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Physical Activity Message Framing and Ethnicity Before and During COVID-19

Jacqueline Francis and Keon West

Department of Psychology, Goldsmiths, University of London

ABSTRACT

People of Black ethnicities are well known to be disproportionately burdened by coronavirus and have poorer health outcomes. Public health messages encouraged physical activity during the pandemic as it is evidenced to positively affect the immune system, however people of Black ethnicities are often reported as failing to achieve the recommended daily amount. Health message framing during COVID-19 specifically in relation to ethnicity and physical activity motivation has yet to be investigated. Two studies examined message frame effect on physical activity motivation prior to and at the onset of the pandemic and how this differed by ethnicity. Gain framed messages were found to positively affect physical activity motivation pre-COVID-19 and during the pandemic fear framed messages were found to positively affect physical activity motivation. Neither of these effects differed by ethnicity. Implications for future physical activity health message framing are discussed.

It is well evidenced that people of Black ethnic groups are disproportionately burdened by coronavirus and have poorer health outcomes (Duncan et al., 2021; Thorlu-Bangura et al., 2021; Valles, 2021). However, people of Black ethnicities are often reported as failing to achieve the recommended daily amount of physical activity which is evidenced to positively affect the immune system (Miller & Gramzow, 2016; Raleigh & Holmes, 2021). Public health messages continued to encourage physical activity during the pandemic despite the enforced movement restrictions to limit the spread of the virus. How such messages are framed in relation to physical activity motivation and ethnicity requires more investigation. Therefore, the purpose of the two studies in this paper was to examine the effect message framing had on motivation to become physically active with two separate populations, one prior to COVID, one during and how this varied by ethnicity.

Terminology

The 2011 UK Census ethnic groupings are used when referring to ethnicity in this paper (Office for National Statistics, 2011). The studies here were conducted in Britain where people are accustomed to being asked for their ethnicity and not their race and maintaining this consistency was helpful in aiding participant understanding. In addition, current scientific research does not support the idea that race is a genuine biological construct, but rather a social one. Using the word ethnicity is a way of signaling that (Smedley & Smedley, 2005).

Ethnic health inequality

People of Black ethnic groups have a four-fold increase in COVID-19 infection compared to White ethnic groups (Lassale et al., 2020). As well as being at higher risk of contracting coronavirus they have poorer outcomes than those of White ethnic groups (GOV.UK, 2020). Recent findings evidence they were more likely to be admitted, more likely to require admission to intensive care, and more likely to die from COVID-19 (Zatorska et al., 2020). Factors attributing to this include poverty socio economic status, preexisting co-morbidities (including cardiovascular disease and obesity) and type of employment, such as front-line care workers and medical professionals (Samuel et al., 2021; Sze et al., 2020). However, when controlling for all these factors those of ethnic minority groups, particularly Black and Asian men still have disproportionately higher COVID-19 risk and morbidity rates (Kirby, 2020; Lo et al., 2021; Qureshi et al., 2021). These disparate health outcomes are widely publicized and generally understood and research into mitigating solutions proliferates (Bernet, 2021; Valles, 2021; Verdini et al., 2021; Woodhead et al., 2021).

Physical activity

Ethnic differences in physical activity levels have previously been investigated and Black ethnicities found to have lower levels of physical activity and be less likely to achieve daily recommended amounts than White ethnicities (Heesch et al., 2000; McElroy, 2002; Saffer et al., 2013). During the restrictions to reduce the spread of the SARs virus physical activity levels reduced (McCarthy et al., 2021; Park et al., 2021; Robinson et al., 2021) and more so for those of minority ethnicities (Sport England, 2020). This difference may contribute to the disproportionality of COVID-19 risk and morbidity experienced by Black ethnicities as physical activity is associated with a reduced risk for severe COVID-19 outcomes (Brown, 2020; Sallis et al., 2021). Investigation into possible determinants of this disproportionality is ongoing yet to date there has been no

CONTACT Jacqueline Francis J.Francis@gold.ac.uk; jfran013@gold.ac.uk Department of Psychology, Goldsmiths, University of London, London SE14 6NW, UK

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specific research into ethnic differences in physical activity motivation during the current pandemic. Prior research finds that Black ethnicities are motivated to be physically active more by health pressures and ill health avoidance than White ethnicities (Egli et al., 2011). Consequently, we were interested in how message frame effects would differ prior to and during the pandemic and be moderated by ethnicity.

Message framing

Pre-pandemic

Gain framed messages that highlight potential benefits, are usually known to support behavior change more so than fear-based messages that highlight potential losses specifically when the behavior has a relatively certain outcome (Kelly & Hornik, 2016; Toll et al., 2007). Reactions to message framing have been evidenced to vary by ethnicity. Schneider et al. (2001) found responses to message framing differed by ethnicity, with African American women benefitting less from loss framed messages than Anglo and Latina women in a study on mammography use promotion. Similarly, Black Africans were more receptive when exposed to a gain-framed message whilst White people were more receptive to cancer screening when exposed to a loss-framed message (Lucas et al., 2015). Evidence shows that racial and ethnic minorities are less likely to accept a risk or warning message as credible without confirmation of the message from known others, specifically interpersonal networks (Spence et al., 2011). This distrust stems from many current and historic malpractices and abuses. Factors such as poor communication between service users and providers, inadequate recognition or response to mental health needs, imbalance of power and authority between service users and providers, cultural naivete, insensitivity and discrimination toward the needs of Black and ethnic minorities, all contribute to this skepticism (Memon et al., 2016). Moreover, both structural discrimination and everyday discrimination are associated with increased medical mistrust and the endorsement of health-related conspiracy beliefs. Research finds health-specific COVID-19 conspiracy beliefs are associated with lower engagement in COVID-19 protective behaviors (Smith et al., 2021). In light of this the UK government public health department suggest avoiding the use of fear-based messages which "may be stressors outside of the control of Black, Asian and minority ethnic communities, such as structural inequalities, which may lead to denial, fatalistic attitudes and avoidance behavior but use evidence of increased risks" (Scientific Advisory Group for Emergencies, 2020). El-Dakhs et al. (2021) also support the avoidance of fear framed messages during COVID-19 pandemic in order to avoid anxiety and depression. Ala et al. (2021) conclude that COVID-19 messaging needs to be culturally appropriate in order to target ethnic minorities and utilize the existing community networks that people trust in order to deliver COVID-19 information. Investigation into the effect of message framing and ethnicity in relation to physical activity behavior change is lacking. Following the pattern of existing studies in other domains (Cronan et al., 2011; Lucas et al., 2015; Schneider et al., 2001), we propose that responses to gain or fear framed messages would differ by ethnicity. We were interested to determine whether prior to the pandemic gain framed messages would predict higher motivation, perceived competence, stage of change and difference between current and intended physical activity levels than fear framed messages and if this effect would be greater for Black and ethnic minority participants than White participants.

During the pandemic

When the required change in behavior is short lived or the outcome temporal as opposed to an ongoing lifestyle adjustment, then fear-based messages appear to be effective at positively influencing attitude, intentions and behaviors (Tannenbaum et al., 2015). When a fear-based message depicted high susceptibility and severity and included efficacy statements recommending one-time only (vs. repeated) behaviors it was found to be effective (Wansink & Pope, 2015). Loss-framed messages are also recommended for serious situations that have desirable outcomes (El-Dakhs et al., 2021). Prior research finds that fear framed messages can also increase risk perception (El-Dakhs et al., 2021; Gantiva et al., 2021). We were therefore interested to determine how belonging to an ethnic minority group with a high COVID-19 risk related to responses to gain or fear framed health messages. In Hypothesis 2 we propose that during the pandemic fear framed messages would relate to higher motivation, perceived competence, stage of change and difference between current and intended physical activity level than gain framed messages, particularly for Black participants.

Measuring motivation to become physically active

Motivation to become physically active was operationalized by locus of motivation, perceived competence, stage of change and difference between current and intended physical activity level.

Locus of motivation

Self-determination theory states that intrinsic rather than extrinsic motivation supports long term behavior change (Deci & Ryan, 1985) and that fulfillment of basic psychological needs: autonomy, competence, and relatedness are requisite factors of motivation. Deci and Ryan (2008) describe the different degrees of extrinsic and intrinsic motivation as covering a range. This point on the range where one is situated is referred to as the locus of motivation. This motivation continuum ranges from external or controlled regulation, where external factors control or influence behavior (rewards, punishment) to integrated autonomous regulation where the self-determined factors drive behavior, such as enjoyment and satisfaction. The process of internalizing a new behavior has been found to be supported by persuasive messaging (Pelletier & Sharp, 2008). Whilst both messages could be deemed external motivators, positive gain framing may better support integration of these extrinsic motivators and subsequent autonomous behavior change than fear framed messages. As

such this study proposes that message framing would affect participants position along the motivation continuum, their locus of motivation.

Perceived competence

Existing research evidences that perceived confidence strongly correlates with motivation to attempt a new behavior (Lee, 2004). Feeling that one is capable and that a new behavior is possible and achievable supports the behavior change process. Those who have more confidence in their own behaviors and believe they are already meeting societal expectations are more likely to disregard messages which conflict with them. Whereas those who believe their health behaviors are not meeting existing optimum levels and lack confidence to make up their own minds may feel obliged to try and follow information given in public health messages. Others may believe that there is little point in attempting to adhere to such guidance due to their lack of self-belief and motivation, often based on previous failed attempts. It has also been found that some assume that their way of life has not been impacted negatively enough and adopt a fatalistic "well it hasn"t killed me yet' approach to continuing with existing behaviors (Bhuiyan et al., 2017; Markland & Tobin, 2004), despite recognizing the detrimental health effects. Hence, we examined participants' stages of change, locus of motivation (intrinsic or extrinsic) and levels of perceived competence to determine the relationship to gain-framed and fear-based health messages.

Stages of change

Research finds that message frame efficacy depends upon the recipient's characteristics, such as motivational orientation, baseline intentions, and cultural background (Godinho et al., 2015). Individual differences in the behavior change process relate to how people respond to health messages (Cheng et al., 2011). Adopting a new behavior or adapting an existing one is often processional rather than an instant or one-off action. In order to gain understanding of the process of behavior change Prochaska and DiClemente (1983) developed the Trans-Theoretical Model of behavior change. Named *trans*-theoretical as it was initially developed from over 30 therapy and psychological theories for use in addictive behavior interventions, namely smoking cessation. It has since been found to be successful in positive behavior change interventions such as promoting health eating, medicine adherence and physical activity. It defines six stages of change, pre-contemplation, contemplation, preparation, action, relapse and maintenance. It is a cyclical process which can be moved through many times before reaching lasting maintenance, always with the potential to relapse and start the process anew. These differing stages of behavior change can explain the inability that some have from adopting new behaviors; for example, being at pre-contemplation can be a static state if one perceives that there is no point in making a change (Mullan & Markland, 1997; Ronda et al., 2001). For others, maintenance may be a short-lived phase due to loss of motivation, boredom, or barriers to exercise they have experienced in the past and although they may wish to ensure that these barriers are not included in their future, new ones may arise. For certain health behaviors such as healthy eating the stages have been found to vary by ethnicity with more of those identifying as Other ethnicity at the maintenance stage compared to Black and White ethnicities who were at the contemplation stage (Paschal et al., 2010). The effect of ethnicity on the stages of change is also evidenced in physical activity research with a higher percentage of ethnic minority participants at the pre-contemplation and contemplation stages than White participants (Suminski & Petosa, 2002). Gain-framed messages have been found to aid the movement from the contemplation stage to the preparation stage (Cornacchione & Smith, 2012). Conversely, fear framed messages were not successful and were met with avoidance and created undesirable behavior change in research by Cho and Salmon (2006) particularly for participants at the pre-contemplation and contemplation stages. It could be argued that people at these stages are the ones that public health messages seek to appeal to the most and appropriate messaging is therefore paramount. How health messages affected stage of change was a focus of this research. We suggested that prior to the pandemic participants reading a fear framed message would be more likely to be at pre-contemplation and contemplation stages than those who read a gain framed messages. During the pandemic participants reading a gain framed message would be more likely to be at pre-contemplation and contemplation stages than those who read a fear framed message and this would be particularly so for Black participants.

Difference between current and intended physical activity level

Each stage of change is linked to a specific intention to change or adopt a new behavior. At pre-contemplation and contemplation there is less intention than at preparation; at the action stage a person's intentions are more fully realized and they are working toward maintaining the intention (Krebs et al., 2018; Prochaska & DiClemente, 1983). Therefore, we measured the difference between participants' current and of intended minutes of physical activity to determine how message frame predicted future physical activity intention. Emerging research in COVID-19 related health behavior suggests fear framed messages are more persuasive than gain framed messages yet as previously mentioned message frame responses can vary by ethnicity (Ye et al., 2021). Also, those of Black ethnicities are reported to have less than optimum physical activity which may also affect their intended physical activity levels (Heesch et al., 2000; McElroy, 2002; Saffer et al., 2013). We proposed that prior to the pandemic reading a fear framed message would result in less difference between current and intended minutes of physical activity than gain framed messages and during the pandemic fear framed messages would result in a greater difference between current and intended minutes of physical activity than gain framed messages and these effects would be stronger for Black participants than White participants.

We investigated the following hypotheses in two experimental studies. The first study was conducted pre COVID-19 with student participants and the second at the onset of the pandemic with adult non-student participants.

Hypotheses

(1) Prior to the pandemic gain framed messages would relate to higher motivation, perceived competence, stage of change and difference between current and intended physical activity levels than fear framed messages, particularly for Black participants.
(2) During the pandemic fear framed messages would relate to higher motivation, perceived competence, stage of change and difference between current and intended physical activity levels than gain framed messages, particularly for Black participants.

Study 1

Method

Student participants ($N = 124$, $n = 111$ women, $M_{age} = 20$, $SD = 4.21$) as part of the host university's research participation scheme received course credits for completing an online questionnaire with an average duration of less than 9 minutes. Only first year psychology students were eligible to participate in the scheme. They completed demographics including an ethnicity question, *(What is your ethnic group? Choose one option that best describes your ethnic group or background: White – British/Irish/Gypsy or Irish Traveller/Any other White background, Black – Black/African/Caribbean/Black British/Any other Black background, Mixed/Multiple ethnic background – White and Black Caribbean/White and Black African/White and Asian/Any other Mixed/Multiple ethnic background, Asian – Pakistani/Bangladeshi/Indian/Chinese/Any other Asian background, Other ethnic background)* and levels of current activity, *(On average, how many minutes a day are you physically active?)*. They read one of two randomly generated short articles: a gain-framed report or a fear-based report of the increased risk of cardiovascular diseases due to a lack of regular physical activity (see Appendix A). They then completed a 6-item Physical Activity Stage of Change questionnaire (see Appendix B) based on Prochaska & DiClemente's Transtheoretical model (Prochaska & DiClemente, 1983), the anchors map on to the model thus: Level 1 = Precontemplation, Level 6 = Maintenance, a 15-item self-regulation questionnaire which measured intrinsic and external motivation based on Self Determination theory (Deci & Ryan, 1985) (*Because I feel that I want to take responsibility for my own health, Because others would be upset with me if I did not*, 1 = not true at all, 7= very true), a 4-item perceived competence scale (*I feel confident in my ability to exercise regularly, I am able to meet the challenge of exercising regularly*, 1 = not true at all, 7= very true) and intended physical activity level (*average minutes active daily in six weeks' time*). Results from a priori power analyses conducted using G*Power3 (Faul et al., 2007) showed that a total sample of between 52 participants with two equal sized groups of $n = 26$ (a large effect size, $d = .80$) and 128 participants with two equal sized groups of $n = 64$ (a medium effect size, $d = .50$), was required to achieve a power of .80 and an alpha of .05. Therefore, due to the small counts of some ethnic groups two cohorts were formed, White ($n = 57$) and Black and ethnic minority ($n = 67$) to create the requisite sized groups. Anagrams such as BIPOC (Black, Indigenous and People of Color), BME (Black and minority ethnic) and BAME (Black, Asian and minority ethnic) are often used as a catch all phrase and the distinctions of each ethnicity hidden. The UK Race Disparities Unit recommends the end of such anagrams in order "to better focus on understanding disparities and outcomes for specific ethnic groups" (Sewell, 2021, p. 10) and we have explicitly chosen not to use them in this research.

To determine sample size required for logistic regression analysis of the effect of message frame on stage of change using a two-tailed test, odds ratio of 3.00 and an alpha of .05, an a priori power analysis was conducted using G*Power3 (Faul et al., 2007). Results showed that a total sample of 119 participants was required to achieve a power of .80. Informed consent was requested at the start of the study and ethical approval obtained in accordance with the British Psychological Society Code and Practice guidelines from the host university's ethical committee.

Results

Hypothesis 1

Analyses of variance were conducted to examine the relationships between message frame and locus of motivation, perceived competence and difference between current and intended physical activity levels and to determine whether these relationships were moderated by ethnicity. The results (displayed in Table 1) revealed the direct effect of message frame on locus of motivation approached significance but there was no effect of nor interaction with ethnicity. Those in

Table 1. Effects of message frame and ethnicity pre-COVID-19.

				Gain framed		Fear framed		Black & Minority		White	
Dependant Variable	F (1, 120)	p	ηp^2	M	SD	M	SD	M	SD	M	SD
Motivation locus†	3.69	.057	.03	9.64	6.21	7.71	6.91				
Ethnicity	1.71	.194	.01					1.56	5.40	0.22	5.76
Message x ethnicity	0.58	.447	.01								
Perceived competence	2.38	.126	.02	4.30	1.55	3.88	1.59				
Ethnicity†	3.68	.058	.03					3.85	1.45	4.39	1.68
Message x ethnicity	0.23	.634	.00								
Difference between current and intended physical activity	1.93	.168	.02	8.25	41.67	17.10	35.20				
Ethnicity**	4.80	.030	.04					19.48	30.97	4.37	45.24
Message x ethnicity	0.77	.382	.01								

Note: **p <.01, †p < .06, $N = 124$

the fear framed message group had lower levels of locus of motivation than those in the gained framed message group indicating that they were more externally motivated than intrinsically motivated. These levels were not significantly different for Black and minority ethnicity participants and White participants.

There was no significant direct effect of message frame on perceived competence nor any interaction between ethnicity and message frame. The effect of ethnicity on perceived competence approached significance and mean levels of perceived competence were lower for Black and minority participants than for White participants.

There was no significant direct effect of message frame on difference between current and intended physical activity level nor interaction effect. Ethnicity had significant direct effect as Black and minority ethnicity participants' difference between current and intended physical activity levels was greater than White participants' levels.

To examine the effect of health message frame and ethnicity on physical activity stage of change we conducted a nominal logistic regression. Results of the analysis indicated that the percentage of participants that were at each stage of change did not differ by message frame $\chi^2(5) = 1.54$, $p = .908$. There was a significant effect of ethnicity $\chi^2(5) = 11.55$, $p = .042$ with White participants being 82%, *Exp (B)* = 0.198, 95% CI (0.071, 0.548) less likely than Black and minority ethnicity participants to be at the preparation stage. The stage of change percentages are displayed in Figure 1.

Our initial hypothesis that gain framed messages would relate to higher motivation, perceived competence, stage of change and difference between current and intended physical activity levels than fear framed messages was partially supported. Message frame related to locus of motivation as hypothesized with gain framed messages relating to more autonomous motivation than fear framed messages. No support was found for a relationship between message frame and difference between current and intended physical activity, perceived competence or stage of change.

Study 2

Method

The sample was drawn from Prolific (>*Prolific | Online Participant Recruitment for Surveys and Market Research*, 2021), a participant portal, where each participant was reimbursed £1 for completing an online survey with an average duration of 10 minutes. To meet the inclusion criteria participants had to be UK resident adults and identify as either Black or White ethnicity. The 441 participants were $M_{age} = 34$ with 215 identifying as Black and 156 were male. Informed consent was requested at the start of the study and ethical approval obtained in accordance with the British Psychological Society Code and Practice guidelines from the host university's ethical committee. The participants completed demographics and the same measures as in Study 1.

Results

Manipulation check

The first study lacked a manipulation check which on reflection was felt to be necessary to determine whether participants were responding to the two different health messages as expected, and therefore a message response question (*After reading the message to what extent did you feel*: *sadness, relief, happiness, and anxiety?* 1 = not at all, 7= very much so) was added to study 2. This response question was created as fear-based messages are known to evoke negative reactions such as fear and anxiety, while gain-framed messages elicit positive responses such as relief and happiness (Guan & Monahan, 2017; Witte & Allen, 2000). An initial MANOVA examined the four health message responses: sadness, relief, happiness, and anxiety as dependent variables, with participant ethnicity (Black or White) and health message framing (gain or fear) as independent variables. Multivariate analysis revealed a statistically significant effect of message framing, Pillais' Trace =.208, F (4, 434) = 28.54, $p < .0005$, $\eta p^2 = .208$, and of ethnicity, Pillais' Trace =.035, F (4, 434) = 3.92, $p = .004$, $\eta p^2 = .035$. However, there was no signif-

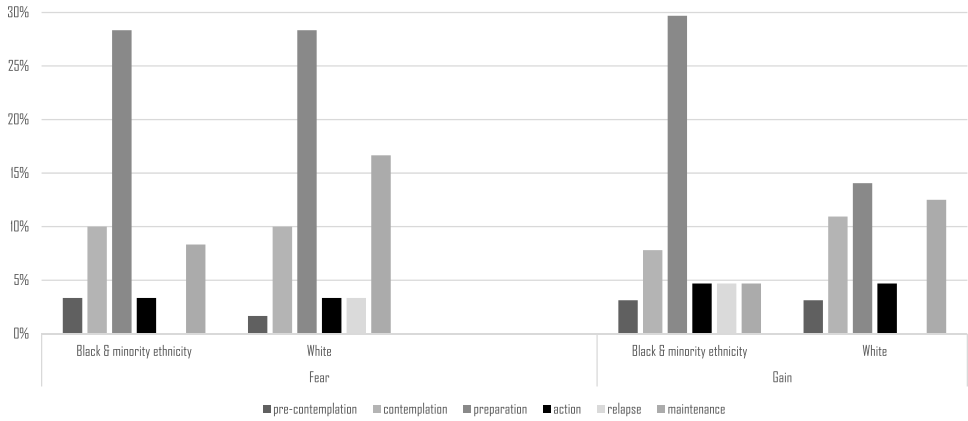

Figure 1. Stage of change percentages by message frame and ethnicity pre COVID-19.

icant interaction effect between message framing and ethnicity, Pillais' Trace =.009, F (4, 434) = 1.02, p = .396. Post hoc analysis found that the effect of ethnicity was only significant for relief scores. Black participants (M = 3.63, SD = 1.9) had significantly higher scores, t (432.30) = 2.65, p < .008, than White participants (M = 3.18, SD = 1.65), d = 0.25.

Hypothesis 2

Analyses of variance were conducted to examine the relationship between message frame, locus of motivation, perceived competence, and future physical activity intention and to determine whether these relationships differed by ethnicity. The results are displayed in Table 2.

The results revealed no significant direct effect of message frame on locus of motivation nor interaction effect between ethnicity and message frame. Mean levels of locus of motivation were not significantly different between the two types of message frame. There was a significant effect of ethnicity, and mean levels of locus of motivation were significantly higher for Black participants than White participants.

The direct effect of message frame on perceived competence approached significance; those in the fear-framed group had higher scores than those in the gain-framed message group. There was a significant direct effect of ethnicity. Black participants had higher perceived competence scores than White participants, but there was no interaction effect. There were no significant direct effects of message frame nor ethnicity on the difference between current and intended physical activity level nor any interaction effect.

To examine the effect of message framing and ethnicity on physical activity stage of change, we conducted a nominal logistic regression. Results of the analysis indicated that the percentage of participants that were at each stage of change did not differ by message frame, $\chi^2(5) = 6.13$, $p = .294$, nor by ethnicity, $\chi^2(5) = 4.19$, $p = .522$. The stage of change percentages are displayed in Figure 2.

The second hypothesis that gain-framed messages would relate to higher motivation, perceived competence, stage of change, and difference between current and intended physical activity level than fear-framed messages, particularly for Black participants, was partially supported. Overall, the type of message read had a marginally significant effect on participants' perceived competence, and those in the fear-framed group had higher scores than those in the gain-framed group. There was no message frame effect on locus of motivation, difference between current and intended physical activity level nor physical activity stage of change. Black participants had higher perceived competence and locus of motivation than White participants.

Table 2. Effects of message frame and ethnicity during COVID-19

				Gain framed		Fear framed		Black		White	
Dependant Variable	F (1, 437)	p	ηp^2	M	SD	M	SD	M	SD	M	SD
Motivation locus	0.13	.716	.00	4.53	5.99	4.62	5.75				
Ethnicity***	24.35	.001	.05					5.91	5.89	3.21	5.55
Message x ethnicity	1.09	.298	.00								
Perceived competence†	3.62	.058	.01	4.68	1.58	4.96	1.58				
Ethnicity***	18.65	.001	.04					5.15	1.46	4.51	1.62
Message x ethnicity	0.03	.874	.00								
Difference between current and intended physical activity	0.95	.508	.49	7.81	19.86	10.66	20.89				
Ethnicity	0.20	.731	.17					9.93	23.82	8.58	16.56
Message x ethnicity	2.38	.123	.01								

Note: †p < .06, ***p < .001, N = 441

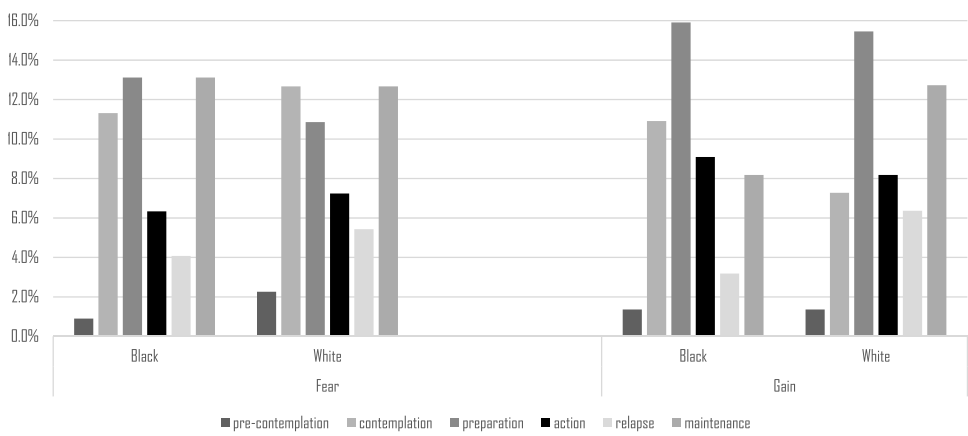

Figure 2. Stage of change percentages by message frame and ethnicity during COVID-19.

Discussion

Our interest in both studies focused on the effect message framing had on motivation to become physically active and how this varied by ethnicity. In Study 2, a manipulation check confirmed that both types of messages created the desired response. Gain-framed messages resulted in higher happiness and relief than fear-framed messages, which led to higher anxiety and sadness. Black participants' feelings of relief were greater than White participants, but the other responses (anxiety, sadness, and happiness) did not differ by ethnicity. Much of the current COVID-19-related messaging provides little hope, and although accurate, it is often scary and depressing in its tone. It therefore follows that Black participants would feel more relief from a gain-framed message, as awareness of the disparities of health outcomes is widely known, and the pandemic has served to highlight the disproportionate burden experienced by Black ethnicities.

In the first study, participants' response to the framing of the health message in relation to locus of motivation while not statistically significant was in the expected direction and in line with the theory that gain-framed messages support more autonomous motivation. Those who received the fear-framed message were more externally motivated than intrinsically motivated. In the second study, however, locus of motivation did not differ by message frame but did differ by ethnicity. The lack of difference of message frame may be due to desensitization attributed to a saturation of messages during the pandemic, which Anson et al. (2021) refer to as an "infodemic" resulting in health information overload for many. The ethnic difference in locus of motivation found that Black and minority ethnicity participants were more intrinsically motivated than White participants, which could be attributed to their knowledge of a greater disposition to many health conditions and preexistent comorbidities, especially metabolic syndrome and cardiovascular diseases, resulting in a longer held more autonomous understanding of the benefits of physical activity in relation to these conditions.

The results evidenced a similar pattern for levels of perceived competence. In the first study, perceived competence did not differ by message frame but did differ by ethnicity. Black and minority ethnicity participants had lower perceived competence than White participants. In study 2, there was a slightly significant higher level of perceived competence for those who read the fear-framed message compared to those who read the gain-framed message, and Black participants had significantly higher perceived competence than White participants. According to Self-determination theory, competence is one of the three fundamental psychological needs, fulfillment of which aids autonomous motivation (Deci & Ryan, 2008). Feeling competent supports goal attainment and satisfaction at being able to engage in an activity effectively and so in turn develops autonomy (Deci & Ryan, 2000). The results of both studies were contrary to the findings of Pelletier and Sharp (2008), who evidence that gain-framed messages support perceived competence in relation to climate change, but research in terms of physical activity is lacking. Why ethnicity moderates levels of perceived competence is worth further investigation, and the findings could improve health promotion strategies.

We examined participants' response to gain-framed and fear-based health messages in relation to their stage of change. In both studies, message frames did not affect participants' stage of change, which was contrary to hypotheses 1 and 2. A potential explanation being that physical activity is not associated with risk in the same way as smoking. Prior research found gain-framed messages most influential on progress from the contemplation to the preparation stage but focused on smoking cessation not physical activity behavior change (Cornacchione & Smith, 2012). However, Jensen et al. (2018) found there to be no direct effect of message frame on exercise behavior, but their findings suggest that self-efficacy moderates both types of message frames. Gain-framed messages were effective for those with low self-efficacy, and loss-framed messages were effective for those with high self-efficacy. This is similar to our results in relation to perceived competence, and future research utilizing perceived competence as a moderator may produce a similar pattern and garner interesting results.

The transtheoretical model states that the preparation stage of change indicates that the individual is considering making a change in their behavior and may even have achieved some small behavior modifications (Norcross et al., 2011). Previous research in physical activity and ethnicity finds ethnic minority participants were more likely to be in the contemplation stage than White participants (Heesch et al., 2000; Suminski & Petosa, 2002). The results from Study 1 indicate the opposite as White participants were less likely to be at the preparation stage (14%) than Black and minority ethnicity participants (30%). This may be due to the latter having a greater awareness of the protective benefits of physical activity for many health conditions, which they know they are more predisposed to than White participants. Interestingly, this effect was not apparent in the results from the second study, and there was no ethnic difference in the percentage of participants at each stage of change; a possible explanation being that due to heightened universal awareness in light of the current pandemic, all ethnicities were equally aware of the protective benefits of physical activity.

People of Black ethnicities are often reported to have lower levels of physical activity than White participants. Results from baseline measures in both studies evidence that levels of physical activity did not differ significantly by ethnicity as displayed in Tables 3 and 4.. Black ethnic minority groups are known to have

Table 3. Baseline physical activity by ethnicity pre-COVID-19.

	Black & Minority		White	
Dependant Variable	*M*	*SD*	*M*	*SD*
Current physical activity	69.03	56.85	76.21	49.78
Intended physical activity	88.51	56.36	80.58	50.98

Note: $N = 124$

Table 4. Baseline physical activity by ethnicity during COVID-19.

	Black		White	
Dependant Variable	*M*	*SD*	*M*	*SD*
Current physical activity	39.53	27.35	40.64	27.57
Intended physical activity	49.47	26.09	49.22	27.22

Note: $N = 438$

poorer COVID-19 health outcomes and often reported to have less than optimum physical activity levels (Kirby, 2020; Saffer et al., 2013; Sport England, 2020; Sze et al., 2020). Physical activity helps to maintain a healthy immune system, and inactivity is associated with a greater risk of COVID-19 hospitalization (Lassale et al., 2020); therefore, strategies to improve physical activity levels for Black ethnic minority groups are essential. Such efforts to mitigate low levels of physical activity in Black ethnic minority groups are ongoing, particularly considering the current pandemic. Reporting that physical activity levels did not differ between these two cohorts may help to counter the existing narrative that people of Black ethnicities fail to meet recommended physical activity guidelines and therefore prove valuable for future physical activity promotion. These findings serve to recognize the people of Black ethnicities who already are meeting the requisite level and so support their ongoing maintenance of this healthy behavior. Second, they provide an ethnically concurrent model of what is possible and so encourage those who wish to become more physically active.

Limitations

There are some limitations that must be considered when interpreting the findings of these studies. Participants recruited for Study 1 were both domestic and international students from diverse ethnic backgrounds, and the research finds that differences exist between their experiences of physical activity (Rosa et al., 2021). Due to the small sample size, leading to inadequate cell counts for statistical analysis, people of Black and ethnic minorities were combined into one cohort. As such the differences between the five different ethnicities were not fully explored. We were aware that the grouping of Black and ethnic minorities has been questioned for upholding a "White and other' view and so ignoring and devaluing the individuality of different ethnic groups (Bunglawala, 2019). Predisposition to certain health risks and associated outcomes also varies between ethnic minority groups; e.g. South Asians have a higher risk of heart disease than Black Africans in the UK, while Black ethnic groups have higher risk of hypertension and stroke than South Asians (Raleigh & Holmes, 2021). Responses to message framing are known to vary by ethnicity as is motivation to be physically active. Message frame responses varied between Latino and African American women in a breast screening study; Latino women were most persuaded by loss-framed messages, while African American women were not influenced by message framing (Schneider et al., 2001). Levels of physical activity have been found to vary between Indian, Bangladeshi, and Pakistani ethnic groups; Indians were significantly more physically active than Bangladeshis (Bhatnagar et al., 2016). Distinctions between ethnic minority groups in Study 1 require further examination with a larger sample, but due to financial constraints, this was not possible in these studies. However, in Study 2, pre-screening was applied, which allowed two ethnic groups to be eligible for participation, and a larger sample was obtained. As health inequalities are known to exist between White ethnicities and Black ethnicities, it was considered practicable, given the sample size that could be funded. However, we were aware that within these two broad ethnic groups, there were differences that this research did not capture. In addition, Study 2 used a non-student sample and as such more representative of the general population than Study 1.

The usual caveats associated with self-report measures and social acceptance bias apply to both studies. Stage of change, perceived competence, and locus of motivation are all behavior measures for which external recording is not feasible. However, external monitoring measures are possible for physical activity levels and as such would provide a more objective record. Providing participants with monitoring devices was not financially viable for these studies, but ensuring all participants utilized a fitness app or tracker to log their activities may have been a possible solution.

Both studies were of a between-subjects design, and a within-subjects approach may have allowed for specific pre-pandemic and during pandemic comparison. Due to the limitations relating to sample size, a within-subjects design was not considered. However, future within-subjects designed studies which also incorporate an additional follow-up stage to compare intention with actual physical activity levels would be worth considering.

Although sample sizes of approximately 100 have been found to be adequate in detecting large effects, samples of 500 have been recommended to detect small effects in logistic regression analysis (Bujang et al., 2018; Vergouwe et al., 2005). As such, there may have been insufficient power to detect small effects of message frame on stages of change.

Conclusion

Health message frame had a slight effect on motivation pre-pandemic, while during the information-saturated pandemic, there was a slight effect on perceived competence. The results from both studies showed the largest percentage of participants were at the preparation stage (the mid-point in the behavioral change model), indicating their physical activity levels were variable irrespective of the framing of message received. More research into the continued effects of the pandemic and physical activity intention is warranted to determine the longer-term effects and in order to develop appropriate health messages during and post pandemic. These studies evidence physical activity levels were not negatively affected by the first wave of the pandemic, and Black and ethnic minorities intended to significantly increase their activity levels in the future. Promotion of this finding will be helpful in encouraging physical activity behavior change particularly for these ethnicities and help counter the disproportionately poor COVID-19 health outcomes.

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ORCID

Jacqueline Francis http://orcid.org/0000-0002-0059-3841
Keon West http://orcid.org/0000-0002-9955-661X

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Appendix A

Gain-framed message

Physical activity is the miracle cure we have always had. However, this is no snake oil! Whatever your age, there is strong scientific evidence that being physically active can help you lead a healthier and happier life.

Physical activity can have immediate and long-term health benefits.

Being physically active can improve your health and reduce the risk of developing several diseases like type 2 diabetes, heart disease, cancer, and stroke. Avoiding these diseases and maintaining good immune system function reduces the risk of severe viral infection.

Physical activity can provide antioxidant protection and promote blood flow, which can protect your skin and delay signs of aging.

Research shows that physical activity can also boost self-esteem and mood, as well as reducing your risk of Alzheimer's disease, depression, dementia, and stress. You will be able to manage your weight better, have lower cholesterol and blood pressure, stronger bones, muscles and joints, and a lower risk of developing osteoporosis.

Just 30 minutes physical activity a day can allow you to enjoy all these benefits. You will feel better – with more energy, feel more relaxed, and even sleep better. Most importantly, regular physical activity can improve your quality of life.

Fear-framed message

Inactivity is described by the Department of Health as a "silent killer".

Not only does inactivity raise your risk of premature death, but the more inactive you are, the higher your health risks are. As you are not using your muscles as much, you lose strength and endurance, and your bones lose some mineral content and get weaker. Your metabolism is affected; your body has trouble breaking down fats and sugars and you burn fewer calories, making you more likely to gain weight. Your immune system may not work well, which puts you at a high risk of viral infection. In addition, your body may have more inflammation and you may develop a hormonal imbalance. All these changes double the risk of cardiovascular diseases, diabetes, and obesity and increase the risk of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression, and anxiety. Chronic diseases caused by inactivity are a leading cause of death in every part of the world. Those with these diseases are more at risk of severe viruses and have much poorer outcomes. People who are not doing at least 30 minutes of physical activity each day are defined as being physically inactive. Is that you?

Appendix B

Physical Activity Stage of Change Questionnaire

The following question asks for your views about physical activity. If you are unsure about how to answer the question, please give the best answer you can.

Do not spend too much time in answering, as your immediate response is likely to be the most accurate.

Moderate or vigorous activity is sufficient to make you slightly breathless and sweaty for 20 minutes. An example of a moderate activity is brisk walking. Consider any activity similar to this or requiring more exertion that lasts for 20 minutes or more and select the statement that you feel is most appropriate.

(a) I am not currently very physically active, and I don't intend to become more active in the next six months/I'm too busy right now.
(b) I am not currently very physically active, but I am thinking about increasing the amount of activity I take in the next six months.
(c) The amount of activity I take varies; sometimes I am physically active, other times not.
(d) I am currently physically active on most days, but have only just begun to be so within the last six months.
(e) A year ago I was physically active on most days, but in the last few months I have been less active.
(f) I am currently physically active on most days and have been so for longer than six months.