid structure of Haiku. Additionally, the semantic network of Senryu-preferred group was more (albeit very little higher) modular, indicating the rigidity of thoughts (Kenett et al., 2015) of that group. This might have constrained flexibility in thought and interpretation of that group, leading to a narrower focus on specific themes and a more conventional approach to creativity judgments. Such a structure contrasts with the more flexible and interconnected semantic network seen in the Haiku-preferred group, highlighting the distinct cognitive processing styles associated with each poetic form. Therefore, these results indicate that while Haiku demands an interconnected and flexible cognitive approach, Senryu aligns with a more compartmentalised processing style, highlighting the diverse cognitive pathways through which poetry can be creatively appreciated.

### 6.4.4. Limitations

Two practical remarks should be considered. First, the participants were not provided with explicit definitions of key constructs such as creativity, originality, and vivid imagery. Instead, they were asked to rely on their intuitive understanding and subjective experience when evaluating the poems or texts (Amabile, 1982). While this approach allowed for a more personal and natural engagement with the material, it might have also introduced variability in the interpretation of these constructs. The lack of a standardised definition for these key terms may have led participants to apply their own definitions, thereby influencing the consistency and reliability of their ratings. Nonetheless, the use of intuitive judgments reflects how poetry is often experienced in real-world settings, where readers engage with the poems through their perceptual lenses and subjective experiences. Second, only award-winning poems were considered in this study. While this selection ensured a certain level of literary quality, it may not have represented the full spectrum of Haiku and Senryu, particularly those that deviate from traditional forms or embrace experimental approaches. Award-winning poems often adhere to specific standards and expectations within the literary community, which might have biased the results toward what is traditionally recognized as creative or original. Consequently, this focus on a narrower subset of poems may have limited the generalisability of the findings. Finally, an additional limitation to consider is the potential impact of participant fatigue due to the large number of trials. With 210 trials in total, participants may have experienced cognitive fatigue, particularly in the later stages of the experiment. Although the blocks and trials were randomised to ensure that any fatigue effects were distributed across the experiment, fatigue could still have affected participants' attention and consistency in judgment.

### 6.4.5. Conclusion

In today's fast-paced world, where attention spans are short and judgments are made rapidly, this study sheds light on how creativity is evaluated in brief, structured texts like Haiku and Senryu. The findings highlight that while originality is crucial, the nuanced interplay of aesthetic appeal and emotional engagement also plays a significant role in creative evaluation. Haiku's refined beauty and Senryu's emotional depth show that even within constrained formats, texts can evoke powerful responses and be perceived as highly creative. These findings may have implications beyond the realm of poetry, extending to contexts where brief, structured communication is valued. Whether in advertising, social media or educational settings, understanding how aesthetic appeal, emotional engagement and originality contribute to rapid creativity judgments can inform how messages are crafted and perceived. Moreover, recognising the role of individual differences in these judgments highlights the importance of tailoring the creative content to diverse audiences. In essence, this study offers a framework for appreciating how structured brevity can promote rich creative experiences.

### 6.4.6. Looking Ahead: Towards Neural Insights

The next chapter, presenting the final study of this thesis, transitions from external observations to neural exploration. Using electroencephalography (EEG), it investigates how the brain processes these poetic forms, delving into the neural correlates of their evaluation. As the final study of this thesis, it aims to illuminate the genre-specific cognitive and emotional pathways involved in interpreting creativity, bridging the gap between the subjective experience of creativity and its underlying neural mechanisms.

# CHAPTER 7

# NEURAL CORRELATES OF CREATIVITY EVALUATION – AN EEG STUDY

*"The Brain is deeper than the sea…The Brain is wider than the sky"*

— *Emily Dickinson*

## 7.1. Introduction

Imagine reading Wordsworth's *"The Solitary Reaper,"* where the beauty of nature unfolds vividly before your eyes, and the melody of the reaper's song lingers in your mind, or turning to Yeats' *"When You Are Old,"* where the gentle pull of nostalgia and subtle melancholy fills your heart. Even though we have experiences of the pleasing sensation and emotion evoked by poetry, we still understand very little about the brain's response when we engage with poetry (Mar, 2011; Ferstl, 2010). Poetic language, with its stylistic devices and 'figures of thought'—such as polysemy, irony, meiosis, and oxymoron—engages our affective and cognitive faculties in ways that facilitate empirical investigation (Jacobs, 2015b). These elements allow for clear predictions about *how* and *where* in the brain such verbal stimuli are processed, thus "presenting to us an experience perfectly designed for the human brain" (Turner & Pöppel, 1983). Emphasising the benefits of studying poetry for understanding the function of mindbrain, Turner & Pöppel (1983) expressed ,"Poetry presents to the brain a system which is temporally and rhythmically hierarchical, as well as linguistically so, and therefore matched to the hierarchical organization of the brain itself" (see Jacobs, 2015a).

The experience of any art is a complex which emerges from the interaction of multiple cognitive and affective processes. There has been a substantial research on neuroscientific research in the field of music perception (Koelsch & Siebel, 2005; Koelsch, 2011; Koelsch, 2014; Bhattacharya et al., 2001; Bhattacharya & Petsche, 2001; Bhattacharya & Petsche, 2005a; Strait et al., 2009; Ruiz et al., 2011), visual art perception (Augustin et al., 2011; Chatterjee, 2003; Adamaszek et al., 2022; Bhattacharya & Petsche, 2002; Bhattacharya &

Petsche, 2005b, Luft et al., 2019; Bhattacharya, 2009), and literary-text (Bohrn et al., 2012a; Bohrn et al., 2012b; Forgács et al., 2012; Hsu et al., 2015; Brink et al., 2011; Cardillo et al., 2010; Dambacher et al., 2006; Dambacher et al., 2012; Dimigen et al., 2011; Engbert et al., 2005; Ferstl, 2010; Hofmann et al., 2014; Kuchinke et al., 2005; Kutas, 2006; Ponz et al., 2014). Comparatively, the neural correlates, particularly of poetry perception, remain less studied (Jacobs, 2015a, 2015b; Wassiliwizky et al., 2017). In an fMRI study, O'Sullivan et al. (2015) investigated the neural basis of literary awareness, which refers to the ability to extract meaning from complex texts such as poetry. Their findings revealed that, compared to prosaic texts, reading poetry uniquely activated more lateral frontal and temporal/occipital regions, including the bilateral precentral gyrus, inferior frontal gyrus (IFG), and the right dorsolateral prefrontal cortex (DLPFC). In contrast, a cluster in the dorsomedial prefrontal cortex showed reduced activation when participants read poetic pieces compared to prosaic ones (O'Sullivan et al., 2015). Zeman et al. (2013) showed that emotional power of both prose and poetry shares ground with that to music, specifically, poetry engaged regions of the right hemisphere which were related to activity in regions linked to the emotional response to music. On contrary, this group found that "Literariness" was majorly associated with activity in a left-sided set of regions; specifically, self-selected poetry activated the classical reading areas like the inferior parietal lobes, and the brain regions associated with introspection were activated by experimenter- chosen poetry. Another fMRI study by Scharinger et al. (2022), focusing on the melodic properties of spoken poems, found that poem processing relied on left temporal regions, including the superior temporal gyrus. A comprehensive neuroscientific study on poetry composition examined the phases of the creative process, the quality of the product, and the level of expertise in a single experiment (Liu et al., 2015). In this experiment Liu et al.  (2015) used a paradigm in which expert and novice poets improvised and revised short-length poems. These poems were then rated by an independent panel of experts, enabling the researchers to study neural mechanisms using the multidimensional model of creative behaviour. Liu et al. (2015) proposed dynamic interactions between the medial prefrontal cortex (MPFC), representing anterior elements of the default mode network, and the dorsolateral prefrontal cortex and parietal cortices (DLPFC/DAN), which regulate executive control. Additionally, they examined the relationships of these regions with other cortical and subcortical areas that regulate the three key aspects of creative behaviour. An fMRI study on Chinese poetry (Gao & Guo, 2018) explored that aesthetic appreciation of the poems was associated with the activation of the left brain regions, including, inferior orbitofrontal cortex (OFC), the bilateral insula, the left fusiform, the left supplementary motor area (SMA), and the left precentral gyrus. Another study (He et al., 2022) investigated brain connectivity patterns during poetry composition

under two experimental conditions like familiar and unfamiliar themes. Their study highlighted the role of knowledge in these processes, showing that familiar themes in poetry composition recruited more functional connections between the right executive control network (RECN) and the default mode network (DMN). In contrast, unfamiliar themes elicited more functional connections between sensorimotor and visual networks. Using psychophysiology, neuro imaging and behavioural responses Wassiliwizky et al. (2017) demonstrated that recited poetry can serve as a powerful stimulus for eliciting peak emotional responses, such as chills and objectively measurable goosebumps engaging the primary reward circuitry. This response highlights the crucial role of the nucleus accumbens, pointing out a distinct difference from the brain correlates associated with music perception.

The present study aimed to investigate how the human brain perceives genre-specific creativity in poetry. English language Haiku and Senryu, two of the shortest poetic forms in the world, were selected as experimental stimuli to serve this purpose. The following section provides an overview of these two specific poetic genres and explains the rationale for their selection as experimental stimuli.

### 7.1.1. English Language Haiku and Senryu (ELH/S)

In this study, two structurally constrained Japanese forms of poetry were chosen: Haiku and Senryu. Considered the world's shortest poetic forms with a 5-7-5 mora structure (Iida, 2008), Haiku and Senryu (both the terms apply to both the singular and plural), while structurally similar, differ in thematic content, providing a controlled format to explore unique aspects of linguistic art. Haiku is a nature-themed genre of poem, typically includes a *kigo*, or season word, and a *kireji* ("cutting word"), a poetical punctuation or verbal caesura that provides structural support to the verse (Trumbull, 2012). While the *kigo* offers a seasonal reference, the *kireji* lends an emotional nuance to the phrase preceding it (Higginson & Harter, 1985). Senryu, which branched out from Haiku in the 18th century under the influence of Karai Hachiemon (1718-1790), who used the pen name Senryu, is structurally similar to Haiku but focuses more on human nature and affairs rather than on the objects of nature. Unlike the delicate and refined tone of Haiku, Senryu often adopts a lighter tone, characterized by vigorous humour, sarcasm, satiric commentary, and tender emotion (Opler & Obayashi, 1945; Giroux, 1989). Additionally, Senryu does not typically include a *kireji* or cutting word and generally omits the *kigo* or seasonal word.

English Language Haiku (ELH), appeared in the late nineteenth century, is "a 'traditional form' for haiku in English" (Higginson & Harter, 1985, p.105), that uses imagistic English language to convey the essence of an experience of nature or the season intuitively linked to the human condition (see Rowland, 2013). ELH are increasingly favoured in empirical investigations over longer poetic forms (Thomas et al., 2017; Belfi et al., 2018; Mehl et al., 2023; Hitsuwari & Nomura, 2022a, 2022b; Hitsuwari et al., 2023). Normative, traditionally structured, three-lined English-language Haiku (ELH) has been regarded as ideal study material for neurocognitive poetics (Pierides et al., 2017; see also Geyer et al., 2020) for the following reasons: (i) ELH are compositionally constrained and structurally consistent, yet vary in meaning and content, allowing for systematic variation and repeated measurement (Thomas et al., 2017; Geyer et al., 2020); (ii) they engage a wide range of mental functions using minimal linguistic means, employing everyday language without stylistic poetic jargon (Thomas et al., 2017; Geyer et al., 2020); (iii) their structural brevity and uniform character count make them easy to control and ideal for psychological experiments (Hitsuwari & Nomura, 2022b); (iv) ELH present an intriguing blend and interaction of background and foreground elements (Pierides et al., 2017).

Building on the previous chapter's findings that aesthetic appeal, vivid imagery, and emotional engagement predict creativity in Haiku and Senryu, this neuroscientific study investigated the neural correlates underlying the assessments of these predictors. It examined how the judgments of aesthetic appeal, vivid imagery, and emotional engagement varied as functions of neuronal oscillatory behaviour. The present study employed Electroencephalography (EEG) to analyse how the brain processes these concise and distinct genres, aiming to uncover the neural mechanisms underlying aesthetic experience, visual imagery, and emotion evoked during reading, thus offering insights into the neural substrates associated with creativity judgments of brief, structured poetry.

The following section provides an overview of key brain regions involved in art appreciation, focusing on areas linked to aesthetic experience, emotional resonance, and visual imagery. It also highlights the role of oscillatory activity across various frequency bands in modulating perception, attention, and emotional engagement, thereby supporting the neural processing of art.

## 7.1.2. Aesthetic Experiences

Neuroaesthetics, the study of aesthetic appreciation and its neural correlates, investigates how our brain perceives beauty and art through neurobiological foundations (Chatterjee, 2011; Chatterjee & Vartanian, 2014; Cela-Conde et al., 2011; Jacobsen, 2010; Skov et al., 2009; Zeki, 2002). An aesthetic experience is generally understood as an evaluative, affectively absorbing perceptual experience that engages comprehension (meaning) processes (Strijbosch et al., 2022). Aesthetic responses to art are subjective and encompass various experiences, from sensation and perception to emotion and self-reflection (Vessel et al., 2012). A substantial body of research using functional neuroimaging indicate that aesthetic experience engages a broad network spanning sensory, cognitive, and motor regions, suggesting that art-related visual aesthetic experience relies on a complex neural system rather than a single region (Vessel et al., 2012; Vartanian & Goel, 2004; Cela-Conde et al., 2011; Kirk et al., 2009; Boccia et al., 2016). The brain regions that are found to be active during art appreciation are, occipito-temporal regions (Vartanian & Skov, 2014), various zones of orbitofrontal cortex (Ishizu & Zeki, 2013; Kawabata & Zeki, 2004), anterior cingulate cortex (Yeh et al., 2015; Boccia et al., 2016). Research utilising electroencephalography (EEG) has identified that oscillatory activity within theta (4-7 Hz), alpha (approximately 10 Hz), and gamma (30 Hz and higher) frequency bands may elucidate the temporal dynamics underlying cognitive networks involved in contemplation, attentional focus, and top-down perceptual processing, respectively (Strijbosch et al., 2022). The ventral attention network, in particular, has consistently shown activation in response to aesthetically pleasing stimuli across various domains (Brown et al., 2011), is further associated with alpha-band oscillatory activity (Klimesch, 2012; Händel et al., 2011; Jensen et al., 2012).

Given that aesthetically appealing stimuli likely engage attention more strongly than non-appealing stimuli, and activation of the ventral visual stream has been associated with alpha power decreases over the parietal region (Jokisch & Jensen, 2007), this study hypothesised that perception of aesthetic appealing poem would correspond with a decrease in alpha activity over parietal areas (Strijbosch et al., 2022). Moreover, sense-making processes in art appreciation have been found to be connected to oscillatory activity in the gamma band (~40 Hz) at longer latencies following stimulus onset (Bertrand & Tallon-Baudry, 2000; Tallon-Baudry & Bertrand, 1999; see Strijbosch et al., 2022). Additionally, literature highlights suppressed beta activity (Herrera-Arcos et al., 2017) and increased gamma activity (Lopez-Persem et al., 2020) over frontal channels for preferred stimuli compared to non-preferred stimuli. The present study, thus hypothesizes that the perception of aesthetically appealing poems would involve increased gamma power and suppressed beta power over frontal

regions, reflecting enhanced cognitive and emotional engagement during the appreciation of poetic creativity.

### 7.1.3. Emotional Resonance

*"Being moved"* has been referred as a class of strong emotions (Frijda, 2017; Scherer et al., 2001), which are "ambiguous" experiences and are considered as aesthetic emotions that "grip the body" (see Zickfeld et al., 2019). Linguistically, *moved* , being related to some kind of passive action or displacement (Menninghaus et al., 2015), *being moved* has been conceptualised as part of a set of emotions (Haidt, 2000) or as a distinct emotion (Cova & Deonna, 2014; Menninghaus et al., 2015; Zickfeld et al., 2019), which often occurs in response to significant relationship events or aesthetic stimuli (Menninghaus et al., 2017). It is categorised as purely positively valenced (Cova & Deonna, 2014 ; Haidt, 2000; Seibt et al., 2017), occurring with mixed affect (Schindler et al., 2017; Menninghaus et al., 2015), and even as primarily negatively valenced (Bartsch et al., 2014). According to the distance-embracing model by Menninghaus et al. (2017), *being moved* helps integrating negative affect into pleasurable states in art reception.

The default-mode network (DMN) has been repeatedly linked to the feeling of *being moved* across various aesthetic stimulus domains, ranging from artworks to natural landscapes (Belfi et al., 2019; Vessel et al., 2012, 2019). The DMN is typically associated with internally directed mental activity as opposed to external focus (Andrews-Hanna et al., 2010; Fox et al., 2005; see also Strijbosch et al., 2022), which can arguably be related to the contemplative and self-reflective nature of aesthetic processing (Strijbosch et al., 2022). Prior research has found power decrease in theta band activity over midfrontal areas as an EEG index of DMN activation (Scheeringa et al., 2008, 2012). The present experiment predicted a decrease in theta power within the frontal region during the perception of the construct *being moved,* consistent with earlier findings (Strijbosch et al., 2022)*.*

### 7.1.4. Visual Imagery

While visual perception can be triggered by externally occurred events and the subsequent falling of light into our retina, visual imagery is triggered internally, primarily (but not restricted to) related to working memory (Tong, 2013; Albers et al., 2013). Visual mental imagery refers to our ability to conjure up a visual experience in the absence of retinal stimulation, similar to

the experience as seeing, and often related to "seeing through mind's eye" ( Kosslyn et al., 2001; Pylyshyn, 2002; see also Cichy et al., 2012). The subjective overlap in visual perception and visual imagery could suggest sharing of similar neural representations, particularly, in the same cortical regions that support perceptual processing of a stimulus are recruited to maintain that information in working memory (Scimeca et al., 2018; D'Esposito, 2007; Dijkstra et al., 2019). There has been a long debate around the question of whether imagery, like perception, relies on depictive, picture-like representations or on symbolic, language-like representations (Pylyshyn, 1973; see Dijkstra et al., 2019). Past literature has established strong links between visual imagery generation and occipital alpha activity, emphasizing the primary visual cortex's role in processing imagery (Cooper et al., 2003; Pearson & Kosslyn, 2015; Dijkstra et al., 2019; Hashim et al., 2024). However, a large body of neuroscientific research supported that that perception and imagery share a variety of neural mechanisms in the visual, parietal, and frontal cortex (Cichy et al., 2012;Dijkstra et al., 2019; Schaefer et al., 2013; Zacks, 2008; see also Hashim et al., 2024). While previous studies emphasised the role of alpha oscillations in the posterior brain regions, e.g., parietal and occipital areas (Kaufman et al., 1990; Williamson et al., 1997; Xie et al., 2020; Salenius et al., 1995), role of other cortical areas and frequency bands are also found during visual imagery processing. Apart from posterior brain regions, parietal, central, and frontal areas of the brain are also involved in visual imagery (Zacks, 2008; de Borst et al., 2012; Thompson et al., 2009; Villena-González et al., 2018). Increased gamma activity in the occipital region of the brain has been linked to experiences of creative and vivid spontaneous visual imagery (Luft et al., 2019; Hamamé et al., 2012; Lachaux et al., 2005, Kawasaki & Watanabe, 2007). Theta and beta oscillations, alongside alpha waves, have also proven effective in differentiating the content of visual imagination (Xie et al., 2020; Villena-González et al., 2018). Consistent with previous research, the current study hypothesised alpha suppression in the frontal, temporal, and parieto-occipital regions to support higher imagery perception, reflecting enhanced cognitive engagement and attentional focus. Additionally, increased gamma band activity in the parieto-occipital region was anticipated, aligning with its established role in supporting vivid imagery through high-level perceptual and integrative processes.

Based on prior neuroscientific research, the present study focused on neural patterns in three brain regions of interest (ROI): frontal , fronto-temporal,  and parieto-occipital (Ishizu & Zeki, 2013; Kawabata & Zeki, 2004; Scheeringa et al., 2008,  2012; Zacks, 2008; de Borst et al., 2012; Thompson et al., 2009; Villena-González et al., 2018; Kaufman et al., 1990; Williamson et al., 1997; Xie et al., 2020; Salenius et al., 1995; Scimeca et al., 2018; D'Esposito, 2007; Dijkstra et al., 2019;  Jokisch & Jensen, 2007;  Pearson & Kosslyn, 2015;

Cichy et al., 2012; Schaefer et al., 2013; Hashim et al., 2024). Five frequency bands of interest were: delta [0–4 Hz], theta [4–8 Hz], alpha [8–12 Hz], beta [12–30 Hz], and lower gamma [30–48 Hz]) (Tan et al., 2024; Ghani et al., 2024; Ma et al., 2024; Kæseler et al., 2022; Kakuszi et al., 2023; Rosenblum et al., 2024; Alexandersen et al., 2023). Due to methodological limitations, higher gamma activity (>48 Hz) was not examined in this study, as it is often more susceptible to contamination from artifacts such as myogenic activity, which can compromise the reliability of EEG data in this frequency range (Muthukumaraswamy, 2013; Gross et al., 2001; see Dimitriadis et al., 2010).

# 7.2. Materials and Methods

## 7.2.1. Stimuli

The experimental stimuli for this EEG study included seventy haiku, seventy senryu, and seventy non-poetic control texts. To ensure authenticity and literary quality, all haiku and senryu were award-winning pieces sourced from reputable competitions such as the Haiku Society of America Haiku Award (in memory of Harold G. Henderson, 1976–2022), the British Haiku Society (BHS) Awards for Haiku (2002–2021), and the Haiku Society of America Senryu Award (in memory of Gerald Brady, 1988–2022). This careful selection process preserved the original essence and structural integrity of haiku and senryu, ensuring they adhered to traditional characteristics of the forms.

The control texts were structurally matched to the Haiku and Senryu with a 3-line, 5-7-5 syllabic pattern. Carefully selected and adapted from AI-generated repositories, these texts were neutral in tone and deliberately devoid of emotional depth, figurative language, or poetic elements. This lack of aesthetic and emotional engagement provided a clear baseline for comparison, ensuring that any differences in creativity judgments could be attributed to the unique qualities of Haiku and Senryu, rather than their structural format alone.

All stimuli were presented without identifying information, such as poets' names, award status, or genre classification (haiku or senryu). This anonymity minimised potential biases, ensuring that participants' evaluations were based solely on text content. By eliminating contextual clues, this approach aimed to prevent familiarity bias, preconceived notions, or expectations related to recognised poets or prestigious accolades, thereby promoting a more objective assessment of creativity and aesthetic response. All Haiku, Senryu, and control texts, are available on the Open Science Framework (OSF) at:

Below are examples representing each type of stimulus utilised in the study.

| Haiku | Senryu | Control |
|---|---|---|
| autumn | holiday letter | code runs |
| an empty booster seat | the stories we choose | logic flows |
| in the barber's window | not to tell | creating software |

### 7.2.2. Participants

Fifty-one participants (*N*=51; 16 male, 28 female, 7 non-binary; Age M = 27.14, SD = 4.55) took part in the experiment. To ensure the robustness of our study, a priori power analysis was conducted using G*Power 3.1 (Faul et al., 2007), for a repeated measures ANOVA with within-subject factors. The input parameters included an effect size (*f*) of 0.229, considering eta squared as 0.05 in the "Direct" method, an alpha error probability ($\alpha$) of 0.05, and a desired power of 0.80. The experimental design involved one group and three measurements (haiku, senryu, control). A correlation of 0.5 among repeated measures was assumed along with a nonsphericity correction ($\varepsilon$) of 1. A minimum total sample size of 33 participants was determined as necessary to achieve the desired power level of 0.80. Consequently, the study's inclusion of 51 participants yielded an actual power of 0.81, ensuring reliable and robust results. Four participants were excluded due to interruptions from twice needing to use the restroom during the EEG experiment, which affected their engagement. This adjustment resulted in a final sample of forty-seven participants (*N* = 47; 13 male, 28 female, 6 non-binary; Age M = 27.06, SD = 4.66). Ethical approval for the research was provided by the Ethics Committee of the Department of Psychology at Goldsmiths, University of London. Written consent was obtained from all participants, who received monetary compensation of 30 GBP for their time.

### 7.2.3. Experimental Design

The presentation protocols of the experiment were conceptualised and designed in PsychoPy (Peirce, 2007), an open-source application for the design of neuroscience, psychology, and psychophysics research. The study followed a within-participant repeated-measures design, where each participant experienced all three stimulus conditions (Haiku, Senryu, and control). The experiment was organised into seven blocks, each containing 30 trials, resulting in a total of 210 stimuli: 70 haiku, 70 senryu, and 70 control texts. Each block

included 10 Haiku, 10 Senryu, and 10 control texts, ensuring a balanced distribution across all blocks. Both the block order and trial sequence within each block were randomised for each participant to control for order effects and enhance data variability.

The EEG session commenced with a 5-minute resting period with eyes open, during which participants focused on a fixation cross displayed on a monitor for 4 seconds with a 500ms jitter. Following the initial resting period, the main experimental instructions appeared on the screen, guiding participants through the subsequent tasks. Participants were informed that a poem would appear on the screen for which they were to read silently, contemplate, and evaluate. Each poem remained on the screen for a total of 10 seconds—5 seconds for reading and 5 seconds for contemplation. Participants rated the respective poem on 5 dimensions, including aesthetic appeal, vivid imagery, state of being moved, originality, and creativity, on a 7-point scale (1= "very low" to 7 = "very high"). The questions for evaluation were as follows: aesthetic appeal ("How aesthetically appealing is the poem?"), vivid imagery ("How vivid is the imagery?"), state of being moved ("How moved are you?"), originality ("How original is the poem?"), and creativity ("How creative is the poem?"). No time limit was set for the ratings, allowing participants to respond at their own pace. Optional breaks were available after each block, and participants could proceed to the next trial by pressing the space bar.  The experiment concluded with a 5-minute resting period with eyes open, during which EEG monitoring continued. The design flow is illustrated in Figure 7.1.

**Figure 7.1**
*Experimental Flow*
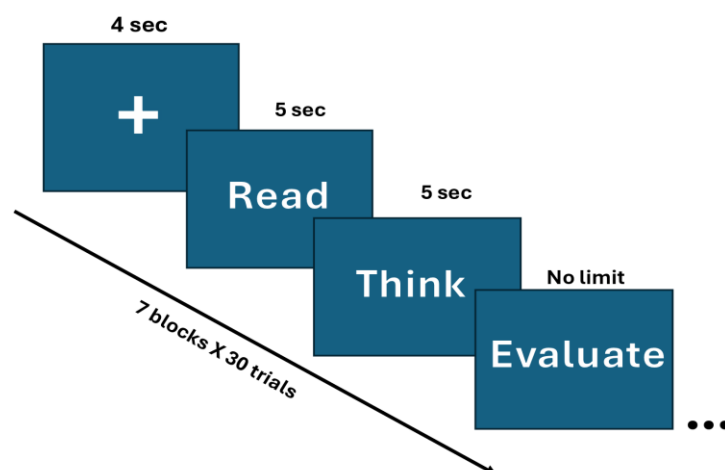
### 7.2.4. EEG Data Recording

EEG signals were recorded using 64 active electrodes placed according to the extended 10–20 electrode placement system and amplified by a BioSemi ActiveTwo amplifier (www.biosemi.com). Vertical and horizontal eye movements (EOGs) were monitored using four additional electrodes placed above and below the right eye and at the outer canthi of both eyes, respectively. Two additional electrodes were positioned on the left and right earlobes, and their average was used as a reference. Additionally, two electrodes were positioned on the right collarbone and left waist for ECG recording; however, the cardiac data obtained will be analysed and discussed in a separate study. All channels were recorded with a same sampling frequency of 512 Hz. The MATLAB toolbox EEGLAB (Delorme & Makeig, 2004) was used for data cleaning and preprocessing. The EEG data were re-referenced to the average of the two earlobes. A 0.5 Hz high-pass filter was applied to remove low frequency drifts often due to electrode movement and slow physiological processes, to prevent interference with the neural signals of interest. To eliminate power line noise, a 50 Hz notch filter with a 4 Hz bandwidth (48–52 Hz) was applied, along with a 100 Hz notch filter with a 4 Hz bandwidth (98–102 Hz) to target specific powerline frequencies. This filtering improved the signal-to-noise ratio in the EEG data by effectively removing powerline interference.

The continuous, filtered EEG data were segmented into epochs around specific events of interest. Epochs were created based on the onset of reading each stimulus, marked by a specific event marker. Each epoch spanned 15 seconds, starting 4 seconds before stimulus onset (serving as the baseline) and extending 11 seconds after onset. This setup enabled the analysis of neural activity time-locked to key events, specifically the reading and contemplation phases of the experimental stimuli. For further preprocessing, independent component analysis (ICA) was conducted using the MATLAB toolbox EEGLAB (Delorme & Makeig, 2004) to decompose the EEG signals into independent components. ICA was applied to the 64 EEG channels, excluding the 8 external electrodes, using the *runica* function (Makeig et al., 1997), which implements the infomax ICA algorithm (Bell & Sejnowski, 1995), in EEGLAB (Delorme & Makeig, 2004). After ICA decomposition, a semi-automatic process was utilised to identify and reject artifact-related components, such as those associated with eye blinks and muscle activity. Identified components were reviewed and removed based on visual inspection. On average, 1–2 independent components (ICs) were excluded per participant. The resulting pruned datasets were then used for further analyses.

## 7.2.5. EEG Spectral Analysis

The study focused on the perception and assessment of literary texts, specifically aiming to explore neural correlates of aesthetic appreciation, imagery perception, and emotional engagement while judging creativity in poetic stimuli. Based on prior neuroscientific research, the present study focused on three brain regions of interest (ROIs): frontal, fronto-temporal, and parieto-occipital areas. The frontal cortex was included for its role in aesthetic decision-making, self-reflection, and internally directed mental activity (Kawabata & Zeki, 2004; Scheeringa et al., 2008;  Vessel et al., 2012). The fronto-temporal regions were selected for their involvement in affective engagement, social cognition, and semantic integration, which are particularly relevant for interpreting the reflective and emotional content of poetic stimuli (Northoff et al., 2006; Villena-González et al., 2018). Finally, the parieto-occipital regions were examined due to their critical role in visual imagery generation, perceptual integration, and aesthetic engagement, particularly in supporting vivid mental imagery and attention modulation(Cichy et al., 2012; Pearson & Kosslyn, 2015; Jokisch & Jensen, 2007).

Spectral analyses were conducted on five frequency bands: delta [0–4 Hz], theta [4–8 Hz], alpha [8–12 Hz], beta [12–30 Hz], and gamma [30–48 Hz]  (Tan et al., 2024;Ghani et al., 2024; Ma et al., 2024; Kæseler et al., 2022;  Kakuszi et al., 2023; Rosenblum et al., 2024; Alexandersen et al., 2023). Due to methodological limitations, higher gamma activity (>48 Hz) was not examined in this study, as it is often more susceptible to contamination from artifacts such as myogenic activity, which can compromise the reliability of EEG data in this frequency range (Muthukumaraswamy, 2013; Gross et al., 2001; see Dimitriadis et al., 2010). Although delta activity is susceptible to ocular artifacts, such as eye movements and blinks, which can interfere with the signal quality in this frequency range (Dimitriadis et al., 2010), it was analysed here, as it has been associated with deep cognitive processes, such as emotional and motivational engagement, which are relevant in the context of poetry appreciation (Başar et al., 2001; Harmony, 2013).

EEG signals were analysed by decomposing the broadband signal from each electrode into its constituent oscillatory components across standard frequency bands. Power spectral density (PSD) was calculated using Welch's method (Welch, 1967), with the 10-second period divided into 2-second windows with a 500 ms overlap. Periodograms were computed for each electrode position and trial for each participant, categorizing the first 4 seconds as baseline, 4-9 seconds as the "early phase" ("E") or reading phase, and 9-14 seconds as the "late phase" ("L") or contemplation phase. EEG spectral power values were averaged across

the frequency bands, log-transformed, and normalised to baseline power to account for individual variation.

To ensure cortical region-specific coverage of neural activity and in alignment with standard practices in neuroscience research (Franko et al., 2016; Hashim et al., 2024), EEG channels were grouped into six clusters representing cortical regions of interest (ROIs): frontal, fronto-temporal, and parieto-occipital. These clusters were determined based purely on scalp topography rather than specific frequency or power spectrum characteristics, facilitating the investigation of region-specific and lateralized brain functions across both hemispheres.

The six electrode clusters (CLs) are defined as follows (Figure 7.2):

CL1: Left Frontal – Including channels AF7, AF3, F1, F3, F5, and F7.

CL2: Left Fronto-Temporal – Including channels FT7, FC3, C1, CP3, TP7, and T7.

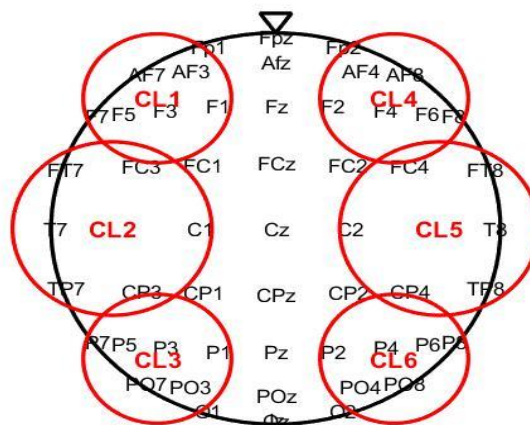CL3: Left Parieto-Occipital – Including channels P7, P5, P3, P1, PO3, and PO7.

CL4: Right Frontal – Including channels AF8, AF4, F2, F4, F6, and F8.

CL5: Right Fronto-Temporal – Including channels FT8, FC4, C2, CP4, TP8, and T8.

CL6: Right Parieto-Occipital – Including channels P8, P6, P4, P2, PO4, and PO8.


**Figure 7.2**
*Location and grouping of electrodes*



### 7.2.6. Statistical Analyses

This study examined how poem ratings—including aesthetic appeal, vivid imagery, emotional engagement, originality, and creativity—varied according to poem type (Condition:

Haiku, Senryu, or Control), phase (reading vs. contemplation), and the spectral power of different EEG frequency bands within specific hemispheric regions of interest (ROIs). As mentioned, each 10-second trial window was divided into two distinct phases: the *early phase* ("E"), consisting of the first 5 seconds, during which participants were instructed to read the poem, and the *late phase* ("L"), covering the final 5 seconds, intended for contemplation.

Following initial data visualisation, linear mixed effects models were employed using R Statistical Software [V4.0.3; R Core Team(2020)], and the *lme4* package (Bates et al., 2015) to investigate how evaluations of parameters like aesthetic appeal, vivid imagery, and emotional engagement ("being moved") varied across three poem conditions in relation to oscillatory power in five specific frequency bands (delta, theta, alpha, beta, and lower gamma). The previous chapter demonstrated that creativity in both Haiku and Senryu conditions was predicted by factors like aesthetic appeal, visual imagery, the state of being moved, and originality, thereby providing a foundation for the current analysis. In the present study, the focus is to examine the neural correlates of perceptual and affective dimensions of creativity evaluation. Accordingly, judgments of aesthetic appeal, visual imagery, and the state of being moved were analysed. While originality was identified in the previous chapter as a strong predictor of creativity judgments, it was excluded from the current linear mixed effects modelling due to its conceptual focus on the cognitive evaluation of novelty. This focus may not align directly with the neural correlates of immediate sensory and emotional engagement. By contrast, aesthetic appeal, visual imagery, and the state of being moved more closely reflect the perceptual and affective dimensions of creativity evaluation, making them appropriate for investigating brain oscillatory activity.

Oscillatory power was assessed within six brain clusters (CL1–CL6), spanning frontal, fronto-temporal, and parieto-occipital regions across both hemispheres, during two distinct phases: early (E) and late (L). These measures were used to predict judgments of creativity predictors, including aesthetic appeal, vivid imagery, and the state of being moved. For each of the five frequency bands, a maximum likelihood linear mixed model was constructed with each creativity predictor serving as the outcome variable. The linear mixed-effects models included interactions between spectral power in the six clusters, poem conditions, and phases as fixed effects, while participant-specific intercepts were modelled as random effects to account for inter-individual variability and enhance model precision. EEG power values were group mean-centred within each subject, before entering the model, to obtain an unambiguous estimate of the within-group effect (Enders & Tofighi, 2007).The control condition and early phase were designated as reference levels in the analysis, facilitating standardised comparisons across conditions and phases.

# 7.3. Results

Figure 7.3 illustrates the topographical distribution of grand-averaged power density across the selected frequency bands for the experimental phases (Early and Late) and experimental conditions (Haiku, Senryu, and Control). The mean spectral power for six clusters across five frequency bands, grouped by phase (Early or Late), is illustrated in Figure 7.4. Each bar represents the averaged power within a specific frequency band and cluster, allowing direct comparisons of neural engagement during reading and contemplation phases. Figure 7.5 illustrates the mean power for each frequency band across six clusters, grouped by experimental condition (Haiku, Senryu, and Control). Error bars represent the standard error of the mean, emphasising the variability in neural responses across phases and conditions.

**Figure 7.3**

*Topographical distribution of grand-averaged EEG power density across five frequency bands, phases (E: reading, L: contemplation), and conditions (H: Haiku, S: Senryu, C: Control)*
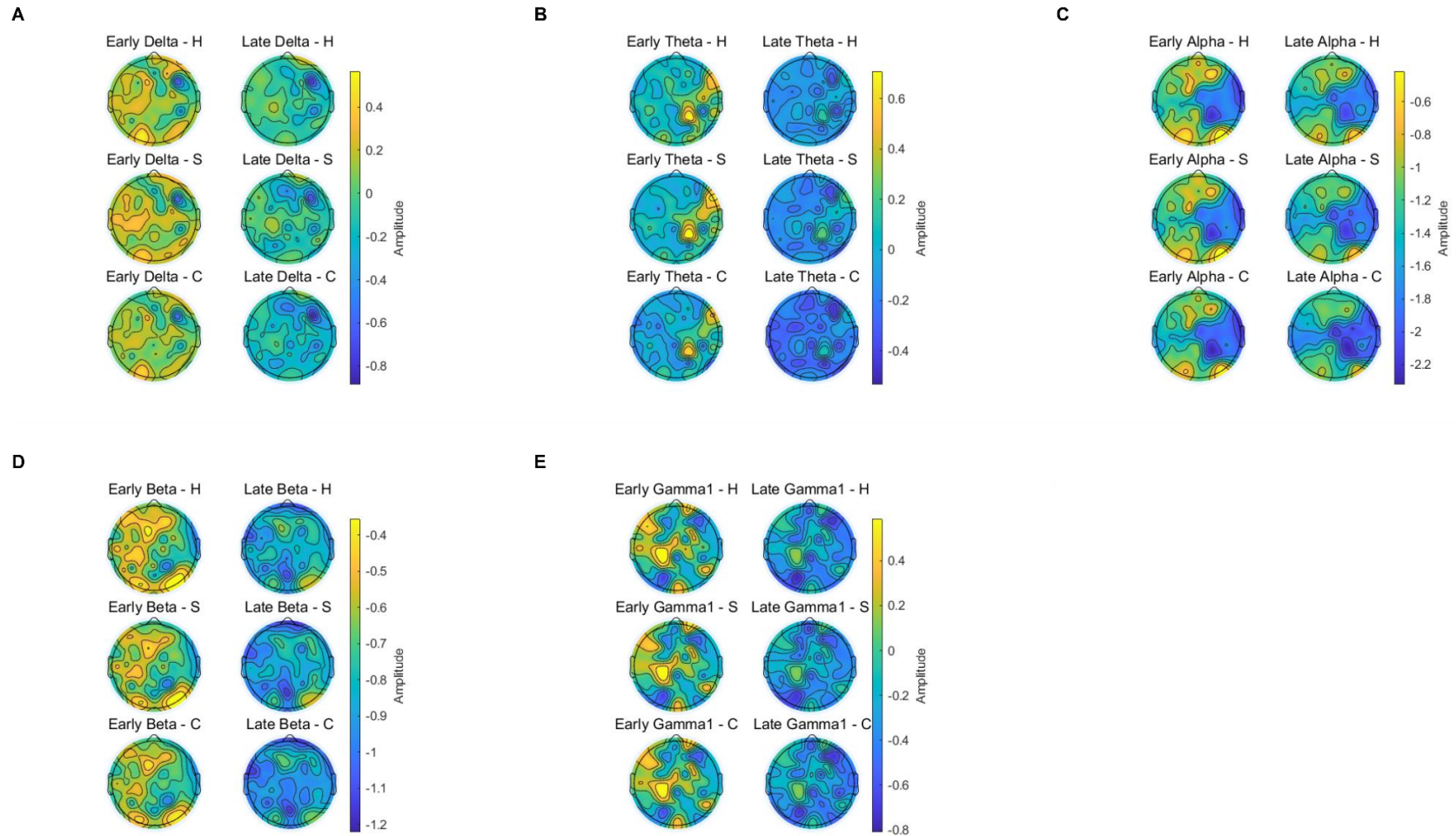
**Figure 7.4**

*The mean spectral power across six clusters for frequency bands grouped by phase (Early/Late). Error bars indicate the standard error of the mean for each cluster and phase.*
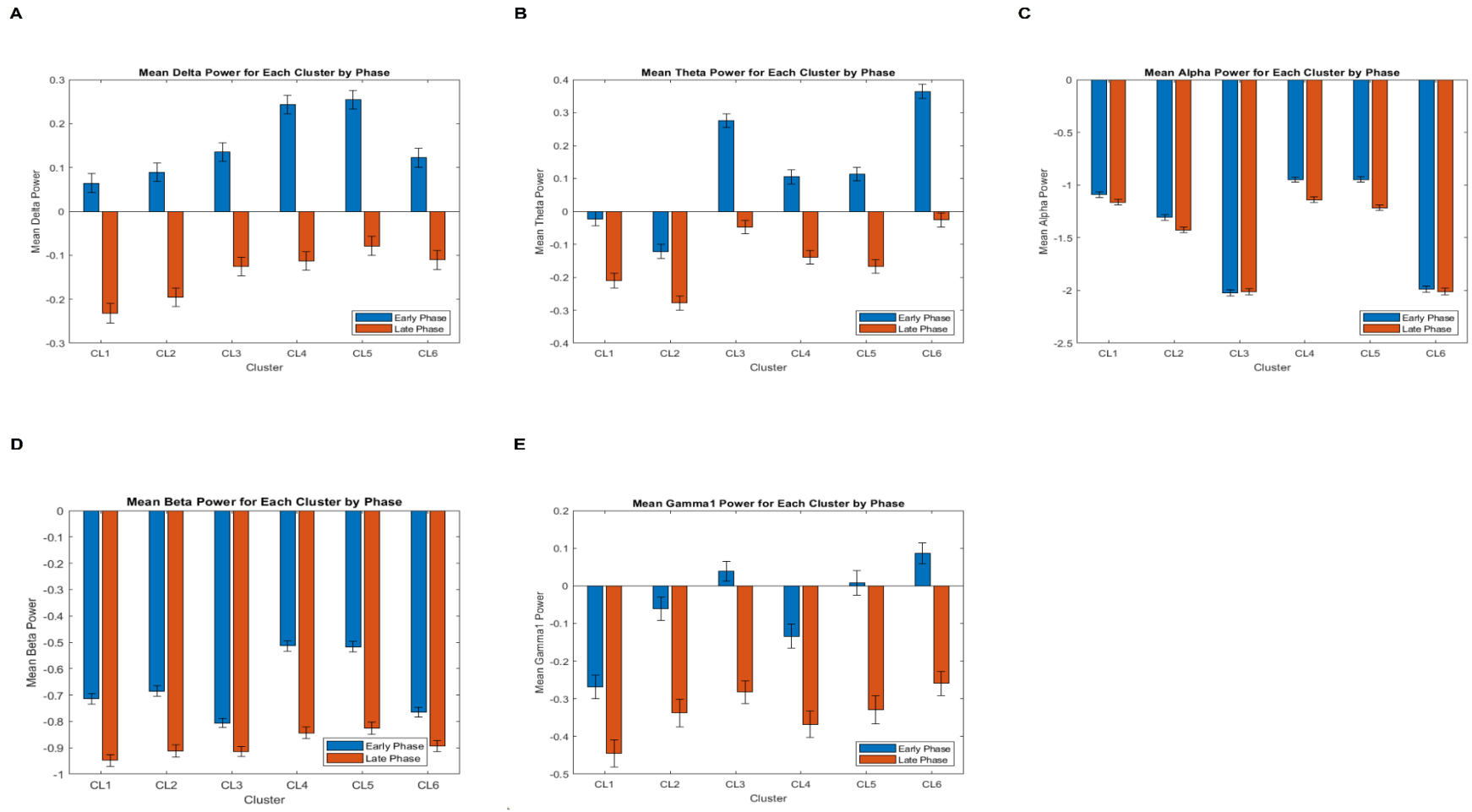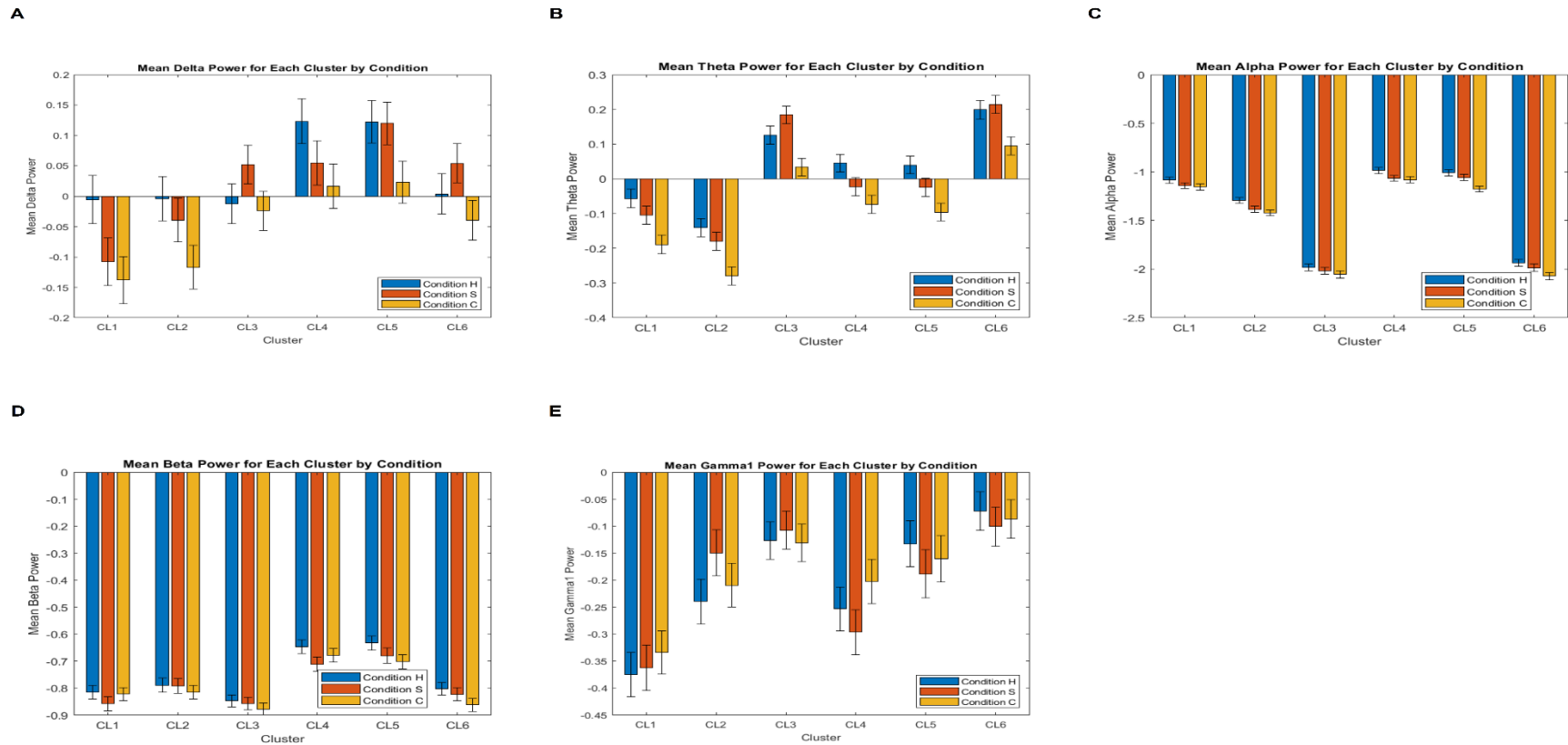
**Figure 7.5**

*The mean spectral power across six clusters for frequency bands grouped by conditions (Haiku "H," Senryu "S," and Control "C"). Error bars indicate the standard error of the mean for each cluster and condition.*

### 7.3.1. Linear Mixed Model Results

*Prediction of Aesthetic Appeal*

Delta band [0-4 Hz] analysis revealed significant main effects for both Haiku (Cond H) and Senryu (Cond S) conditions when compared to the control condition (Cond C). Senryu showed a positive association with aesthetic appeal (*β*=0.51, SE = 0.03, *t* (19693) =44.89, *p*<0.001), while Haiku demonstrated an even stronger positive effect (*β*=0.68, SE = 0.03, *t* (19693.01) =54.14, *p*<0.001). These results suggest that both Haiku and Senryu were perceived as more aesthetically appealing than control, with Haiku receiving the highest ratings. Although both poetic forms were preferred over the control, there were no significant interactions between phases, clusters, or conditions. This lack of interaction indicates that the perception of aesthetic appeal for Haiku and Senryu did not significantly vary across different perceptual phases or brain clusters, suggesting a consistent aesthetic appeal of these forms independent of these variables.

Theta band [4-8 Hz] analysis revealed significant main effects for both Haiku (Cond H) and Senryu (Cond S) conditions when compared to the control condition (Cond C). Senryu showed a positive association with aesthetic appeal (*β*=0.70, SE = 0.03, *t* (19693) =44.67, *p*<0.001), while Haiku demonstrated an even stronger positive effect (*β*=0.87, SE = 0.03, *t* (19693.01) =54.14, *p*<0.001). These results suggest that both Haiku and Senryu were perceived as more aesthetically appealing than control, with haiku being rated highest. Furthermore, an interaction between the left frontal cluster (CL1) and Senryu (*β*=−0.04, SE = 0.03, *t* (19693.77) =−2.25, *p*=0.02) highlights the role of the left frontal cluster in modulating the cognitive processing related to aesthetic appreciation of Senryu. Interactions of right frontal cluster (CL4) (*β*= .07, SE = 0.03, *t* (19693.77) = 2.02, *p*=0.04), and right fronto-temporal cluster (CL5) (*β*= -0.04, SE = 0.04, *t* (19693.77) = -1.93, *p*=0.05) with Senryu condition highlights the influence of the right frontal and fronto-temporal clusters in shaping Senryu's aesthetic appeal judgment.

Alpha band [8-12 Hz] analysis revealed significant main effects for both Haiku (Cond H) and Senryu (Cond S) conditions when compared to the control condition (Cond C). Senryu showed a positive association with aesthetic appeal (*β*=0.60, SE = 0.03, *t* (19693) =45.06, *p*<0.001), while Haiku demonstrated an even stronger positive effect (*β*=0.67, SE = 0.03, *t* (19693.01) =54.19, *p*<0.001). These results suggest that both Haiku and Senryu were perceived as more aesthetically appealing than control, with Haiku being rated highest. Furthermore, an interaction between the left frontal cluster (CL1) and Senryu (*β*=−0.03, SE =

0.03, *t* (19693.77) =−2.38, p=0.02) highlights the role of the left frontal cluster in modulating the cognitive processing related to aesthetic appreciation of Senryu.

Similar patterns of significant main effects were observed for both poem conditions in the beta band [12-30 Hz] analysis. The effect of Haiku on aesthetic appeal was again more pronounced (*β*=0.97, SE = 0.03, *t* (19693.01) =54.1, *p*<0.001) compared to Senryu (*β*=0.68, SE = 0.03, *t* (19693) =44.89, *p*<0.001) with respect to control. Interestingly, no significant interaction effects were observed, suggesting a relatively consistent influence of these poem conditions across different brain regions at this frequency during aesthetic appeal assessment.

In the lower gamma frequency band [30-48 Hz], Haiku again showed a stronger effect (*β*=0.62, SE = 0.03, *t* (19693) =54.1, *p*<0.001) than Senryu (*β*=0.42, SE = 0.03, *t* (19693) =44.77, *p*<0.001), reinforcing the idea that poems under Haiku were perceived as more aesthetically pleasing. Significant interactions between the Haiku condition and two bilaterally symmetric parieto-occipital clusters: CL3 (left hemisphere) and CL6 (right hemisphere) were observed. A positive interaction in CL3 (*β* = 0.02, SE = 0.04, *t* (19693.76) = 2.19, *p* = 0.03), suggesting that increased gamma power in this cluster is associated with enhanced aesthetic appreciation of Haiku. In contrast, for CL6, a marginally significant negative interaction was found (*β* = -0.08, SE = 0.04, *t* (19693.5) = -2, *p* = 0.05), indicating gamma suppression in CL6 cluster. The bilateral symmetry of CL3 and CL6 highlights their distinct neural processing patterns, emphasising the importance of considering hemispheric differences in aesthetic experience. The findings in CL6 suggest a potentially novel (albeit smaller effect) cognitive or neural mechanism underlying Haiku appreciation in the right hemisphere, which may diverge from the left hemisphere's processing strategies.


*Prediction of Vivid Imagery*

The analysis of vivid imagery responses in the delta band [0-4 Hz] indicates that both Haiku and Senryu poems significantly enhanced imagery vividness compared to the control condition. Senryu poems (Cond S) were associated with a significant positive increase in vivid imagery, (*β*=0.45, SE = 0.03, *t* (19693.01) =36.4 *p*<0.001). Haiku poems (Cond H) exhibited an even stronger effect, (*β*=0.55, SE = 0.03, *t* (19693.01) =40.34, *p*<0.001), indicating that Haiku produced the most vivid imagery among the conditions tested. However, there were no significant interactions between phases, clusters, or conditions. This lack of interaction indicates that the vividness of imagery evoked by Haiku and Senryu did

not significantly vary across different perceptual phases or brain clusters, suggesting a stable effect of these poetic forms on vivid imagery, independent of these contextual variables.

In the theta frequency band [4-8 Hz], both Haiku and Senryu conditions significantly increase vivid imagery compared to the control.  Haiku exhibited a stronger effect on vivid imagery ($\beta$ = 0.71, SE = 0.03, $t$ (19693) = 40.13, $p$ < 0.001) than Senryu ($\beta$ = 0.62, SE = 0.03, $t$ (19693) = 36.08, $p$ < 0.001), suggesting that Haiku evoked more vivid mental imagery compared to Senryu. The interaction between the right fronto-temporal cluster (CL5) and the senryu condition (Cond S) shows a small, but statistically significant negative effect on vivid imagery (β = -0.05, SE = 0.05, $t$ = -2.17, $p$ = 0.03). This suggests that while Senryu generally enhanced vivid imagery, its effect was slightly reduced when the right fronto-temporal cluster (CL5) was activated. In other words, the influence of Senryu on vivid imagery was moderated by activity in the CL5 region, with the impact of senryu being less pronounced when this brain cluster was involved.

In the alpha band [8-12 Hz], both Haiku and Senryu conditions significantly influenced vivid imagery ratings when compared to the control condition. Senryu was positively associated with vivid imagery, showing a main effect ($\beta$ = 0.53, SE = 0.03, $t$ (19693.01) = 36.37, $p$ < 0.001). Haiku demonstrated a slightly stronger positive effect ($\beta$ = 0.54, SE = 0.03, $t$ (19693.01) = 40.24, $p$ < 0.001). This suggests that both poem types evoked enhanced vividness of mental imagery as compared to the control, with Haiku being marginally more effective. Significant interactions were found between the left frontal cluster (CL1) and both poem types. For both Senryu ($\beta$ = -0.04, SE = 0.04, $t$ (19693.9) = -2.52, $p$ = 0.012), and Haiku ($\beta$ = -0.04, SE = 0.04, $t$ (19693.78) = -2.32, $p$ = 0.02), alpha suppression was observed with similar effects. This suggests that alpha suppression in the left frontal region is associated with the perception of vivid imagery for both poem genres, indicating that reduced alpha activity may facilitate more vivid mental imagery. Further significant interactions were observed involving the clusters CL2 and CL5. The interaction between Senryu (Cond S) and the parieto-occipital cluster (CL2) showed a positive effect on vivid imagery ($\beta$ = 0.04, SE = 0.04, $t$ (19694.01) = 2.49, $p$ = 0.01), indicating that activity in the parieto-occipital region may enhance vivid imagery specifically for Senryu. Similarly, the interaction between Haiku (Cond H) and CL2 also showed a positive effect, though slightly weaker ($\beta$ = 0.03, SE = 0.04, $t$ (19693.78) = 1.96, $p$ = 0.05). These results suggest that the parieto-occipital cluster played a role in augmenting vivid imagery for both poem types, with a slightly stronger association for Senryu. Additionally, a significant interaction was found between the right fronto-temporal cluster (CL5) and the Senryu condition (Cond S), with a

negative effect on vivid imagery ($β$ = -0.04, SE = 0.04, $t$ (19694.14) = -2.37, $p$ = 0.02). This suggests that while CL5 activity generally enhanced vivid imagery, it had a moderating effect for Senryu, slightly diminishing its impact on mental imagery vividness when the right fronto-temporal cluster was engaged.

The beta band [12-30 Hz] analysis also showed significant main effects for both Senryu and Haiku on vivid imagery. Senryu's effect was substantial ($β$ = 0.60, SE = 0.03, $t$ (19693) = 36.5, $p$ < 0.001), while Haiku's effect was even more pronounced ($β$ = 0.79, SE = 0.03, $t$ (19693.01) = 40.39, $p$ < 0.001). These results suggest that both types of poems are associated with enhanced vivid imagery at the beta frequency, with Haiku having a stronger impact than Senryu. An interesting interaction was observed between Senryu and the right parieto-occipital cluster (CL6). The interaction term ($β$ = 0.07, SE = 0.05, $t$ (19693.99) = 2.72, $p$ = 0.01) indicated that higher beta power in this region was associated with increased vivid imagery ratings for Senryu. This finding suggests that the right parieto-occipital region may play a critical role in modulating the vivid imagery experienced while processing Senryu poems, potentially by enhancing beta oscillatory activity. However, the main effect of cluster CL6 was negative ($β$ = -0.04, SE = 0.03, $t$ (19693.89) = -2.68, $p$ = 0.01), showing that this region's beta power is generally associated with lower vivid imagery. Hence the positive interaction implies a context-dependent role where beta activity might enhance vividness specifically for Senryu.

Analysis of the lower gamma band [30-48 Hz] showed significant main effects of both Senryu and Haiku on vivid imagery. Senryu was positively associated with vivid imagery (β = 1.21, SE = 0.03, $t$ (19693) = 36.23, $p$ < 0.001), while Haiku showed an even stronger effect (β = 1.35, SE = 0.03, $t$ (19693.01) = 40.34, $p$ < 0.001). No significant interactions with specific brain clusters were observed in the lower gamma band, suggesting that the effects of Haiku and Senryu on vivid imagery are consistent across different brain regions at lower gamma band.

Overall, both Senryu and Haiku showed enhanced vivid imagery across different frequency bands, with Haiku consistently showing a stronger effect. Specifically, suppression in alpha in left frontal region and enhanced beta in right parieto-occipital region appear to moderate the cognitive experience of vivid imagery evoked by these poems, suggesting a nuanced neural correlates of perception of imagery in poems.

*Prediction of the State of Being Moved*

In both the delta [0-4 Hz] and theta [4-8 Hz] frequency bands, Haiku and Senryu conditions were found to significantly predict feelings of being moved compared to the control condition, without any interactions involving specific brain clusters. In the delta band, Senryu showed a positive association with the feeling of being moved, with a beta coefficient of 0.55 (SE = 0.03, $t$ = 45.05, $p$ < 0.001), while haiku demonstrated a slightly stronger effect with a beta of 0.59 (SE = 0.03, $t$ = 44.15, $p$ < 0.001). In the theta band, both conditions also significantly increased feelings of being moved. The effect size for Senryu was 0.75 (SE = 0.03, $t$ = 44.92, $p$ < 0.001), and for haiku, it was 0.76 (SE = 0.03, $t$ = 44.18, $p$ < 0.001). These results suggest that both poem types consistently enhanced feelings of being moved, with Haiku generally having a marginally stronger effect in each band.

Both Senryu and Haiku conditions significantly predicted the state of being moved compared to the control condition in alpha band [8-12 Hz]. Senryu was positively associated with the state of being moved, showing a main effect ($\beta$ = 0.64, SE = 0.03, $t$ (19693) = 45.19, $p$ < 0.001), while Haiku demonstrating a lower positive effect ($\beta$ = 0.58, SE = 0.03, $t$ (19693.01) = 44.14, $p$ < 0.001), suggesting that while both types of poems enhanced the emotional response compared to the control, Senryu showed a greater impact on evoking a state of being moved than Haiku. A significant interaction was observed between the right fronto-temporal cluster (CL5) and Senryu condition ($\beta$ = -0.03, SE = 0.04, $t$ (19693.66) = -2.00, $p$ = 0.046). A positive main effect (0.03) for fronto-temporal cluster (CL5) suggests that higher alpha power correlates with increased emotional engagement. However, the interaction with Senryu condition had a negative value (-0.03), suggesting that the positive relationship between alpha power in CL5 and the state of being moved was diminished when participants engage with Senryu poems.

The analysis of beta band [12-30 Hz] activity also showed significant positive effects for both Senryu ($\beta$ = 0.73, SE = 0.03, $t$ (19693) = 45.11, $p$ < 0.001) and Haiku ($\beta$ = 0.84, SE = 0.03, $t$ (19693.01) = 44.09, $p$ < 0.001) on the state of being moved, with Haiku having a slightly stronger effect. conditions A small positive main effect was observed for left frontotemporal cluster (CL2) ($\beta$ = 0.03, SE = 0.04, $t$ (19693.44) = 1.95, $p$ = 0.05), suggesting a marginal contribution to the state of being moved when beta power was present in this region. There was a significant negative main effect for left parieto-occipital cluster (CL3) ($\beta$ = -0.05, SE = 0.03, $t$ (19693.46) = -2.67, $p$ = 0.01). This finding suggests that beta activity in the left parieto-occipital area may reduce the emotional impact or the feeling of being moved. Significant interactions were found between Haiku and both the left parieto-occipital cluster (CL3) ($\beta$ = 0.05, SE = 0.05, $t$ (19693.63) = 2.23, $p$ = 0.03) and the right fronto-temporal

cluster (CL5) (*β* = 0.06, SE = 0.05, *t* (19693.35) = 2.32, *p* = 0.02). These interactions indicate that beta activity in these regions enhances the emotional impact of Haiku, making individuals feel more moved by these poems.

The analysis of the lower gamma band [30-48 Hz)] revealed that both Senryu (*β* =0.45, SE = 0.03, *t* (19693) = 44.94, *p* < 0.001) and Haiku (*β* = 0.54, SE = 0.03, *t* (19693) = 44.09, *p* < 0.001) conditions showed significant positive effects on the state of being moved. However, no significant interaction effects were observed between poem conditions and specific brain regions in the lower gamma band for the state of being moved, indicating that the effect of these poem types on the state of being moved did not appear to vary with the lower gamma activity in the brain clusters analysed.

Table 7.1 provides the summary of linear mixed model analyses across multiple frequency bands, predicting aesthetic appeal, vivid imagery, and the state of being moved in two poem conditions. It includes main effects, interaction terms, and model fit statistics, based on 19,740 observations. For better understanding, statistically significant (p < .05) interactions between poem conditions and spectral power are summarised in Table 7.2.

**Table 7.1**

*Detailed results from linear mixed model (LMM) analyses predicting aesthetic appeal, vivid imagery, and state of being moved across frequency bands (Delta, Theta, Alpha, Beta, Gamma1)*

| Frequency Band | Predictive Model | Effect | Beta | Std. Error | t-value | d.f. | p-value |
|---|---|---|---|---|---|---|---|
| **Delta** | DV: **Aesthetic Appeal** | (Intercept) | 3.08 | 0.1 | 30.39 | 50.81 | <0.001 |
| **[0-4Hz]** | Observations: 19740 | Cond S | 0.51 | 0.03 | 44.89 | 19693.01 | <0.001 |
| | AIC = 64820.13, BIC = 65167.31 | Cond H | 0.68 | 0.03 | 54.14 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.21 | | | | | | |
| | Pseudo-R² (total) = 0.39 | | | | | | |
| | | | | | | | |
| | DV: **Vivid Imagery** | (Intercept) | 3.86 | 0.1 | 37.54 | 51.45 | <0.001 |
| | Observations: 19740 | Cond S | 0.45 | 0.03 | 36.4 | 19693.01 | <0.001 |
| | AIC = 68228.82, BIC = 68575.99 | Cond H | 0.55 | 0.03 | 40.34 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.14 | | | | | | |
| | Pseudo-R² (total) = 0.32 | | | | | | |
| | | | | | | | |
| | DV: **State of Being Moved** | | | | | | |
| | Observations: 19740 | (Intercept) | 2.77 | 0.13 | 21.3 | 49.57 | <0.001 |
| | AIC = 67248.76, BIC = 67595.94 | Cond S | 0.55 | 0.03 | 45.05 | 19693 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.16 | Cond H | 0.59 | 0.03 | 44.15 | 19693.01 | <0.001 |
| | Pseudo-R² (total) = 0.42 | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Theta [4-8Hz]** | DV: **Aesthetic Appeal** | (Intercept) | 3.08 | 0.1 | 30.35 | 50.81 | <.001 |
| | Observations: 19740 | Cond S | 0.7 | 0.03 | 44.67 | 19693.01 | <0.001 |
| | AIC = 64811.45, BIC = 65158.63 | Cond H | 0.87 | 0.03 | 54.14 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.21 | CL1*Cond S | -0.04 | 0.03 | -2.25 | 19693.55 | 0.02 |
| | Pseudo-R² (total) = 0.39 | CL4*Cond S | 0.07 | 0.04 | 2.02 | 19693.68 | 0.04 |
| | | CL5*Cond S | -0.04 | 0.04 | -1.93 | 19693.55 | 0.05 |
| | | | | | | | |
| | DV: **Vivid Imagery** | (Intercept) | 3.86 | 0.1 | 37.58 | 51.46 | <.001 |
| | Observations: 19740 | Cond S | 0.62 | 0.03 | 36.08 | 19693.01 | <0.001 |
| | AIC = 68228.82, BIC = 68575.99 | Cond H | 0.71 | 0.03 | 40.13 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.14 | CL4 | -0.06 | 0.03 | -2.27 | 19693.75 | 0.02 |
| | Pseudo-R² (total) = 0.32 | CL5 | 0.05 | 0.03 | 2.84 | 19693.58 | <0.001 |
| | | CL6 | -0.03 | 0.03 | -2.26 | 19693.96 | 0.02 |
| | | CL5*Cond S | -0.05 | 0.05 | -2.17 | 19693.64 | 0.03 |
| | | | | | | | |
| | DV: **State of Being Moved** | (Intercept) | 2.77 | 0.13 | 21.29 | 49.57 | <0.001 |
| | Observations: 19740 | Cond S | 0.75 | 0.03 | 44.92 | 19693.01 | <0.001 |
| | AIC = 67240.90, BIC = 67588.07 | Cond H | 0.76 | 0.03 | 44.18 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.16 | | | | | | |
| | Pseudo-R² (total) = 0.42 | | | | | | |
| | | | | | | | |
| **Alpha [8-12Hz]** | DV: **Aesthetic Appeal** | (Intercept) | 3.08 | 0.1 | 30.33 | 50.79 | <0.001 |
| | Observations: 19740 | Cond S | 0.6 | 0.03 | 45.06 | 19693 | <0.001 |
| | AIC = 64805.12, BIC = 65152.30 | Cond H | 0.67 | 0.03 | 54.19 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.21 | CL1*Cond S | -0.03 | 0.03 | -2.38 | 19693.77 | 0.02 |
| | Pseudo-R² (total) = 0.39 | | | | | | |
| | | | | | | | |
| | DV: **Vivid Imagery** | (Intercept) | 3.86 | 0.1 | 37.57 | 51.44 | <0.001 |
| | Observations: 19740 | CL1_centered | 0.03 | 0.03 | 2.88 | 19693.72 | 0.004 |
| | AIC = 68244.51, BIC = 68591.68 | Cond S | 0.53 | 0.03 | 36.37 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.14 | Cond H | 0.54 | 0.03 | 40.24 | 19693.01 | <0.001 |
| | Pseudo-R² (total) = 0.32 | CL2 | -0.04 | 0.03 | -3.1 | 19693.87 | 0.002 |
| | | CL4 | -0.07 | 0.03 | -2.51 | 19693.99 | 0.012 |
| | | CL5 | 0.04 | 0.03 | 3.01 | 19693.93 | 0.003 |
| | | CL1 * Cond S | -0.04 | 0.04 | -2.52 | 19693.9 | 0.01 |
| | | CL1 * Cond H | -0.04 | 0.04 | -2.32 | 19693.78 | 0.02 |
| | | Cond S * CL2 | 0.04 | 0.04 | 2.49 | 19694.01 | 0.01 |
| | | Cond H * CL2 | 0.03 | 0.04 | 1.96 | 19693.78 | 0.05 |
| | | Cond S * CL5 | -0.04 | 0.04 | -2.37 | 19694.14 | 0.02 |
| | | | | | | | |
| | DV: **State of Being Moved** | (Intercept) | 2.77 | 0.13 | 21.27 | 49.55 | <0.001 |
| | Observations: 19740 | Cond S | 0.64 | 0.03 | 45.19 | 19693 | <0.001 |
| | AIC = 67233.15, BIC = 67580.33 | Cond H | 0.58 | 0.03 | 44.14 | 19693.01 | <0.001 |
| | Pseudo-R² (fixed effects) = 0.16 | CL5 | 0.03 | 0.03 | 2.28 | 19693.54 | 0.022 |
| | Pseudo-R² (total) = 0.42 | Cond S * CL5 | -0.03 | 0.04 | -2 | 19693.66 | 0.05 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Beta**<br>**[12-30Hz]** | DV: **Aesthetic Appeal**<br>Observations: 19740<br>AIC =64795.33, BIC = 65142.51<br>Pseudo-R² (fixed effects) = 0.21<br>Pseudo-R² (total) = 0.39 | (Intercept)<br>Cond S<br>Cond H | 3.08<br>0.68<br>0.97 | 0.1<br>0.03<br>0.03 | 30.39<br>44.89<br>54.1 | 50.81<br>19693<br>19693.01 | <0.001<br><0.001<br><0.001 |
| | DV: **Vivid Imagery**<br>Observations: 19740<br>AIC = 68221.88, BIC = 68569.06<br>Pseudo-R² (fixed effects) = 0.14<br>Pseudo-R² (total) = 0.32 | (Intercept)<br>Cond S<br>Cond H<br>CL6<br>Cond S * CL6 | 3.85<br>0.6<br>0.79<br>-0.04<br>0.07 | 0.1<br>0.03<br>0.03<br>0.03<br>0.05 | 37.56<br>36.5<br>40.39<br>-2.68<br>2.72 | 51.46<br>19693<br>19693.01<br>19693.89<br>19693.99 | <0.001<br><0.001<br><0.001<br>0.01<br>0.01 |
| | DV: **State of Being Moved**<br>Observations: 19740<br>AIC = 67208.81, BIC = 67555.99<br>Pseudo-R² (fixed effects) = 0.16<br>Pseudo-R² (total) = 0.42 | (Intercept)<br>Cond S<br>Cond H<br>CL2<br>CL3<br>Cond H * CL3<br>Cond H * CL5 | 2.76<br>0.73<br>0.84<br>0.03<br>-0.05<br>0.05<br>0.06 | 0.13<br>0.03<br>0.03<br>0.04<br>0.03<br>0.05<br>0.05 | 21.27<br>45.11<br>44.09<br>1.95<br>-2.67<br>2.23<br>2.32 | 49.56<br>19693<br>19693.01<br>19693.44<br>19693.46<br>19693.63<br>19693.35 | <0.001<br><0.001<br><0.001<br>0.05<br>0.01<br>0.03<br>0.02 |
| **Gamma1**<br>**[30-48Hz]** | DV: **Aesthetic Appeal**<br>Observations: 19740<br>AIC = 64784.95, BIC =65132.12<br>Pseudo-R² (fixed effects) = 0.21<br>Pseudo-R² (total) = 0.39 | (Intercept)<br>Cond S<br>Cond H<br>CL3<br>Cond H*CL3<br>Cond H*CL6 | 3.08<br>0.42<br>0.62<br>-0.02<br>0.02<br>-0.08 | 0.1<br>0.03<br>0.03<br>0.03<br>0.04<br>0.04 | 30.41<br>44.77<br>54.1<br>-2<br>2.19<br>-2 | 50.8<br>19693<br>19693<br>19693.98<br>19693.76<br>19693.5 | <0.001<br><0.001<br><0.001<br>0.05<br>0.03<br>0.05 |
| | DV: **Vivid Imagery**<br>Observations: 19740<br>AIC = 68214.31, BIC = 68561.49<br>Pseudo-R² (fixed effects) = 0.14<br>Pseudo-R² (total) = 0.32 | (Intercept)<br>Cond S<br>Cond H | 3.86<br>1.21<br>1.35 | 0.1<br>0.03<br>0.03 | 37.61<br>36.23<br>40.34 | 51.45<br>19693<br>19693.01 | <0.001<br><0.001<br><0.001 |
| | DV: **State of Being Moved**<br>Observations: 19740<br>AIC = 67209.20, BIC = 67556.38<br>Pseudo-R² (fixed effects) = 0.16<br>Pseudo-R² (total) = 0.42 | (Intercept)<br>Cond S<br>Cond H<br>CL2 | 2.77<br>0.45<br>0.54<br>0.02 | 0.13<br>0.03<br>0.03<br>0.03 | 21.31<br>44.94<br>44.09<br>2.22 | 49.56<br>19693<br>19693<br>19693.82 | <0.001<br><0.001<br><0.001<br>0.03 |

**Table 7.2.**

*Statistically significant (p < .05) interactions between poem conditions and spectral power in predicting aesthetic appeal, vivid imagery, and emotional engagement assessments*

| Genre | Predicted Variable | Freq. Band | Cluster | ROI | Increase/Decrease in Spectral Power | Significance Level (*p*-value) |
|---|---|---|---|---|---|---|
| Haiku | Aesthetic Appeal | gamma | CL3 | L. parieto-occipital | Increase | 0.03 |
| | Vivid Imagery | alpha | CL 1 | L. frontal | Decrease | 0.02 |
| | Being Moved | beta | Cl 3 | L. parieto-occipital | Increase | 0.03 |
| | | beta | Cl 5 | R. fronto-temporal | Increase | 0.02 |
| Senryu | Aesthetic Appeal | theta | Cl 1 | L. frontal | Decrease | 0.02 |
| | | theta | Cl 4 | R. frontal | Increase | 0.04 |
| | | alpha | Cl 1 | L. frontal | Decrease | 0.02 |
| | Vivid Imagery | theta | Cl 5 | R. fronto-temporal | Decrease | 0.03 |
| | | alpha | Cl 1 | L. frontal | Decrease | 0.01 |
| | | alpha | Cl 5 | R. fronto-temporal | Decrease | 0.02 |
| | | alpha | Cl 2 | L. fronto-temporal | Increase | 0.01 |
| | | beta | Cl 6 | R. parieto-occipital | Increase | 0.01 |

# 7.4. Discussion

Art appreciation is a multifaceted experience, blending perceptual, cognitive, and affective processes (Nadal, 2013). This aligns with theories in neuroaesthetics, which propose that art perception involves a complex interplay among sensory-motor, emotional, and knowledge-related neural networks (Chatterjee & Vartanian, 2016; Pearce et al., 2016). Therefore, art perception is not unitary but relies on a flexible interaction between neural networks involved in sensory-motor, emotion-valuation, and meaning-knowledge processing (Chatterjee & Vartanian, 2014; Sacheli et al., 2022).

This framework provides a valuable lens for interpreting the findings of the current EEG study, which aimed to identify specific oscillatory patterns and cortical brain activity underlying creativity judgments of two poetry genres—Haiku and Senryu—focusing on assessments of aesthetic appeal, vivid imagery, and emotional engagement. Power spectral

analysis and linear mixed model results suggest that these poetic forms, while engaging multiple neural systems, evoke distinct oscillatory responses across frequency bands, reflecting the nuanced interplay between cognitive and emotional processes in poetry evaluation. Haiku and Senryu elicited unique patterns of brain activity across frontal, fronto-temporal, and parieto-occipital cortical regions, highlighting how each genre engages sensory, attentional, and evaluative neural circuits differently, with Senryu generally showing stronger positive associations with cognitive responses compared to Haiku, particularly in perception of aesthetic appeal and imagery. The following sections explore the oscillatory activity through power spectrum analysis, in five specific frequency bands—delta, theta, alpha, beta, and lower gamma—analysing their roles in cognitive processes and discussing how these neural patterns align with poetic creativity evaluation.

### 7.4.1. Aesthetic Appeal Assessment

*Frontal and fronto-temporal theta suppression in Senryu*

While Haiku's aesthetic appreciation did not exhibit influence of theta activity in cortical regions of interest, Senryu engaged distinct patterns of theta band activity across frontal regions (both hemispheres) and the right fronto-temporal region. Significant theta suppression was observed in the left frontal cluster, while the right frontal region exhibited a less significant increase in theta activity. Additionally, a marginally significant theta suppression was observed in the right fronto-temporal cluster. These findings suggest a lateralised pattern of frontal theta activity, with a notable dominance of left frontal suppression.

In the awake state, increased left frontal theta activity has been consistently associated with heightened metabolic activity, commonly observed during cognitively demanding tasks requiring increased information processing (Eisma et al., 2021; Cherenfant et al., 2024), including memory, attention, and emotional processing (Senoussi et al., 2022; Klimesch, 1999; Gevins et al., 1997; Raghavachari et al., 2006). However, the observed overall theta suppression in the left frontal and temporal regions, considered primary sources of theta waves (Tatum, 2012), suggests a reduced reliance on cognitive control, signalling a potential shift away from analytical processing toward more spontaneous emotional engagement. This aligns with the affective and relevance-based processing often attributed to the left frontal cortex (Northoff et al., 2006). On the other hand, the right hemisphere's involvement in theta increase supports attentional integration across sensory and cognitive tasks, aligning with a more affective and emotional mode of processing (Aftanas & Golocheikine, 2001; Davidson,

1992). This right-hemisphere activity may indicate enhanced emotional resonance with Senryu's socially oriented themes (Knyazev, 2007). Thus, Senryu's theta-based interactions, less prominent in Haiku, suggest that aesthetic appreciation in poetry relies on cognitive processes aligned with thematic content (Chatterjee & Vartanian, 2014; Vessel et al., 2012; Kawabata & Zeki, 2004; Cela-Conde et al., 2004). Specifically, these interactions may reflect engagement with socially resonant and emotionally evocative content, emphasising the unique cognitive and emotional dynamics involved in appreciating Senryu, compared to Haiku.

*Frontal alpha suppression in Senryu*

Left frontal alpha suppression was observed in response to Senryu's aesthetic appeal, diverging from the initial hypothesis that aligned with typical neuroaesthetic patterns observed in visual art, where decreased alpha power in parietal regions often reflects heightened attentional focus (Strijbosch et al., 2022 ; Jokisch & Jensen, 2007; Kawabata & Zeki, 2004;  Chatterjee, 2011; Cela-Conde et al., 2004; Ishizu & Zeki, 2011). This deviation highlights that aesthetic engagement with poetry, as an abstract and linguistic art form, may activate unique frontal dynamics associated with meaning-making, emotional reflection, and cognitive control (Cela-Conde et al., 2004; Chatterjee & Vartanian, 2014). The left frontal alpha suppression observed in Senryu likely reflects heightened cognitive involvement with its personal and socially reflective themes, engaging mechanisms such as self-referential thinking and social cognition (Amodio & Frith, 2016; Mitchell et al., 2006). This pattern aligns with the notion that poetry's aesthetic appeal relies on deeper cognitive engagement through processes like self-reflection and emotional resonance (Vessel et al., 2012; Winecoff et al., 2011; Miller & Cohen, 2001). The left hemisphere dominance, often linked to language processing and introspection, highlights the cognitive depth required for engaging with Senryu's reflective themes, which centre on human experience and social nuances (Chatterjee & Vartanian, 2014; Vessel et al., 2012).

These findings suggest that aesthetic engagement in literary perception, particularly for poetry, involves reflective and socially oriented cognitive processes in the left frontal regions. This distinguishes it from visual forms of aesthetic experience, which are more reliant on sensory and attentional mechanisms. Interestingly, Haiku again exhibited less pronounced effects compared to Senryu, suggesting that the latter's socially resonant content evokes a more robust cognitive and emotional response.

*Heightened parieto-occipital gamma in Haiku*

The aesthetic appreciation of Haiku engaged higher-order cognitive processes through distinct gamma band interactions in the parieto-occipital regions. This finding contrasts with the initial hypothesis, which predicted increased gamma activity over the frontal regions for aesthetically appealing stimuli like Haiku (Lopez-Persem et al., 2020 ; Strijbosch et al., 2022).

This deviation suggests that the nature-themed and imagery-based aesthetic appeal of Haiku may rely more heavily on visual imagery and sensory integration processes, functions commonly associated with parieto-occipital gamma activity (Tallon-Baudry & Bertrand, 1999). The observed heightened left gamma activity in particular points to sensory and imagery-based processing in Haiku (Kawabata & Zeki, 2004; Cela-Conde et al., 2004). Studies have shown that the left parieto-occipital region is critically involved in spatial awareness and high-level visual processing, supporting tasks such as visual integration, spatial attention, and object manipulation (Culham & Kanwisher, 2001). Moreover, activation in this region is strongly associated with complex perceptual and cognitive tasks that involve visual imagery and attentional control (Corbetta et al., 2008). Thus, the increased gamma activity in the left parieto-occipital cortex likely reflects readers' deep cognitive engagement with Haiku's vivid imagery, enabling the creation of rich mental scenes and abstract conceptualization (Bhattacharya & Petsche, 2002; Bhattacharya & Petsche, 2005; Tallon-Baudry & Bertrand, 1999).

This left-lateralised gamma enhancement highlights Haiku's unique reliance on high-level perceptual processing, distinguishing it from the more socially reflective cognitive processes associated with Senryu. These findings provide evidence that Haiku engages distinct neural pathways through its vivid, concise nature and reliance on visual-spatial and sensory elements, indicating the diversity of cognitive demands in poetic appreciation.

In contrast to the hypothesis predicting beta suppression in the frontal regions during the perception of aesthetically appealing poems (Herrera-Arcos et al., 2017), this expected pattern was not observed in the current study. This result may indicate that aesthetic appreciation of poems relies probably less on the motor-related or action-oriented processes and instead emphasises higher-order processes such as meaning-making, imagery construction, and emotional resonance.

### 7.4.2. Visual Imagery Assessment

*Right fronto-temporal theta suppression in Senryu*

Right fronto-temporal theta suppression was observed during Senryu's imagery assessment, highlighting its role in aesthetic appreciation. The temporal regions, primary sources of theta waves (Tatum, 2012), are associated with holistic and emotional processing, including semantic integration, memory retrieval, and emotional resonance (Aftanas & Golocheikine, 2001). This suppression may indicate reduced cognitive control, reflecting a shift from analytical processing to spontaneous, emotionally driven engagement. This aligns with Senryu's nature, where vivid imagery evokes intuitive and reflective interpretations rather than detailed analysis. The temporal regions' involvement suggests that readers may draw on autobiographical memories and personal experiences to construct immersive mental imagery, balancing emotional engagement and imagery processing.

*Frontal alpha suppression in Haiku and Senryu*

Frontal alpha suppression was observed during imagery perception in both Senryu and Haiku, reflecting active engagement with vivid imagery, as predicted. Left frontal alpha suppression suggests reduced cognitive inhibition and enhanced attentional focus, indicating deeper reflective processing for Senryu's socially themed content and immersive engagement with Haiku's natural imagery (Klimesch, 2012). Additionally, a significant alpha suppression in the right fronto-temporal cluster, linked to affective processing of Senryu's visual imagery (Aftanas & Golocheikine, 2001), supports its emotionally resonant themes.

In contrast, heightened alpha activity in the left fronto-temporal cluster in both genres suggests a relaxed, non-focused engagement. Increased alpha power here reflects reduced allocation of resources to detailed analytical processing, favouring spontaneous, immersive experiences (Klimesch, 2012). For Senryu, this alpha increase facilitates emotional resonance without cognitive constraints, while for Haiku, subtler alpha activity implies a balanced engagement that merges abstract mental imagery with sensory attention. The increased alpha likely supports internally generated imagery over external sensory details, enhancing the reflective and creative mental space encouraged by both poetic forms (Ray & Cole, 1985; Klimesch, 1999, 2012; Jensen & Mazaheri, 2010).

*Heightened beta activity in parieto-occipital region in Senryu*

An increase in beta band activity in the right parieto-occipital cortical cluster during vivid imagery processing of Senryu suggests enhanced visual processing and attentional engagement, particularly for detailed and vivid imagery (Wróbel, 2000; Culham & Kanwisher, 2001). This heightened beta power likely reflects a focused attentional state on sensory visualisation, enabling participants to mentally construct imagery that embodies the human-centred qualities of Senryu. By bridging sensory input and higher-order cognitive processing, these beta dynamics support introspective engagement with social or personal themes, directing attention to emotionally resonant and reflective content.

*No gamma activity*

The absence of significant interaction between gamma band activity and specific clusters or conditions contrasts with the hypothesis that increased gamma activity in the occipital region would support creative and vivid spontaneous visual imagery (Luft et al., 2019; Hamamé et al., 2012; Lachaux et al., 2005, Kawasaki & Watanabe, 2007). The lack of gamma modulation suggests that participants' vivid imagery processing of both Haiku and Senryu did not heavily engage higher-order processes (Başar, 2013). The consistent gamma response across clusters and conditions points to a shared neural mechanism for perceptual and cognitive efforts during poetic imagery perception, without prompting uniquely complex or integrative cognitive demands.

### 7.4.3. Emotional Engagement Assessment

*Right fronto-temporal alpha suppression in Senryu*

A marginally significant alpha suppression in the right fronto-temporal region during emotional engagement with Senryu suggests a state of emotional openness, where cognitive inhibition is minimised, facilitating a more direct connection to affective content (Knyazev, 2007; Lindquist et al., 2012). The right fronto-temporal region, frequently associated with language, emotional processing, and social cognition, aligns with Senryu's contemplative and socially resonant nature, inviting readers to reflect on human experiences and shared social nuances (Vessel et al., 2012). This suppression likely enhances a balanced and introspective experience (Friston et al., 1994; Lutz et al., 2008).  Thus, fronto-temporal alpha suppression in the right hemisphere serves as an indicator of emotional engagement, enabling participants to process Senryu's themes of personal and social

reflection in a more integrative and affective manner (Northoff et al., 2006; Bechara et al., 2000). This right-lateralised alpha activity highlights how Senryu's themes enhance contemplative emotional engagement, providing insight into the neural processes that support literary appreciation in a socially reflective context. This right-lateralised alpha activity highlights how Senryu's themes involve in a contemplative emotional engagement, providing insight into how neural processes support literary appreciation in a socially reflective context.

*Heightened parieto-occipital and fronto-temporal beta activity in Haiku*

Heightened beta activity in the right parieto-occipital region suggests strong perceptual and cognitive engagement, particularly in visual imagery and spatial attention processing, consistent with beta's established role in these functions (Ganis et al., 2004; Kosslyn et al., 2001; Culham & Kanwisher, 2001). This further aligns with findings linking dynamic imagery to enhanced beta power in the parieto-occipital area (Hashim et al., 2024), indicating the vivid, nature-centric dynamicity of imagery evoked by Haiku. Additionally, significant increased beta activity in the right fronto-temporal cluster supports nuanced emotional and reflective processing, linked to sustained attention and cognitive focus in introspective contexts (Engel & Fries, 2010). This suggests participants' focused engagement with Haiku's contemplative themes, merging introspective and socially resonant processing to evoke a state of being moved (Davidson, 1992). This right-lateralised beta increase suggests that participants are not only visually engaged with Haiku's imagery but are also emotionally connected to its contemplative, nature-oriented content.

Lastly, the absence of gamma activity changes across conditions and clusters suggests that higher-order cognitive processes, such as complex perceptual integration or abstract high-level processing, are not distinctly activated in participants' evaluation of their emotional response to the poems. Instead, their engagement seems to rely more on attentional, sensory, and imagery processing rather than the complex integrative processing commonly associated with gamma activity.

The absence of frontal theta band activity across conditions during the perception of the construct "being moved," contrasts with the initial hypothesis, which predicted a decrease in frontal theta power—an EEG index of default mode network activity (Scheeringa et al., 2008, 2012) typically associated with internally directed mental activity, such as contemplation and self-reflection (Andrews-Hanna et al., 2010; Fox et al., 2005; see also Strijbosch et al., 2022). This may indicate that poetry appreciation predominantly engages higher-frequency

oscillations, which are more closely associated with complex cognitive processes and perceptual integration.

### 7.4.4. Limitations

While this study offers novel insights, several limitations must be acknowledged. First, the study relied on spectral analysis, which, while informative about frequency components in EEG signals, lacks the ability to capture dynamic changes in brain activity over time. Incorporating time-frequency analysis in future studies could provide a more precise understanding of rapid oscillatory dynamics (Strijbosch et al., 2022; Herrera-Arcos et al., 2017; Lopez-Persem et al., 2020; Lindsen et al., 2010) and provide insights into the temporal dynamics of brain networks involved in aesthetic and emotional experiences, as identified through fMRI research (Scheeringa et al., 2008). Second, although regression-based analyses were primarily used to explore relationships between EEG features and subjective ratings, machine learning based classification approach (pattern recognition) could yield additional insights (Boashash et al., 2015; Iscan et al., 2011). Employing machine learning classification techniques to categorise responses based on EEG patterns might enhance prediction accuracy and help identify distinct neural markers associated with different types of subjective experiences (Xu et al., 2019; Ridouh et al., 2017). Third, the study focused on broad categories of poetic forms (e.g., Haiku and Senryu) but did not examine how specific linguistic and thematic elements within the poems (e.g., use of metaphor, rhythm, or imagery) might differentially influence neural responses. These finer elements could significantly shape cognitive and emotional engagement, meaning that variations in the content of the poems themselves might partially explain the EEG findings. Incorporating tools like natural language processing (NLP) in future research could allow for a more detailed exploration of how specific linguistic and thematic features of poetry contribute to the neural activity observed during creativity judgments.  Finally, the study assumed a clear separation between aesthetic and emotional responses based on EEG spectral bands. However, cognitive and emotional processes are often interdependent (Storbeck & Clore, 2007), particularly in regions like the frontal cortex, which are associated with both domains. This potential overlap could introduce confounding effects, complicating the interpretation of the findings. Future research could address this limitation by incorporating concurrent measures, such as behavioural tasks or physiological indicators (e.g., heart rate variability), to better disentangle the intertwined cognitive and emotional responses (Thayer et al., 2009; Forte et al., 2019).

### 7.4.5. Conclusion

This study investigated the neural correlates underlying the evaluation of poetic creativity in Haiku and Senryu. Power spectral analysis linked subjective predictors of poetic creativity—aesthetic appeal, vivid imagery, and emotional engagement—to oscillatory brain activity in three cortical regions of interest: frontal, fronto-temporal, and parieto-occipital. While both poetic forms engaged multiple cortical regions, Senryu elicited stronger associations with cognitive and emotional processes, reflecting its socially reflective and introspective themes. In contrast, Haiku prominently engaged sensory and perceptual processing, driven by its vivid, nature-centred imagery. These findings highlight the genre-specific neural signatures involved in evaluating poetic creativity, providing a broad, albeit not highly specific, understanding of how different brief and structured poetic forms engage the brain's cognitive and emotional networks.

### 7.4.6. Looking Ahead

Though the thesis concludes here, ongoing work continues to explore the neuronal dynamics of poetic creativity using time-frequency analysis and machine learning-based feature extraction, focusing on the influence of reading and contemplation phases, which were not fully addressed in the initial spectral analysis. The next chapter provides an overall discussion of the thesis, revisiting the research questions, contextualising findings within poetic creativity evaluation, and summarising key insights to highlight the outcomes and contributions.

# CHAPTER 8

# TOWARDS AN INTEGRATED UNDERSTANDING OF EVALUATION OF POETIC CREATIVITY

*"What we know is a drop, what we don't know is an ocean."*

*— Isaac Newton*

As this thesis draws to a close, it brings together the insights gained throughout each chapter, offering an integrated discussion of the findings and their implications for understanding poetic creativity. While this remains a vast field open to further exploration, this research has made significant strides in advancing knowledge of how poetry engages readers and is perceived as creative. By examining the neurocognitive and linguistic factors influencing creativity judgments, this work offers insights into the processes underlying poetic evaluation. This chapter revisits the central inquiry—*What makes a poem creative?* — by synthesising results from each study, addressing the broader significance of these findings within the field, and highlighting key contributions to both poetry evaluation and the psychology of creativity.

## 8.1. Review of Research Questions

Poetry is widely regarded as one of the most creative expressions of language, yet what specifically leads a poem to be judged as creative remains an open question. Therefore, to move beyond the generic assumption that a poem is inherently creative, this thesis seeks to answer the central inquiry: *"What makes a poem creative?"* While the appreciation of poetry, like any art form, is inherently subjective—shaped by personal experiences, emotions, and knowledge— this research probes deeper, asking whether a common cognitive framework exists. Adopting a tripartite approach—behavioural, neuroscientific, and computational—this thesis investigates the underlying neurocognitive mechanisms that contribute to creativity judgments in poetry and explores whether shared cognitive scaffolding shapes how we perceive poetic creativity. This section revisits the research questions that guided the central

inquiry, synthesising the key findings and providing a framework for understanding the insights drawn from the investigation.

### 8.1.1. Aesthetic Appeal Strongly Predicts Poetic Creativity

Addressing the first research question—*What are the key subjective qualities of a poem that predict judgments of a poem's creativity?* — this study examined both the subjective qualities of poems and the psychological states of readers that shape creativity judgments. The findings revealed that poetry-related constructs, particularly aesthetic appeal and surprise, play pivotal roles in predicting poetic creativity. Furthermore, readers' emotional valence emerged as a significant predictor, highlighting the importance of readers' emotional states in shaping creativity judgments.

### 8.1.2. Literary Expertise Moderates Creativity Evaluation

Addressing the second research question—*How does domain-specific expertise in literature influence the role of subjective qualities in the evaluation of creativity in poetry?* — this work examined how the creativity assessment of poems is shaped by readers' expertise in English literature. The results indicated that experts prioritised structural and stylistic features, such as aesthetic appeal, while non-experts responded more strongly to emotional resonance and thematic impact, particularly elements that evoke surprise. These findings highlight an interplay between domain-specific factors (favouring skill-dependent features) and domain-general factors (emphasising emotional and surprising elements) in the evaluation of poetic creativity.

### 8.1.3. Personality Traits Influence Creativity Evaluation

Addressing the third research question—*How do individual differences in readers' personality traits shape their judgments of a poem's creativity?* —this study explored the impact of traits such as openness, intellect, awe-proneness, and epistemic curiosity (i.e., knowledge-seeking curiosity) on evaluations of poetic creativity. The findings revealed distinct moderation effects, with individuals high in these traits placing greater emphasis on aesthetic appeal when assessing a poem's creativity, and openness emerging as the strongest moderator. It is important to note that this study did not aim to determine whether individuals with higher personality traits tended to rate predictors of creativity more or less favourably on average compared to those with lower traits. Instead, the focus was on

examining the differential levels of predictor ratings for readers with high and low traits.

### 8.1.4. Aesthetic and Creativity Evaluations Follow Different Routes

Addressing the fourth research question—*While perceiving a poem, do assessments of aesthetics and creativity rely on identical criteria, or do they vary depending on underlying factors?* — this study investigated whether these judgments are shaped by the same or distinct factors. The findings indicated that aesthetic and creative assessments are indeed guided by distinct evaluative criteria. Creativity judgments were found to be more strongly linked to originality, usefulness, and vivid imagery, while aesthetic judgments were primarily influenced by reading fluency, perceived emotions, and vivid imagery. These results suggest that the internal models for evaluating creativity align with the standard bipartite definition, emphasising both originality and usefulness. While there is some overlap between aesthetic and creativity assessments, they are ultimately shaped by separate cognitive and emotional processes, reflecting distinct pathways of evaluation.

### 8.1.5. Reading Poetry Boosts Associative Thinking

Addressing the fifth research question—*Does reading act as an effective incubator for creative ideation in readers?* —this study investigated whether reading poetry during a break from complex tasks, referred to as incubation, could serve as a positive catalyst to enhance creative thinking in readers. The findings suggested that poetry reading facilitates free-flowing or naturalistic thoughts, a cognitive process strongly linked to associative creativity. However, it may not necessarily lead to the generation of entirely novel or original ideas. This indicates that the incubation effect of poetry reading primarily enhances associative thinking, promoting connections between existing ideas rather than promoting wholly divergent or original ideation. These results highlight poetry's unique influence on creativity as being more connective than generative, offering a distinct pathway for enhancing creative cognition.

### 8.1.6. Creativity in Minimalist Poetry: Theme Drives Assessment

Addressing the sixth research question—*How is poetic creativity perceived within brief, structured poems?* —this study examined the behavioural component of a broader neuroscientific investigation of the evaluation of creativity in concise and highly structured

poetic forms. Focusing on two of the shortest poetic genres, Haiku and Senryu, the findings revealed a genre-specific model of creativity assessment. While originality emerged as the strongest predictor of creativity in both forms, the emphasis on aesthetic appeal and emotionality differed: haiku evaluations prioritised aesthetic beauty, whereas senryu evaluations focused more on emotional expression. These results suggest that creativity perceptions in brief poetry are influenced not only by originality but also by the unique aesthetic or emotional priorities inherent to the theme of each genre.

### 8.1.7. Neural Correlates of Creativity Judgments: Key Oscillatory Activity and Cortical Regions

Finally, addressing the seventh research question—*What are the neural correlates of creativity judgments during poetry perception?* —this study employed EEG power spectral analysis to examine neural activity in response to perceptions of Haiku and Senryu. The findings revealed distinct patterns in five frequency bands of interest — theta, alpha, beta, and lower gamma — each linked to key predictors of creativity, including aesthetic appeal, vivid imagery, and emotional impact. Haiku and Senryu elicited unique patterns of brain activity across frontal, fronto-temporal, and parieto-occipital cortical regions, highlighting how each genre engages sensory, attentional, and evaluative processing differently, with Senryu generally showing more positive associations with perceptions of aesthetic appeal and imagery compared to Haiku.

## 8.2. Review of Chapters and Findings

This section presents a detailed review of the key findings from each chapter, highlighting their primary contributions and implications while providing a cohesive synthesis of the thesis's insights into the evaluation of poetic creativity.

The first study, presented in Chapter 2, explored the role of subjective qualities in predicting creativity judgments across a diverse selection of English-language poems. Key parameters, including clarity, aesthetic appeal, and surprise, were examined alongside readers' psychological states—felt emotional valence and arousal—to understand their contributions to creativity assessment. Multilevel analysis revealed that aesthetic appeal was the strongest predictor: the more aesthetically appealing a poem, the more likely it was judged as creative. Surprise, operationalised as a thematic shift within the poem, was

the second-most influential factor (Simonton, 2012), followed by felt emotional valence, highlighting poetry's capacity to evoke strong emotional experiences (Wassiliwizky et al., 2017). Additionally, both surprise and felt valence were found to partially mediate the effect of aesthetic appeal on creativity judgments, showing how emotional content in verbal materials influences reading experiences. These findings highlight the role of subjective emotional appraisal in aesthetic appreciation (Chatterjee & Vartanian, 2014; Leder et al., 2004) and further demonstrate connection between surprise and aesthetic appreciation (Silvia, 2009). Furthermore, computational creativity metrics, utilising semantic distance methods and large language models (LLMs) (Beaty & Johnson, 2021), provided objective validation for subjective experiences of surprise by revealing that surprising lines were driven by measurable semantic shifts rather than arbitrary choices. Additionally, the study highlighted the moderating role of domain-specific expertise in evaluating poetic creativity: experts prioritised aesthetic appeal and skill-dependent features, whereas non-experts placed greater emphasis on emotional valence and surprise, reflecting parallels with experiences in both poetry and music (Juslin & Västfjäll, 2008, Wassiliwizky et al., 2017).

The findings of this study provide critical insights into the multifaceted nature of poetic creativity evaluation, demonstrating that aesthetic appeal, surprise, and emotional valence are key drivers of creativity judgments. In plain words, a poem is said to be creative when it is judged aesthetically appealing, surprising, and emotionally resonating. This study aligns with broader theories in neuroaesthetics that emphasise the centrality of beauty in art appreciation (Leder et al., 2004), while also supporting the three-criterion definition of creativity, which identifies surprise as a core component of creativity (Simonton, 2012). The integration of computational metrics, such as semantic distance analysis, offers a novel methodological contribution, bridging subjective experiences with objective measures of creativity and paving the way for future interdisciplinary approaches in literary analysis. Furthermore, the moderating role of expertise highlights the interplay between domain-specific reliance on literary style-centric knowledge and domain-general reliance on affective processes, offering valuable implications for understanding how poetry is perceived differently by experts and non-experts. This study lays the groundwork for exploring the cognitive processes that poetry uniquely and commonly engages, making it an important contribution to understanding creativity in both psychology and literary studies.

Chapter 3 explores how readers' personality traits shape their evaluations of poetic creativity. Four traits, including openness, intellect, awe-proneness, and epistemic curiosity, were analysed for their moderating effects on key creativity predictors: aesthetic appeal, surprise,

and felt valence. Results indicated that individuals high in these traits placed greater emphasis on aesthetic appeal, while those in lower were more influenced by emotional experiences and surprise. Specifically, openness and intellect were linked to a stronger preference for aesthetic appeal over emotional response (Oleynick et al., 2017; Leder et al., 2004;  McCrae, 1987; Fayn et al., 2015). Awe-proneness and curiosity showed similar moderating trends: individuals with higher levels of both traits emphasised a poem's aesthetic appeal linking awe and curiosity to appreciation for beauty (Peterson & Seligman, 2004; Güsewell & Ruch, 2012) and engagement in complex, abstract stimuli (Kenett et al., 2023) respectively.

This study highlights the role of interpersonal factors in art appreciation, showing how individual idiosyncrasies influence the inherently subjective process of evaluating creative works. These findings align with a robust body of research linking creativity and personality (Feist, 1998; Batey & Furnham, 2006; Kaufman et al., 2016; Oleynick et al., 2017;  Ceh et al., 2022; Lloyd-Cox et al., 2022). By revealing how traits like openness and intellect prioritise aesthetic appeal over emotional response, the study aligns with theories that link these traits to cognitive engagement with abstract and complex stimuli (Fayn et al., 2015). Similarly, the results suggest that readers predisposed to awe are more attuned to the artistic and moral beauty of poems  (Diessner et al., 2008; Peterson & Seligman, 2004; Güsewell & Ruch, 2012), while those with high curiosity find intricate poems more engaging and intellectually stimulating (Kenett et al., 2023; Silvia, 2008b).These findings expand frameworks on personality and creativity by showing that individual traits not only influence art preferences but also moderate the pathways for evaluating literary creativity, bridging personality psychology and literary studies.

Chapter 4 investigates the crucial and rudimentary question of whether judgments of aesthetics and creativity in poems rely on the same criteria or are shaped by distinct evaluative processes. The study assessed contemporary English poems across nine dimensions, including reading fluency, vivid imagery, perceived emotions (valence and arousal), surprise, originality, usefulness, aesthetic appeal, and creativity. The findings revealed that creativity and aesthetic appeal involve distinct evaluation processes with minimal overlap. Creativity judgments are primarily driven by originality, usefulness, and vivid imagery, aligning with the standard definition of creativity as both original and useful (Runco & Jaeger, 2012). In contrast, aesthetic appeal is influenced mainly by reading fluency, perceived emotions, and vivid imagery. Vivid imagery emerged as the common link between creativity and aesthetic appeal assessments. Defined as "the sensory and figurative language used in poetry" (https://www.britannica.com/art/poetic-imagery), vivid imagery is widely recognised as

essential to creating poetic meaning (Brandt & Brandt, 2005). Interestingly, the common role of vivid imagery in both poetic creativity and aesthetic appeal suggests a creative interplay between perception of higher-order abstract feature like creativity and appreciation of aesthetic qualities of a poem. The distinct evaluative paths of creativity and aesthetic appeal are further evident in their relationship with individual differences: creativity judgments are mainly moderated by openness and curiosity, whereas aesthetic appeal judgments are influenced by a wider range of traits, including intellect and vividness in visual and auditory imagery.

These findings contribute to a nuanced understanding of how creativity and aesthetic appeal are evaluated; a poem deemed creative may not necessarily be seen as aesthetically appealing, and vice versa. This study reinforces the standard definition of creativity (Runco & Jaeger, 2012) while extending it to the realm of poetry. The shared role of vivid imagery highlights its importance in bridging abstract cognitive evaluations with aesthetic experiences, suggesting that poetic language operates on multiple levels of meaning and engagement. The outcome of this study is significant for literary criticism, highlighting the importance of considering the distinct yet interconnected roles of creativity and aesthetics to develop a more comprehensive framework for evaluating literary works.

Chapter 5 explores whether reading poetry enhances creative thinking by stimulating mind-wandering, a cognitive process linked to creative incubation. Incubation refers to the process by which unexpected insights arise after temporarily stepping away from a problem, allowing the unconscious mind to enhance creativity (Smith & Blankenship, 1989; Baird et al., 2012; Tan et al., 2015; Ritter & Dijksterhuis, 2014; Gilhooly et al., 2013; Hélie & Sun, 2010). Additionally, mind-wandering, defined as "a shift in the contents of thought away from an ongoing task and/or from events in the external environment to self-generated thoughts and feelings" (Smallwood & Schooler, 2015, p. 488), is suggested in literature as a mechanism that can facilitate creative problem-solving during incubation (Baird et al., 2012; Christoff et al., 2011; Yamaoka & Yukawa, 2016; Tan et al., 2015). Results showed that mind-wandering during poetry reading enhanced associative thinking, promoting associative creativity, while divergent thinking—essential for generating novel ideas—remained unaffected. This suggests that poetry reading primarily promotes semantic diversity and spontaneous thought, supporting associative creativity rather than driving entirely new idea generation.

These findings contribute to creativity research by highlighting poetry reading's potential as a catalyst for associative, rather than divergent, thinking, expanding our understanding of creative incubation. The research suggests that cognitive demands during incubation tasks,

such as poetry reading, play a crucial role in creative outcomes by allowing the mind to wander and encouraging connections that might otherwise be overlooked. This indicates that poetry may offer a unique way to engage the brain's default mode network (Mason et al., 2007; Smallwood et al., 2021; Andrews-Hanna et al., 2010, 2014), enhancing associative thought without the executive control necessary for novel idea generation (Christensen et al., 2019). Overall, these findings highlight the influence of cognitive load and mind-wandering in determining how incubation tasks using reading poetry affect creative processes. However, the implication of this study is not as straightforward as suggesting that poetry reading directly boosts creativity. Instead, they suggest that poetry's true power lies in creating a reflective mental space where readers can explore familiar ideas from fresh perspectives, enabling creative insights over time. In an age of constant distractions, poetry may provide an opportunity for readers to slow down and discover overlooked connections, a process that can nurture creativity gradually. Future neuroimaging studies could explore how interactions between the brain's default mode and executive control networks during poetry reading deepen our understanding of the relationship between mind-wandering, cognitive load, and creative thinking, clarifying how such mental engagement contributes to the development of creative insights.

Chapter 6 presents a behavioural study within a larger neuroscientific investigation, aimed at understanding how creativity is evaluated in brief, structured poetry. Two three-line genres with a 5-7-5 syllabic structure were analysed: Haiku, focused on nature (Rowland, 2013), and senryu, centred on human experiences (Opler & Obayashi, 1945), with non-poetic control texts as a baseline. The study assessed how factors such as aesthetic appeal, emotional impact, vivid imagery, and originality influenced creativity judgments and explored the role of individual differences. Results suggests that originality or novelty of expression is a key criterion in judging creativity (Chaudhuri et al., 2024b), regardless of theme, aligning with the standard definition of creativity (Runco & Jaeger, 2012). Beyond originality, aesthetic appeal, and the emotional state of being moved significantly influenced creativity judgments in both genres (Chaudhuri et al., 2024a), with genre-specific differences: Haiku judgments were driven by aesthetic appeal, reflecting its contemplative, beauty-focused nature (Brady, 2019; Parsons, 2007; Belfi et al., 2018; Frame et al., 2024), while Senryu creativity judgments emphasised emotional resonance, consistent with its personal and evocative themes (Opler & Obayashi, 1945). Interestingly, vivid imagery was not identified as a direct predictor of creativity, which is surprising given that forms like haiku rely heavily on vivid imagery for composition and appreciation (Blasko & Merski, 1999), and that imagery is crucial in the cognitive processing of artistic works (Paivio, 1990). However, the results suggest that vivid imagery may serve as a foundational expectation, enhancing aesthetic and emotional

qualities rather than directly driving creativity judgments. Readers may assess creativity based on how imagery supports aesthetic appeal and emotional engagement, rather than its vividness alone. Nevertheless, this nuanced role of imagery warrants further exploration in future studies. This study revealed a stronger impact of individual differences on creativity judgments in Senryu compared to Haiku. In Senryu, traits like openness, intellect, and vividness in visual and auditory imagery moderated the effects of aesthetic appeal and state of being moved on creativity judgments. For Haiku, only auditory imagery positively influenced state of being moved. Semantic memory analysis showed that Haiku preferences were linked to more flexible, interconnected networks, while Senryu preferences reflected a modular, compartmentalised approach to creativity judgment.

These findings highlight the unique ways in which creativity is evaluated in brief, structured poetry forms, demonstrating how theme and structure shape creative perception. Additionally, the findings emphasise the role of individual differences in creativity judgments, highlighting the potential to tailor creative content to resonate with diverse audiences. These insights may extend beyond poetry to fields such as advertising, social media, and education, where concise, impactful communication is essential. This study thus emphasises the role of structured brevity in creative evaluation, offering a framework for understanding how brief yet thematically rich texts enhance meaningful creative experiences.

Chapter 7 concludes the thesis with a neuroscientific study using EEG to investigate the neural correlates of creativity judgments in poetry. Power spectral analysis explored how key predictors of poetic creativity—aesthetic appeal, vivid imagery, and emotional engagement— are linked to oscillatory brain activity across three regions of interest: frontal, fronto-temporal, and parieto-occipital. Power spectral density was examined across five frequency bands: delta [0–4 Hz], theta [4–8 Hz], alpha [8–12 Hz], beta [12–30 Hz], and lower gamma [30–48 Hz]. Linear mixed-effects models, with creativity predictors as outcome variables and interactions between spectral power, poem conditions, and phases (reading and contemplation) as fixed effects, along with participant intercepts as random effects, revealed distinct neural oscillation patterns across the analysed frequency bands. The aesthetic appeal of Haiku was linked to increased gamma activity in the left parieto-occipital region, while Senryu involved left frontal alpha suppression. Vivid imagery in Haiku showed decreased alpha activity in the left frontal region, whereas Senryu engaged theta suppression in the right fronto-temporal region, alpha suppression in the left frontal and right fronto-temporal regions, and beta activity in the right parieto-occipital region. For the emotional state of being moved, Haiku showed increased beta activity in the left parieto-occipital and right fronto-temporal regions. Overall, Senryu perception demonstrated greater oscillatory involvement across brain regions, particularly in aesthetic

appeal and imagery processing.

This study advances the understanding of the neural mechanisms underlying poetry evaluation by demonstrating how distinct oscillatory patterns correspond to specific cognitive and emotional processes across poetic genres. The findings highlight the centrality of mid-frequency rhythms—theta, alpha, and beta—in creativity judgments, revealing how poetry engages neural patterns linked to attention, imagery, and emotional processing. For instance, Haiku's vivid, nature-focused imagery is associated with parieto-occipital regions, while Senryu's introspective themes engage frontal and fronto-temporal areas, highlighting genre-specific neural signatures in subjective poetic perceptions. These insights contribute to the growing field of neuroaesthetics by offering a detailed account of how the brain processes creative literary content, emphasising the interplay between emotional resonance, aesthetic appreciation, and cognitive engagement specific to poetic themes. Additionally, this study lays a foundation for interdisciplinary research on the neural dynamics of creativity across art forms, bridging neuroscience, literary studies, and psychology. Looking forward, advancing this research through time-frequency analysis could uncover finer temporal dynamics underlying creativity judgments in poetry, providing deeper insights into how oscillatory rhythms contribute to the cognitive and emotional responses evoked by different poetic genres.

# CHAPTER 9

# CONCLUSION

*"Every exit is an entry somewhere else."*
*— Tom Stoppard*

## 9.1. Contributions, Challenges, and Future Directions

Creativity, as a multifaceted construct, resists simple characterisation—particularly in the context of literary art like poetry, where subjectivity predominates. This thesis set out to explore the intricate interplay between creativity, aesthetics, and cognition, using poetry as its lens, and emphasising the role of individual differences in shaping these judgments. By adopting a multidisciplinary approach that integrates behavioural, computational, and neuroscientific methods, this work advances the understanding of mechanisms underlying evaluations of literary creativity. These insights into the cognitive dynamics of literary appreciation not only deepen our understanding of how poetry engages the human mind but also point out new pathways for exploring the connections between art and cognition. As this research journey draws to a close, it reflects on the contributions made, the challenges encountered, and the opportunities that lie ahead.

Several key conclusions and contributions emerge from this research. Aesthetic appeal stood out as the strongest predictor of creativity judgments in poetry, while emotional valence and vivid imagery played significant supporting factors. This finding advances our understanding of how subjective qualities drive creativity evaluations, reinforcing the interconnectedness of aesthetic and emotional engagement. Expertise was shown to influence these judgments, with experts prioritising aesthetic qualities and non-experts focusing on emotional resonance. This highlights the domain-specificity of poetic creativity judgments, contributing valuable insights to both neuroaesthetics and literary pedagogy. Creativity and aesthetic judgments were found to follow distinct cognitive pathways: creativity prioritised the novelty criterion, while aesthetic appeal relied on reading fluency. This highlights the need for separate frameworks to assess these constructs and the complexity of literary creativity evaluation. Additionally, poetry reading boosted associative creativity by supporting naturalistic thought flow, though it was less effective in generating entirely novel ideas. This finding contributes to understanding how low-

demand literary tasks like poetry reading can enhance associative creativity, while also clarifying their limitations in generating entirely novel ideation. Neural investigations revealed mid-frequency oscillatory activity as central to the genre-specific neural signatures of structured poetry evaluation. This marks a contribution to the field of neuroaesthetics by linking oscillatory patterns to specific poetics perceptions. Finally, considering the inherent subjectivity in poetry perception, the role of individual differences in readers' personalities has been a consistent focus across all studies, highlighting the critical and profound interplay between personality traits, and literary appreciation.

As with any research, this thesis represents a single step in the broader journey in the exploration of a phenomenon as intricate and deeply personal as creativity. A notable methodological feature of this work was the decision not to provide explicit definitions for constructs like creativity during evaluations, adhering to the principles of the Consensual Assessment Technique (CAT: Amabile,1982). While this approach is widely regarded as the gold standard in creativity assessment (Baer & McKool, 2009) and supports context-sensitive and unbiased evaluations, it also may introduce potential challenges. The lack of explicit definitions may influence participants' interpretations and evaluative consistency, particularly among non-expert raters. This raises a compelling question for future research: Would providing explicit definitions refine or limit differentiation, especially in instances where creativity and aesthetic judgments diverge? Addressing these gaps could involve integrating explicit instructions or definitions alongside traditional CAT-based instructions to investigate how implicit and explicit models influence creativity judgments. Furthermore, the absence of open-ended questions about participants' conceptualisations of creativity presents another limitation. Employing semi-structured, grounded-theory approaches could offer a deeper understanding of how participants interpret and evaluate constructs like usefulness or originality, shedding light on the nuanced pathways through which these judgments emerge. Such efforts would not only broaden our understanding of evaluative frameworks but also enhance the reliability of creativity assessments and refine methodological approaches.

Another potential limitation of this study lies in its focus on the influence of context and appeal-based characteristics of poetry, without specifically examining structural elements such as rhythm, rhyme, meter (Lau et al., 2018; Obermeier et al., 2013; Aryani et al., 2016; Rasse et al., 2020) that distinguish poetry from other forms of writing. This decision, while broadening the scope of the analysis, limited the ability to investigate the specific effects of structural features on creativity assessments. However, the potential influence of these objective features inherent on the creativity assessment of poems could not be ruled out. Future research could address this gap by incorporating a more diverse and representative sample of poems, allowing for a

deeper exploration of how structural characteristics shape perceptions of creativity.

From a neuroscientific perspective, this study relied on spectral analysis, which, while effective for capturing frequency-specific neural activity, does not account for dynamic changes over time (Strijbosch et al., 2022). Future research could address this limitation by incorporating time-frequency analysis and machine learning classification techniques ( Boashash et al., 2015; Iscan et al., 2011) to uncover transient neural patterns tied to specific phases of poem perception. This approach would provide a more precise understanding of the evolving aesthetic and emotional experiences during poetry evaluation. Currently, work is underway to apply time-frequency methods, integrating machine learning classification approaches, to the dataset used in this thesis. These efforts aim to capture the temporal dynamics underlying creativity judgments in poetry and enhance predictive accuracy. Such advancements promise to bridge computational innovation and creativity research, paving the way for a deeper exploration of neural mechanisms involved in literary creativity evaluation.

This research opens several pathways for further exploration. Computational linguistic approaches hold significant potential for advancing our understanding of creativity assessments in poems. Text analytics using natural language processing, including sentiment analysis and topic modelling, could be applied to investigate the influence of structural and semantic features on creativity assessments, expanding beyond the appeal-based characteristics explored here. Deep Neural Networks (DNN), particularly transformer-based architectures like Bidirectional Encoder Representations from Transformers (BERT), could be highly promising for uncovering nuanced linguistic patterns and semantic relationships in poetry, offering profound insights into how language drives creativity judgments. Furthermore, semantic network analysis could reveal how an individual reader's memory structure shapes their evaluation of a poem's creative potential. Additionally, machine learning-based classification approaches could be applied to neural data to uncover dynamic patterns tied to specific phases of poetry perception and creativity evaluation. These advancements could lead to more robust and interdisciplinary models of creativity evaluation, integrating computational methods with literary and psychological insights.

## 9.2. Closing Remarks

As I conclude this thesis, I reflect on the remarkable journey of exploring the delicate interplay between poetry, creativity, and cognition. This journey has been as challenging as it has been rewarding, with each step deepening my appreciation for the multifaceted nature of creative expression of language. Investigating how we engage with and evaluate poetry has been more than a scholarly pursuit—it has been a source of profound joy. Through every experiment, result, and analysis, I have been continually inspired by the richness of human thought and the boundless possibilities of scientific inquiry.

If I were to reflect on the sense of fulfilment and wonder I've experienced throughout this research journey, it would be rooted in my deep-seated fascination with poetry, its universal appeal, and the enduring mystery of creativity. This work is more than an academic milestone to me—it represents a single step in a broader journey to uncover the profound connections between art and the human mind. I feel deeply fulfilled by the opportunity to explore the intricate relationships between creativity, aesthetics, and cognition. Looking ahead, I am inspired by a renewed sense of purpose and a deep commitment to further exploring how we experience and evaluate poetic art. Steve Jobs' words resonate deeply with me: "The journey is the reward." It is this pursuit of discovery, curiosity, understanding, and above all happiness that makes the journey so joyful. The challenges and revelations encountered along the way have not only enriched my perspective but will continue to inspire and propel my work in the years ahead.

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# Appendix-1

# Questionnaires Used

## Chapter 2

1. Clarity: How clear was the content of the poem?
2. Aesthetic appeal: How aesthetically appealing was the poem?
3. Felt valence: How positive (higher scores) or negative (lower scores) did you feel when you read the poem?
4. Felt arousal: How stimulating (higher scores) or relaxing (lower scores) did you feel when you read the poem?
5. Surprise: How surprising was the poem? By "surprise" we mean a contrast to expectation in the concept of the poem. Please mention the line(s) where you found surprise in the poem.
6. Creativity: How creative was the poem? Please answer based on your intuitive understanding of creativity of poem.
7. (Expertise criterion): Are you graduate/postgraduate in English?
8. (Poetry association criterion): How long have you been associated with English poetry?

## Chapter 3

**Openness/Intellect:**

1. Enjoy the beauty of nature
2. Believe in the importance of art
3. Love to reflect on things
4. Get deeply immersed in music
5. Do not like poetry (R)
6. See beauty in things that others might not notice
7. Need a creative outlet
8. Seldom get lost in thought (R)
9. Seldom daydream (R)
10. Seldom notice the emotional aspects of paintings and pictures (R)
11. Quick to understand people
12. Have difficulty understanding abstract ideas (R)
13. Can handle a lot of information
14. Like to solve complex problems
15. Avoid philosophical discussions (R)
16. Avoid difficult reading material (R)

17. Have a rich vocabulary 18. Think quickly
19. Learn things slowly (R)
20. Formulate ideas clearly


**Awe-proneness**

1. I often feel awe
2. I see beauty all around me
3. I feel wonder almost everyday
4. I often look for patterns in the objects around me
5. I have many opportunities to see the beauty of nature
6. I seek out experiences that challenge my understanding of the world

**Epistemic Curiosity**
1.I enjoy learning about subjects which are unfamiliar
2. I am fascinating to learn new information
3. I enjoy exploring new ideas
4. I learn something new/ like to find out more
5. I enjoy discussing abstract concepts
6. I see a complicated piece of machinery/ ask someone how it works
7. I enjoy new kind of arithmetic problem/ enjoy imagining solutions
8. I enjoy incomplete puzzle/ try and imagine the final solution
9. I am interested in discovering how things work
10. I enjoy riddle/ interested in trying to solve it


# Chapter 4

1.Reading Fluency: How Easy is it to read this poem?
2.Aesthetic Appeal: How Aesthetically Appealing is this poem?
3.Valence: How Positive (Higher Scores) or Negative (Lower Scores) is the content of the poem?
4.Arousal: How stimulating (higher scores) or relaxing (lower scores) is the poem?
5.Surprise: How Surprising is this poem? By "Surprise" we mean a contrast to expectation in the concept of the poem.
6.Vividness of Imagery: How Vivid is the Imagery evoked from this poem?
7.Originality: How Original do you find this poem? Use your own subjective understanding of originality.
8.Usefulness: How Useful to you do you find this poem? Use your own subjective understanding of usefulness.
9.Creativity: How Creative is this poem? Use your intuitive understanding of creativity.


**Vividness of Visual Imagery Questionnaire (VVIQ)**

Instruction: The VVIQ is a self-report measure of the clarity and liveliness of visual imagery and, in so doing, aims to evoke images that vary in vividness, ambiance, and feeling as well. The instructions state the following:
"Visual imagery refers to the ability to visualize, that is, the ability to form mental pictures, or to 'see in the mind's eye.'"

Instructions to participants will be as follows:
For each item on this questionnaire, try to form a visual image, and consider your experience carefully. Please note that there are no right or wrong answers to the questions, and that it is not necessarily desirable to experience imagery or, if you do, to have more vivid imagery.

Scale
1.No image at all (only "knowing" that you are thinking of the object)
2. Vague and dim
3.Moderately vague
4.Neutral
5.Moderately Clear
6.Clear and reasonably vivid
7.Perfectly clear and as vivid as normal vision

Theme1
Think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind's eye. Then rate the following items:
The exact contour of face, head, shoulders, and body. (Please tick one)
Characteristic poses of head, attitudes of body, etc. (Please tick one) The precise carriage, length of step, etc., in walking. (Please tick one) The different colours worn in some familiar clothes. (Please tick one):

Theme 2
Visualize a rising sun. Consider carefully the picture that comes before your mind's eye. Then rate the following items.
The sun is rising above the horizon into a hazy sky. (Please tick one) The sky clears and surrounds the sun with blueness. (Please tick one) Clouds. A storm blows up, with flashes of lightning. (Please tick one) A rainbow appears. (Please tick one)

Theme 3
Think of the front of a shop to which you often go. Consider the picture that comes before your mind's eye. Then rate the following items.
The overall appearance of the shop from the opposite side of the road. (Please tick one)

A window display including colours, shapes, and details of individual items for sale. (Please tick one) You are near the entrance. The color, shape, and details of the door. (Please tick one)
You enter the shop and go to the counter. The counter assistant serves you. Money changes hands. (Please tick one)

Theme 4
Finally, think of a country scene which involves trees, mountains and a lake. Consider the picture that comes before your mind's eye. Then rate the following items.
The contours of the landscape. (Please tick one) The colour and shape of the trees. (Please tick one) The colour and shape of the lake. (Please tick one)
A strong wind blows on the trees and on the lake, causing waves. (Please tick one)

**The Bucknell Auditory Imagery Scale—Vividness (BAIS-V)** [ Abbreviated as AVIQ throughout the thesis]

Instruction: This scale is designed to measure auditory imagery, or the way in which you "think about sounds in your head." For the following items you are asked to do the following: Read the item and consider whether you think of an image of the described sound in your head. Then rate the vividness of your image using the following "Vividness Rating Scale." If no image is generated, give a rating of 1. Please feel free to use all of the levels in the scale when selecting your ratings.

Vividness Rating Scale
1.No image at all (only "knowing" that you are thinking of the object)
2. Vague and dim
3.Moderately vague
4.Neither vague nor vivid
5.Moderately vivid
6.Clear and reasonably vivid
7.Perfectly clear and as vivid as actual sound

Vividness Rating
1.Consider the beginning of the song "Happy Birthday."
The sound of a trumpet beginning the piece.

2.Consider ordering something over the phone. The voice of an elderly clerk assisting you.

3.Consider being at the beach.
The sound of the waves crashing against nearby rocks.

4.consider going to a dentist appointment.
The loud sound of the dentist's drill.

5.consider being present at a jazz club. The sound of a saxophone solo.

6.consider being at a live baseball game.
The cheer of the crowd as a player hits the ball.

7.consider attending a choir rehearsal.
The sound of an all-children's choir singing the first verse of a song.

8.consider attending an orchestral performance of Beethoven's Fifth.
The sound of the ensemble playing.

9.consider listening to a rainstorm. The sound of gentle rain.

10.Consider attending classes.
The slow-paced voice of your English teacher.

11.consider seeing a live opera performance.
The voice of an opera singer in the middle of a verse.

12.consider attending a new tap-dance performance. The sound of tap-shoes on the stage.

13.consider a kindergarten class.
The voice of the teacher reading a story to the children.

14.consider driving in a car.
The sound of an upbeat rock song on the radio.

# Chapter 5

**Mind wandering (Dundee Stress State Questionnaire: DSSQ)**

1.I was determined to succeed on the task. (Task engagement)
2.My attention was directed towards the task.
3.I thought about something that happened earlier today. (Worry)
4.I thought about personal concerns and interests.

# Daydreaming Trait

## (Daydreaming Frequency subscale (DDFS) of the Imaginal Process Inventory (IPI)

TABLE 1. THE DAYDREAMING FREQUENCY SCALE

1. I daydream
   A. infrequently.
   B. once a week.
   C. once a day.
   D. a few times during the day.
   E. many different times during the day.
2. Day dreams or fantasies make up
   A. no part of my waking thoughts.
   B. less than 10% of my waking thoughts.
   C. at least 10% of my waking thoughts.
   D. at least 25% of my waking thoughts.
   E. at least 50% of my waking thoughts.
3. As regards daydreaming, I would characterize myself as someone who
   A. never daydreams.
   B. very rarely engages in daydreaming.
   C. tends towards occasional daydreaming.
   D. tends towards moderate daydreaming.
   E. is a habitual daydreamer.
4. I recall or think over my daydreams
   A. infrequently.
   B. once a week.
   C. once a day.
   D. a few times during the day.
   E. many different times during the day.
5. When I am not paying close attention to some job, book or TV, I tend to be daydreaming
   A. 0% of the time.
   B. 10% of the time.
   C. 25% of the time
   D. 50% of the time.
   E. 75% of the time.
6. Instead of noticing people and events in the world around me, I will spend approximately
   A. 0% of my time lost in thought.
   B. less than 10% of my time lost in thought.
   C. 10% of my time lost in thought.
   D. 25% of my time lost in thought.
   E. 50% of my time lost in thought.
7. I daydream at work (or school) [Note: Work is defined as any kind, not just for pay.]
   A. infrequently.
   B. once a week.
   C. once a day.
   D. a few times during the day.
   E. many different times during the day.
8. Recalling things from the past, thinking of the future, or imagining unusual kinds of events occupies
   A. 0% of my waking day.
   B. less than 10% of my waking day.
   C. 10% of my waking day.
   D. 25% of my waking day.
   E. 50% of my waking day.
9. I lose myself in active daydreaming
   A. infrequently.
   B. once a week.
   C. once a day.
   D. a few times during the day.
   E. many different times during the day.

# Chapter 6

**Openness/Intellect, Curiosity** (See Study 1 Questionnaires)

**VVIQ, AVIQ** (see Study 2 Questionnaires)

## Mindfulness Questionnaires

1. I could be experiencing some emotion and not be conscious of it until sometime later

 2. I break or spill things because of carelessness, not paying attention, or thinking of something else.

3. I find it difficult to stay focused on what's happening in the present.

 4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.

5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.

6. I forget a person's name almost as soon as I've been told it for the first time

7. It seems I am "running on automatic" without much awareness of what I'm doing.

8. I rush through activities without being really attentive to them.

 9. I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.

10. I do jobs or tasks automatically, without being aware of what I'm doing.

11. I find myself listening to someone with one ear, doing something else at the same time.

12. I drive places on "automatic pilot" and then wonder why I went there.

13. I find myself preoccupied with the future or the past.

14. I find myself doing things without paying attention.

15. I snack without being aware that I'm eating.

## Aesthetic Responsiveness (AReA) Questionnaires

1. I visit museums or go to musical/dance performances.
2. I notice beauty when I look at art.
3. I am emotionally moved by music.
4. When viewing artistic works, I am impressed by their harmony.
5. I sculpt, paint, draw, direct films, or do design work.
6. When I look at art, I feel positive energy or invigoration.
7. I write poetry or fiction.
8. When I look at art, my heart beats faster, I perspire, get dizzy, or have other physical effects.
9. I appreciate the visual design of buildings.

10. Presently (or in the past) I take (or have taken) classes in art, creative writing, or aesthetics.
11. I experience awe, fear, or a feeling of being overwhelmed when looking at art.
12. When viewing artistic works, I feel a oneness, unity or connectedness with the universe/nature/existence/my deity.
13. I am deeply moved when I see art.
14. I experience joy, serenity, or other positive emotions when looking at art.

# APPENDIX-2

# DATA AVAILABILITY

Chapter 2: https://osf.io/rqxm5/

Chapter 3: https://osf.io/9mw7r/?view_only=07137f4871d146c790501f22bc7743d5

Chapter 4: https://osf.io/8m5y9/?view_only=be1b4a5aeda04d979b548c92c6462a23

Chapter 5:
Stimulus selection:
https://drive.google.com/file/d/1IWroaGjU4LKSxP_uVSOMpZpXk2mEgTc/view?usp=sharing
Analysis:
https://drive.google.com/file/d/1vemEIVfdlfNbjH9lCKqAzfyyu6oDPmAR/view?usp=sharing

Chapter 6 & 7:
Haiku set:
https://drive.google.com/file/d/1muMKbuE97JTQroCz6lVZoRhrzsOQn_8C/view?usp=sharing

Senryu set:
https://drive.google.com/file/d/1_DBzR9jcOLzOOdTMlsTr36LgLnBmtbbU/view?usp=sharing

Control set:
https://drive.google.com/file/d/1ZGmyhI4KcvnofylASWUHH-WUP5hfXa3x/view?usp=sharing