The Flushtration Count Illusion: Attribute substitution tricks our interpretation of a simple visual event sequence

Cyril Thomas[1], André Didierjean[2] and Gustav Kuhn[1]

[1] Department of Psychology
Goldsmiths University of London
New Cross, London SE14 6NW
United Kingdom

[2] Laboratoire de Psychologie & MSHE
Université de Bourgogne-Franche-Comté,
30 rue Mégevand, 25030 Besançon
France

Address for correspondence: Cyril Thomas, Department of Psychology, Goldsmiths University of London, New Cross, London SE14 6NW, United Kingdom

E-mail: Cyril.thomas@univ-fcomte.fr

Telephone number: +33 (0)3 81 66 51 92

Fax number: +33 (0)3 81 66 54 40

Abstract: When faced with a difficult question, people sometimes work out an answer to a related, easier question without realizing that a substitution has taken place (e.g., Kahneman; 2011). In two experiments, we investigated whether this attribute substitution effect can also affect the interpretation of a simple visual event sequence. We used a magic trick called the "Flushtration Count Illusion," which involves a technique used by magicians to give the illusion of having seen multiple cards with identical backs, when in fact only the back of one card (the bottom card) is repeatedly shown. In Experiment 1, we demonstrated that most participants are susceptible to the illusion, even if they have the visual and analytical reasoning capacity to correctly process the sequence. In Experiment 2, we demonstrated that participants construct a biased and simplified representation of the Flushtration Count by substituting some attributes of the event sequence. We discussed of the psychological processes underlying this attribute substitution effect.

Keywords: Magic, Attribute Substitution Effect, Misdirection, Flushtration Count Illusion, Perception, reasoning, Dual process theory

Word Count: 4992.

Significance Statement

Studies on reasoning have shown that people often answer difficult questions by modifying parts of it, and then answering a related easier version without realizing the substitution. We investigated whether this attribute substitution can also affect the interpretation of a simple visual event sequence. We used a magic trick called the “Flushtration Count Illusion”, a method

used to give the illusion of having seen multiple cards with identical backs, when in fact only the back of one card is repeatedly shown. Our investigation is the first experimental evidence to suggest that attribute substitution influence the interpretation of a simple visual event sequence. Our results provide new insights concerning the influence of heuristics on perceptual experiences.

Introduction

In everyday life, our ability to think fast allows us to quickly adapt to new circumstances and make decisions. According to Kahneman's dual process model (see Kahneman, 2011), decision making and problem solving involve two complementary systems. System 1 refers to heuristic based processes. Its operations are intuitive, automatic, and unconscious. This system is fast and uses fewer cognitive resources. Conversely, system 2 refers to analytical reasoning processes. Its operations are counter-intuitive, controlled, and conscious. This system is relatively slow and requires more cognitive resources. While in many situations it is desirable to process information quickly (system 1), these quick processes are more prone to error and subject to cognitive biases (see Bourgeois-Gironde & Vanderhenst, 2009; Kahneman 2011). The classic "bat-and-ball problem" illustrates a situation where quick reasoning can easily lead to an error:

"A bat and a ball together cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?"

When people try to solve this question, they often incorrectly answer "10 cents." The correct answer is actually 5 cents (i.e. $0.05). Given that the bat costs $1 more than the 5-cent ball, then the bat must cost $1.05. The problem can be deceptive, even though it is arguably not intrinsically difficult; multiple studies have demonstrated that large proportions of participants (even 66% of MIT students) fail to find the correct answer (see Bourgeois-Gironde & Vanderhenst, 2009; Frederick, 2005). According to De Neys, Rossi and Houdé (2013), this error results from the "attribute substitution" effect: rather than directly addressing the question, participants answer an easier question without realizing that a substitution has taken place (e.g., Kahnemann; 2011; Kahneman & Frederick, 2002; Thompson, 2009; Toplak et al., 2011). In this particular instance, when presented with the "bat and ball" problem, the participants could substitute the "bat costs $1 more than the ball" statement with a simpler "the bat costs $1" statement. This intuitive, and automatic, attribute substitution simplifies the problem, but leads to a wrong answer. According to Kahneman and Frederick (2005; see also Thompson, 2009; Toplak et al., 2011), participants fail to notice this substitution and do not realize their error because they do not activate a controlled reflection (system 2) to analyze their answer. If they did, they would surely notice that "10 cents" is wrong because "10 cents + $1.10 = $1.20" and not $1.10. Indeed, once the “10 cents” answer is deactivated, participants are more willing to search for alternatives and to finding the correct “5-cent” answer (see Meyer, Spunt, & Frederick, 2013).

Previous studies in reasoning and decision-making have demonstrated that intuitive and automatic thinking (system 1) can lead participants to substitute/delete some elements of a complex or ambiguous problem to solve an easier or more usual version. Similarly, we frequently use heuristics and automatic reasoning processes to disambiguate complex or incomplete sensory information and interpret it in a meaningful way (see Changizi, 2009). Our perceptual experiences are influenced by our past experiences and expectations (see Hubbard, 2005; Intraub & Richardson, 1989; O'Regan, Rensink & Clark, 1999; Simon & Chabris, 1999) and according to Kahnemann (2003), the attribute substitution heuristic might also underpin some our perceptual experiences. For example, theories on amodal completion (Ekroll, Sayim, Van der Hallen, & Wagemans, 2016; Ekroll, Sayim, & Wagemans, 2013; Kanizsa & Gerbino, 1982; Michotte, Thines, & Crabbe, 1991) suggest that we have a natural tendency to use prior knowledge to fill in things we do not directly perceive. In other words, our perceptual system automatically substitutes the target attribute "*what is visible and not occluded*" with the heuristic attribute “*what (partially occluded) objects are constructed through amodal completion*”. It is generally accepted that the attribute substitution heuristic is responsible for a number of optical illusions and perceptual biases (see Kahneman, 2013). However, to the best of our knowledge, there have been no studies that have experimentally investigate how this phenomenon can bias the interpretation of a simple visual event sequence.

In this paper, we explore the role of the attribute substitution heuristic in the interpretation of a simple but unusual visual event sequence. We propose that people, at times, substitute part of an unusual visual event sequence for a simpler and more usual construal of it.

The attribution substitution errors may explain why we are so easily fooled by simple sleight of hand tricks, which is why we chose the domain of magic to study this heuristic.

Over the centuries, magicians have developed intuitive knowledge about people's cognitive limitations (Kuhn, Amlani, & Rensink, 2008; Rensink & Kuhn, 2014, 2015; Thomas, Didierjean, Maquestiaux, & Gygax, 2015; see Thomas, Didierjean & Nicolas, 2016, for very early studies on this topic), and magic offers scientists a versatile toolkit to investigate a variety of cognitive processes, including perception, memory, attention and reasoning (Kuhn, Caffaratti, Teszka & Rensink, 2014). According to Kuhn and al. (2008), magicians' performances can lead their audiences to adopt more intuitive, automatic, and reflexive reasoning-styles. In other words, magic performances are designed to activate system 1 at the expense of system 2. For example, when a magician pressures participants to quickly pick a card, they will be more inclined to intuitively choose the most visible one (because it is the most accessible/economic choice) and will fail to notice that it was not a free choice (Kuhn, Caffaratti, Teszka & Rensink, 2014). According to Thomas and al. (2015), during a magic trick, our intuitive thinking can also lead us to interpret an unnatural move (e.g., the magician transferred a coin from one hand to the other one in an unusual way) as a related but different/simplified natural or familiar move (the magician transferred the coin from one hand to the other one).

The "Flushtration Count Illusion" is a classic magic effect that illustrates this idea. The Flustration Count is a method that creates the illusion that all the cards of a small packet have identical backs, when in fact they are all different. To produce this effect, the magician shows the back of the bottom card of the stack, after which he turns his wrist, and deals the top card (rather than the one that has been shown) of the stack. He then repeats this sequence until all of the cards have been dealt on the table (see Figure 1 and appendix A for a video link). When performed successfully, the Flustration Count Illusion should leave the audience with the impression that the magician has displayed the backs of all of the dealt cards, when in reality they have only seen the bottom card.

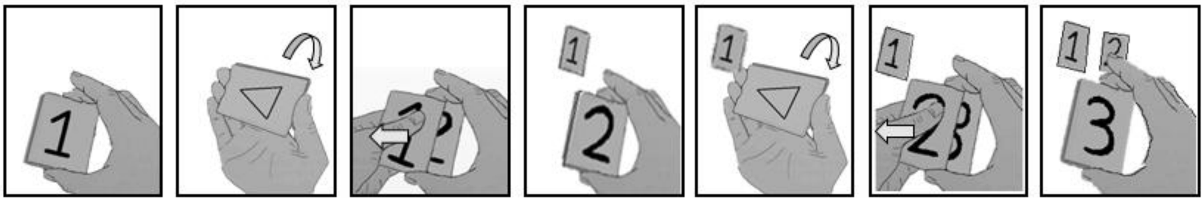

Figure. 1. Visual description of the Flushtration Count sequences. The magician has a small stack of cards in his hand (e.g., four cards with a number from 1 to 4 draw on their face), he shows the top one (number 1), turns his wrist to show the back of the bottom card that represent a triangle, he turns his wrist to deals the top card on the table (number 1). He reproduces the same sequence for the number 2 and then for all the remaining cards of his small stack.

Magicians commonly use the Flustration Count, and we propose that the illusion results from an attribution substitution error. According to this hypothesis, when exposed to the Flushtration Count illusion, people substitute some parts of the unusual/unfamiliar sequence with something simpler and more usual/expected: he showed me the back of the top card and then he dealt it on the table. However, there are several other potential explanations that we would like to investigate. For example, it is possible that people fail to correctly see which card (top one or bottom) has been dealt because the dealing action is too fast, and thus people fail to perceive the action correctly[1]. We call this the "quicker than the eye" hypothesis, and we will

[1] Magician often use this kind of "fast deal confusion" to make spectators believe that he has dealt the top card of the deck while in fact, he has quickly deal another card of the same deck.

test it by directing participants' attention to the top card before it is dealt, thus ensuring that it can be correctly seen. Another possibility is that people simply lack the analytical capacity to correctly understand the result of the event sequence. For example, people might accurately perceive that the magician showed them the back of the bottom card of the stack, and proceeded to turn his wrist, but they might simply fail to understand which of the cards (top or bottom) they saw (before he turned his wrist). We will address this question by directly questioning participants' understanding of this partial sequence.

We present two experiments designed to investigate the possible mechanisms underlying the Flushtration Count Illusion. In experiment one, we evaluated participants' susceptibility to the Flushtration Count Illusion by ensuring that the action is clearly visible, and assessed whether the illusion results from limitations in understanding the action sequence. We predict that most of the participants will be susceptible to the first presentation of the illusion, even if they have the analytical reasoning (system 2) capacity to process the unusual sequence. We also predict that the illusion is sufficiently powerful that the activation of this prior analytic reasoning will fail to break it. In Experiment two, we exposed participants to the Flushtration Count and asked them to reproduce it themselves. We predicted that most of the participants would fail to reproduce the count and would substitute some parts of the Flushtration Count to propose a simpler and more usual version of it.

Experiment 1

The aim of Experiment 1 was to measure participants' susceptibility to the Flushtration Count Illusion and to evaluate whether the illusion occurred because of visual difficulties and/or limitations in analytical (system 2) reasoning. We also tested whether the activation of this analytical process could break the illusion.

Method

Participants

Forty students (22 female, 18 male, mean age: 21 years, SD: 2,01) participated in the experiment. All participants had normal or corrected-to normal visual acuity and provided informed consent.

Procedure

A three-phase magic trick (see Appendix B for video links) was presented live by the same performer, and each participant was tested individually. The magic performance was presented as a memory task rather than a magic trick.

Phase 1: The aim of the first phase was to establish the extent to which participants where susceptible to the Flushtration Count. In this phase, the performer presented two sets of 4 playing cards. The first set of cards was simply intended to enhance the complexity and the credibility of the presumed memory task. This set of cards, which was arranged in a row with all 4 backs hidden, had the letters A, B, C and D written on their face. During this phase, participants never see the backs of these cards. The second set of cards was used to perform the Flushtration Count Illusion. This set of cards had the numbers 1, 2, 3, and 4 written on their faces, and these four cards were arranged in a stack (the card number 1 was the top card, the number 4 was the bottom one and a triangle was represented on its back). The magician showed the order of the four number cards and then performed a Flushtration Count, showing four times the back of the card number 4 that represented a triangle. The four numbered cards were dealt in a row in front of the letter cards row (1 in front of A, 2 in front of B…) (see Appendix B for a video link[2]). The experimenter pointed to the number printed on the face of each card and read it out aloud, before and after each card was dealt on the table. Doing so ensured that it was impossible for the observer to not see which card was dealt on the table (the top card). The magician then verbally gave the following instructions: "For each card, I will ask you to tell me whether you saw the front of the card. If so, please can you tell me what you saw". After these instructions, the magician pointed to each of the cards in the following order: A, B, C, D[3], 1, 2, 3, 4, and took note of the answers. To answer the question correctly, the participant needed to state that they had *only* seen the back of the card number 4, which represented a triangle, and they had not seen the backs of any of the other cards.

Phase 2: The aim of the second phase was to establish whether participants had the analytical capacities to understand the event sequence. The magician took the four letter-cards and placed them in a stack (the card marked 'A' was the top card and the card marked 'D' was the bottom card and its back represented a circle). As during the first sequence of the Flushtration Count, he rotated his wrist to present the back of the bottom card revealing a circle, and then rotated his wrist again (the top card is now the card marked with the number 1) (see Appendix B for a video link). He then fanned the four cards to show the four letters, and asked participants the following question: "if I want to place on the table the card I just showed you before with a circle drawn on its back, which card should I deal?" To answer correctly, the participant needed to indicate the bottom card, which was the card marked with the 'D.'

[2] The whole videos were filmed without any sound. However during the real live experiment, the magician verbally gave the instructions and read the number (or letter) printed on the face of each card aloud before and after each card was dealt on the table.

[3] The A, B, C and D cards were included to justify the potential answer "I have not seen the back of this card" without enhancing the suspicion on the numbered cards for participants who were sure that they have seen four triangles during the Flushtration Count.

Phase 3: The aim of the final phase was to explore whether the analytical process that was explicitly activated and engaged in phase 2 failed to eliminate the illusion. The magician performed a second Flushtration Count (from the letter A to the letter D), showing four times the back of the card D that represented a circle (see Appendix B for a video link), after which he asked participants the same question as in phase 1.

Results

Phase 1: In the first phase, 34/40 participants (85%) failed to provide the correct answer. Among these 34 participants, 32 claimed that they saw a triangle on each of the cards (1, 2, 3 and 4), and two of the participants claimed that they saw a triangle under cards number 2, 3 and 4. Only six participants (non-susceptible) correctly claimed that they only saw the triangle under the card number 4.

Phase 2: When asked which card has been shown with a circle drawn on its back, almost all the participants (37/40) gave the correct answer (the bottom card), and only 3 participants falsely assumed that the magician had taken the top card. Incidentally, all of the participants who gave the wrong answer where susceptible to the Flushtration Count in phase one. These results demonstrate that the illusion does not rely on an inability to analytically understand the event sequence.

Phase 3: When exposed to a second Flushtration Count, 55% of participants were susceptible towards the illusion, and whilst the susceptibility was significantly reduced (55% vs. 85%, McNemar $\chi^2 = 8{,}64$, $p < .01$) the illusion is still surprisingly effective. 62% of the participants who experienced the illusion in phase one, remained susceptible towards the illusion. One of the six participants who did not experience the illusion in phase one experienced it in phase 2.

Discussion

Experiment 1 showed that a large majority of people are susceptible to the Flushtration Count Illusion, even when they are verbally reminded about which card is placed on the table. When performed in this context it is extremely unlikely that participants failed to correctly see the action. In the next experiment we tried to rule out the "quicker than the eye hypothesis" by verifying participants' capacity to correctly see which card was dealt onto the table. We also demonstrated that people have the analytical reasoning capacity to correctly understand that the card that is dealt (the top one) is not the card that has been shown (the bottom one). Rather surprisingly, even after having correctly understood the key move of the Flushtration Count sequence, 55% of our participants failed to activate an efficient analytical reflection and were susceptible towards the illusion in the last phase. These results support the attribute substitution hypothesis. We suggest that when people are exposed to the Flushtration Count Illusion, they automatically construct a simplified version of the unusual sequence: "he showed me a card with a triangle on its back, and he put the top card on the table, so the top card should be the card with the triangle". This simplified version of the unusual sequence is probably sufficiently familiar and therefore will not raise the suspicion of the analytical process that has been activated by the experimenter question in the second phase.

The aim of the Experiment 2 was to confirm the attribute substitution hypothesis by investigating participants' representations of the Flushtration Count after being exposed to the illusion.

Experiment 2

The aim of this experiment was to gain insights into the way people remember the event sequence, by asking them to reproduce the actions immediately after the have seen the illusion.

Method

Participants

Forty students (22 female, 18 male, mean age: 22 years, SD: 1,93) participated in the experiment. All participants had normal or corrected-to normal visual acuity and provided informed consent and signed the ethic forms.

Procedure

Phase 1: This phase was exactly the same as the Phase 1 used in Experiment 1.

Phase 2: The aim of this phase was to investigate how participants represented the Flushtration Count after Phase 1, and also to ensure that participants have correctly seen the magician deal the top card during the Flushtration Count. The magician asked participants to take the four numbered cards and to place them in a stack that respected the order of his own stack at the beginning of the experiment. The correct order is number 1, 2, 3 and 4 with the number one as the top card of the stack and the number 4 as the bottom card. Participants were then asked to take the stack and reproduce as similar as possible the actions the magician made with this stack during the experiment (each cards had a triangle on its back). The experimenter recorded each of the participants' actions in writing.

Results

Phase 1: 32/40 participants (80%) falsely claimed to have seen the triangle under each of the cards (see Table 1). Eight participants (non-susceptible) correctly claimed that they only saw the triangle under the card number 4. These results replicates those obtained in Experiment 1.

Phase 2: In the imitation phase, 38/40 participants (95%) arranged the cards in the correct order (with the card number 1 as the top card and the number 4 as the bottom one). Among the 32 participants who were susceptible to the Flushtration Count Illusion, 29 failed to reproduce the Flushtration Count sequence (see Table 1 for a detailed description of the participant's answers) and most of them (26/29) dealt the four cards in an usual/expected way: they took the top card, turned it to show its back, and turned it again to place it on the table (they repeated this action for the three other cards). All of the participants who were not susceptible to the illusion (8) accurately reproduced the Flushtration Count. Our results confirm that the Flushtration Count Illusion is not caused by a "quicker than the eyes" effect, because virtually all of the participants (97,5%) dealt the top card, which illustrates that they correctly noticed the top card being dealt on the table.

Discussion

The aim of the Experiment 2 was to investigate whether the Flustration Count results from an attribution substitution error. Our results confirm that most of the participants who are susceptible to the illusion swap some attribute of the Flushtration Count to produce a simplified and more usual/expected version of it. Thus, when participants are exposed to this unusual sequence: "he turns his wrist to show me the back of a card (the bottom one), he turns his wrist again and deals the top card", they keep the main elements of the sequence but slightly alter the order to create a representation that is quite similar, but more expected and less paradoxical: "he took the top card, turns his wrist to show me its back he then turns his wrist again to deal it on the table". This substituted version of the Flushtration Count is probably so familiar and expected that most people fail to engage a more analytical System 2 reflection that would lead them to find the correct answer (see Experiment 1).

Table. 1. Detailed description of participants' answers and actions for each phase (1 and 2).

Phase 1	32/40 Susceptible					8/40 Non-susceptible
Phase 2 Order (1234)	30/32 Correct (1234)			2/32 Non-correct (4321)		8/8 Correct (1234)
Phase 2 Type of count	25/32 Usual/expected count (top cards shown and dealt)	3/32 Flushtration count	2/32 Cards dealt in a row and turned one by one	1/2 Usual/expected count (top cards shown and dealt)	1/2 Inverted Usual/expected count (bottom cards shown and dealt)	8/8 Flushtration count

General discussion

Previous studies on reasoning and decision making have shown that people often answer difficult questions by modifying parts of the question, and then answering a related easier version of it without realizing that a substitution has taken place (e.g., Kahneman; 2011; Kahneman & Frederick, 2002; Thompson, 2009; Toplak et al., 2011). We investigated whether this attribute substitution can also affect the interpretation of a simple visual event sequence. We used a magic trick called the "Flushtration Count Illusion", a method used to give you the illusion of having seen multiple cards with identical backs, when in fact only the back of one card is repeatedly seen. In two experiments, we tested the hypothesis that the Flushtration Count Illusion is caused by an attribute substitution effect.

Our results showed that, even if participants have the visual and analytical reasoning capacity to correctly understand the event sequence (Experiment 1, phase 2), most individuals substitute some attribute of this unusual visual event sequence to construct a simpler and a more typical version of it (Experiment 1 phase 1 and 3, Experiment 2). Instead of noticing that the experimenter has repeatedly shown the back of the bottom card, they interpret the sequence as if he has shown one by one the backs of all the cards of the stack. Surprisingly, while most of the participants understand the visual event sequence when they are invited to analyse it (Experiment 1, phase 2), more than half of them still failed to activate this analytical thinking when they were exposed to the same sequence for a second time (Experiment 1, phase 3). To the best of our knowledge, our systematic investigation of the Flustration Count illusion is the first experimental evidence to suggest that this attribute substitution influence the interpretation of a simple visual event sequence.

According to Kahneman's dual process theory, much of our reasoning is based on fast and sloppy system 1 process, and the attribute substitution represents one of these shortcuts. As illustrated in the 'bat and ball' problem, (see Kahneman & Frederick, 2005; Meyer, Spunt & Frederick, 2013; Thompson, 2009; Toplak et al., 2011), when participants are invited to analyse their answer, they quickly notice that "10 cents" is a wrong answer because "10 cents + $1.10 = $1.20" and not $1.10. Once this error is noticed, participants quickly rectified the error and identified the correct answer (Meyer, Spunt, & Frederick, 2013). In the present study, we suspect that a critical analysis of the visual event sequence can engage a 'system 2 like' process which helps people override the attribute substitution error (see Experiment 1, phase 2). However, despite this critical analysis, when exposed to the Flushtration Count a second time (see Experiment 1, phase 3), nearly half of our participants were still susceptible towards the illusion which suggests that this visual event sequence attribution effect is more resilient than those found in abstract reasoning (e.g., Kahneman & Frederick, 2005; Meyer, Spunt, & Frederick, 2013; Thompson, 2009; Toplak et al., 2011).

According to Thomas and Didierjean (2016a; 2016b; see also Beth & Ekroll, 2015; Ekroll, Sayim, and Wagemans, 2013; Barnhart, 2010; Kuhn & Rensink, 2016) during a magic trick, participants' susceptibility to the illusion often relies on their capacity to reduce the dissonance between what they saw and what they expected to see. To reduce this dissonance, some participants could prioritize their beliefs and ignore some perceptual feedback (see Thomas & Didierjean, 2016a). We propose that participants could also reduce this dissonance by modifying some attribute of the unusual visual feedback to construct a more prototypical version of it. In the Flushtration Count Illusion, the magician's actions are visually similar to participants' expectations of how people typically deal cards onto the table. In both cases, the person must twist his/her wrist twice at different point in the sequence, and shows the back of a card and place a card on the table. The first difference between these two deals is the order of the actions: in the typical deal, a card is taken, shown and then dealt; in the Flushtration Count Illusion, a card is shown, then a card is taken and dealt. By substituting the "showing then taking" sequence with the "taking then showing" one, participants' could substitute the unusual action (i.e. Flushtration Count) with a more typical deal. Secondly, in the typical deal the card that has been taken is shown; in the Flustration Count Illusion, the bottom card, rather than the one that was taken is shown. Although participants know that the stack of four cards is composed of four elements, the stack is very thin and thus it looks like a single object with a back (the back of the bottom card) and a face (the number/letter of the top card). Thus, when the magician performs the Flushtration Count Illusion and deals the top card on the table, it looks like he dealt the single object that was previously shown (with a back: the back of the bottom card). By substituting the concept of a "stack of card" with the concept of "a single object/card", participants could complete the construction of a simplified and acceptable representation of the action as a typical deal without alerting a more analytical system 2 monitoring (see Kahneman, 2003).

We are confident that this principle may also account for the effectiveness of some simple, yet effective other magic tricks (e.g., false card cuts, sleight of hand effects; see

Appendix C for a video link). In all of these cases, the magic effect relies on people interpreting the unusual action as a more familiar prototypical action.

According to Kahneman (2011), when the attribution substitution error is committed, people generally do not realize that a substitution has taken place. However, others have shown that people are less confident in their answer when a substitution has occurred, which suggests they are not completely oblivious to the error (see De Neys, 2012; De Neys, 2018; De Neys, Rossi & Houdé, 2013). Whilst we did not measure participants' confidence rating, our informal observations suggest that participants were not aware of the substitution. Almost all of the participants who were susceptible towards the illusion were very surprised to learn that the three cards were blank. This strong surprise attests to a strong violation of expectations, that might not be as strong if their convictions were uncertain. Even after the explanation of the illusion, some participants struggled to understand it. However, more research is required to establish whether people can consciously, or unconsciously detect that substitution error has occurred.

Our own experience with this illusion suggests that at some level the Flustration Count Illusion is impenetrable to analytical reasoning. For example, when we watch the following video clip in which the illusion is performed (see Appendix A), even though we are fully aware of how this trick works, we are still partially fooled by it. As we are watching the trick, we rationally know that we are not seeing four red backed cards, yet we still feel as if we have seen them. Kahneman's dual process model cannot fully account for this enduring effect, because according to his model, once system 2 detects an error, it will always override system 1 (Kahneman, 2011).

There are, however, numerous of instances where people hold irrational believes that are resilient to analytical thought. For example, many magical beliefs, such 'negative contagion', or the 'law of similarity' (Risen, 2016) are irrational beliefs that we know to be unfounded, yet they still influence our behaviour. For example, when people avoid eating a piece of chocolate simply because it physically resembles dog faeces; they are fully aware that this behaviour is irrational (Rozin, Millman & Nemeroff, 1986). In this context, system 1 quickly generates the magical intuition, based on the similarly heuristic "like causes like", which once activated acts as a default for judgments and behaviours. However, unlike in the abstract reasoning task, this erroneous judgement cannot be corrected though analytical reasoning. Risen (2016) has recently proposed a revised dual process model that accounts for the fact that people often detect an error, but "choose" not to correct it, a process she refers to as acquiescence. Risen suggests that system 2 is not simply 'slow and lazy' it is also a bit of a 'push over', which explains why people maintain and endorse irrational beliefs they know to be wrong. We believe that the Flustration Count Illusion belongs to one of these 'irrational' illusions; you 'feel' as if you have seen the card, even when you rationally know this was not the case (for other illustrations and discussions on the cognitive impenetrability of perception, see Ekroll, Sayim & Wagemans, 2017; Firestone & Scholl, 2016; Pylyshyn, 1999).

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Appendix A.

The Flushtration Count: red to blue:

https://www.youtube.com/watch?v=MyEHbhrENnQ&feature=youtu.be

Appendix B.

Experiment 1:

- **Phase 1:** https://youtu.be/4uZhedZcmoA
- **Phase 2:** https://youtu.be/fTORuVeqm44
- **Phase 3:** https://youtu.be/d2-jdsFTtGs

Appendix C.

Other magic tricks probably based on an attribute substitution effect:

https://www.youtube.com/watch?v=5YsADeoNwyw