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Gain-Framed Messaging to Promote Adult Sport: An Exploration of the Effects of Efficacy-Enhancing  
Messages on Psychological and Behavioural Outcomes

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A thesis submitted to the Faculty of Graduate and Postdoctoral Studies in partial fulfillment of the  
requirements for the degree of Master of Arts in Human Kinetics

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## Abstract

To understand how to better stimulate adult sport engagement, this study investigated effects of gain-framed messages (GFM; Rothman & Updegraff, 2010) on psychological/behavioural outcomes, with or without efficacy-enhancing messages (Latimer et al., 2010). Eligible adults (30-69 years-old) were randomly assigned to one of two experimental conditions ('GFM alone' or 'GFM plus efficacy-enhancing messages'), or a control condition. Participants ( $N = 232$ ; 62.5% female) completed baseline/screening measures, watched their messaging intervention and reported outcomes one-week later (Time 2), and responded one-month later (Time 3). Comparing the experimental conditions showed non-significant differences for all outcomes, indicating no added benefit of efficacy-enhancing messages. Collapsing the experimental groups and comparing against the control showed significant group-by-time interactions for three 'outcome expectancies' (travel, social affiliation, stress relief), with reports higher among experimental participants. Results also indicated that moderate-to-vigorous physical activity significantly decreased at Time 3 within the control, but remained constant among experimental participants.

### Acknowledgements

This thesis would not have been made possible without the support and guidance of many individuals. First and foremost, I give my deepest thanks and appreciation to my wonderful supervisor, Dr. Bradley Young. Brad, I am extremely grateful for having the opportunity to work with you during the past two years. Your passion towards research, open-mindedness and creativity, and constant support and encouragement was critical at every stage in my Masters journey. Thank you for challenging my ideas, expanding my perspectives, and allowing me to learn and grow as a researcher.

I also extend my gratitude to my committee members, Dr. Michelle Fortier and Dr. Shaelyn Strachan, for their involvement in and support for my Masters research project. Thank you for taking the time to critique and challenge my ideas, and for providing novel suggestions to make my research as rich and valuable as possible. Thank you also to my amazing lab mates, Scott, Justin, Dora, Raf, and Lindsay, for your willingness to help develop and refine my research plans. I truly appreciate all of your attention to detail, unique perspectives, and creativity; your feedback and suggestions helped to make my study as rigorous as possible. Thank you all for challenging my thinking and deepening my understanding of many different facets of sport psychology.

Lastly, thank you to my amazing friends and family for helping to keep me level-headed and motivated throughout this chapter of my life. The journey of my Masters degree has been a rollercoaster, filled with many ups and downs, accomplishments and challenges, and I am so thankful to have been surrounded by so many incredible people through it all. Thank you, especially, to my parents for always supporting my ambitions and encouraging me to follow my passions. Your undying love and encouragement has helped to fill my life with many valuable experiences, and has allowed me to constantly grow and develop as an individual. As this chapter in my life closes, I am so grateful to be taking many lessons learned to the next one that awaits.

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The Canadian population is currently aging rapidly and adults aged 35 and above have the highest rates of physical inactivity (Statistics Canada, 2013). It has been well-documented that participation in physical activity (PA) is associated with significant health benefits, both physical and psychological in nature. In contrast, physical inactivity is associated with a wide range of physical and psychological impairments, such as heightened blood pressure (e.g., Nelson et al., 2007) and lower quality of life (e.g., Naylor, Gordon, & James, 2012). Since these impairments can become exaggerated with age, solutions are needed to reverse this trend and increase PA participation among adults to increase individual health and well-being (Statistics Canada, 2013). As such, the well-being and health of adults stands to benefit from interventions aimed to increase adult PA participation across a host of PA venues and modalities.

Sport is one possible adult PA venue. Sport Canada defines sport as, “an activity that involves two or more participants engaged for the purpose of competition [...], that involves formal rules and procedures, requires tactics and strategies, specialized neuromuscular skills, and a high degree of difficulty and effort” (Canadian Heritage, 2012, p. 13). Thus, sport represents a form of PA that is distinct from exercise, which does not necessarily involve two or more participants in a structured environment or organized competition. Sport may not be a viable/attractive venue for all adults, however, it is increasingly being considered as one avenue that may provide opportunities for more adult participants to become regularly physically active, and may offer benefits associated with health, fitness, and social connection (Baker, Fraser-Thomas, Dionigi, & Horton, 2010; Vallerand & Young, 2014). Remaining consistently physically active is crucial to reap the associated benefits; thus, it is important to understand characteristics that best predict commitment to PA. For example, Vallerand and Young (2014) investigated potential motives that were associated with greater commitment to structured PA programming. These authors found that *enjoyment* of PA was a significant predictor of commitment in both sport and exercise contexts. Thus, it is important to promote a variety of ways that adults can become (and remain) physically active, as individuals may perceive various forms of PA in

different ways. For instance, one adult might best enjoy being active on his/her own, such as going for runs and bike rides (exercise activities). However, another adult may prefer to be active with other individuals and enjoy competitive activities, such as playing hockey or soccer (sport activities). As such, promoting various forms of PA (e.g., sport) is important to accommodate the wide range of motives and preferences for PA, and to provide equal opportunities for adults to be physically active.

Statistics Canada reported that in 2010, 64 percent of sport participants reported that they considered themselves to be in excellent/very good health as compared to only 47 percent of non-participants. Furthermore, sport participants reported significantly higher rates of sound mental health and life satisfaction than non-participants (Canadian Heritage, 2012). Adult sport, oftentimes called Masters sport, provides the opportunity for adults (typically 35 years and above) to engage in sport throughout the life span. Furthermore, participation in Masters sport has been shown to appeal to a wide range of motives, such as the opportunity to reap health and fitness benefits, test personal skills, and for peer companionship (e.g., Young & Medic, 2011). The wide range of benefits associated with Masters sport participation is reflected in the exceptional growth in the population of participants (Coaching Association of Canada, n.d.).

However, similar to overall PA rates, cross-sectional sport participation rates in Canada still show substantial decline with age. Approximately 54 percent of Canadians aged 15 to 19 regularly participate in sport, with consecutive declines at subsequent age periods, such that only 17 percent of Canadians aged 55 and above participate in sport (Canadian Heritage, 2012). In light of this, employing strategies to promote adult sport may attract additional participants and increase PA rates among adults, especially during middle adulthood (40-60 years old) because engaging in sport during this time might increase the likelihood of continuing involvement in older adulthood (Gray & Harrington, 2011). As such, this study investigated the effects of two different adult sport promotional messaging approaches for encouraging a targeted sample of middle-aged adults to engage in adult sport.

## Literature Review

### Message Framing

*Message framing* is a technique that can be used to present a persuasive message in different ways to encourage the uptake of a targeted behaviour (Rothman & Updegraff, 2010). Of the two main types of framing, gain-framed messages (GFM) represent an emphasis on the benefits or anticipated favourable circumstances that might be associated with performing an activity, whereas loss-framed messages (LFM) emphasize costs related to not performing an activity. In the PA domain, an example of a GFM is, “If you participate in regular PA, you can improve strength and flexibility.” Alternatively, a sample LFM is, “If you do not regularly participate in PA, you will likely lack strength and be inflexible.” It has been posited that GFM are more persuasive when promoting an activity that is perceived as relatively safe without the risk of unpleasant outcomes (e.g., health-affirming activities, such as engaging in dental hygiene practices). Conversely, LFM are more advantageous when promoting an activity that may pose the risk of an unpleasant outcome (e.g., illness-detection activities, such as a health screening procedure to detect a disease). According to Rothman and Salovey (1997), PA is considered a low-risk behaviour and, therefore, GFM should be more persuasive than LFM.

Recent meta-analyses have indeed concluded that a gain-framed approach is more effective than a loss-framed approach when promoting PA (Gallagher & Updegraff, 2012; O’Keefe & Jensen, 2007). There is growing body of evidence illustrating the capability of GFM for eliciting changes in both proximal (psychological) and distal (behavioural) outcomes in targeted contexts of PA. Stimulating changes in proximal outcome variables is valuable because proximal outcomes typically act as mediators or correlates of whether individuals eventually become more regularly physically active (Brawley & Latimer, 2007). Research in PA domains, almost exclusively on exercise or fitness activities, has consistently shown evidence for positive effects on commonly measured proximal outcomes, including intentions to be active (e.g., van’t Riet, Ruiters, Werrij, & de Vries, 2010), attitudes toward PA (e.g., Berenbaum & Latimer-Cheung, 2014), and perceived behavioural control (PBC; e.g.,

Graham, Prapavessis, & Cameron, 2006) to regularly participate. In a sample of middle-aged adults, van't Riet et al. (2010) assessed the effects of Web-based message framing following the provision of tailored feedback (i.e., participants were told whether their current PA levels met recommended guidelines) on various PA-related outcomes. Participants who read GFM reported significantly stronger intentions to do PA, higher message agreeability, and more positive attitudes toward PA, than those who read LFM. However, there was no significant increase in PA participation for either group.

Although effects on behavioural outcomes are more difficult to demonstrate, evidence shows that persuasive messaging, and GFM in particular, can have significant positive effects on behaviour. For example, Li, Cheng, and Fung (2014) examined the effects of gain-framed and loss-framed PA-promotion pamphlets on cognitive and behavioural outcomes in inactive adults. Results showed that older adults (60 + years) provided significantly more positive evaluations for the gain-framed pamphlet compared to the loss-framed pamphlet, and self-reported and accelerometer-assessed PA significantly increased among older men receiving GFM compared to those that received LFM (Li et al., 2014). Similarly, Berenbaum and Latimer-Cheung (2014) provided a group of low-to-moderately active college-aged women with a series of gain- or loss-framed digital print advertisements promoting PA. Compared to reading LFM, participants that received GFM paid more attention to the messages, better recalled the content of the messages, had stronger intentions to be active, reported higher rates of PA, and signed-up for a “free-choice” open gym session more often. Latimer et al. (2008a) investigated the relative effectiveness of GFM and LFM among middle-aged adults, where mix-framed messages (MFM) acted as the control condition. Framed PA-promotion messages (GFM, LFM, or MFM) were delivered on three separate occasions (baseline, week five, week nine) using different formats on each occasion: a telephone call, a print PA guide, and a brochure. In addition to the framed content, all participants received practical strategies for overcoming barriers to incorporate PA into one's daily routine. Results showed a significant advantage for the GFM condition, which showed increasing

intentions and self-efficacy (SE) in the earlier weeks of the intervention, as well as increasing moderate and vigorous physical activities at a week nine follow-up.

The message framing studies described above all found significant positive advantages for GFM in stimulating increases in cognitive and/or behavioural outcomes. However, one major limitation of GFM in general is the fact that although significant results are typically found, the advantages for GFM have often yielded “exceptionally small” effect sizes (O’Keefe & Jensen, 2007, p. 634). Messaging researchers have therefore begun to investigate conditions that may enhance messaging interventions and perhaps garner larger effect sizes. Emerging work suggests that, for example, interventions may be more effective when: (a) messages are targeted to personal characteristics (e.g., stage of change; Latimer, Brawley, & Bassett, 2010), (b) messages are framed to consider an individual’s regulatory goal orientation (promotion or prevention; Cesario, Corker, Jelinek, 2013), or (c) message content is guided by theoretical correlates of behaviour change (e.g., SE; Hatchell, Bassett-Gunter, Clarke, Kimura, & Latimer-Cheung, 2013).

Although persuading inactive individuals to begin participation in PA is the ultimate goal of messaging interventions, promotional materials are sometimes not sufficient enough to stimulate this behaviour. In their review of PA-related messaging interventions, Latimer et al. (2010) stated that one of the most concerning methodological limitations was, “the absence of a theoretical framework to guide message content” (p. 8). Although various theories may inform the choice of which proximal dependent variables to measure, many messaging interventions do not specifically design the content of the messages to directly target change in these variables (Sweet, Brawley, Hatchell, Gainforth, & Latimer-Cheung, 2014). As such, pairing other theoretically-driven content with framed content may be promising for developing more effective messaging interventions to stimulate physically active behaviour (Latimer et al., 2010).

### **Incorporating Theoretically-Based Information into Message Content**

Messaging researchers are advocating for theoretically-grounded approaches to the construction of messaging content (e.g., Brawley & Latimer, 2007; Latimer et al., 2010). In particular, there have been recommendations that message content should address information relating to cognitive correlates (or salient proximal outcomes) from a variety of behaviour change theories. Targeting these variables in lieu of, or in addition to, anticipated gains/benefits may increase the effectiveness of messaging interventions (Hatchell et al., 2013). For instance, in a meta-analysis of health-related internet-based behaviour change interventions, Webb, Joseph, Yardley, and Michie (2010) found that interventions developed with extensive use of theory, as opposed to interventions that were less theory-driven, attained significantly higher effect sizes.

One theory that has been useful in understanding change in PA behaviour is Social Cognitive Theory (SCT; Bandura, 2001). SCT outlines conditions that influence how people learn and behave, including individual, behavioural, and environmental factors. Specifically, an individual's level of SE, expectations of the outcomes that an activity will produce, and environmental factors, all influence if and how one engages in a target behaviour (Bandura, 2001). For example, an individual will likely engage in PA if he/she has high SE in his/her ability, expects that participation will result in favourable outcomes, and believes they are in a social environment where others like them also capably participate. SE constructs are incorporated in multiple behaviour change theories and have been shown to strongly impact PA behaviour (e.g., Rothman, Baldwin, Hertel, & Fuglestad, 2010). Rothman et al. (2010) specified that factors guiding behavioural decisions, such as SE, vary in strength and importance depending on the stage of behaviour change or motivational readiness in which an individual resides. According to Rothman et al. (2010; also see McAuley & Blissmer, 2000), efficacy beliefs are most important during the early stages of behavioural change (e.g., in stages of pre-contemplation, contemplation, preparation in the Transtheoretical Model; Prochaska & DiClemente, 1982) when an individual initially puts forth effort to alter physical inactivity. Although SE is well-known as a

determinant of behaviour change during these early stages, there has been a paucity of research to date that has specifically targeted and manipulated this construct in a messaging intervention (e.g., Latimer et al., 2010). Furthermore, when SE-enhancing messages are included in an intervention, the effects of these messages are often not analyzed systematically. For example, although Latimer et al. (2008a) included message content designed to increase SE for overcoming barriers to PA, all participants in framed content conditions received this information. As such, the effects of this efficacy-enhancing content could not be contrasted with GFM content alone, nor could the added benefit of barrier efficacy content be discerned.

The current study intended to remedy this limitation by contrasting a ‘GFM-alone’ condition with a second condition that *paired* GFM with efficacy-enhancing content designed to increase SE for overcoming barriers to begin regularly participating in adult sport. Before reviewing recent literature that has investigated the effects of such paired messaging conditions, it is important to first review the lone adult sport-promotion messaging study, because it helped to inform the development of the GFM-alone condition for this current study.

### **Message Framing in the Context of Adult Sport**

Although there is a plethora of PA messaging studies that promote participation in exercise, there has only been one messaging study that has specifically promoted *sport* participation (Lithopoulos, Rathwell, & Young, 2015; Lithopoulos, 2014). Lithopoulos et al. (2015) and Lithopoulos (2014) assessed the effects of GFM with a sample of 244 participants between the ages of 40 and 59 years old ( $Mage = 50.59$ ,  $SD = 5.39$  years), who were once active in sport during youth but not regularly engaged in sport as an adult (in one of the first three stages of change for sport). This experimental gain-framed intervention was designed to highlight frequently-reported benefits associated with participation in Masters sport (these benefits were referred to as “involvement opportunities”; see Young, Bennett, & Séguin, 2015; Young & Medic, 2011) and was delivered using an online intervention. Nine GFM were created to detail the following nine involvement opportunities:

(1) health and fitness benefits; (2) delaying the effects of aging; (3) social affiliation; (4) enjoyment; (5) stress relief; (6) improving physical skills; (7) excitement; (8) travel opportunities; and (9) achieving competitive goals. Following message exposure, the results from a manipulation check showed that participants attended to certain messages more than others. For instance, ‘health and fitness’ was recalled more frequently than any other benefit, and benefits relating to ‘delaying the effects of aging’, ‘social affiliation’, ‘enjoyment’ and ‘stress relief’ were attended to well and recalled at expected levels. Messages pertaining to ‘improving physical skills’, ‘excitement’, ‘travel opportunities’ and ‘achieving competitive goals’ were not attended to strongly and were stated less frequently at a level lower than would be expected by chance.

In regards to key outcome variables, Lithopoulos et al. (2015; see also Lithopoulos, 2014) investigated the effects of viewing the nine GFM on eliciting possible hoped-for sport selves, intentions to engage in sport, requests for a newsletter about adult sport opportunities in the area, registration for a sport program, and weekly sport activity. Results showed that participants who viewed the GFM video, as opposed to those who completed a quiz about sport and PA (comparison group), elaborated significantly more about a hoped-for sport self, and elaborated specifically on themes that were consistent with GFM in the experimental condition. GFM participants also requested significantly more sport-related newsletters immediately after exposure, and were more likely to report registering for a sport program one month after the intervention (Lithopoulos, 2014). There were, however, no significant benefits for the GFM group for self-reported sport activity assessed with the moderate and strenuous scores on the Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985). This finding may indicate that the GFM intervention was not strong enough to elicit significant increases in physically active behaviour. However, it may also indicate that the GLTEQ was not able to accurately capture changes in *sport* behaviour, as this measure produces an overall score for exercise and sport combined. As such, a more sport-specific measurement tool may be more appropriate; thus, we opted to utilize the Short Questionnaire to Assess Health Enhancing Physical Activity survey

(SQUASH; Wendel-Vos, Schuit, Saris, & Kromhout, 2003) to measure sport-specific behaviour.

Although some significant positive results were found for GFM in this adult sport context, which shows the possible utility for messaging in re-attracting adults to sport, more research is needed to confirm and extend these results. Moreover, there were other limitations, which could be remediated with additional research in this area. For example, Lithopoulos (2014) reported unexpected findings for intentions to engage in sport based on the individual characteristic of ‘approach motivation,’ (e.g., Mann, Sherman, & Updegraff, 2004). Only participants in the GFM group that had a low ‘behavioural approach activation system’ (BAS) drive significantly increased their sport intentions, which appeared counter-intuitive to past research that has shown that GFM are most persuasive for individuals with high BAS drive (e.g., Mann, et al., 2004). Lithopoulos et al. considered ‘approach motivation’ in a similar manner to ‘regulatory goal orientation’ (Higgins, 1997). It is possible that their findings may have been less equivocal had they measured regulatory focus according to ‘promotion’ and ‘prevention’ orientations from Higgins’ (1997) Regulatory Focus Theory, as these scales (see Appendix A) have been helpful in explaining the effectiveness of framed content based on the specific regulatory goal orientation of message recipients. Individuals with a ‘promotion’ orientation are concerned with nurturance and growth needs, and are more motivated by potentially pleasurable/gainful outcomes. Conversely, individuals with a ‘prevention’ orientation are concerned with security and safety needs, and are more motivated by the threat of potentially painful/costly outcomes should they not do a target behaviour. For example, Latimer et al. (2008b) found support for the concept of “regulatory fit,” as promotional messages that matched the orientation of the recipient (GFM for promoters, and LFM for preventers) resulted in more positive thoughts and PA participation than mismatched messages.

In addition to the potential measurement limitation described above, the nine GFM in Lithopoulos et al. (2015) were not randomized, which may have confounded how the results could be attributed to different gains/involvement opportunity themes advertised in the messages. Since

participants' attention may be drawn to the first or last message to which they are exposed (e.g., primacy and recency effects; e.g., Brunel & Nelson, 2003), randomizing the order of the messages is important. As such, the order of the messages in the interventions developed for this study was randomized to account for potential primacy/recency effects. Furthermore, the 'control' group in Lithopoulos et al. (2015) completed a quiz about sport and PA, meaning it was a comparison group, which may have affected their reports of key outcome variables. Thus, we chose to implement a 'true' control condition, whereby these participants only completed survey measures and did not engage in any additional tasks as a way to track their sport-related thoughts and behaviour naturally over time.

As discussed previously, pairing framed messages with efficacy-enhancing content may be a promising approach for developing more effective promotional messages to stimulate desired target behaviours. Therefore, the purpose of this study was to investigate the added effects of a paired intervention condition, compared to a GFM-alone (e.g., Lithopoulos et al., 2015), within the context of attracting middle-aged persons to adult sport. Thus, recent literature investigating the capability of such paired conditions will now be discussed, as this literature informed the development of the paired condition for this study.

### **Pairing Message Content with Efficacy Content**

There are a limited number of messaging studies that have manipulated SE. Of particular interest are the few studies that have *paired* efficacy-enhancing messages with framed content to stimulate behaviour change. For example, Hatchell et al. (2013) developed an online messaging intervention to promote PA with a sample of 611 men (25 to 45 years old) that were not meeting minimum weekly PA recommendations at baseline. Specifically, these authors designed LFM to highlight pertinent risks of inactivity, and paired this content with messages that targeted three types of SE. Detailed information was intended to persuade men to have stronger response-efficacy (RE) beliefs, that is, to expect that PA would help them successfully avert cardiovascular disease, erectile dysfunction, and Type 2 diabetes. Information was also intended to persuade the men to have greater

confidence in one's ability to plan for and include PA in daily life (i.e., scheduling SE), and information about the ease of performing specific activities (e.g., strengthening) was provided to increase task SE beliefs. Each participant was randomly assigned to one of four messaging conditions: (1) LFM paired with high efficacy information; (2) LFM paired with low efficacy information; (3) High efficacy alone; or (4) Low efficacy alone. Results showed that intentions to be active increased regardless of the messaging condition, and men that received LFM were significantly more likely to engage in PA at the 14-day follow-up than those that did not receive framed content. Notably, differential effects between one paired condition and the unpaired conditions were found. Specifically, men in the 'LFM with low efficacy information' group were significantly less likely to meet PA recommendations at the 14-day follow-up than the other groups. From this proof-of-concept experiment, it was evident that LFM and low-efficacy had the most negative effects. In their discussion, these authors recommended pairing high efficacy information (i.e., efficacy-enhancing rather than efficacy-diminishing messages) with framed content, although they did not show specific advantages for such a pairing (at least with LFM) in their investigation.

Other proof-of-concept studies have also assessed the effects of messages with efficacy-enhancing information versus efficacy-diminishing information. With a sample of 195 undergraduate students not currently enrolled in an exercise program, Stanley and Maddux (1986) distributed promotional essays that described either: (a) an exercise program that was very easy to complete (high efficacy condition); or (b) an exercise program that was very difficult to complete (low efficacy condition). Results showed that SE and intentions to be active were higher among participants that received the high efficacy message compared to those who read the low efficacy message. Similarly, in another study among 427 undergraduate students, Courneya and Hellsten (2001) distributed promotional essays that described the amount of PA needed to reduce the risk of cancer. The high efficacy condition described the PA requirement as two to three days per week for 20 minutes of moderate intensity. Conversely, the low efficacy condition described the required PA as five to six days

per week for 60 minutes of high intensity. Results showed that post-test SE was higher among recipients of the high efficacy message than those of the low efficacy message. Thus, efficacy-enhancing messages result in higher SE and intentions to be active than efficacy-diminishing messages.

In addition to the proof-of-concept studies described above, a few randomized experiments have also manipulated SE in messaging interventions. For example, Graham et al. (2006) distributed promotional DVDs to a targeted group of school employees (they were targeted to be in the pre-contemplation, contemplation, and preparation stages of change for PA behaviour) ( $N = 72$ ,  $Mage = 43.81$ ,  $SD = 11.50$ , 70% female). The experimental DVD was 18-minutes long and included SE-enhancing information about practical ways to incorporate PA into daily life, paired with gain-framed RE-enhancing information about the ability of exercise to decrease the risk of colon cancer. There was also an 'attention control' group that received a 15-minute long DVD outlining general information about the link between diet and colon cancer. One-week and one-month after receiving the DVDs, participants reported their beliefs about exercise to decrease the risk of colon cancer (RE), PBC to participate in exercise, intentions to engage in exercise, and exercise behaviour. Results showed that watching the experimental DVD, as opposed to the 'attention control' DVD, stimulated significantly higher reports of RE and intentions to engage in exercise. PBC, which was used as a construct to assess SE, was also higher among the experimental group, however, this advantage did not reach significance.

Another recent messaging intervention did not pair framed content with efficacy-enhancing information per se, but instead paired GFM with instructions on *action planning* (Sweet et al., 2014). Action planning is a behavioural strategy, or process by which individuals map their intended plans for PA participation, including when, where, and how they will participate (Lippke, Ziegelmann, & Schwarzer, 2004); action planning has been found to mediate PA behavior and has been correlated with efficacy enhancement (Schwarzer, 2008). Sweet et al. (2014; Study 1) assessed the effects of pairing GFM about PA benefits with messages outlining how to create action plans for PA in a population of inactive men and women ( $N = 133$ , women = 99,  $Mage = 41.8$ ). Participants were randomly assigned to

one of two experimental conditions: (1) GFM-alone; or (2) GFM paired with action planning messages. The results showed that participants in both conditions were equally likely to create an action plan after viewing their respective messages; however, significantly higher quality (more detailed) action plans were created by those in the paired condition. Although actual PA behaviour was not assessed as an outcome variable, the authors recommended pairing messages about the benefits of PA with messages targeted at more proximal outcomes (e.g., action planning), based on the premise that more detailed action planning should result in PA engagement (Sweet et al., 2014).

The studies reviewed above showed that paired messaging conditions can result in significant positive increases in key PA-related outcomes when compared to traditional unpaired (i.e., framed alone) conditions. This study aimed to investigate the effects of efficacy-enhancing content paired with GFM in eliciting changes in key outcomes in a sporting context, compared to a GFM-alone condition. Although the few studies described above found some significant positive effects for targeting and manipulating mediating variables such as SE and action planning, there were various methodological limitations that informed considerations in this study. For example, Graham et al. (2006) and Sweet et al. (2014; Study 1) did not control for the length of time of each messaging intervention. Graham et al.'s experimental DVD was three minutes longer than the 'attention control' DVD, and the supplementary promotional materials in Sweet et al.'s paired message condition was two and a half pages longer than in the unpaired condition. Research has shown that the length of time spent attending to a message can significantly affect its capability to stimulate changes in outcome variables (e.g., Petty, Brinol, & Priester, 2009). Thus, message duration was controlled for in the present investigation. Furthermore, although proof-of-concept studies (Stanley & Maddux, 1986; Courneya & Hellsten, 2001; Hatchell et al., 2013) are useful for investigating the validity of theoretical constructs, results are not particularly useful for providing practical implications for applied promotional materials. For instance, including 'low efficacy' content that describes a PA program as being very difficult to complete would not be practical. As such, the current study filled a need for additional randomized-control experiments

that explore messaging targeting changes in SE in a facilitating manner. Lastly, some past messaging studies have found positive effects for the dependent variable *response efficacy*, which represents beliefs about outcomes of PA participation (e.g., Graham et al., 2006). To remain theoretically consistent with SCT (which guided the construction of our SE-enhancing messages), we instead opted to measure a related dependent variable included in this theory, *outcome expectancies* (Bandura, 2001).

### **The Role of SE in Overcoming Barriers to Begin Adult Sport**

There are promising results in preliminary work pairing GFM with efficacy-enhancing content of various sorts. Thus, similar paired messaging manipulations may be of value in persuading middle-aged adults to engage in adult sport. Since notions of participation largely depend on navigating barriers (Sallis & Owen, 1999), it is important to review literature to determine the most salient or common barriers to adult sport that may inform efficacy-enhancing message content. Although participation in Masters sport is quickly growing, there are limited studies that have explicitly examined barriers to adult sport (Young, 2011). Cardenas, Henderson, and Wilson (2009) surveyed 440 older adults (55 years old and above) that participated at the North Carolina Senior Games. Their notable barriers were ‘lack of time’ and ‘lack of self-discipline’. Young, Medic, Cameron, Theberge, and Latham (2009) investigated perceived barriers among a group of Ontario Seniors Games participants. Their most commonly reported barriers were ‘unavailability of organized training and competitive opportunities’ and ‘lack of participation by family members’. Although these studies give some indication of barriers to adult sport, both were conducted with older adults who were already active in sport. Thus, these may not be salient barriers when considering inactive sporting adults.

More broadly, there has been extensive research examining the perceived barriers that constrain inactive adults from initiating engagement in PA. It is important to consider the individual, their physical and social environment, and how interaction between the individual and their environment creates perceived barriers (Sallis & Owen, 1999). Within this literature, there are common themes that arise. For example, Booth, Bauman, Owen, and Gore (1997) had 1,232 inactive adults report what they

believed to be their primary barriers to regular PA participation. A perceived ‘lack of time’ and ‘lack of motivation’ were cited as the most common barriers among those 40-59 years old. Similarly, Booth, Bauman, and Owen (2002) surveyed 402 participants aged 60 and above; they found that ‘not having enough time’ and feeling ‘too old’ were reported by more than 10 percent of all inactive men and women. Feeling “too old” to participate in PA is a perceived attitudinal barrier that may emerge as an individual ages, largely due to the prevalence of negative aging stereotypes (e.g., older adults are seen as being too frail to participate). As such, many adults ‘buy into’ these negative stigmas and avoid PA as they get older, regardless of whether they have the ability to participate (e.g., Horton, 2010).

In another study by Cerin, Leslie, Sugiyama, and Owen (2010) with 2,194 adults, results showed that a ‘lack of motivation’ and ‘time’ were associated with level of leisure-time PA (LTPA), and ‘lack of motivation’ and ‘lack of facilities’ predicted greater odds of non-participation in LTPA. Furthermore, Carey and Young (2012) showed that 45-74 year old inactive Canadian adults perceived a lack of: ‘encouragement from significant others’, ‘motivation’, ‘SE’, and ‘nearby PA opportunities’, to a greater extent than their active counterparts.

Taken together, these results, among other relevant studies, illustrate that inactive adults face barriers at the intrapersonal, interpersonal, and environmental levels. Specifically, the following perceived barriers are frequently reported by inactive adults: (1) lack of time (PA interfering with other obligations); (2) lack of motivation; (3) negative attitude (feeling “too old”); (4) lack of facilities and/or opportunities nearby; and (5) lack of encouragement from significant others. Thus, adults who may be persuaded to engage in adult sport might need to become more efficacious with respect to these ‘salient’ barriers and might need to become more aware of strategies to overcome such barriers. Importantly, for the current intervention, the content of each of these five ‘salient’ barriers was specifically addressed in the construction of the efficacy-enhancing messages.

### **Objectives and Hypotheses**

The main purpose of this study was to investigate how a gain-framed sport-promotion messaging intervention impacted psychological and behavioural outcomes, based on the inclusion (or lack thereof) of efficacy-enhancing messages. Specifically, this study sought to answer three main research questions:

- 1) What are the psychological effects of a GFM-alone condition on attitudes, outcome expectancies (OEs), intentions to do sport, and SE, when compared to a condition that pairs GFM with efficacy-enhancing content?
- 2) How is sport behaviour and moderate-to-vigorous PA impacted after being exposed to a GFM-alone condition compared to the paired messaging condition?
- 3) What are the psychological and behavioural effects of receiving *either* messaging intervention when compared to a control condition that receives no intervention?

It was expected that both messaging conditions in this study would lead to increases in psychological and behavioural outcomes. However, it was expected that participants in the paired (GFM+SE) condition would score higher on outcomes at the one-month follow-up than those receiving GFM-alone, as the added efficacy-enhancing messages would make the paired intervention more effective as evidenced by effect sizes and any statistical significant group differences. Specifically, the following results were hypothesized:

- 1) Participants in the paired condition would report significantly higher SE than those in the GFM-alone condition because the additional messages contained content designed to increase SE beliefs.
- 2) Participants in the paired condition would report stronger intentions, more weekly sport behaviour, report registering for a sport program and/or event more often, and would be more likely to request a sport-related newsletter than those in the GFM-alone condition because enhanced SE beliefs have been shown to elicit behaviour change.
- 3) Both groups of participants would report increases in attitudes and OE because both conditions detail the same benefits of being involved in regular sport.

- 4) Participants in the two experimental conditions would show greater increases in psychological and behavioural outcomes when compared to participants in the control condition.

## Method

### Participants

Potential participants were recruited from a variety of sources, including on-site at community centres and at youth sport events, as well as via social media platforms (e.g., Facebook) and online boards (e.g., Kijiji). All participants provided informed consent and voluntarily took part in the experiment after reading the Letter of Information (see Appendix B). Furthermore, all consenting participants were aware that four individuals would be randomly selected to win a \$75 cash prize each for their participation. To be eligible to complete all three surveys and considered for data analyses, each participant was required to meet the following inclusion criteria: (i) between the ages of 40 and 60 years old; (ii) in one of the first three stages of change for sport activity (Prochaska, DiClemente, & Norcross, 1992; Appendix C); (iii) perceive themselves healthy enough to regularly participate in sport (Lithopoulos et al., 2015; response = yes or no); (iv) did not perceive adult sport as being a risky activity (i.e., rated the riskiness of adult sport as a '5' or less on a Likert scale anchored a '1' – not at all risky to '7' – extremely risky; Lithopoulos et al., 2015).

### Procedure and Data collection

There were three distinctive time points for data collection during the intervention (baseline, one-week later, and a one-month follow-up). All survey items and messaging interventions were implemented online through the FluidSurveys.com platform. With two experimental groups and a 'no-intervention' control condition, this study adopted a randomized-control design; random assignment occurred after completion of the Time 1 survey. All protocols were approved by the Research Ethics Board (REB) at the University of Ottawa (see Appendix D).

**Time 1.** After accessing the link for the first online survey, recruited participants completed demographic and inclusion criteria measures to determine eligibility for the study (sex, age, stage of

change, health status, risk perception). Participants also responded to an additional screening measure gauging their degree of participation in sport during youth. Lastly, participants responded to questions regarding seven baseline dependent measures: weekly sport behavior, moderate-to-vigorous PA (MVPA), attitudes toward adult sport, intention to regularly participate in sport, barrier SE, scheduling SE, and OEs about the likelihood of adult sport to result in positive outcomes.

*Typical weekly sport behaviour* in the past month was assessed by self-report using a modified version of the SQUASH to reflect sport behaviour (Wendel-Vos et al., 2003; Appendix E). The SQUASH has produced valid and reliable indices for both sport and exercise behaviour in adults, and includes a compendium based on metabolic equivalent of task (MET) for each activity to yield a distribution of sport activity scores in a sample (SQUASH scores were used to dichotomously code participants as either ‘yes’ or ‘no’ in regards to participation in sport-related activities). *Typical MVPA* was assessed using the moderate and vigorous scales of Godin and Shephard’s (1985) GLTEQ, which is widely used in PA research (Appendix F). This measure provided a baseline indication of typical weekly engagement in PA, including both sport and exercise activities. *Attitudes toward adult sport* were assessed using seven items on a 7-point scale to gauge how each participant generally viewed adult sport. We implemented the semantic differential anchors used by Berenbaum and Latimer-Cheung (2014) but modified the preface to reflect sport-specific attitudes, rather than general PA attitudes (Appendix G). These items have shown acceptable Cronbach alpha scores in various PA contexts with adults. *Intention to regularly participate in sport* was assessed using five items, each on a 7-point Likert scale; three of these items had been previously used to assess messaging effects (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999), but were modified for sport behavior. An additional item was used from Prins et al. (2010), with a final item added because of its prior use in assessing messaging in adult sport (Lithopoulos et al., 2015; see Appendix H). All five items were chosen because they showed very high internal consistency in the middle-aged adult sample in Lithopoulos et al. (2015). Although *attitudes* and *intentions* are not constructs included in SCT,

multiple studies have found positive effects on these outcomes. Thus, we viewed *attitudes* and *intentions* as important dependent variables to measure due to their prevalence in messaging literature.

*Barrier SE* was assessed using five items following guidelines for barrier SE scale construction (Bandura, 2006; Appendix I), which reflected five ‘salient’ barriers to adult sport participation (i.e., lack of time, lack of motivation, negative attitude, lack of sport facilities/opportunities, lack of encouragement from significant others). This measure provided an indication of one’s confidence in their ability to overcome barriers/constraints to regularly engage in sport. *Scheduling SE* was assessed using five items on a 7-point Likert scale that have shown acceptable validity in adult samples (Arbour-Nicitopoulos, Martin Ginis, & Latimer, 2009; Appendix J). This measure provided an index of one’s confidence in their ability to schedule increasing amounts of engagement in sport activity. Lastly, *OE*s were measured by responses to nine questions on a 5-point Likert scale about the likelihood of regular adult sport participation to result in favourable outcomes (e.g., Gellert, Ziegelmann, & Schwarzer, 2012). Each question matched one of the nine tailored GFM in this study: optimal health; delay effects of aging; social affiliation; fun/enjoyment; stress relief; improvement of physical capabilities; thrills/excitement; achievement of competitive goals; travel opportunities (Appendix K).

As participants responded to the survey at Time 1, after assuring they met inclusion criteria, the principal investigator assigned participants to either one of the two the experimental conditions, or to the ‘no-intervention’ control condition. Following random group assignment, participants were sent an email link inviting them to participate at Time 2 one week later.

**Time 2.** Participants were able to open their own private web-link to view their respective experimental messaging intervention, either GFM-alone or GFM+SE. Participants assigned to the ‘no-intervention’ control condition did not receive a messaging intervention; they solely completed a second series of survey measures.

***GFM-alone.*** A four-minute PowerPoint Presentation (PPT) that included nine consecutive GFM, each detailing a benefit of adult sport participation, followed by five neutral slides, was delivered

to participants assigned to this condition. Male participants received an intervention with a male voice recording, and females received a female voice recording, to ensure that the video was tailored for both sexes. The GFM were based on known benefits of Masters sport, which have been established through past research surveying adult sport participants about involvement opportunities realized through their participation (Young et al., 2015; Young & Medic, 2011). Furthermore, the nine GFM replicated the GFM developed by Lithopoulos et al. (2015), which were created using recommended guidelines for GFM construction (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; see Appendix L for the full GFM). The five ‘neutral’ messages outlined factual/historical information related to adult sport; these additional messages were included in this intervention to ensure both groups of experimental participants received the same number of messages in a video of the same length (see Appendix M). The order of the nine GFM was randomized, as well as the order of the neutral slides, and participants could not pause the video to guarantee that the messages ran linearly and were not repeated, with equal exposure time per message.

***GFM+SE.*** Participants assigned to this experimental condition received a four-minute narrated PPT, which included the same nine GFM in a randomized order, followed by five additional messages designed to increase SE for overcoming barriers to Masters sport. Each efficacy-enhancing message suggested a technique to overcome a common barrier to sport, and key sources of SE, as detailed by Bandura (2001; e.g., mastery, vicarious and imaginal experiences), were embedded within the construction of these messages (see Appendix N for the full messages). Once again, participants in this experimental condition were not able to pause the promotional video as a way to ensure equal exposure time per message.

***Immediately following exposure.*** Immediately after watching the video, participants in the two experimental conditions completed a manipulation check to ensure that he/she did in fact view the intervention. The manipulation check asked each participant to type two main themes that were present

in the messages; any participant that was unable to recall two themes was subsequently eliminated from the study (e.g., McCall & Martin Ginis, 2004).

**Time 2 survey measures.** Immediately following the manipulation check, participants in the experimental conditions completed another series of survey items (participants in the control condition immediately began completing the items). All participants reported on dependent measures for attitudes toward sport, intention to participate, barrier SE, scheduling SE, and OEs. Additionally, they were asked whether they would like to request *an adult sport-related newsletter* (response = yes or no), as an indication of sport-related information-seeking behaviour (Lithopoulos et al., 2015; Appendix O), as well as survey measures relating to *goal-setting SE* and *PBC*.

*Goal-setting SE* was measured to capture individual beliefs regarding their ability to set goals to help enable participation in adult sport (Arbour-Nicitopoulos et al., 2009; Appendix P); six items measured on a 7-point Likert scale were for assessment. *PBC* is a concept that is closely related to SE, as it represents individual beliefs about the perceived ease or difficulty of engaging in a specific behaviour (Ajzen, 1991). *PBC* is another prevalent dependent variable in messaging literature, which is why we decided to measure it in this study. Four items measured on a 7-point Likert scale were employed to assess PBC as it relates to engaging in sport as an adult, which have shown acceptable validity in adult samples (Ajzen, 1991; Appendix Q).

**Time 3.** Four-weeks after watching the promotional video and/or completing Time 2 survey items (control group), all participants were emailed one final link to the last online survey. Participants were again asked to report on dependent measures for attitudes, intention, barrier SE, and scheduling SE. Furthermore, participants were also asked to report their weekly sport behaviour during the past month using the SQUASH (scored dichotomously as ‘yes’ or ‘no’ in regards to sport participation), and were asked whether or not they had *registered for a sport program* (e.g., organization, team, club; response = yes or no), and whether they had *registered for a sport event* (e.g., a local 10km race; response = yes or no) within the past month. Additionally, each participant was asked to report the

*likelihood of registering* within: (a) the next month, and (b) the next six months, on a Likert scale (1 = ‘extremely unlikely’, to 7 = ‘extremely likely’). Lastly, participants once again reported their typical weekly MVPA behaviour (including both sport and exercise activities) using the GLTEQ.

### **Planned Analyses**

A series of analyses were run to investigate the immediate effects of exposure to the messaging interventions (e.g., dependent variables that were measured at Time 2 after watching the promotional video). Furthermore, analyses were also conducted to investigate delayed effects one-month after exposure to the messaging interventions. Repeated-measures analyses of covariance (RM-ANCOVAs) and repeated-measures analyses of variance (RM-ANOVAs) were run for the continuous dependent variables measured at multiple time points, one-way ANCOVAs were used for continuous dependent variables measured at one time point only, and binary logistic regressions and chi-square tests were used to analyze all categorical variables. The results of these analyses were used to explore statistically significant differences between the participant groups in reports of key dependent variables over the course of the study.

### **Presentation of Manuscript**

The following manuscript entitled, *Gain-Framed Messaging to Promote Adult Sport: Exploring the Effects of Efficacy-Enhancing Information on Psychological and Behavioural Outcomes*, presents the findings for the majority of the dependent variables in the proposed analyses. Due to space restrictions imposed by the manuscript format, any analyses pertaining to outstanding dependent variables that are not included in the manuscript are presented in Chapter 3 (Supplementary analyses).

Gain-Framed Messaging to Promote Adult Sport: Exploring the Effects of Efficacy-Enhancing  
Information on Psychological and Behavioural Outcomes

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## Abstract

To understand how to better promote adult engagement in sport, this experiment tested the impact of a gain-framed (Rothman & Updegraff, 2010) messaging intervention on psychological and behavioural outcomes, based on the inclusion (or lack thereof) of efficacy-enhancing messages (Latimer et al., 2010). Eligible participants were randomly assigned to one of two experimental conditions: (a) Gain-framed messages alone (GFM-alone); (b) Gain-framed messages plus efficacy-enhancing messages (GFM+SE); or to a control condition. A total of 232 participants (62.5% female,  $M$  age = 46.8,  $SD$  = 8.68) completed baseline and screening measures (Time 1), survey measures one week later after experimental participants viewed a messaging intervention (Time 2), and follow-up measures one month later (Time 3). When the GFM-alone and GFM+SE conditions were directly compared, non-significant differences were found for all variables measured throughout the intervention. When the two experimental groups were collapsed and compared against the control condition, significant group by time interaction effects showed messaging resulted in increased ‘outcome expectancies’ for adult sport to provide opportunities for ‘travel’, ‘social affiliation’, and ‘stress relief’. Specifically, reports of these variables tended to increase from baseline to Time 2 for experimental group participants while these reports remained constant or decreased within the control. Results also indicated that reports of moderate-to-vigorous physical activity significantly decreased from Time 1 to Time 3 within the control group, but remained constant for experimental group participants. Thus, this study did not find any added benefit of providing messages designed to increase self-efficacy for adult sport. Providing gain-framed messages enhanced certain sport-related outcome expectancies, and provided an apparent ‘buffer’ effect against typical seasonal declines in reports of MVPA. Future research should continue to investigate interventions that have the potential to effectively motivate adult participation in sport.

## Gain-Framed Messaging to Promote Adult Sport: An Exploration of the Effects of Efficacy-Enhancing Information on Psychological and Behavioural Outcomes

Regular participation in physical activity (PA) has been widely associated with significant psychological and physical health benefits (Nelson et al., 2007). With the Canadian population aging rapidly and the lowest rates of PA among adults aged 35 and above (Statistics Canada, 2013), solutions are needed to increase PA participation within the adult population to guard against impairments associated with inactivity. Although exercise and fitness activities are widely promoted as means to achieve recommended PA guidelines, sport is another distinct PA venue that may appeal to some Canadian adults. Data collected by Statistics Canada have shown that sport participants report higher perceptions of physical and mental health, as well as life satisfaction, than non-participants (Canadian Heritage, 2012). The notion that sport promotes successful aging has also been specifically advanced for middle- and older-aged individuals (Baker, Meisner, Logan, Kungl, & Weir, 2009; Menec, 2003). Furthermore, participation in adult ('Masters') sport has been shown to appeal to a wide range of motives, such as opportunities to test skills and for peer companionship (Young & Medic, 2011).

Employing strategies to promote adult sport may attract additional participants and increase PA rates among middle-aged adults, which could increase the likelihood of continued engagement in later adulthood (Gray & Harrington, 2011). The current study examined messaging, which is one promotional tactic that has been used to provide motivating information designed to stimulate engagement in PA. Message framing is a technique commonly used to present a persuasive message in different ways to encourage a particular behaviour (Rothman & Updegraff, 2010). Of the two main types of framing, gain-framed messages (GFM) represent an emphasis on the benefits or anticipated favourable circumstances that might be associated with performing a target activity (e.g., 'If you engage in PA, you can improve strength and flexibility'), whereas loss-framed messages (LFM) emphasize costs related to not performing an activity (e.g., 'If you do not engage in PA, you will likely lack strength and be inflexible'). Recent meta-analyses have concluded that a gain-framed approach is

generally more effective than a loss-framed approach when promoting PA (Gallagher & Updegraff, 2012; O’Keefe & Jensen, 2007). Furthermore, there is a substantial body of evidence that has reported the effectiveness of GFM for eliciting changes in both proximal (psychological; e.g., intentions to be active) and distal (behavioural) outcomes in PA contexts (e.g., Berenbaum & Latimer-Cheung, 2014; Brawley & Latimer, 2007; Li, Cheng, & Fung, 2014).

Although many message framing studies have found significant positive advantages for GFM, many of these results have yielded fairly small effect sizes (O’Keefe & Jensen, 2007). Accordingly, messaging researchers have recently begun investigating various conditions that may enhance messaging effectiveness in PA contexts. For instance, Latimer, Brawley, and Bassett (2010) stated that one of the most concerning methodological limitations was, “the absence of a theoretical framework to guide message content” (p. 8). Although theories have often informed the choice of proximal dependent variables that have been selected for assessment purposes, many messaging interventions have not specifically designed the content of messages to directly target change in important theoretical tenants/correlates of behavioural change (Hatchell, Bassett-Gunter, Clarke, Kimura, & Latimer-Cheung, 2013; Sweet, Brawley, Hatchell, Gainforth, & Latimer-Cheung, 2014). Furthermore, although GFM may be useful to increase individual awareness and knowledge of the benefits of PA, this is likely not enough to stimulate actual behaviour change. For instance, Cavill and Bauman (2004) discussed how knowledge and awareness are foundational for eventual behaviour change, but additional antecedent variables (i.e., self-efficacy) must also be successfully targeted to motivate behaviour. Thus, pairing theoretically-driven content that targets self-efficacy (SE) beliefs with GFM may be promising for developing more effective messaging interventions (Latimer et al., 2010).

### **Incorporating Theoretically-Based Information into Message Content**

Bandura’s (2001) Social Cognitive Theory (SCT) has been particularly useful in understanding change in PA behaviour. SCT outlines conditions that influence how people learn and behave; specifically, an individual’s level of SE toward a target activity, expectations of the outcomes an

activity will produce, and environmental factors, all influence if and how one engages in a target activity. SE constructs are incorporated in multiple behaviour change theories and have been shown to strongly impact PA behaviour (e.g., Rothman, Baldwin, Hertel, & Fuglestad, 2010).

With respect to sport, there is a dearth of messaging studies, with only one investigation having specifically attempted to promote *sport* participation (Lithopoulos, Rathwell, & Young, 2015; Lithopoulos & Young, 2016). Lithopoulos et al. (2015; 2016) assessed the effects of GFM with a sample of 244 40-59 year-olds who were not regularly engaged in sport as an adult. This experimental gain-framed intervention was designed to highlight nine frequently-reported benefits ('involvement opportunities' see Young, Bennett, & Séguin, 2015) associated with participation in Masters sport, delivered in an online video. Results showed that participants who viewed the GFM video, as opposed to those who completed a quiz about sport and PA (comparison group), elaborated significantly more about a hoped-for sport self on themes that were consistent with what had been promoted in the GFM condition (Lithopoulos et al., 2015). GFM participants also requested significantly more sport-related newsletters immediately after GFM video exposure, and were more likely to report having registered for a sport program one month after the intervention (Lithopoulos & Young, 2016). There were, however, no significant benefits for the GFM group for self-reported moderate and vigorous PA on the Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985). In their discussion, Lithopoulos and Young (2016) explained how they inadvertently created 'paired' and 'unpaired' conditions with the addition of a possible selves protocol (PSP): (a) participants that received GFM and completed the PSP (GFM-PS); (b) participants that received the GFM but did not complete the PSP (GFM-alone); (c) participants that completed the quiz and PSP (Q-PSP); (d) participants that solely completed the quiz (Q-alone). Results of the *a posteriori* analyses that compared these four groups showed that there were some enhanced benefits for the GFM-PSP group; these participants immediately requested significantly more newsletters and reported significantly higher rates of sport registration at Time 3 than the GFM-alone group. Furthermore, both paired conditions showed

significant increases in sport intentions, which were not observed for the unpaired groups. Although this study showed trends indicating an advantage for the paired intervention condition, the current study is an *a priori* attempt to measure a paired condition (GFM with SE-enhancing information).

### **Pairing Message Content with Efficacy Content**

Recent literature has advanced the notion that paired messaging interventions may have greater capability in eliciting and sustaining behavior change. Of particular interest are the few studies that have *paired* efficacy-enhancing messages with framed content, which have effectively showed the theoretical merit of SE-enhancing information to stimulate behaviour change. For example, in a proof-of-concept experiment with 195 undergraduate students, Stanley and Maddux (1986) found that SE and intentions to be active were higher among participants that received a message describing an easy-to-complete exercise program (high efficacy message) compared to those who read a message about a difficult exercise program (low efficacy message). Similarly, Courneya and Hellsten (2001) distributed messages that described the amount of PA needed to reduce the risk of cancer, and found that post-test SE was higher among recipients of the high efficacy message compared to those who read the low efficacy message. Hatchell et al. (2013) also performed a proof-of-concept investigation with a sample of 611 men (25 to 45 years old) that were not meeting minimum weekly PA recommendations at baseline and further substantiated the claim that high efficacy information be paired with framed content. Thus, efficacy-enhancing messages tend to result in higher SE and intentions to be active.

A few randomized experiments have also manipulated SE in messaging interventions and have found some promising results. Graham, Prapavessis, and Cameron (2006) distributed promotional DVDs to a targeted group of 72 low-active school employees ( $M_{age} = 43.81$ ). The experimental DVD was 18-minutes long and included SE-enhancing information about practical ways to incorporate PA into daily life, paired with GFM about the ability of exercise to decrease the risk of colon cancer. An ‘attention control’ group received a 15-minute DVD outlining general information about the link between diet and colon cancer. Results showed that watching the experimental DVD stimulated

significantly higher reports of response efficacy and intentions to engage in exercise. Perceived Behavioural Control (PBC), which was used as a construct to assess SE, was also higher among the experimental group. Latimer et al. (2008) investigated the relative effectiveness of GFM and LFM in a sample of middle-aged adults, and also included message content designed to increase SE for overcoming barriers to PA. Results showed a significant advantage for the GFM condition in increasing intentions to be active and SE, as well as increasing follow-up PA.

Sweet et al. (2014) paired GFM with efficacy-enhancing messages about action planning in a messaging intervention delivered to a sample of 133 inactive men and women (*Mean age* = 41.8). Action planning is a behavioural strategy whereby individuals map their intended plans for PA participation, which has been found to mediate PA behavior and has been correlated with efficacy enhancement (Schwarzer, 2008). Participants were randomly assigned to one of two experimental conditions: (1) GFM-alone; or (2) GFM paired with action planning messages. The results showed that participants in both conditions were equally likely to create an action plan after viewing their respective messages; however, significantly higher quality (more detailed) action plans were created by those in the paired condition. Although actual PA behaviour was not assessed as an outcome variable, the authors recommended pairing messages about the benefits of PA with messages targeted at more proximal outcomes (e.g., action planning), based on the premise that more detailed action planning should result in PA engagement (Sweet et al., 2014).

In sum, the studies reviewed above suggest that paired messaging conditions can result in positive increases in key PA-related outcomes when compared to traditional framed alone conditions. Framed information may help to increase awareness and knowledge about *why* PA is important, but this may not be enough to change additional antecedent variables to behaviour, such as SE (Cavill & Bauman, 2004). With respect to a supplemental efficacy enhancement condition, only a couple of studies (e.g., Graham et al., 2006; Latimer et al., 2008) have deliberately designed message content in randomized field interventions to target change in SE. Although the results of these studies showed a

significant advantage for participants that received GFM paired with SE-enhancing messages, participants in *all* experimental conditions received the additional SE-enhancing information. Since the direct effects of the SE-enhancing content was not analyzed systematically, the effects of the efficacy-enhancing content could not be contrasted with GFM content alone, nor could the impact of SE message content be discerned. Furthermore, although proof-of-concept studies are valuable in providing empirical evidence to support theoretical tenants, these studies can not necessarily offer practical implications for applied settings. Lastly, although the Sweet et al. (2014) paired GFM with messages designed to increase knowledge of and SE for *action planning*, they did not specifically target SE for PA itself, nor did they measure behavioural outcomes related to actual PA.

This study aimed to investigate the effects of efficacy-enhancing content paired with GFM, while addressing prior limitations. Firstly, the current study filled a need for additional randomized-controlled trials in the field, rather than relying on proof-of-concept experimentation in the laboratory. Secondly, we took methodological steps to equate message duration across conditions in our investigation, as the length of time spent attending to a message can significantly impact its effectiveness (e.g., Petty, Brinol, & Priester, 2009). Graham et al. (2006) and Sweet et al. (2014; Study 1) did not control for wide variations in the length of time of each condition in their interventions. Thirdly, the current study explored the benefits of efficacy-enhancement messages using content that were constructed and informed by contemporary research on barriers to regular sport participation in adults, meaning the SE content was designed in a purposeful manner pertinent to the target sample. Finally, comparing the effects of a paired (GFM+SE) messaging intervention against those of a traditional GFM-alone intervention, allowed us to systematically investigate any added effects of the SE-enhancing messages.

**The role of SE in overcoming barriers to adult sport.** Since notions of PA participation depend on navigating barriers (Sallis & Owen, 1999), interventions should consider the most common barriers to adult sport that may inform efficacy-enhancing message content. Cardenas, Henderson, and

Wilson (2009) surveyed adults participating at the North Carolina Senior Games and found that notable barriers were ‘lack of time’ and ‘lack of self-discipline’. Similarly, Young, Medic, Cameron, Theberge, and Latham (2009) found that commonly-reported barriers among Ontario Seniors Games participants included ‘unavailability of organized training and competitive opportunities’ and ‘lack of participation by family members’. More broadly, extensive research examining perceived barriers that constrain inactive adults from initiating engagement in PA reveal common themes, such as: lack of time (PA interfering with other obligations); lack of motivation; negative attitude (feeling “too old”); lack of facilities and/or opportunities nearby; and lack of encouragement from significant others (e.g., Booth, Bauman, & Owen, 2002; Carey & Young, 2012; Cerin, Leslie, Sugiyama, & Owen, 2010). Thus, adults who may be persuaded to engage in adult sport might need to become more efficacious with respect to navigating these ‘salient’ barriers. Importantly, for this intervention, the content of each of these five ‘salient’ barriers was specifically addressed in the construction of the efficacy-enhancing messages.

### **Objectives and Hypotheses**

The purpose of this study was to investigate the added effects of a paired intervention condition, compared to a GFM-alone condition, within the context of attracting middle-aged persons to sport. It represented an extension of prior research by Lithopoulos et al. (2015; 2016) on messaging for adult sport and a sport-specific application of theoretical principles on paired messaging conditions. This study sought to answer three research questions: (1) What are the psychological effects (on attitudes, outcome expectancies, intentions, SE) of a GFM-alone condition compared to a paired condition (GFM+SE)?; (2) How is sport behaviour and moderate-to-vigorous PA impacted after being exposed to a GFM-alone condition compared to the GFM+SE condition?; (3) What are the psychological and behavioural effects of receiving *either* messaging intervention compared to a control condition that receives no intervention? These questions were examined immediately after experimental exposure and at one-month post intervention. The following results were hypothesized: (H1) The GFM+SE condition would result in higher SE beliefs than the GFM-alone condition; (H2) The GFM+SE condition would

report stronger intentions, higher rates of sport registration and sport activity, and be more likely to request a sport-related newsletter than those in the GFM-alone condition; (H3) Both experimental groups would report increases in attitudes and outcome expectancies (OEs); (H4) the experimental groups would show greater increases in psychological and behavioural outcomes than the control.

## Method

### Participants

Potential participants were recruited from a variety of sources in Canada, including on-site at community centres and at youth sport events, as well as via social media platforms (e.g., Facebook) and online boards (e.g., Kijiji). All participants provided informed consent and voluntarily took part in the experiment after reading the Letter of Information. Furthermore, all consenting participants were aware that four individuals would be randomly selected to win a \$75 cash prize each for their participation.

A total of 603 participants initiated the investigation by completing the first of three surveys. Of this initial sample, a total of 475 participants (female = 61.9%; male = 37.7%; other and missing = 0.4%; *M age* = 45.93, *SD* = 7.92) met inclusion criteria and were considered for invitation to participate in the experimental design. The inclusion criteria were: (i) between the ages of 30 and 69 years old; and (ii) did not perceive adult sport as being a risky activity (i.e., rated the riskiness of adult sport as a '5' or less on a Likert scale anchored a 1 – 'not at all risky' to 7 – 'extremely risky').

### Procedure and Data Collection

All protocol were approved the Research Ethics Board (REB) at the host institution. There were three distinctive time points where data collection took place throughout the intervention. All survey items, as well as the messaging interventions, were implemented online using the FluidSurveys.com platform. This study employed a randomized-control design with two experimental groups and a control group with random assignment occurring after completion of the survey at Time 1.

**Time 1.** All recruited participants were emailed the link for the first online survey. They completed demographic and inclusion criteria measures to determine eligibility for the study (age and

risk perception). They also responded to screening questions assessing stage of change (Prochaska, DiClemente, & Norcross, 1992) status with respect to sport behaviour (range = 1-5), perceived health status to participate in sport ('Do you currently consider yourself healthy enough to regularly participate in sport?'; response = yes or no), and sport engagement during youth (response = yes, somewhat, or no). Following these measures, participants completed seven baseline dependent measures: weekly sport behavior, moderate-to-vigorous PA (MVPA), attitudes toward adult sport, intention to regularly participate in sport, barrier SE, scheduling SE, and OEs.

*Typical weekly sport behaviour* in the past month was assessed by self-report using a modified version of the Short Questionnaire to Assess Health Enhancing Physical Activity survey (SQUASH) to reflect sport behaviour (Wendel-Vos, Schuit, Saris, & Kromhout, 2003). The SQUASH has produced valid and reliable indices for both sport and exercise behaviour in adults, and includes a compendium based on metabolic equivalent of task (MET) for each activity to yield a distribution of sport activity scores in a sample. For the purposes of the current study, however, the SQUASH scores were used to dichotomously code participants as either 'yes' or 'no' in regards to sport participation.

*Typical MVPA* was assessed using the moderate and vigorous scales of Godin and Shephard's (1985) GLTEQ. This measure asked participants to report weekly frequencies of strenuous and moderate PA in a typical 7-day period. Thus, the GLTEQ provided a baseline indication of typical weekly engagement in PA without distinguishing sport from exercise or fitness activities.

*Attitudes toward adult sport* were assessed using seven items, each on a 7-point scale, to gauge how each participant viewed adult sport. In response to the prompt, "For me, regularly participating in sport as an adult would be...", participants made a judgment using a semantic differential scale anchored at opposite ends for each of the seven items as follows: good – bad; beneficial – harmful; valuable – worthless; enjoyable – unenjoyable; pleasant – unpleasant; interesting – boring; relaxing – stressful. We employed semantic differential anchors used by Berenbaum and Latimer-Cheung (2014) but modified the preface to reflect attitudes toward sport rather than PA. These items have shown

acceptable Cronbach alpha scores in PA contexts with adults, and showed strong internal consistency reliability as a single *attitudes* scale in the current sample ( $\alpha = .90$ ).

*Intention to regularly participate in sport* was assessed using five items, each on a 7-point Likert scale, that have been previously used to assess messaging in adult sport (Lithopoulos et al., 2015). For example, items asked ‘How likely is it that you will participate in sport activity sometime soon?’ and ‘If faced with the decision to begin regular participation in sport today, how likely is it that you would do so?’ These five items showed very high internal consistency in the middle-aged adult sample in Lithopoulos et al. (2015), as well as in the current sample ( $\alpha = .92$ ).

*Barrier SE* was assessed to derive an index of one’s confidence in their ability to overcome barriers/constraints to regularly engage in sport. Five items reflected ‘salient’ barriers to adult sport participation (i.e., lack of time, lack of motivation, negative attitude, lack of sport facilities/opportunities, lack of encouragement from significant others). Following guidelines for barrier SE scale construction (Bandura, 2006), participants reported a score from 0-100 (in increments of 10) to indicate their perceived confidence in their ability to overcome each of the barriers to adult sport. The single scale showed acceptable internal consistency reliability ( $\alpha = .77$ ).

*Scheduling SE* was measured to derive an index of one’s confidence in their ability to schedule increasing amounts of engagement in sport activity. Following the prompt ‘Assuming you are motivated, in the next month, how confident are you that you can fit at least 30 minutes of moderate-to-heavy intensity sport participation into your weekly schedule’, participants made judgments for each of the following options: Once per week; Twice per week; Three times per week; Four times per week; and, Five or more times per week. Reports were made on a 7-point Likert scale (1 = ‘not at all confident’ to 7 = ‘completely confident’). This protocol has shown acceptable validity in adult samples (Arbour-Nicitopoulos, Martin Ginis, & Latimer, 2009), and the resultant single scale score showed strong internal consistency reliability in the current sample ( $\alpha = .93$ ).

*OEs* were assessed to derive individuals' beliefs about the likelihood that regular sport participation would result in favourable outcomes (Gellert, Ziegelmann, & Schwarzer, 2012). Participants responded to nine items about various gainful outcomes (each matching the nine tailored GFM in the current study): optimal health; delayed effects of aging; social affiliation; fun/enjoyment; stress relief; improvement of physical capabilities; thrills/excitement; achievement of competitive goals; travel opportunities. Responses were on a 5-point Likert scale (1 = 'strongly disagree' to 5 = 'strongly agree').

As participants responded to the Time 1 survey, after assuring inclusion criteria, the principal investigator assigned each consecutive sample of five responders randomly to groups in a 2-2-1 fashion (i.e., first two respondents to the 'GFM-alone' condition, the next two to the 'GFM+SE' condition, with the final respondent to the 'no intervention' control condition). Following random group assignment, participants were sent an email link inviting them to participate at Time 2 one week later.

**Time 2.** Participants were able to open their own private web-link to view their respective experimental messaging intervention, either GFM-alone or GFM+SE. Participants assigned to the 'no-intervention' control condition did not receive a messaging intervention; they solely completed a second series of survey measures.

***GFM-alone.*** Participants assigned to this condition received a four-minute narrated PowerPoint Presentation (PPT) with nine consecutive GFM that highlighted nine benefits of being involved in Masters sport, followed by five neutral slides. The five neutral slides contained factual/historical information about adult sport and were included to ensure that both experimental conditions received the same number of messages in a video of the same length. The benefits of Masters sport have been established through prior research surveying current adult sportspersons about the involvement opportunities gained through participation (Young et al., 2015; Young & Medic, 2011). A male and female voice recording was used for the narrations to ensure that the messages were tailored for both sexes (female participants received an intervention with the female voice recording, and male

participants received the male voice recording). The order of the nine GFM and five neutral messages was randomized, and participants were not able to pause the video at any time to guarantee that the messages ran linearly and were not repeated, with equal exposure time per message. The nine GFM messages replicated the promoted benefits from the experimental manipulation by Lithopoulos et al. (2015), which were created using recommended guidelines for GFM construction (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; see supplementary Appendix A for the full messages).

***GFM+SE.*** Participants also received a four-minute narrated PPT, however, the content represented a condition in which GFM were paired with efficacy-enhancing messages. Participants received fourteen messages, with the first nine being the same consecutive GFM messages, presented in a randomized order. After the first nine GFM messages, the narrated PPT continued with five consecutive efficacy-enhancing messages, also presented in a randomized order. Each efficacy-enhancing message was designed to increase SE to regularly participate in sport when faced with a common barrier, by suggesting a technique to overcome each barrier. Moreover, key sources of SE as detailed by Bandura (2001) – mastery, vicarious and imaginal experiences, were embedded within the construction of these messages (see supplementary Appendix B for the full messages). Like the GFM-alone condition, participants could not pause the video, ensuring equal exposure time per message.

***Immediately following exposure.*** Immediately after watching the video, participants in the two experimental conditions completed a manipulation check to ensure that he/she did in fact view the intervention by asking each participant to type out two main themes presented in the messages. Any participant unable to recall two themes was subsequently eliminated; resultantly, 12 participants were excluded from the analyses (*GFM-alone* = 7; *GFM+SE* = 5).

***Time 2 survey measures.*** Immediately following the manipulation check, participants in the experimental conditions completed another series of survey items (participants in the control condition immediately began completing the items). All participants reported on dependent measures for attitudes toward sport, intention to do sport, barrier SE, scheduling SE, and OEs. Additionally, they were asked

whether they would like to request *an adult sport-related newsletter* (response = yes or no), as an indication of sport-related information-seeking behaviour (Lithopoulos et al., 2015).

**Time 3.** Four-weeks after watching the promotional video and/or completing Time 2 survey items (control group), all participants were emailed one final link to the online survey. Participants were again asked to report on dependent measures for attitudes, intentions, barrier SE, and scheduling SE. Participants were also asked to report on their weekly sport behaviour during the past month using the SQUASH (scored dichotomously as ‘yes’ or ‘no’), and were asked whether or not they had *registered for a sport program* (e.g., organization, team, club; response = yes or no), and whether they had *registered for a sport event* (e.g., a local 10km race; response = yes or no) within the past month. Each participant was also asked to report the *likelihood of registering for a program/event* within: (a) the next month, and (b) the next six months, on a 7-point Likert scale (1 = ‘extremely unlikely’, to 7 = ‘extremely likely’). Lastly, participants once again reported their typical weekly MVPA behaviour using the GLTEQ.

## Analyses & Results

### Preliminary Analyses

Each continuous dependent variable measured at baseline was inspected for potential violations of normality. Distributions were investigated for the total sample collapsed, and separately within each group. With the total sample collapsed, the only dependent variable outside the recommended guidelines for normality was *OE-Health*, which showed a skewness of -2.27 ( $SE = .16$ ) and kurtosis of 4.90 ( $SE = .32$ ). There was also evidence of leptokurtosis and mild negative skewness within each group. All other interval dependent variables showed skewness and kurtosis values within the recommended range of  $\pm 2 SD$  (Field, 2005; *OE-Friends*:  $S = -.80$ ,  $K = .35$ ; *OE-Fun*:  $S = -1.1$ ,  $K = .77$ ; *OE-Stress relief*:  $S = -1.1$ ,  $K = .73$ ; *OE-Physical capabilities*:  $S = -1.0$ ,  $K = .51$ ; *OE-Thrills*:  $S = -.40$ ,  $K = -.59$ ; *OE-Goals*:  $S = -.19$ ,  $K = -.69$ ; *OE-Travel*:  $S = .23$ ,  $K = -.76$ ), except for *OE-Aging*, which showed a slightly high kurtosis ( $S = -1.5$ ,  $K = 2.2$ ).

Moreover, we conducted a series of Pearson correlation tests between the nine separate OE items at Time 1 to explore relationships between them. None of the items was significantly correlated with another OE item at a level of .80 or higher (all correlations were  $<.70$ ). As such, multicollinearity between these variables was not a cause for concern (Field, 2005). Keeping in mind that both messaging interventions (GFM+SE and GFM-alone) included the same nine messages that promoted nine separate benefits of sport, we opted to treat each OE item as separate dependent variables.

Across all groups, and then on a within-group basis, analyses were performed to identify and remove any extreme outlying cases. An investigation of distribution for the baseline variables showed that three participants across all groups were extreme outliers ( $> 3.29 SD$  from the mean) based on their GLTEQ scores; these participants were subsequently excluded from further analyses (no extreme outliers were found on a within-group basis).

**Baseline equivalency tests.** The final sample of 232 participants consisted of 145 females and 83 males, one participant who reported gender as ‘other’ and three participants who did not respond to gender. Baseline equivalency tests were run to inspect between-group differences for demographic, screening and dependent measures collected at Time 1 for participants that completed the entire study ( $N = 232$ ). Overall, the groups were not significantly different for almost all demographic and screening measures at baseline (see Table 1). One variable that showed between-group differences at baseline was *perceived health status* ( $p = .00$ ), whereby significantly more participants in the control group perceived themselves as being *not* healthy enough to regularly participate in sport. Although some participants did not perceive themselves healthy enough to engage in sport, their GLTEQ data indicated that they reported high activity levels in other forms of PA. As such, we were not as concerned about risk, and elected to conduct all main analyses with the total sample. We also decided to re-run all analyses with only those participants in each group that reported perceiving themselves healthy enough to regularly participate in sport at baseline. Any discrepancies between the ‘total sample’ analyses and ‘healthy only’ analyses are described in the respective results sections that

follow. With respect to the dependent variables, there were only two between-group differences at baseline: *OE-Fun* ( $p = .02$ ) and *OE-Physical capabilities* ( $p = .02$ ). Full descriptive statistics for the remaining dependent variables are presented in Tables 2 and 3.

**Attrition analyses.** A total of 475 participants completed the first of three surveys and were eligible for the study, 244 continued to complete the second survey one week later, and 232 participants completed the third and final survey. Attrition analyses ( $t$ -tests for continuous variables, and chi-square tests for categorical data) were performed for the entire sample and on a within-group basis to compare baseline characteristics between participants that completed the entire study and those that dropped out at some point. Analyses for the entire sample showed significant baseline differences between ‘drop-outs’ and ‘completers’ for *group assignment*, *age*, and *SQUASH weekly sport behaviour* (all  $ps < .03$ ). Participants assigned to the GFM-alone (drop-outs = 41.2%) and GFM+SE (drop-outs = 39.5%) groups were more likely than the control group (drop-outs = 19.3 %) to drop-out. Completers were slightly older than those that dropped out within the GFM+SE group (*completers*:  $M = 47.9$ ,  $SD = 7.3$ ; *drop-outs*:  $M = 44.8$ ,  $SD = 5.4$ ;  $p = .00$ ) and in the GFM-alone group (*completers*:  $M = 47.3$ ,  $SD = 8.1$ ; *drop-outs*:  $M = 44.8$ ,  $SD = 5.6$ ;  $p = .02$ ), but not in the control group ( $p = .39$ ). Drop-outs were more likely to have reported participation in sport-related activities at baseline (74.8%), as evidenced by their SQUASH categorization, than those that completed the entire study (31.5%). Analyses of baseline sport activity performed on a within-group basis showed that this was also true for all three groups (all  $ps = .00$ ). Furthermore, results on a within-group basis showed that within the Control group, completers were significantly more likely to report *not* having participated in sport during youth (*no youth sport* = 32.5%; *somewhat participated in youth sport* = 8.8%; *participated in youth sport* = 58.5%) than participants that dropped out at some point (*no youth sport* = 4.5%; *somewhat participated in youth sport* = 27.3%; *participated in youth sport* = 4.5%). There were no differences between drop-outs and completers for reports of youth sport participation within the GFM-alone ( $p = .65$ ) or GFM+SE group ( $p = .64$ ).

For the entire sample, drop-outs consistently reported higher expectations of sport to result in six positive outcomes (for fun, stress relief, physical capabilities, thrills, goals, and travel) than those that completed the entire study (all  $ps < .02$ ). On a within-group basis, Control group drop-outs had higher OEs for *Fun*, *Stress relief*, *Physical capabilities*, *Thrills*, *Travel*, and *Goals* than Control group completers (all  $ps < .02$ ). There were no significant differences between drop-outs and completers for OE variables within either of the experimental groups (all  $ps > .05$ ).

**Covariate analyses.** According to Tabachnick and Fidell (2012), covariates can be chosen based on theoretical grounds (e.g., established relationships between variables) and/or statistical rationale, such as strong correlations between two pertinent variables. A series of bivariate correlations explored relationships between variables in search of potential covariates based on statistical rationale. Baseline *attitudes toward sport* was chosen as the covariate for all analyses pertaining to the dependent variable *intentions* due to strong correlations ( $r = .64, p = .00$ ), as well as theoretical rationale whereby attitudes toward an activity affects intention to engage in it (Ajzen, 1991). Baseline *attitudes* was also chosen as the covariate for analyses pertaining to the nine separate *OE* dependent variables because of moderate correlations (correlations ranged from .15 to .54 between baseline *attitudes* and the individual *OE* items), and theoretical rationale that overarching attitudes about sport can affect beliefs about the likelihood of sport to result in positive outcomes. Moderate-to-strong bivariate correlations also resulted in baseline *intentions* being chosen as the covariate for the remaining dependent variables: *barrier SE* ( $r = .33$ ); *scheduling SE* ( $r = .59$ ); *MVPA* ( $r = .53$ ); *intention to register for a sport program/event in next month* ( $r = .35$ ); and *intention to register for a sport program/event in next six months* ( $r = .45$ ), all  $ps < .01$ .

### **Main Analyses**

**Did the GFM-alone and the GF+SE experimental groups elicit different effects?** Initially, we analyzed whether the two experimental groups (GFM+SE and GFM-alone) differed in how they

reacted almost immediately after exposure to their respective messaging interventions, and then we performed the same comparative analyses over time.

***Immediate effects following exposure.*** A series of Group x Time (1, 2) repeated-measures analysis of covariance (RM-ANCOVAs; covariate: T1 attitudes) were conducted to directly compare trends between the experimental groups in their responses to the *OE* variables. No significant interaction effects were found for any of the analyses for the nine separate *OE* variables (*Health*:  $p = .75^1$ ; *Aging*:  $p = .10$ ; *Friends*:  $p = .97$ ; *Fun*:  $p = .23$ ; *Stress Relief*:  $p = .51$ ; *Physical Capabilities*:  $p = .14$ ; *Thrills*:  $p = .28$ ; *Goals*:  $p = .11$ ; *Travel*:  $p = .70$ ), confirming no differences attributed to the intervention groups.

A binary logistic regression was conducted to explore if assignment to one of the two experimental groups better predicted immediate *request for a sport-related newsletter*, while controlling for baseline intention by inserting it into the model as another simultaneous independent variable. Results showed that the model was not significant [ $X^2(2) = 1.91, p = .38, Nagelkerke R^2 = .01$ ], and ‘Group’ did not significantly contribute to variance in newsletter requests ( $p = .69, B = 1.1$ ).

***Outcomes across three time points.*** Further analyses were run to directly compare the experimental groups in their reports of the variables that were measured at multiple time points, including the one-month follow-up (Time 3). A Group x Time (1, 2, 3) repeated-measures analysis of variance (RM-ANOVA) was performed for *attitudes*. Results failed to show a significant group by time interaction ( $p = .33, \eta^2_p = .00$ ). Similar RM-ANCOVAs were conducted separately for *intentions* (covariate: T1 attitudes), for *barrier SE* and *scheduling SE*, with T1 intentions serving as covariate in the latter two analyses. None of these analyses showed a significant group by time interaction: *intentions* ( $p = .65, \eta^2_p = .00$ ), *barrier SE* ( $p = .36, \eta^2_p = .01$ ), *scheduling SE* ( $p = .54, \eta^2_p = .01$ ).

A Group x Time (1, 3) RM-ANCOVA (covariate: T1 intentions) was conducted for *MVPA* scores on the GLTEQ. There was a non-significant group by time interaction ( $p = .88, \eta^2_p = .00$ ).

Finally, a chi-square test was used to examine between-group differences in the frequency of *reported sport activity* (yes or no, as derived from the SQUASH) at Time 3, using baseline sport activity categorization (yes or no) as a layer (control) variable. Again, results showed that there was no difference in the frequency of reported sport activity between the experimental groups at Time 3 [ $\chi^2(1) = 2.0, p = .15, \text{Cramer's } V = .12; \% \text{ active in sport: } GFM+SE = 29.9\%; GFM-alone = 41.9\%$ ]. Of particular importance, results showed that participants in both experimental groups that were not active in sport at Time 1 were equally as likely to report sport activity at Time 3 [ $\chi^2(1) = .94, p = .33, \text{Cramer's } V = .10; \% \text{ active in sport: } GFM+SE = 9.5\%; GFM-alone = 16.7\%$ ].

***Outcomes measured only at one-month follow-up.*** For participants that were not active in sport at Time 1 (as indicated by their SQUASH categorization), a separate binary logistic regression to explore if assignment to one of the two experimental groups better predicted *registration in a sport program* and *registration in a sport event*, while controlling for Time 1 intentions by inserting it into the models as another simultaneous independent variable. The overall model for registration in a sport program was significant [ $\chi^2(2) = 11.29, p = .00, \text{Nagelkerke } R^2 = .15$ ], but 'Group' did not significantly contribute to variance in the frequency for reported registration ( $p = .64, B = 1.2$ ). The model for registration in a sport event did not reach significance [ $\chi^2(2) = 1.87, p = .39, \text{Nagelkerke } R^2 = .03$ ], and 'Group' did not significantly contribute to variance in the frequency of reported event ( $p = .73, B = .81$ ). Lastly, a separate one-way ANCOVA (covariate: T1 intentions) was run to compare the experimental groups for their responses on *intention to register for a sport program/event within the next month* and *next six months*. These tests were only run with participants who reported no sport behaviour at Time 1 (as evidenced by their SQUASH categorization), and reported not having registered for a sport program or event within the month post-intervention. There were no differences between the experimental groups for intentions to register for a program/event within the next month [ $F(1,69) = .43, p = .51, \eta^2_p = .00$ ] nor within the next six months [ $F(1,69) = .49, p = .48, \eta^2_p = .00$ ].

All of the aforementioned results were replicated using follow-up analyses on a reduced ‘healthy only’ sample. Results did not show any major changes, as none of the group differences reached significance (all  $p$ s > .09). Since the two experimental groups acted similarly both immediately after exposure to their respective messaging interventions and over time, the GFM+SE and GFM-alone groups were then collapsed and compared against the control group.

**Analyses comparing a collapsed intervention group to the control group.** The following sections detail results that directly compared an ‘Intervention’ group (GFM+SE and GFM-alone collapsed) against the Control condition.

**Immediate effects following exposure.** Separate Group x Time (1, 2) RM-ANCOVAs (covariate: T1 attitudes) were run for each of the nine *OE* variables. These results revealed significant group by time interaction effects for the *Travel* [ $F(1,219) = 12.3, p = .00, \eta^2_p = .05$ ], *Friends* [ $F(1,217) = 5.30, p = .02, \eta^2_p = .02$ ], and *Stress Relief* [ $F(1,217) = 3.78, p = .05, \eta^2_p = .01$ ] variables (see Figures 1A, 1B and 1C). Post-hoc tests of pairwise comparisons revealed that the Intervention group reported significantly higher expectations of sport to provide travel opportunities than the Control group at Time 2 ( $p = .03, \eta^2_p = .02$ ). Furthermore, the Intervention group significantly increased in their reports of *OE-Travel* after watching the messaging intervention compared to their levels at Time 1 ( $p = .00, \eta^2_p = .07$ ). The Control group decreased in their reports of *OE-Travel* over time, however, this trend did not reach significance ( $p = .11, \eta^2_p = .01$ ).

Post-hoc tests of pairwise comparisons for the significant group by time interaction for *OE-Friends* showed the Intervention group significantly increased their expectations about sport providing opportunities to make new friends after watching a messaging intervention compared to their levels at Time 1 ( $p = .03, \eta^2_p = .02$ ). The Control group did not significantly change over time ( $p = .17, \eta^2_p = .00$ ), and the Intervention and Control groups were not significantly different at Time 2 ( $p = .14, \eta^2_p = .01$ ). Post-hoc pairwise comparisons for the significant interaction for *OE-Stress Relief* revealed that

while the Control group significantly decreased in their expectations of sport to provide stress relief from Time 1 to Time 2 ( $p = .00$ ,  $\eta^2_p = .03$ ), the Intervention group did not significantly change over time ( $p = .61$ ,  $\eta^2_p = .00$ ), nor were the groups significantly different at Time 2 ( $p = .12$ ,  $\eta^2_p = .01$ ).

There were no significant group by time interactions for the remaining six OE dependent variables. The closest was for *OE-Thrills*, which showed an interaction that trended towards significance [ $F(1,217) = 2.35$ ,  $p = .12$ ,  $\eta^2_p = .01$ ]. Furthermore, although the post-hoc tests revealed that the Intervention and Control groups were not significantly different at Time 1 ( $p = .50$ ,  $\eta^2_p = .00$ ), the Intervention group reported significantly higher expectations of sport to provide thrills at Time 2 ( $p = .01$ ,  $\eta^2_p = .02$ ). Although the results showed non-significant interaction effects for the remaining five OEs (good health<sup>1</sup>, optimal aging, fun, improved physical capabilities, goal attainment), the Intervention group consistently trended positively in reports of OE over time, while the Control group remained constant or slightly decreased in their reports at Time 2.

The same analyses were run separately for each OE variable with only ‘healthy’ participants. Overall, analyses for the same four OE variables resulted in similar interaction effects, with the direction of trends remaining consistent and the strength of these results changing slightly: *Travel* [ $F(1,175) = 3.23$ ,  $p = .00$ ,  $\eta^2_p = .04$ ]; *Friends* [ $F(1,174) = 3.43$ ,  $p = .06$ ,  $\eta^2_p = .01$ ]; and *Stress Relief* [ $F(1,173) = 3.23$ ,  $p = .07$ ,  $\eta^2_p = .01$ ]. The interaction effect for *OE-Thrills* reached significance with the ‘healthy only’ sample [ $F(1,173) = 3.95$ ,  $p = .04$ ,  $\eta^2_p = .02$ ], with trends indicating a benefit for the Intervention group (having increased expectations for thrills) and decreasing trends regarding expectations for thrills from Time 1 to Time 2 for the Control group.

A binary logistic regression examined whether group assignment significantly predicted *request for a sport-related newsletter*, while controlling for T1 intentions. Although the overall model was significant [ $X^2(2) = 10.94$ ,  $p = .00$ , *Nagelkerke*  $R^2 = .06$ ], ‘Group’ did not significantly contribute to variance in the frequency of requests ( $p = .15$ ,  $B = .65$ ). With the reduced ‘healthy’ sample, the model

was non-significant [ $X^2(2) = 2.87, p = .23, Nagelkerke R^2 = .02$ ] and ‘Group’ did not contribute to variance in the dependent variable ( $p = .20, B = .64$ ).

**Outcomes across three time points.** A Group x Time (1, 2, 3) RM-ANOVA was performed for *attitudes*. Similar RM-ANCOVAs were conducted for *intentions* (covariate: T1 attitudes), and for each of *barrier SE* and *scheduling SE*, with T1 intentions serving as covariate in the latter two analyses. Results all showed non-significant group by time interactions for attitudes, intentions, barrier SE, and scheduling SE (all  $ps > .45$ ). There was, however, a significant main effect of time for *attitudes* [ $F(1.70, 290.89) = 9.05, p = .00, \eta^2_p = .05$ ] and *scheduling SE* [ $F(2, 316) = 2.94, p = .05, \eta^2_p = .01$ ], whereby reports for both of these variables decreased over the course of the study for all participants. Post-hoc pairwise comparisons showed that attitudes at Time 3 was significantly lower than attitudes at Time 2 ( $p = .00, \eta^2_p = .09$ ) and Time 1 ( $p = .00, \eta^2_p = .09$ ), but attitudes at Time 1 was not significantly different from *attitudes* at Time 2 ( $p = .17$ ).

A Group x Time (1, 3) RM-ANCOVA (covariate: T1 Intentions) was conducted for moderate-to-vigorous scores on the GLTEQ. Results showed a marginally significant group by time interaction effect [ $F(1, 180) = 3.13, p = .07, \eta^2_p = .01$ ]. Although none of the pairwise post-hoc tests reached significance (all  $ps > .12$ ), there appeared to be a trend for the Control group to decrease in reports of PA over time, while the Intervention group increased slightly. Furthermore, when the RM-ANCOVA was run with only participants that indicated they were ‘healthy’ enough to regularly participate in sport, the group by time interaction effect became stronger and reached statistical significance [ $F(1, 145) = 4.79, p = .03, \eta^2_p = .03$ ] (see Figure 1D). Post-hoc tests of pairwise comparisons revealed that GLTEQ scores significantly decreased from Time 1 to Time 3 for the Control group ( $p = .05, \eta^2_p = .02$ ), but scores among the Intervention group participants did not change ( $p = .32, \eta^2_p = .00$ ).

Finally, a chi-square test was run for reported *sport behaviour* (SQUASH) at Time 3, while controlling for baseline sport behaviour as a layer variable. There was no difference between the

Intervention and Control group for frequency of sport activity [ $X^2(1) = .85, p = .35$  Cramer's  $V = .06$ ; % active in sport: *Intervention* = 35.7%; *Control* = 28.8%]. Importantly, among participants who were not active in sport at Time 1, members of the Intervention and Control groups were equally as likely to report sport activity at Time 3 [ $X^2(1) = .10, p = .74$ , Cramer's  $V = .02$ ; % active in sport: *Intervention* = 13.1%; *Control* = 11.1%].

The remaining analyses performed with only 'healthy' participants replicated all of the non-significant group by time interactions found for the larger sample (*attitudes*:  $p = .90, \eta^2_p = .00$ ; *intentions*:  $p = .71, \eta^2_p = .00$ ; *barrier SE*:  $p = .46, \eta^2_p = .01$ ; *scheduling SE*:  $p = .76, \eta^2_p = .00$ ; Time 3 sport activity *SQUASH* categorization:  $p = .89$ ). Results with the 'healthy' sample also replicated main effects for time for *attitudes* [ $F(1.78, 249.46) = 7.14, p = .00, \eta^2_p = .04$ ]. Post-hoc tests showed that *attitudes* at Time 3 were significantly lower than at Time 1 ( $p = .001, \eta^2_p = .09$ ) and Time 2 ( $p = .00, \eta^2_p = .09$ ).

**Outcomes measured only at one-month follow-up.** A binary logistic regression examined whether group assignment could predict *registration in a sport program* and *registration in a sport event*, while controlling for Time 1 intentions. Only participants that were not active in sport at Time 1 were included in the analyses. The overall model for registration in a sport program was not significant [ $X^2(2) = 2.69, p = .26, Nagelkerke R^2 = .10$ ], and 'Group' did not significantly contribute to variance in frequency of reported program registration ( $p = .99, B = .00$ ). The overall model for registration in a sport event reached significance [ $X^2(2) = 10.71, p = .00, Nagelkerke R^2 = .11$ ], but 'Group' did not significantly contribute to variance in event registration ( $p = .27, B = .58$ ). Lastly, a separate one-way ANCOVA (covariate: T1 intentions) was run to compare responses on *intention to register for a sport program/event within the next month* and *next six months* for participants that were not active in sport at Time 1 and had not reported registering for a sport program or event within the past month. Results showed no differences between the groups for intention to register within the next month [ $F(1, 107) =$

1.8,  $p = .18$ ,  $\eta^2_p = .01$ ] and within the next six months [ $F(1,107) = .02$ ,  $p = .87$ ,  $\eta^2_p = .00$ ]. All of these analyses were also non-significant with the reduced 'healthy' sample ( $ps > .20$ ).

### **Discussion**

The purpose of this randomized-controlled trial was to investigate how a gain-framed sport-promotion messaging intervention impacted psychological and behavioural outcomes, based on the inclusion (or lack thereof) of efficacy-enhancing messages. We were specifically interested in the immediate and delayed effects of the two different sport-promotion messaging interventions and had hypothesized that the added efficacy-enhancing messages in the paired condition would elicit greater increases in key outcome variables (e.g., SE, sport behaviour). However, results showed that the two experimental groups acted similarly over the course of the intervention.

#### **No Significant Differences Between the Two Experimental Groups**

Directly after viewing their respective messaging intervention, participants in the GFM-alone and GFM+SE groups reported similar OEs about adult sport and were equally as likely to seek a sport-related newsletter. After exposure and at the one-month follow-up, GFM-alone and GFM+SE participants reported similar attitudes about adult sport, intentions to be active in sport, barrier SE, scheduling SE, and similar activity levels, as measured by the GLTEQ. Participants in both experimental groups also reported similar rates of sport-specific participation (SQUASH), registration in sport programs and events in the past month, and showed equal intentions to register for a sport program/event going forward. As such, contrary to our hypotheses, there did not seem to be an advantage for the additional efficacy-enhancing messages to stimulate significantly greater increases in key outcome variables.

Although the 'efficacy-enhancing' messages in the paired condition embedded key sources of SE (e.g., mastery, vicarious and imaginal experiences; Bandura, 2001), these messages did not appear to increase SE among participants in this condition, nor were these variables heightened compared to

the GFM-alone condition. Authors such as Latimer et al. (2010) have recommended guiding message content by theoretical correlates of behaviour change to directly target change in key variables, however, there is still a paucity of research that has empirically tested this notion. Our results indicate that messages designed to increase SE (even when constructed based on tenants of SCT) may not be enough to significantly change one's SE to overcome barriers to engaging in a particular activity, at least not in relation to the target behaviour of adult sport. Since 64.3% of participants in the GFM+SE group were *not* active in sport at baseline, it is possible that the 'efficacy-enhancing' messages actually reinforced the belief that there are barriers to adult sport participation. Although these added efficacy messages were intended to suggest *how* individuals could overcome common barriers and persuaded individuals they could accomplish this, some participants may have not felt confident in their ability to implement the suggestion and/or overcome the respective barrier, thus keeping their perceived SE constant or perhaps even causing it to decrease. This effect may be explained by the Theory of Ironic Processing (Wegner, 1994), which posits that while a conscious thought process directs attention toward a desired behaviour (e.g., sport participation), a parallel process of 'ironic' control monitors indicators of potential failure (e.g., lack of ability to overcome barriers to sport participation). This theory suggests that the ironic control process is more automatic, less effortful, and can directly cause unwanted thoughts/behaviours when an individual is facing high cognitive demand. Since the individuals reported their perceived SE levels after watching a video and responding to a multitude of other survey measures, it is possible that this cognitive demand led to the ironic control process guiding thoughts about SE. Rather than focusing on a desired behaviour of successfully overcoming barriers to begin sport participation, it is possible that the 'efficacy-enhancing' messages resulted in some participants focusing on the potential failure of *not* overcoming barriers to adult sport, thereby negating any possible advantage from the paired GFM+SE condition.

Our results suggest that efficacy-enhancement may not be the most appropriate messaging approach when attempting to stimulate PA behaviour, at least not in the context of adult sport. Pairing

GFM with other theoretically-driven content may be more effective. For instance, Lithopoulos and Young (2016) paired GFM with an identity-elaboration ('possible sport selves') protocol and found advantages for higher rates of sport-specific information-seeking behaviour and sport registration, and significant increases in sport intentions. Sweet et al. (2014) paired GFM with messages designed to increase motivation for action planning and found that higher quality action plans were developed among participants in the paired condition. Having participants deliberately write about aspects of a "possible sport self" or create an action plan for PA engages these individuals to a greater extent than simply reading promotional messages. Thus, behavioural-oriented alternatives such as these should continue to be explored for paired messaging conditions in a variety of PA contexts.

### **Comparing the Collapsed Experimental Groups against the Control Condition**

The results of our follow-up analyses provided some insight about the effects of receiving *either* messaging intervention on key psychological and behavioural outcomes variables, compared to a control condition.

**Psychological outcomes.** Results of the analyses performed on the nine separate OEs showed that the Intervention group consistently trended positively in reports of OEs over time, while the Control group remained constant or slightly decreased in their reports of anticipated OEs. Specifically, the Intervention group showed significantly stronger effects for the anticipated likelihood that sport would result in travel opportunities, opportunities to make friends, and opportunities for stress relief.

The largest increases over time were regarding the likelihood of adult sport to provide travel opportunities and opportunities to make new friends. It is possible that these OE variables increased most because they were perhaps the most 'novel' of the GFM included in the interventions (Petty et al., 2009). Traditional messages promoting PA often focus on health and fitness benefits, and these outcomes of PA are widely acknowledged. It is plausible that the novelty of messages about travel and social affiliation made a greater impression on the experimental participants (significantly increased their expectations) than more traditional/common messages. *OE-Travel* may have seen the greatest

increase among Intervention participants because it had the greatest potential for growth, as it had the lowest baseline mean of the nine OE variables.

Results for the remaining variables indicated that the Intervention and Control group did not statistically differ in their reports of attitudes, intentions, barrier SE, and scheduling SE over the course of the study, nor did they differ for intentions to register for a sport program/event at one month post-intervention. The multitude of non-significant between-group results indicates that the messages were perhaps not strong enough to elicit changes in key psychological variables, or that the one-time dose of the intervention was insufficient to significantly affect most variables measured. It is likely that reports of OE variables increased because the GFM in the interventions specifically targeted beliefs about positive outcomes of adult sport participation; each of the nine OE questions reflected a specific outcome promoted in the messaging interventions. However, even though the additional SE-enhancing messaging specifically targeted SE variables (e.g., barrier, scheduling), these messages did not appear to be strong enough to increase reports of these variables over time. Although a few OE variables were enhanced among participants in the experimental conditions, this advantage did not appear to translate into gains in other important outcome variables (e.g., attitudes, intentions). Although beliefs about the benefits of sport are important in the early stages of behaviour change, additional proximal variables like SE and intention should also be enhanced to lead to actual increases in behaviour in targeted PA contexts (Cavill & Bauman, 2004). Since our results suggest that increases in OE beliefs do not directly lead to increases in other proximal psychological variables, additional messages (or alternative promotional tactics) that specifically target other key constructs may be more effective in positively changing these variables, which may help to motivate PA behaviour. For instance, Lithopoulos and Young (2016) found that rates of request for a sport-related newsletter, as well as sport registration, were significantly higher among participants that received GFM *and* completed a possible-selves protocol than those who only received GFM. Various messaging techniques and alternative sport-promotion tactics should continue to be explored to understand how to best motivate sport behaviour.

**Behavioural outcomes.** Results showed that the frequency by which Intervention and Control participants requested a sport-related newsletter (information-seeking behaviour) was similar immediately after the intervention, as was their levels of sport activity (SQUASH), and sport registration, at one-month post-intervention. The only statistically significant result found was a group by time interaction effect for MVPA, as measured by the GLTEQ, which approached significance with the total sample and reached significance when the reduced ‘healthy only’ sample was analyzed. Post-hoc tests showed that GLTEQ scores significantly decreased from baseline to Time 3 for the Control group, but scores among the Intervention group participants did not drop. Keeping in mind that we collected the majority of our data from November to January (predominantly winter months in a cold Canadian climate), it is possible that all participants were subjected to typical seasonal declines in rates of MVPA. Since the Control group did not receive a messaging intervention, their survey responses over time may have represented more-typical seasonal downturns in PA, whereas Intervention group participants may have benefitted from receiving a sport-promotion messaging intervention that ‘buffered’ against seasonal declines in MVPA. It is, however, somewhat surprising that messages designed to specifically promote sport activities did not appear to stimulate increases in sport-specific behaviour (e.g., registration in sport programs/events, weekly participation in sport). Many past messaging studies have also reported the difficulty of changing PA behaviour (e.g., Latimer et al., 2010); these results reinforce the challenge of motivating increases in targeted PA behaviours through messaging interventions. It is possible that GFM about the benefits of adult sport were translated to positive thoughts about the benefits of PA in general, which motivated consistent participation in typical MVPA during the period of data collection. Thus, increased OEs among experimental participants, as well as a trend for experimental participants to report higher OE beliefs than control participants, may explain the buffer effect against typical seasonal declines in rates of MVPA. Although this explanation for the ‘buffer’ effect can not be confirmed by the analyses performed in this

current study, planned mediation analyses in future messaging interventions could help to explain the effects of psychological variables on behavioural outcomes.

### **Merits, Limitations and Future Directions**

This study had many merits from a methodological perspective. The inclusion of a 'no intervention' control condition, as well as three distinctive time points for data collection (including a one-month follow-up), added rigor compared to prior sport-promotion messaging interventions. Moreover, the order of the nine messages in both the GFM-alone and GFM+SE conditions was randomized, thereby negating potential primacy and/or recency effects of message reception and recall (e.g., Brunel & Nelson, 2003). This meant that inferences could be drawn about the prominence of various message themes and how they affected OE variables, without any biases related to presentation order. Lastly, the length of both messaging interventions (GFM-alone and GFM+SE) was equal, which eliminated the potential confound of time spent attending to the messages (Petty et al., 2009).

Although there were many strengths attributed to this randomized-controlled trial, there were various limitations that should be improved upon in future messaging studies. Although over 600 individuals initiated the first survey of this study, the final sample consisted of 232 participants that persisted throughout. High attrition in Internet-based interventions has been cited by many other authors (e.g., Wangberg, Bergmo, & Johnsen, 2008); in light of these concerns, we could not target our sample as much as would have liked, or has been suggested by messaging researchers (e.g., Rothman, Bartels, Wlaschin, & Salovey, 2006). For example, past messaging studies have recommended only including individuals in the early stages of change for PA behaviour (Latimer et al., 2010), yet we included individuals in all stages of change to maximize our sample size. Whereas past research has targeted 40-59 years of age as a critical range to re-attract adults to sport (Lithopoulos et al., 2015), we expanded our recruitment to include 30-69 year-olds, again to maximize our initial sample size. Furthermore, despite the importance of intervention studies, there is some degree of burden placed on participants to remain in these types of trials and complete all required measurements, resulting in

higher attrition. In the current study, taking time to complete three separate surveys about adult sport may have slightly irritated some participants and caused them to think negatively about sport in general. For example, negative reactivity may explain the main effects of time, whereby attitudes toward adult sport significantly decreased over time and especially at Time 3. Current results should be interpreted within the context of possible reactivity over time, which may have constrained residual effects derived from either intervention condition. There remains a need to implement effective tactics to retain more participants in these types of intervention studies.

Our attrition analyses with the total sample and on a within-group basis allowed us to understand characteristics of individuals that completed the study in full (all three time points). Firstly, individuals assigned to an experimental condition (either GFM-alone or GFM+SE) were more likely to drop-out of the study than those in the Control group, suggesting the added participant burden of watching a promotional video may be to blame. Secondly, individuals were more likely to complete the entire study if they were not active in sport as an adult or during youth, and had lower expectations regarding the beneficial outcomes of adult sport participation prior to intervention.

Sport participation at baseline proved to be a defining characteristic of drop-outs within all three groups. Thus, it is possible that individuals that were already active in sport ‘turned off’ to this sport-promotion study, as they were sufficiently motivated to be engaged in sport activities without a messaging intervention. This explanation may also hold similarly for individuals who at baseline generally held higher OEs regarding the likelihood of adult sport to result in various benefits, or those who participated in sport in youth, as they were more likely to drop-out. It is possible that individuals that dropped out were already convinced of the benefits of sport, and thus, did not see any use for remaining within a fairly time-consuming sport-promotion study. Our results showed that the added efficacy-enhancing messages in the paired condition did not stimulate substantial increases in key psychological or behavioural outcomes when compared to a traditional GFM-alone condition. Furthermore, there was little advantage to receiving *either* the GFM-alone or GFM+SE messaging

intervention compared to a ‘no intervention’ control condition, limited to three novel OE variables, and a possible buffering against seasonal decline in MVPA rates.

Overall, it appeared that receiving a sport-promotion messaging intervention was not sufficient enough to stimulate significant increases in the majority of the psychological and behavioural outcome variables measured in this study. Future research should continue to investigate more effective ways to enhance key psychological and behavioural outcomes related to adult sport participation. Recent messaging literature has shown a shift away from providing cognitive/instrumental information (e.g., logical reasons why participation in PA is beneficial that would typify traditional GFM) to more affective-based information (tapping into emotional rationale for PA participation). For example, Sirriyeh, Lawton, and Ward (2010) assessed the effects of receiving a daily PA-promotion text message over a two week span. Results showed that inactive participants that received the messages targeting affective beliefs (e.g., enjoyable) increased their rates of PA significantly more than participants that received a set of instrumental belief messages (e.g., detailing the benefits), or a combination of affective and instrumental belief messages, as well as a control group (neutral text messages). Other recent messaging interventions in PA contexts have also documented advantages for messages focusing on affective beliefs and outcomes over cognitive-based rationale (e.g., Morris, Lawton, McEachan, Hurling, & Conner, 2016). Thus, these studies provide some evidence that PA-promotion messages that include affective-based information may be more effective in increasing rates of PA than traditional ‘instrumental’ messages. In a sport-specific context, Lithopoulos and Young (2016) found that pairing GFM (cognitive-based information) with personal representations of one’s identity (‘possible selves’) lead to increases in sport-related outcomes, both psychological and behaviour in nature. Since the messages in our study contained primarily instrumental-based information and did not substantially change key outcome variables, a ripe area of future work could be to investigate the effectiveness of affective-based messages in targeted contexts of PA (e.g., sport).

Messaging interventions may also be more effective when they are a part of a more holistic approach. For instance, providing persuasive messages to individuals that are also participating in a *behavioural* intervention (e.g., exercise program) have found positive results with significant increases in psychological and behavioural outcomes (e.g., Kinnafick, Thogersen-Ntoumani, & Duda, 2016). Other promising directions for messaging interventions in PA contexts include targeting and tailoring messages to personal characteristics (e.g., Mistry, Sweet, Rhodes, & Latimer-Cheung, 2015). The recent advances in messaging literature described above (e.g., affective-based messages, tailoring/targeting) should continue to be empirically tested to deepen our understanding of the best promotional tactics to stimulate increases in PA rates among adults.

## References

- Arbour-Nicitopoulos, K.P., Martin Ginis, K.A., & Latimer, A.E. (2009). Planning, leisure-time physical activity, and coping self-efficacy in persons with spinal cord injury: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation, 12*, 173-189.
- Azjen, I. (1991). The theory of planned behaviour. *Organizational Behaviour & Human Decision Processes, 50*, 179-211.
- Baker, J., Meisner, B., Logan, J. Kungl, A.M., & Weir, P. (2009). Physical activity and successful aging in Canadian seniors. *Journal of Aging and Physical Activity, 17*, 223-235.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1-26.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In T. Urdan & F. Pajares (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT: Information Age Publishing.
- Berenbaum, E., & Latimer-Cheung, A.E. (2014). Examining the link between framed physical ads and behavior among women. *Journal of Sport & Exercise Psychology, 36*, 271-280.
- Booth, M.L., Bauman, A., & Owen, N. (2002). Perceived barriers to physical activity among older Australians. *Journal of Aging & Physical Activity, 10*, 271-280.
- Brawley, L.R., & Latimer, A.E. (2007). Physical activity guides for Canadians: Messaging strategies, realistic expectations for change, and evaluation. *Applied Physiology, Nutrition, & Metabolism, 32*, S170-S184.
- Brunel, F.F., & Nelson, M.R. (2003). Message order effects and gender differences in advertising persuasion. *Journal of Advertising Research, 43*, 330-341. doi: 10.1017/S0021849903030320
- Canadian Heritage. (2012). *Canadian Heritage Sport Participation 2010: Research Paper*. (Catalogue no. CH24-1/2012E-PDF). Retrieved from [http://publications.gc.ca/collections/collection\\_2013/pc-ch/CH24-1-2012-eng.pdf](http://publications.gc.ca/collections/collection_2013/pc-ch/CH24-1-2012-eng.pdf).

- Cardenas, D., Henderson, K.A., & Wilson, B.E. (2009). Physical activity and Senior Games participation: Benefits, constraints, and behaviors. *Journal of Aging & Physical Activity, 17*, 135-153.
- Carey, S., & Young, B.W. (2012). Identifying barriers to physical activity using a social-ecological model: Barriers as a function of age and physical activity status. *Journal of Sport & Exercise Psychology, 34*(Suppl.), S211.
- Cavill, N., & Bauman, A. (2004). Changing the way people think about health-enhancing physical activity: Do mass media campaigns have a role? *Journal of Sport Sciences, 22*, 771-790.
- Cerin, E., Leslie, E., Sugiyama, T., & Owen, N. (2010). Perceived barriers to leisure-time physical activity in adults: An ecological perspective. *Journal of Physical Activity & Health, 7*, 451-459.
- Courneya, K.S., & Hellsten, L.A.M. (2001). Cancer prevention as a source of exercise motivation: An experimental test using protection motivation theory. *Psychology, Health, & Medicine, 6*, 59-64.
- Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology, 18*, 189-196. doi: 10.1037/0278-6133.18.2.189
- Field, A. (2005). *Discovering statistics using SPSS* (2<sup>nd</sup> ed.). Thousand Oaks, CA: SAGE Publications.
- Gallagher, K.M., & Updegraff, J.A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine, 43*, 101-116.
- Gellert, P., Ziegelmann, J.P., & Schwarzer, R. (2012). Affective and health-related outcome expectancies for physical activity in older adults. *Psychology and Health, 27*, 816-828.
- Godin, G., & Shephard, R.J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences, 10*, 141-146.

- Graham, S.P, Prapavessis, H., & Cameron, L.D. (2006). Colon cancer information as a source of exercise motivation. *Psychology & Health, 21*, 739-755.
- Gray, J.B., & Harrington, N.G. (2011). Narrative and framing: A test of an integrated message strategy in the exercise context. *Journal of Health Communication, 16*, 264-281.
- Hatchell, A.C., Bassett-Gunter, R.L., Clarke, M., Kimura, S., & Latimer-Cheung, A.E. (2013). Messages for men: The efficacy of EPPM-based messages targeting men's physical activity. *Health Psychology, 32*, 24-32.
- Kinnafick, F, Thogersen-Ntoumani, C., & Duda, J. (2016). The effect of need supportive text messages on motivation and physical activity behaviour. *Journal of Behavioural Medicine, 39*, 574-586.
- Latimer, A.E., Brawley, L.R., & Bassett, R.L. (2010). A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? *International Journal of Behavioral Nutrition & Physical Activity, 7*, 1-17.
- Latimer, A.E., Rench, T.A., Rivers, S.E., Katulak, N.A., Materese, S.A., Cadmus, L., ... Salovey, P. (2008). Promoting participation in physical activity using framed messages: An application of prospect theory. *British Journal of Health Psychology, 13*, 659-681.
- Li, K-K., Cheng, S-T., & Fung, H.H. (2014). Effects of message framing on self-report and accelerometer-assessed physical activity across age and gender groups. *Journal of Sport & Exercise Psychology, 36*, 40-51.
- Lithopoulos, A., Rathwell, S., & Young, B.W. (2015). Examining the effects of gain-framed messages on the activation and elaboration of possible sport selves in middle-aged adults. *Journal of Applied Sport Psychology, 27*, 140-155. doi: 10.1080/10413200.2014.961618
- Lithopoulos, A., & Young, B.W. (2016). Sport gain-framed messages, possible selves, and their effects on adults' interest, intentions, and decision to register in sport. *International Journal of Sport & Exercise Psychology, 1-14*. doi: 10.1080/1612197X.2016.1216003

- Menec, V. (2003). The relation between everyday activities and successful aging: A 6-year longitudinal study. *Journal of Gerontology: Social Sciences, 58B*, S74-S82.
- Mistry, C.D., Sweet, S.N., Rhodes, R.E., & Latimer-Cheung, A.E. (2015). Text2Plan: Exploring changes in the quantity and quality of action plans and physical activity in a text messaging intervention. *Psychology & Health, 30*, 839-856. doi: 10.1080/08870446.2014.997731
- Morris, B., Lawton, R., McEachan, R., Hurling, R., & Conner, M. (2016). Changing self-reported physical activity using different types of affectively and cognitively framed health messages, in a student population. *Psychology, Health & Medicine, 21*, 198-207.
- Nelson, M.E., Rajeski, J., Blair, S.N., Duncan, P.W., Judge, J.O., King, A.C., ...Castaneda-Sceppa, C. (2007). Physical activity and public health in older adults: Recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation, 116*, 1094-1105.
- O'Keefe, D.J., & Jensen, J.D. (2007). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of Health Communication, 12*, 623-644.
- Petty, R.E., Brinol, P., & Priester, J.R. (2009). Mass media attitude change: Implications of the Elaboration Likelihood Model of persuasion. In J. Bryant & M.B. Oliver (Eds.), *Media effects: Advances in theory and research* (3<sup>rd</sup> ed.) (pp. 125-164). New York, NY: Routledge.
- Prochaska, J.O., & DiClemente, C.C., & Norcross, J.C. (1992). In search of how people change: Applications to addictive behavior. *American Psychologist, 47*, 1102-1114. doi: 10.1037/0003-66X.47.9.1102
- Rothman, A.J., Baldwin, A.S., Hertel, A.W., & Fuglestad, P.T. (2010). Self-regulation and behavior change: Disentangling behavioral initiation and behavioral maintenance. In K.D. Vohs (Ed.), *Handbook of self-regulation: Research, theory, and applications* (2<sup>nd</sup> edn) (pp. 106-122). New York, NY: Guilford Press.

- Rothman, A.J., Bartels, R.D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56*, S202-S220. doi: 10.1111/j.1460-2466.2006.00290.x
- Rothman, A J., & Updegraff, J.A. (2010). Specifying when and how gain- and loss-framed messages motivate healthy behavior: An integrated approach. In G. Keren (Ed.), *Perspectives on framing* (pp. 257-277). London: Psychology Press.
- Sallis, J.F., & Owen, N. (1999). *Physical Activity & Behavioural Medicine*. USA: Sage Publications.
- Schwarzer, R. (2008). Modeling health behaviour change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review, 57*, 1-29.
- Sirriyeh, R., Lawton, R., & Ward, J. (2010). Physical activity and adolescents: An exploratory randomized controlled trial investigating the influence of affective and instrumental text messages. *British Journal of Health Psychology, 15*, 825-840.
- Stanley, M.A., & Maddux, J.E. (1986). Cognitive processes in health enhancement: Investigation of a combined protection motivation and self-efficacy model. *Basic & Applied Social Psychology, 7*, 101-113.
- Statistics Canada. (2013). *Annual Demographic Estimates: Canada, Provinces and Territories*. (Catalogue no. 91-215-X). Retrieved from <http://www.statcan.gc.ca/pub/91-215-x/91-215-x2013000-eng.pdf>
- Sweet, S., Brawley, L.R., Hatchell, A., Gainforth, H.L., & Latimer-Cheung, A.E. (2014). Can persuasive messages encourage individuals to create action plans for physical activity? *Journal of Sport & Exercise Psychology, 36*, 413-423.
- Tabachnick, B.G., & Fidell, L.S. (2012). *Using multivariate statistics* (6<sup>th</sup> ed.). Boston, MA: Pearson.
- Wangberg, S.C., Bergmo, T.S., & Johnsen, J, K. (2008). Adherence in Internet-based interventions. *Patient Preference & Adherence, 2*, 57-65.

Wegner, D.M. (1994). Ironic processes of mental control. *Psychological Review*, *101*, 34-52.

Wendel-Vos, G.C.W., Schuit, A.J., Saris, W.H.M., & Kromhout, D. (2003). Reproducibility and relative validity of the sport questionnaire to assess health-enhancing physical activity. *Journal of Clinical Epidemiology*, *56*, 1163-1169.

Young, B.W., Bennett, A., & Séguin, B. (2015). Masters sport perspectives. In M.M. Parent & J-L Chappelet (Eds.), *Routledge handbook of sports event management: A stakeholder approach* (pp.136-162). London: Routledge.

Young, B.W., & Medic, N. (2011). Veteraaniurheilijat: tutkimuksia merkittävästä panostuksesta, motivaatiosta ja mahdollisuuksista [Masters athletes: Studies on remarkable investments, motives, and opportunities]. In Finnish Veterans' Athletic Association (Eds.), *Eriäinen tapa vanheta [Different ways of aging in sport]* (pp. 45-58). Lappeenranta, Finland: KS-Paino.

Young, B.W., Medic, N., Cameron, S., Theberge, I., & Latham, C. (2009, October). *Exploring perceived barriers to sport involvement amongst Ontario Senior Games participants*. Presented at the meeting of the Canadian Society for Psychomotor Learning & Sport Psychology, Toronto, ON.

## Footnotes

<sup>1</sup> Due to evidence of non-normality, the variable *OE-Health* at Time 1 and Time 2 (both for the total sample, as well as the reduced ‘healthy’ only sample) were subsequently treated via a Log transformation with a reflection to account for negative skewness. These transformations allowed the distributions of these variables to become more normalized. As such, RM-ANCOVAs (covariate: T1 Attitudes) were re-run with the transformed OE-Health variables for the total sample and for the reduced ‘healthy’ sample. Results again showed that there was no significant Group x Time interaction when the collapsed Intervention and Control groups were compared (total sample:  $p = .38, n^2_p = .00$ ; healthy sample:  $p = .18, n^2_p = .00$ ).

## Tables and Figures

Table 1.

*Descriptive statistics for screening variables at baseline*

	GFM-alone	GFM+SE	Control
N	79	84	69
Mean age ( <i>SD</i> )	47.3 (8.13)	47.9 (7.32)	44.7 (10.3)
Mean risk perception ( <i>SD</i> )	2.62 (1.43)	2.55 (1.43)	2.93 (1.43)
Perceived health status			
Healthy (%)	87.3	85.5	63.8
Not healthy (%)	12.7	14.5	36.2
SQUASH status			
Active in sport (%)	32.9	35.7	24.6
Not active in sport (%)	67.1	64.3	75.4
Youth sport participation			
Yes (%)	58.2	57.1	58.0
Somewhat (%)	15.2	11.9	8.70
No (%)	25.3	25.0	31.9
Missing data (%)	1.30	6.00	1.40
Stage of change			
1 – Pre-contemplation (%)	43.1	36.9	53.6
2 – Contemplation (%)	13.9	14.3	13.2
3 – Preparation (%)	6.30	9.50	1.40
4 – Action (%)	5.10	3.60	2.90
5 – Maintenance (%)	29.1	35.7	27.5
Missing data (%)	2.50	0.00	1.40

*Note.* These are results for the total sample

Table 2.

*Descriptive statistics for outcome expectancy variables at multiple time points*

<i>Group</i>		<i>Time 1</i>		<i>Time 2</i>	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
GFM-alone group	OE-Health	4.46	1.04	4.51	.879
	OE-Aging	4.19	1.02	4.35	.770
	OE-Friends	3.95	1.04	4.09	.871
	OE-Fun	4.01	1.17	3.97	1.00
	OE-Stress relief	3.90	1.13	3.82	1.13
	OE-Physical capabilities	3.95	1.10	4.15	.927
	OE-Thrills	3.53	1.06	3.71	1.09
	OE-Goals	3.24	1.17	3.58	1.12
	OE-Travel	2.63	1.35	3.04	1.16
GFM+SE group	OE-Health	4.59	.841	4.57	.913
	OE-Aging	4.41	.938	4.30	.965
	OE-Friends	3.94	1.05	4.17	.829
	OE-Fun	4.34	.984	4.14	.964
	OE-Stress relief	4.29	.962	4.19	.943
	OE-Physical capabilities	4.34	.830	4.29	.809
	OE-Thrills	3.76	1.15	3.76	.945
	OE-Goals	3.52	1.11	3.57	1.15
	OE-Travel	2.77	1.20	3.10	1.17
Control group	OE-Health	4.51	.872	4.45	.822
	OE-Aging	4.25	1.01	4.24	.932
	OE-Friends	4.09	.900	3.91	.942
	OE-Fun	3.88	1.11	3.75	1.18
	OE-Stress relief	4.07	1.09	3.72	1.18
	OE-Physical capabilities	3.96	1.06	4.03	.976
	OE-Thrills	3.45	1.19	3.32	1.11
	OE-Goals	3.31	1.22	3.34	1.22
	OE-Travel	2.91	1.15	2.69	1.16

*Note.* These are results for the total sample

Table 3.

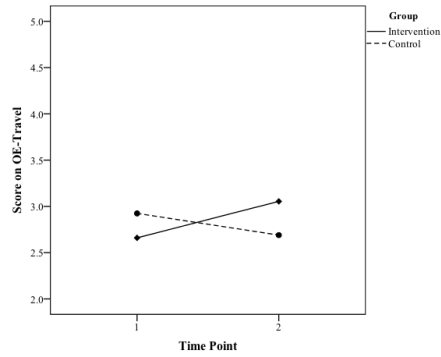
*Descriptive statistics for remaining interval dependent variables measured at multiple time points*

<i>Group</i>	<i>Variable</i>	<i>Time 1</i>		<i>Time 2</i>		<i>Time 3</i>	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
GFM-alone group	Attitudes	5.75	1.18	5.72	1.18	5.54	1.27
	Barrier SE	50.4	23.1	49.5	20.6	52.9	19.2
	Intentions	4.01	2.01	3.88	1.80	3.83	1.83
	MVPA (GLTEQ)	23.6	18.3			23.6	17.6
	Scheduling SE	3.63	1.86	3.35	1.63	3.42	1.73
GFM+SE group	Attitudes	5.79	1.33	5.56	1.32	5.43	1.31
	Barrier SE	52.2	23.0	51.8	25.5	52.5	23.0
	Intentions	3.82	1.73	3.82	1.73	3.99	1.85
	MVPA (GLTEQ)	27.9	19.2			29.4	20.6
	Scheduling SE	3.76	1.85	3.68	1.65	3.66	1.70
Control group	Attitudes	5.51	1.29	5.32	1.40	5.10	1.48
	Barrier SE	44.6	25.9	46.8	22.7	44.1	22.6
	Intentions	3.93	2.06	3.70	1.93	3.94	1.99
	MVPA (GLTEQ)	26.8	22.6			24.7	22.5
	Scheduling SE	3.34	1.98	3.44	1.71	3.43	1.88

*Note.* These are results for the total sample

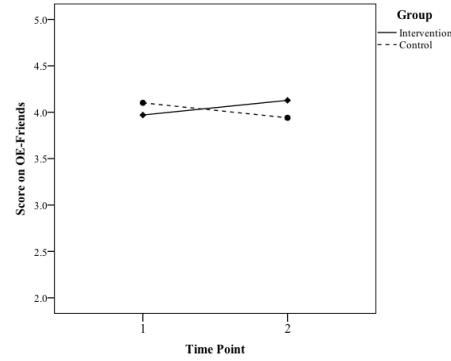
**Figure 1: Significant group by time interaction effects**

Figure 1A: OE-Travel



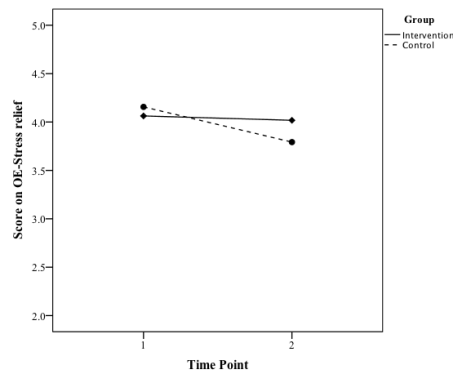
Note. Covariate appearing in the model: T1 Attitude (mean) = 5.70

Figure 1B: OE-Friends



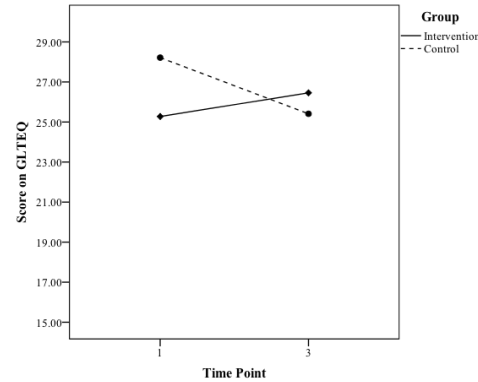
Note. Covariate appearing in the model: T1 Attitude (mean) = 5.70

Figure 1C: OE-Stress Relief



Note. Covariate appearing in the model: T1 Attitude (mean) = 5.70

Figure 1D: MVPA (as per GLTEQ)



Note. Covariate appearing in the model: T1 Intention (mean) = 4.08

*Figure 1.* Results of the significant ( $p < .05$ ) group by time interactions for RM-ANCOVAs comparing collapsed Intervention group against the ‘no intervention’ control condition. Figures 1A, 1B, and 1C display results for the total sample. Figure 1D displays results for the reduced ‘healthy only’ sample.

Supplementary Appendices

**Appendix A: Gain-framed messages**

*Preface to sport-promotion messaging video:* The Canadian Physical Activity Guidelines recommend that adults between the ages of 18-64 accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week. Many people reach these recommendations through traditional exercise methods (e.g., exercising at the gym), or by participating in what is known as **Masters sport**. **Masters sport** is organized sport for adults that involves formal enrollment in a club, league, program, or formal registration for a sport event. Masters sport is structured so that adults can be regularly involved in scheduled sport activities, such as competitions against other adults of a similar age. The degree of competitiveness varies widely, from weekly local practices, to international sports events that are held in different countries. Masters sport is an emerging phenomenon, and some say that it is the fastest growing sport cohort in the Western world. Our research with Masters sport participants indicate that there are numerous **advantages** that arise when people are **regularly involved** in adult sport for **extended periods of time**. We would now like you to watch a short video (approximately three minutes) that describes some of these advantages. Afterwards, we will ask you a few questions based on your thoughts regarding the video.

Involvement Opportunity	Message
Health and fitness	Many Masters athletes claim that their participation makes them feel <b>fitter and healthier</b> . If you get involved in Masters sport, you too can increase your aerobic capacity, strength and flexibility, and overall health.
Delay the effects of aging	Many Masters sport participants tell us that they continue to do it because it helps <b>delay the effects of aging</b> . Masters sport can give you a chance to retain a youthful look and feel.
Social affiliation	Masters sport participants tell us that it provides great opportunities for <b>fellowship with other likeminded individuals</b> . If you get into Masters sport, you too will also make many friends whom you can interact with on a regular basis.
Enjoyment	Participants in Masters sport tell us that it is a way for them to <b>enjoy themselves and have fun</b> . If you get involved in Masters sport, you too will learn to love the game again, like you did years ago.
Stress relief	Masters participants indicate that, oftentimes following training, they feel calmer and more relaxed. If you get involved in Masters sport, you too can significantly <b>reduce stress and tension</b> .
Improve physical skills	Masters sport gives people chances to <b>develop new physical capabilities</b> and to prevent existing ones from declining. If you get involved, you too will have opportunities to work on techniques and strategies in sport.
Excitement	Participants tell us that Masters sport helps prevent them from ever being bored. You too will find yourself constantly <b>stimulated by thrills and challenges</b> in training and competition.
Travel	Many participants tell us that it lets them break away from the same daily routine by offering chances for away games, tournaments, or training camps. You too will be more likely to <b>travel and see new places</b> through adult sport.
Achieve competitive goals	Masters participants tell us that they regularly have opportunities to <b>pursue their competitive goals</b> . If you take up Masters sport, you too can compare yourself against your own standards and can test your skills against others.

*Note.* The messages appeared in a randomized order

**Appendix B:** ‘Efficacy-enhancing’ messages

Barrier to sport participation	Message
Lack of time (interferes with other obligations)	When first thinking about joining adult sport, others <b>just like you</b> were not so sure they could find time for it because of other commitments. However, with a little bit of <b>scheduling and planning</b> , they soon found that they could do it. <b><u>YOU TOO</u></b> can find the time to get involved in Masters sport!
Lack of motivation	When first thinking about joining adult sport, others <b>just like you</b> worried that they didn’t have enough drive to get involved. However, by <b>committing to a sport that was right for them and setting goals</b> , they soon discovered they could motivate themselves. <b><u>YOU TOO</u></b> can become motivated and begin participating!
Negative attitude (feeling “too old”)	When first thinking about joining adult sport, others <b>just like you</b> worried that it was not for people their age. However, by <b>keeping an open mind and adopting a positive attitude, they tried it out</b> and discovered it’s for people of all ages. <b><u>YOU TOO</u></b> can give Masters sport a try regardless of your age!
Lack of facilities and/or opportunities in home neighbourhood	When first considering participating, other people <b>just like you</b> did not know of opportunities for adult sport in their community. By <b>seeking out information</b> , they found the right program and facility to get involved in Masters sport. <b><u>YOU TOO</u></b> can easily find an opportunity that’s close by and right for you!
Lack of encouragement from family and/or friends	When first considering taking up Masters sport, many others <b>just like you</b> felt little encouragement from family and friends. However, by <b>sharing with others why participating is important to them</b> , they were able to recruit support. <b><u>YOU TOO</u></b> can gain encouragement from others to begin participating in sport again!

*Note.* The messages appeared in a randomized order, directly following the nine GFM in the GFM+SE messaging video

### Supplementary Analyses

A number of analyses that were originally proposed were not included in the manuscript due to space limitations. As such, this chapter details the results of the remaining analyses: (a) analyses comparing the three groups of participants separately (GFM-alone, GFM+SE, Control) using RM-ANOVAs, RM-ANCOVAs, one-way ANCOVAs, binary logistic regressions, and chi-square tests; (b) one-way ANCOVAs exploring potential between-group differences in reports of *goal-setting SE* and *PBC*; (c) analyses exploring the effects of two different survey versions completed at Time 1 (original long or shortened version) using RM-ANOVAs and RM-ANCOVAs.

### Analyses & Results

#### Comparing Results between the GFM-alone, GFM+SE, and Control groups

Using the same participant pool that was used for analyses described in the manuscript, initial analyses were run to directly compare survey responses over time between the three groups of participants (GFM-alone, GFM+SE, Control). To recall, the final sample consisted of 232 adults (*female* = 62.5%) between the ages of 30 and 69 (*M age*: *GFM-alone* = 47.39, *SD* = 8.13; *GFM+SE* = 47.93, *SD* = 7.32; *Control* = 44.79, *SD* = 10.37). Due to a significant between-group difference at baseline in reports of *perceived health status* ( $p = .00$ ; response = ‘no’: *GFM-alone* = 12.7%; *GFM+SE* = 14.5%; *Control* = 36.2%), all analyses conducted with the total sample were repeated including only participants that reported perceiving themselves healthy enough to regularly participate in sport. Any notable differences between the ‘total sample’ and ‘healthy only’ analyses are described in their respective sections.

RM-ANOVAs and RM-ANCOVAs were run for the continuous dependent measures that were assessed at multiple time points (OEs, attitudes, intention, barrier SE, scheduling SE, MVPA), and one-way ANCOVAs were run for the continuous dependent variables measured at one time point only (goal-setting SE, PBC, intention to register within the next month, intention to register within the next six months). Lastly, separate binary logistic regressions were run for the categorical dependent

variables measured at one time point (request for a sport-related newsletter at Time 2, registration in a sport program within past month at Time 3, registration in a sport event within past month at Time 3), and a chi-square test controlling for baseline sport status as a layer variable was conducted to investigate potential differences in sport participation (yes/no) at Time 3.

The results of the three-group analyses overwhelmingly showed non-significant between-group results (see Tables 1 and 2). The only result that indicated significant between-group differences was a group by time interaction for the *OE-Travel* variable [ $F(2,218) = 6.2, p = .00, \eta^2_p = .05$ ] (see Figure 1). Post-hoc tests of multiple pairwise comparisons showed that *OE-Travel* increased significantly from Time 1 to Time 2 for each of the two experimental groups (*GFM-alone*:  $p = .00, \eta^2_p = .04$ ; *GFM+SE*:  $p = .01, \eta^2_p = .03$ ). Furthermore, the *GFM+SE* group had significantly higher reports of *OE-Travel* than the control group immediately after exposure to the video at Time 2 ( $p = .05, \eta^2_p = .02$ ). This significant group by time interaction for *OE-Travel* was replicated when the ‘healthy only’ sample was analyzed [ $F(2,174) = 4.0, p = .01, \eta^2_p = .04$ ]. Post-hoc tests of pairwise comparisons once again showed that reports of *OE-Travel* significantly increased over time for both groups of experimental participants (*GFM-alone*:  $p = .00, \eta^2_p = .03$ ; *GFM+SE*:  $p = .01, \eta^2_p = .03$ ).

Table 1.

*Results of group by time interactions (RM-ANOVAs and RM-ANCOVAs)*

	<i>df</i>	<i>F</i>	<i>p</i>	$\eta^2_p$
Attitudes	3.4, 291	.62	.62	.00
Barrier SE <sup>^</sup>	4.0, 324	.79	.53	.01
Intentions*	3.8, 325	.53	.70	.00
MVPA (GLTEQ) <sup>^</sup>	2.0, 179	1.5	.21	.01
OE-Aging*	2.0, 217	1.4	.23	.01
OE-Friends*	2.0, 216	2.6	.07	.02
OE-Fun*	2.0, 217	.82	.43	.00
OE-Goals*	2.0, 214	1.7	.17	.01
OE-Health*	2.0, 217	.32	.72	.00
OE-Physical capabilities*	2.0, 213	1.1	.30	.01
OE-Stress relief*	2.0, 216	2.0	.12	.01
OE-Thrills*	2.0, 216	1.8	.16	.01
OE-Travel*	2.0, 218	6.2	.00	.05
Scheduling SE <sup>^</sup>	4.0, 314	.49	.73	.00

*Note.* These are results for the total sample; \* Covariate = Attitudes (Time 1); <sup>^</sup> Covariate = Intentions (Time 1)

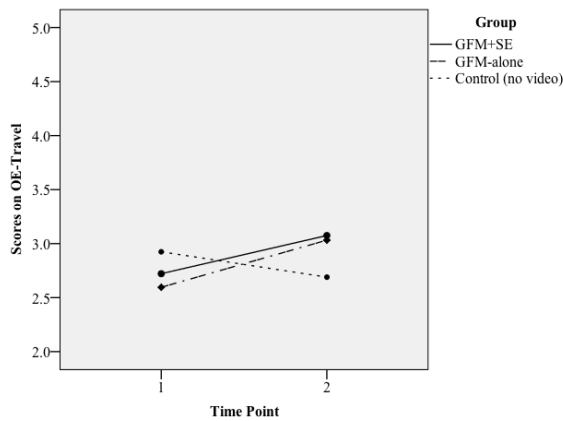
Table 2.

*Results of between-group analyses (one-way ANCOVAs)*

	<i>df</i>	<i>F</i>	<i>p</i>	$\eta^2_p$
Goal-setting SE <sup>^</sup>	2, 211	.02	.97	.00
Intention to register for sport program/event in next month* <sup>^</sup>	2, 106	1.1	.32	.02
Intention to register for sport program/event in next 6 months* <sup>^</sup>	2, 106	.29	.74	.00
PBC <sup>^</sup>	2, 213	.27	.76	.00

*Note.* These are results for the total sample; \* Only included participants that were not active in sport at baseline, and did not report registering for program/event within past month; <sup>^</sup>Covariate = Intentions (Time 1)

**Figure 1.** Significant group by time interaction for reports of OE-Travel over time



Note. Covariate appearing in the model: T1 Attitude (mean) = 5.70

**Figure 1.** Results of the significant group by time interaction comparing all three groups separately for the total sample.

In regards to the categorical variables, a binary logistic regression was conducted to explore if group assignment significantly predicted *request for a sport-related newsletter* at Time 2 (while controlling for baseline intention by entering it into the model as another simultaneous predictor variable). Although the overall model was significant [ $X^2(3) = 11.1, p = .01, Nagelkerke R^2 = .06$ ], ‘Group’ did not significantly contribute to variance in request for a newsletter ( $p = .30, B = .70$ ). In a similar analysis for predicting *registration for a sport program within the past month* at Time 3 (while controlling for baseline intention), the overall model was significant [ $X^2(3) = 19.9, p = .00, Nagelkerke R^2 = .19$ ], but ‘Group’ did not significantly contribute to variance in the dependent variable ( $p = .22, B = 2.12$ ). Similarly, the model predicting *registration for a sport event within the past month* at Time 3 (while controlling for baseline intentions) was significant [ $X^2(3) = 10.8, p = .01, Nagelkerke R^2 = .11$ ], but ‘Group’ again did not significantly contribute to variance in the dependent variable ( $p = .27, B = .52$ ). Lastly, results of the chi-square test for SQUASH categorization (i.e., yes/no to sport activity) at Time 3 (while controlling for sport categorization at Time 1 by including it as a layer variable) showed that there was no difference between the three groups for frequency of reported sport activity at Time 3 [ $X^2(2) = 2.96, p = .22, Cramer’s V = .22$ ], and participants in all three groups that were *not* active in

sport at Time 1 were equally as likely to report sport activity at Time 3 [ $X^2(2) = 1.09, p = .57, Cramer's V = .09$ ].

### **Ancillary Dependent Variables**

As described in the Method chapter (Chapter 2) of this thesis, *goal-setting SE* and *PBC* were each measured at Time 2 as ancillary dependent variables that may be altered by exposure to a messaging intervention. These analyses were left out of the manuscript in the thesis but are reported here instead. As per the initial progression of analyses in the manuscript, separate one-way ANCOVAs (covariate: T1 Intention) were first conducted to explore potential differences in the reports of these variables between the two experimental groups (GFM-alone and GFM+SE). Using the entire sample, results showed no significant between-group differences in reports of *goal-setting SE* [ $F(1,152) = .02, p = .87, \eta^2_p = .00$ ], nor *PBC* [ $F(1,148) = .08, p = .77, \eta^2_p = .00$ ]; these results were duplicated with the reduced 'healthy only' sample [*goal-setting SE*:  $F(1,130) = .10, p = .74, \eta^2_p = .00$ ; *PBC*:  $F(1,127) = .27, p = .60, \eta^2_p = .00$ ]. Thus, the gain-framed messaging condition and the paired efficacy-enhancing condition were no different in terms of their influence on goal-setting SE and PBC. As in the manuscript, the two experimental groups were then collapsed and compared against the control group; the resultant ANCOVA showed non-significant between-group differences at Time 2 in reports of *goal-setting SE* [ $F(1,212) = .01, p = .91, \eta^2_p = .00$ ] and *PBC* [ $F(1,214) = .45, p = .50, \eta^2_p = .00$ ]. These results were replicated with the 'healthy only' sample [*goal-setting SE*:  $F(1,168) = .81, p = .36, \eta^2_p = .00$ ; *PBC*:  $F(1,168) = .44, p = .50, \eta^2_p = .00$ ]. Thus, it appeared that these additional psychological outcomes were not significantly affected by exposure to the messaging interventions.

### **Short versus Long Baseline Survey Protocol**

High attrition in Internet-based PA interventions is a pressing issue for many researchers (Wangberg, Bergmo, & Johnsen, 2008). This attrition rate may be further exacerbated if the affiliated assessment protocol are too onerous or extended, resulting in participant frustration and drop-out.

Preliminary results in our study showed that the majority of participants that completed the first survey did *not* continue to complete the second or third surveys, suggesting negative reactive effects toward the long protocol; approximately 43.1% of participants that completed the original onerous Time 1 survey responded to the Time 2 invitation. Approximately halfway through data collection, in an attempt to increase our adherence rate, we opted to shorten the first online survey to only include assessment of screening variables that were key to answering our research questions. Resultantly, we removed the section that measured regulatory goal orientation (Higgins, 1997), the section that measured individual cognitions held about the notion of aging (Wurm et al., 2007), and simplified the section that explored youth sport experiences to one categorical question. These changes reduced the average completion time of the first survey by approximately five minutes, which resulted in an increased response rate to our invitations to complete the Time 2 protocol (~55.2%), which propagated through the remaining surveys of the study. Application of these changes to the length of the assessment protocol was consistently enforced from the same starting point for all groups in this randomized-controlled experiment. There were no significant between-group differences ( $p = .22$ , *Cramer's V* = .11) in the distribution of participants that completed the original long baseline survey protocol and those that completed the shortened version (*percentage of participants that completed long version: GFM-alone* = 57%; *GFM+SE* = 63%; *Control* = 49%).

Although there were less reactive effects from participants that completed the short version of the baseline survey, which facilitated more participants completing the remaining protocol, we were interested to see if the version of the Time 1 survey affected responses. To explore if the survey version completed at baseline (long or shortened) impacted survey responses over time, we ran RM-ANOVAs and RM-ANCOVAs on all continuous dependent variables measured at baseline (OEs, attitudes, intention, barrier SE, scheduling SE, MVPA) and specifically inspected 'survey version' by time interactions. Results showed only one significant 'survey version' by time interaction for the RM-ANOVA run for *attitudes* [ $F(1.7,290.7) = 5.9, p = .00, \eta^2_p = .03$ ]. Post-hoc tests of multiple pairwise

comparisons showed that among participants that completed the original onerous Time 1 protocol, scores at Time 3 were significant lower than those reported at Time 2 ( $p = .00$ ,  $\eta^2_p = .16$ ) and Time 1 ( $p = .00$ ,  $\eta^2_p = .16$ ). All other ‘survey version’ by time interactions were non-significant (all  $ps > .06$ ). This one significant interaction was in keeping with a trend found among all analyses, whereby participants who completed the shortened version of the survey tended to increase in their reports of the dependent measures over time, while those who completed the long version tended to decrease their scores over time. Again, there may have been reactive effects associated with the long version attenuating the influence on dependent variables over time.

Due to this trend, we further explored whether the results we reported in our manuscript would change if we were to only analyze responses from participants that completed the shortened Time 1 protocol. Specifically, we wished to verify whether results were different than what we had reported, if we were to consider the short version alone. Analyses run with this reduced sample would increase our confidence in the results reported in the manuscript, as there were likely little to no reactive effects stemming from completing the shortened Time 1 protocol. Results of these follow-up RM-ANCOVAs showed that the same significant 2 Group (Intervention, Control) x 2 Time interactions for *OE-Friends* [ $F(1,91) = 4.2, p = .04, \eta^2_p = .04$ ], *OE-Stress relief* [ $F(1,90) = 5.8, p = .01, \eta^2_p = .06$ ], and *OE-Travel* [ $F(1,92) = 4.2, p = .04, \eta^2_p = .04$ ], reported in the manuscript remained significant with the total sample of participants who had completed the shortened Time 1 survey version. Moreover, the significant group by time interaction (i.e., the potential buffering effect attributed to the Intervention group against seasonal declines in activity) for *MVPA* (as measured by the GLTEQ) remained significant with the ‘healthy only’ sample,  $F(1,68) = 3.7, p = .05, \eta^2_p = .05$ . As such, the original results detailed in the manuscript were replicated with the ‘short Time 1 survey version’ sample. Thus, the effects of the messaging interventions did not seem to be substantially enhanced when only participants who completed the reduced survey version were included in analyses. As a result, we

remained confident in our decision to include both ‘long version’ and ‘short version’ participants in our original analyses, and thus, have confidence in the results reported in the manuscript.

### Discussion

This supplementary chapter summarized the results of all analyses that were not included in the manuscript due to space limitations. The analyses that directly compared the three groups of participants (GFM-alone, GFM+SE, Control) showed non-significant group by time interactions, between-group differences, and variance explained by group assignment for most of the dependent variables measured. The sole analysis that resulted in a significant group by time interaction effect was the 3 Group (GFM-alone, GFM+SE, Control) by 2 Time (1, 2) RM-ANCOVA run for *OE-Travel*. It appeared that receiving either messaging intervention resulted in significant increases in expectations about travel opportunities directly after watching the promotional video, and reports by participants in the GFM+SE condition were significantly higher than those who did not receive any intervention. The plethora of non-significant three-group analyses may indicate that neither messaging intervention was strong enough to significantly enhance key outcome variables when compared to the other experimental condition nor the control. These non-significant results may also indicate an inadequate sample size to detect between-group differences and/or group by time interaction effects across three groups. Since the required sample size increases with each group included in analyses, future research should employ more effective recruitment and adherence tactics to retain a larger sample size to conduct required analyses with ample power needed to detect significant differences.

Non-significant between-group differences were also found for reports of *goal-setting SE* and *PBC* over time when the GFM-alone and GFM+SE groups were compared, and also when the collapsed Intervention and Control groups were compared. Since the GFM+SE messaging intervention included efficacy-enhancing information that had some content suggesting goal-setting strategies to become more involved in sport activities, it is somewhat surprising that there was no added benefit to

receiving these messages, when compared to participants that only received GFM. These added messages did not appear to be strong enough to substantially increase SE for setting sport-related goals.

Finally, we examined whether an onerous versus less-onerous Time 1 assessment protocol may have had an effect on results, attenuating possible outcomes. The results of a secondary series of RM-ANOVAs and ANCOVAs that only included participants who completed the shortened version showed group by time interaction effects that were consistent with the original results discussed in the manuscript, which included the entire sample of participants. It can therefore be concluded that the results of our study were not significantly affected by the Time 1 survey version completed. Although we can not completely rule out that there may have been some mild reactive effects to completing the original onerous version of the Time 1 survey, these potential reactive effects appeared to influence the two experimental groups equally. As such, the plethora of non-significant results reported in the manuscript may in fact represent a conservative interpretation of the effects of the messaging interventions. Future research should be mindful of the length of surveys distributed to participants, especially in intervention studies that include multiple time points. Ideally, researchers should aim to find a balance between collecting data on important variables while reducing participant burden as much as possible. Future research that analyzes a sample where all participants complete the same short assessment protocol would be helpful in confirming the present results.

## General Discussion

The main purpose of this randomized-controlled trial was to better understand how to stimulate adult engagement in sport through messaging. Specifically, we sought to investigate how a gain-framed sport-promotion messaging intervention impacted psychological and behavioural outcomes, based on the inclusion (or lack thereof) of efficacy-enhancing messages. Three main research questions were proposed: (R1) What are the psychological effects of a GFM-alone condition on attitudes, OEs, intention to do sport, and SE when compared to a condition that pairs GFM with efficacy-enhancing content? (R2) How is sport behaviour and moderate-to-vigorous PA impacted after being exposed to a GFM-alone condition compared to the paired messaging condition? (R3) What are the psychological and behavioural effects of receiving *either* messaging intervention when compared to a control condition that receives no intervention? Based on past studies that have found advantages for GFM in PA contexts, we expected that both messaging conditions would lead to increases in psychological and behavioural outcomes. However, it was expected that participants in the paired (GFM+SE) condition would score higher on outcomes at the one-month follow-up than those receiving GFM-alone, as the added efficacy-enhancing messages would make the paired intervention more effective as evidenced by effect sizes and any statistical significant group differences. Thus, the following four hypotheses were made prior to the investigation:

H1: Participants in the paired condition would report significantly higher SE than GFM-alone participants because the paired messages contained content designed to increase SE beliefs;

H2: Participants in the paired condition would report stronger intentions, more weekly sport behaviour, report registering for a sport program and/or sport event more often, and be more likely to request a sport-related newsletter than those in the GFM-alone condition. Stronger intentions and behavioural outcomes were expected in the paired condition because enhanced SE beliefs have been shown to elicit behaviour change;

H3: Both groups of experimental participants would report increases in attitudes and OEs because both conditions detail the same benefits of being involved in regular sport;

H4: Participants in the two experimental conditions would show greater increases in psychological and behavioural outcomes than participants in the control condition.

### **Summary of Results**

To answer our first and second research questions (psychological and behavioural effects of receiving the GFM-alone versus the GFM+SE messaging intervention), we ran a series of RM-ANOVAs, RM-ANCOVAs, one-way ANCOVAs, binary logistic regressions, and chi-square tests. Results of all analyses showed non-significant group by time interactions for the continuous dependent variables measured at multiple time points (OEs, attitudes, intention, barrier SE, scheduling SE, MVPA), non-significant between-group differences for the continuous dependent variables measured at one time point only (goal-setting SE, PBC, intention to register within the next month, intention to register within the next six months), and insignificant amounts of variance explained by group assignment for the categorical variables (request for a sport-related newsletter, registration in a sport program within past month, registration in a sport event within past month, sport status at Time 3). Thus, our results indicated that there was no apparent benefit of receiving the paired messaging intervention when compared to the GFM-alone condition. The additional messages designed to increase SE for overcoming barriers to sport participation did not prove to be effective in stimulating enhanced sport-related psychological and behavioural outcomes. As such, our first and second hypotheses that posited significantly higher SE, stronger intentions to do sport, more weekly sport behaviour, higher rates of registration in a sport program/event, and more requests for a sport-related newsletter among the GFM+SE participants compared to GFM-alone participants were not realized.

With results indicating no significant differences between the two experimental groups, we collapsed all experimental participants into one 'Intervention' group to investigate the psychological and behavioural effects of receiving *either* messaging intervention when compared to a 'no-

intervention' control condition. Once again we ran a series of RM-ANOVAs and RM-ANCOVAs for all continuous dependent variables measured at multiple time points, one-way ANCOVAs for all continuous dependent variables measured at one time point only, and binary logistic regressions and chi-square tests for the categorical dependent variables. In regards to psychological outcomes, three OE variables (travel, friends, stress relief) resulted in significant group by time interaction effects, and a fourth (thrills) also showed a significant interaction when the 'healthy only' sample was analyzed. Specifically, reports of these variables increased over time and/or were significantly higher than control group participants at Time 2, indicating an immediate post-exposure advantage for receiving a messaging intervention in stimulating increases in OEs related to adult sport. Thus, our third hypothesis was partially supported (increases in OE beliefs for all experimental participants). Scores on the remaining OEs and other psychological outcome variables (attitudes, scheduling SE, intention to do sport, barrier SE, intention to register within next month, intention to register within six months, goal-setting SE, and PBC) resulted in no significant differences between the Intervention and Control group.

In regards to behavioural outcomes, only MVPA (as measured by the GLTEQ) resulted in a notable group by time interaction. Although this interaction was only marginally significant when the entire sample was included in the analysis, it reached significance when the reduced 'healthy' sample was analyzed. Post-hoc tests showed that while the control group significantly decreased in their reports of MVPA from baseline to Time 3, the Intervention group remained consistent (no significant changes from baseline to Time 3). Since the control group participants reported their outcome scores over time but did not receive a messaging intervention, their rates of MVPA likely represent typical seasonal fluctuations in PA. With the majority of the data for this study collected during the winter season (November to January) in a cold, Canadian climate, it is possible that viewing a sport-promotion messaging intervention helped to 'buffer' against this seasonal decline in PA. Perhaps receiving messages about the benefits of sport participation helped to motivate individuals to stay active during this time. Although watching the promotional video did not appear to lead to increases in sport-specific

behaviour, it is possible that positive effects of the intervention were ‘diffused’ into *various* forms of PA, as measured by the moderate and vigorous scales of the GLTEQ. Future research should continue to explore the effects of receiving information about the benefits of sport on motivation for a variety of physically active behaviours. All other behavioural outcomes (requests for a sport-related newsletter, sport involvement status, registration in a sport program within the past month, and registration in a sport event within the past month) resulted in equal frequencies between the intervention and control group participants. Thus, receiving a sport-promotion messaging intervention did not appear to significantly stimulate increases in sport-related behaviour. The multitude of non-significant between-group results for both psychological and behavioural outcome variables means that our final hypothesis that posited increases in key variables after receiving either messaging intervention when compared to the control group was also not realized.

### **Methodological Merits**

This study had many merits from a methodological perspective. This was the second messaging intervention that specifically targeted the promotion of adult sport participation (Lithopoulos et al., 2015; Lithopoulos & Young, 2016), which is a viable and attractive PA venue for some adults, thus warranting additional investigation into the effective promotion of this form of PA. The inclusion of a no-intervention control condition, as well as three distinctive time points where data collection took place (including a one-month follow-up), represented added rigor compared to the prior adult sport-promotion messaging intervention.

Although past messaging literature has shown that GFM is more effective than LFM in PA contexts, there have been recommendations for further enhancement of messaging content to elicit greater effects in psychological and behavioural outcomes (e.g., Latimer et al., 2010). Thus, this study was one of the first to *pair* GFM with messages designed to increase SE for overcoming barriers to PA, and we did this specifically with respect to adult sport participation. Furthermore, as recommended by other messaging researchers (e.g., Latimer et al., 2010), the content of the ‘efficacy-enhancing’

messages was guided by theoretical correlates of behaviour change to directly target change in key variables (e.g., SCT to target changes in SE). We also designed our experiment in a way that allowed us to systematically analyze the direct effects of the added SE-enhancing messages by comparing a paired condition with a GFM-alone intervention. Moreover, randomizing the order of the messages in both the GFM-alone and GFM+SE conditions negated potential primacy/recency effects of message reception and recall (e.g., Brunel & Nelson, 2003). Lastly, equating the length of both messaging interventions eliminated the potential confound of time spent attending to messages (Petty et al., 2009).

### **Limitations and Future Directions**

Despite the many strengths attributed to this randomized-controlled trial, there were various limitations that should be improved upon in future messaging studies. In regards to challenges with recruitment, the final sample consisted of 232 participants that persisted through the entire investigation, however, over 600 individuals initiated the first survey of this study. Although the importance of intervention studies is well-known, there is always the risk that assessment demands compromise participants' adherence longitudinally. As a result, high attrition in the current study meant that we could not apply our inclusion criteria to target our sample as much as possible. For example, although messaging researchers have recommended only including individuals in the early stages of change for PA behaviour, we included individuals in all stages in order to have enough power to run our planned analyses. Similarly, our 'middle-aged' sample was expanded to 30-69 years old (originally planned to include 40-60 year-olds) in order to retain as many participants as possible. Lastly, although some authors have advocated for the consideration of individual regulatory goal orientation to help explain results in messaging interventions with framed content (e.g., Cesario et al., 2013; see Appendix A), as well as measuring cognitions about aging (e.g., Lithopoulos et al., 2015; see Appendix R), we opted to remove this section of the baseline survey in the short protocol version to reduce completion time in an attempt to increase adherence rate. High attrition in Internet-based interventions has been cited by many other authors (e.g., Wangberg et al., 2008), however, there is still a need to implement

effective measurement strategies to retain more participants in these types of intervention studies, while ensuring key dependent variables have been validly and reliably assessed.

Our attrition analyses with the total sample and on a within-group basis allowed us to understand characteristics of individuals that completed the study in full (all three time points). Results showed that individuals that were already active in sport at baseline (as evidenced by their SQUASH categorization) were statistically more likely to drop-out of the study than those who were not active in sport at baseline; sport participation at baseline proved to be a defining characteristic of drop-outs within all three groups. Thus, it is possible that individuals that were already active in sport ‘turned off’ to this sport-promotion study, as they were sufficiently motivated to be engaged in sport activities without a messaging intervention. Similarly, results showed that within the control group, individuals that dropped out of the study held higher OEs regarding the likelihood of adult sport to result in various benefits, and drop-outs were more likely to report having participated in sport during youth. As such, results indicate that individuals were more likely to persist and complete the entire study if they were not active in sport as an adult or during youth, and had the potential to increase their expectations regarding the beneficial outcomes of adult sport participation. It is possible that individuals that dropped out were already convinced of the benefits of sport, and thus, did not see any use for remaining within a fairly time-consuming sport-promotion study. It is also important to note that our sample was sufficiently active at baseline according to their GLTEQ scores (*mean* >24; Godin & Shephard, 1985). Thus, it is possible that some participants did not feel compelled to increase sport-specific behaviour because they were already achieving recommended PA levels through other physically active behaviours. Lastly, attrition analyses also showed that individuals assigned to an experimental condition (either GFM-alone or GFM+SE) were more likely to drop-out of the study than those assigned to the control group. It is possible that there was a higher rate of drop-out within the experimental groups due to the added participant burden of watching a promotional video.

Our results showed that the added efficacy-enhancing messages in the paired condition did not stimulate substantial increases in key psychological or behavioural outcomes when compared to a traditional GFM-alone condition. Furthermore, when the two experimental groups were collapsed and compared to the control condition, the only advantages for receiving a messaging intervention were found for a few OEs, and a ‘buffer’ against an apparent seasonal decline in MVPA rates. Overall, it appeared that receiving a sport-promotion messaging intervention was not sufficient enough to stimulate significant increases in the majority of the psychological and behavioural outcome variables measured in this study. One pressing question therefore remains: *How can we improve messaging interventions to stimulate substantial increases in psychological and behavioural outcomes related to various forms of PA?*

Recent messaging literature has shown a shift away from providing cognitive/instrumental information (e.g., traditional health-related reasons why participation in PA is beneficial) to more affective-based information (tapping into emotional rationale for PA participation). For example, Sirriyeh, Lawton, and Ward (2010) assessed the effects of receiving a daily PA-promotion text message over a two week span that targeted either: (a) affective PA beliefs (e.g., enjoyable/unenjoyable); (b) instrumental beliefs (e.g., beneficial/harmful); or (c) a combination of affective and instrumental beliefs. There was also a control condition, which received one neutral text message per week. Results showed that inactive participants that received the messages targeting affective beliefs increased their rates of PA significantly more than participants that received the instrumental belief messages, the combined messages, and the control group. Other recent messaging interventions in PA contexts have also documented advantages for messages focusing on affective beliefs and outcomes over cognitive-based ones. For instance, Morris, Lawton, McEachan, Hurling, and Conner (2016) paired either affective or cognitive-based messages with a description of either a short- or long-term time frame for which the benefits of PA would be realized (participants were assigned to either: short-term affective; long-term affective; short-term cognitive; long-term cognitive; no-intervention control). These authors

advocated for the value of distinguishing between the type of information included in messages (affective versus cognitive) and the temporal nature of the description (short- versus long-term), as the results showed that recipients of the affective short-term messages showed the greatest increases in PA at the seven day follow-up.

These studies provide some evidence that PA-promotion messages that include affective-based information (target emotional beliefs about PA) may be more effective in increasing rates of PA than traditional 'instrumental' messages. Since the messages in our study contained primarily instrumental-based information and did not substantially change key outcome variables, future research should continue to investigate the effectiveness of affective-based messages in targeted contexts of PA (e.g., sport). For instance, the few GFM in our sport-promotion study that promoted emotional benefits of adult sport participation (i.e., having fun, experiencing thrills) represent more affective-based involvement opportunities (e.g., Young & Medic, 2011) than the majority of our GFM, which were cognitive-based (i.e., health and fitness benefits, delay effects of aging, improvement of physical capabilities). Thus, a messaging intervention that includes all or mostly affective-based GFM may see stronger, positive effects on key sport-related outcome variables. Moreover, although our SE-enhancing messages tapped into most sources of SE, as detailed by SCT (e.g., vicarious/imaginal experiences, verbal persuasion), we did not tap into physical/emotional states. Aligned with the heightened focus on the role of *affect* in messaging literature, inducing a positive affective state before/during message delivery may help to increase the effectiveness of the intervention.

Other promising directions for messaging interventions in PA contexts include targeting and tailoring messages to personal characteristics. For example, Mistry, Sweet, Rhodes, and Latimer-Cheung (2015) provided participants with either generic or tailored messages about action planning (a known mediator to physically active behaviour) or about PA (conditions: tailored messages about action planning; generic messages about action planning; generic messages about PA). All participants received three text messages per week over a one-month span about the benefits of action planning or

PA (GFM), as well as messages that targeted PBC (designed to increase confidence in engaging in either action planning or PA). Participants in the tailored condition received the same type of messages, however the content was tailored to individually perceived benefits and barriers to action planning, which had been recorded at baseline, and the messages were personalized with first names. After the one-month period of text messages, there was a second follow-up month during which participants received no text messages. Results showed that there were no differences between the groups in action planning or PA rates, however, the absence of text messages resulted in a decrease in the quantity of action plans created, which predicted changes in PA. Furthermore, participants that received tailored messages were less likely to drop out of the study (greater adherence rates). Thus, tailoring messages to personal beliefs about PA and other mediators to PA (e.g., action planning) may have some advantages to increasing adherence to intervention studies and motivating behaviour.

A recent review by Cesario et al. (2013) explored the effects of targeting the individual characteristic of regulatory goal orientation. These authors concluded that messages detailing the benefits/pleasures of adhering to a behaviour (GFM) are most effective when recipients have a promotion orientation (concerned with nurturance and growth needs), whereas messages that outline the losses/pains of non-adherence (LFM) are most effective when individuals have a prevention orientation (concerned with security and safety needs). Other authors like Latimer et al. (2008b) have also found support for the concept of “regulatory fit,” as messages that matched the orientation of the recipient (GFM for promoters, and LFM for preventers) resulted in more positive thoughts and PA participation than mismatched messages. Thus, targeting pertinent personal characteristics like regulatory goal orientation may help to explain the effectiveness, or lack thereof, of framed message content. Although we had originally planned to investigate the concept of “regulatory fit” in this current study, we opted to eliminate this section of screening questions due to the onerous demand of the original Time 1 survey. It is possible that our gain-framed messaging interventions would have produced stronger effects on key sport-related outcome variables if we had distributed the interventions

to a 'promotion-oriented' sample. Future research should continue to consider targeting messages to personal characteristics in a wide range of PA contexts.

As previously discussed, messaging researchers have recommended designing content based on theoretical tenants of behaviour change to directly target increases in key variables. The 'efficacy-enhancing' messages in our study were constructed using SCT by including various sources of SE (i.e., mastery, vicarious, imaginal experiences). Although these messages were driven by theory to target SE beliefs about overcoming common barriers to sport participation, the ineffectiveness of these messages in stimulating increases in key outcomes may be explained by flaws in SCT itself. Recently, traditional behaviour change theories like SCT have come under scrutiny in the academic community. For instance, although many social cognitive theories posit that outcomes of the activity, capability to do the activity, and intentions to participate ultimately predict commitment, these components are necessary, but are not sufficient to impact behaviour (Rhodes, 2015; Rhodes & de Bruijn, 2013). Interventions based on social cognitive theories often find that there needs to be a *huge* increase in intentions to result in behaviour change. Furthermore, there is often confusion over the distinction between motivation (i.e., "I will participate if I desire to") and capability ("I can participate because I have the ability to do so"). For example, an individual may be confident in his/her ability to engage in PA (exhibit high SE/PBC), but simultaneously lack the necessary motivation to actually be physically active. Recently, some researchers have instead advocated for the use of behaviour regulation techniques to guide behaviour change, and increased attention has been given to the potential of *affect* (hedonic responses to PA) to impact commitment to physically active behaviour. Recent literature discussing positive effects of affective-based messages to promote PA behaviour is therefore aligned with these contemporary advances in behaviour change theories. The flaws inherent in SCT may partially explain why our 'efficacy-enhancing' messages were ineffective in stimulating increases in key outcome variables.

With questions emerging about the validity of social cognitive theories in predicting behaviour change in PA contexts, some researchers have investigated the impact of messages designed in congruence with other behaviour change and motivation theories. For example, Kinnafick, Thogersen-Ntoumani, and Duda (2016) used the tenants of Social Determination Theory (SDT) to design motivational text messages that incorporated need supportive information (i.e., autonomy, relatedness, competence). Individuals in the 10-week study were also apart of an established exercise programme and were randomly assigned to either an intervention (received need supportive text messages) or control group (received neutral text messages). Results showed that although both groups of participants increased their intrinsic motivation to be more active, PA was greater among intervention participants than the control at the four-month follow-up. Furthermore, the intervention group also saw increases in perceived autonomy support for PA and psychological need satisfaction. As such, this study provided support for the use of SDT in constructing messages designed to stimulate physically active behaviour. Future research should continue to investigate the effectiveness of using SDT and other contemporary theories in messaging interventions, to advance the field past the use of traditional social cognitive theories.

A multitude of past messaging interventions have found that even when key outcome variables are enhanced, these increases are often accompanied by small effect sizes (O'Keefe & Jensen, 2007). According to recent literature, messaging interventions may be more effective when they are apart of a more holistic approach. For example, Kinnafick et al. (2016) distributed persuasive messages to individuals that were part of a larger existing exercise programme and found positive effects for all participants (i.e., increased intrinsic motivation), even for those that received neutral messages. In another holistic intervention delivered to post-natal women, Fjelsoe, Miller, and Marshall (2010) incorporated in-person goal-setting consultations, distributed goal-setting materials, paired participants with a nominated support contact person, and distributed two persuasive text messages per week. When compared to a minimal contact control condition, participants in the intervention group significantly

increased their exercise and walking frequencies. Thus, these studies support the notion that the effectiveness of messaging can be enhanced when this technique is apart of a more holistic intervention that also incorporates behavioural tactics to motivate increased PA.

One final limitation of our messaging intervention, as well as past studies, is the potential lack of external validity. Even when persuasive messages are designed following recommendations in the literature, the modality of the message delivery may not always be an accurate representation of what persuasive messages would look like in practice. For instance, our messages were delivered in the form of a video to duplicate the delivery of the messages from the only other sport-promotion messaging intervention (Lithopolous et al., 2015). This modality may have some similarities with other video-based PA promotions (e.g., television commercials), however, unlike applied promotions, our videos only included the text of the messages; we did not consider other factors like images and colours, which can impact the effectiveness of promotional interventions (e.g., Petty et al., 2009). As such, interventions designed by researchers may have theoretical merit and implications, however, they may not be acceptable to use in practice. The effectiveness of various modalities of message delivery and representations should continue to be investigated in future messaging studies. For example, Desphande et al. (2015) compared the influence of dynamic versus static images in PA-promotion advertisements and found that the dynamic versions stimulated increased message recall, reception, and behaviour motivation. Future studies should also consider empirically testing the effectiveness of established persuasive message campaigns to improve the external validity of results. For instance, Craig et al. (2015) evaluated the effectiveness of the *My ParticipACTION* television campaign to stimulate increased SE for PA, as well as physically active behaviour. Empirical examinations of existing promotional campaigns in PA contexts are critical to understanding how to stimulate increased PA rates among Canadians, and those seeking to promote adult sport may benefit from lessons learned from established campaigns in other venues of PA.

In regards to the practical implications of this investigation, our results indicate that there are some positive advantages for providing individuals with messages that detail *why* they should be involved in adult sport (GFM), which is consistent with past literature. In particular, our results indicate that GFM about adult sport can help to increase expectations about the likelihood of sport to result in positive outcomes (especially outcomes that have some degree of novelty, such as opportunities for travel through adult sport), and may provide diffused effects that ‘buffer’ against typical seasonal declines in MVPA. Our results also showed that our messages designed to target barrier SE beliefs were not substantially effective in stimulating increases in key psychological and behavioural outcomes. Thus, it may not be beneficial to target barrier SE when most participants are not involved in sport activities, as these types of messages may ironically reinforce the fact that there are barriers to sport participation (e.g., Ironic Processing Theory; Wegner, 1994). Messaging researchers and practitioners (e.g., sport marketers) should continue to explore the most effective ways to stimulate physically active behaviour (e.g., adult sport registration and participation). Educating individuals about the benefits of participation may have some advantages, but other techniques that have the capability to impact cognitions, affect and behaviour related to PA should continue to be explored. Messaging and other informational-approaches to PA promotion will always be part of the mix, but it is only *one* component, and it may not be the most important part. The recent advances in messaging literature described above (e.g., affective-based messages, tailoring/targeting, the use of contemporary theories, behavioural interventions, various messaging modalities) should continue to be empirically tested to deepen our understanding of the best promotional tactics to stimulate physically active behaviour, including sport, across the lifespan.

## References

- Arbour-Nicitopoulos, K.P., Martin Ginis, K.A., & Latimer, A.E. (2009). Planning, leisure-time physical activity, and coping self-efficacy in persons with spinal cord injury: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation, 12*, 173-189.
- Azjen, I. (1991). The theory of planned behaviour. *Organizational Behaviour & Human Decision Processes, 50*, 179-211.
- Baker, J., Fraser-Thomas, J., Dionigi, R.A., & Horton, S. (2010). Sport participation and positive development in older persons. *European Review of Aging & Physical Activity, 7*, 3-12.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1-26.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In T. Urdan & F. Pajares (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT, USA: Information Age Publishing.
- Berenbaum, E., & Latimer-Cheung, A.E. (2014). Examining the link between framed physical ads and behavior among women. *Journal of Sport & Exercise Psychology, 36*, 271-280.
- Booth, M.L., Bauman, A., & Owen, N. (2002). Perceived barriers to physical activity among older Australians. *Journal of Aging & Physical Activity, 10*, 271-280.
- Booth, M.L., Bauman, A., Owen, N., & Gore, C.J. (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine, 26*, 131-137.
- Brawley, L.R., & Latimer, A.E. (2007). Physical activity guides for Canadians: Messaging strategies, realistic expectations for change, and evaluation. *Applied Physiology, Nutrition, & Metabolism, 32*, S170-S184.
- Brunel, F.F., & Nelson, M.R. (2003). Message order effects and gender differences in advertising persuasion. *Journal of Advertising Research, 43*, 330-341. doi: 10.1017/S0021849903030320

Canadian Heritage. (2012). *Canadian Heritage Sport Participation 2010: Research Paper*.

(Catalogue no. CH24-1/2012E-PDF). Retrieved from

[http://publications.gc.ca/collections/collection\\_2013/pc-ch/CH24-1-2012-eng.pdf](http://publications.gc.ca/collections/collection_2013/pc-ch/CH24-1-2012-eng.pdf).

Cardenas, D., Henderson, K.A., & Wilson, B.E. (2009). Physical activity and Senior Games participation: Benefits, constraints, and behaviors. *Journal of Aging & Physical Activity, 17*, 135-153.

Carey, C., & Young, B.W. (2012). Identifying barriers to physical activity using a social-ecological model: Barriers as a function of age and physical activity status. *Journal of Sport & Exercise Psychology, 34*(Suppl.), S211.

Cerin, E., Leslie, E., Sugiyama, T., & Owen, N. (2010). Perceived barriers to leisure-time physical activity in adults: An ecological perspective. *Journal of Physical Activity & Health, 7*, 451-459.

Cesario, J., Corker, K.S., & Jelinek, S. (2013). A self-regulatory framework for message framing. *Journal of Experimental Social Psychology, 49*, 238-249.

Coaching Association of Canada. (n.d.). Coaching masters athletes. Retrieved from

[www.coach.ca/files/Coaching\\_Master\\_Athletes\\_FINAL\\_EN.pdf](http://www.coach.ca/files/Coaching_Master_Athletes_FINAL_EN.pdf)

Courneya, K.S., & Hellsten, L.A.M. (2001). Cancer prevention as a source of exercise motivation: An experimental test using protection motivation theory. *Psychology, Health, & Medicine, 6*, 59-64.

Craig, C.L., Bauman, A., Latimer-Cheung, A., Rhodes, R.E., Faulkner, G., Berry, T.R., ... Spence, J.C. (2015). An evaluation of the My ParticipACTION campaign to increase self-efficacy for being more physically active. *Journal of Health Communication, 20*(9), 995-1003.

Desphande, S., Berry, T.R., Faulkner, G.E., Latimer-Cheung, A.E., Rhodes, R.E., & Tremblay, M.S. (2015). Comparing the influence of dynamic and static versions of media in evaluating

physical-activity-promotion ads. *Social Marketing Quarterly*, 21(3). doi:  
10.1177/1524500415599376

Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology*, 18, 189-196. doi: 10.1037/0278-6133.18.2.189

Fjeldsoe, B.S., Miller, Y.D., & Marshall, A.L. (2010). MobileMums: A randomized controlled trial of an SMS-based physical activity intervention. *Annals of Behavioural Medicine*, 39, 101-111.

Gallagher, K.M., & Updegraff, J.A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine*, 43, 101-116.

Gellert, P., Ziegelmann, J.P., & Schwarzer, R. (2012). Affective and health-related outcome expectancies for physical activity in older adults. *Psychology and Health*, 27(7), 816-828.

Godin, G., & Shephard, R.J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.

Graham, S.P, Prapavessis, H., & Cameron, L.D. (2006). Colon cancer information as a source of exercise motivation. *Psychology & Health*, 21, 739-755.

Gray, J.B., & Harrington, N.G. (2011). Narrative and framing: A test of an integrated message strategy in the exercise context. *Journal of Health Communication*, 16, 264-281.

Hatchell, A.C., Bassett-Gunter, R.L., Clarke, M., Kimura, S., & Latimer-Cheung, A.E. (2013). Messages for men: The efficacy of EPPM-based messages targeting men's physical activity. *Health Psychology*, 32, 24-32.

Higgins, E.T. (1997). Beyond pleasure and pain. *American Psychologist*, 52, 1280-1300.

Higgins, E.T., Friedman, R.S., Harlow, R.E., Idson, L.C., Ayduk, O.N., & Taylor, A. (2001). Achievement orientations from subjective histories of success: Promotion pride versus prevention pride. *European Journal of Social Psychology*, 31, 3-23.

- Horton, S. (2010). Masters athletes as role models? Combating stereotypes of aging. In J. Baker, S. Horton & P. Weir (Eds.) *The Masters Athlete: Understanding the role of sport and exercise in optimizing aging* (pp.122-36). New York, NY: Routledge.
- Kinnafick, F, Thogersen-Ntoumani, C., & Duda, J. (2016). The effect of need supportive text messages on motivation and physical activity behaviour. *Journal of Behavioural Medicine, 39*, 574-586.
- Latimer, A.E., Brawley, L.R., & Bassett, R.L. (2010). A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? *International Journal of Behavioral Nutrition & Physical Activity, 7*, 1-17.
- Latimer, A.E., Rench, T.A., Rivers, S.E., Katulak, N.A., Materese, S.A., Cadmus, L., ... Salovey, P. (2008a). Promoting participation in physical activity using framed messages: An application of prospect theory. *British Journal of Health Psychology, 13*, 659-681.
- Latimer, A.E., Rivers, S.E., Rench, T.A., Katulak, N.A., Hicks, A., Hodorowski, J.K., ... Salovey, P. (2008b). A field experiment testing the utility of regulatory fit messages for promoting physical activity. *Journal of Experimental Social Psychology, 44*, 826-832.
- Li, K-K., Cheng, S-T., & Fung, H.H. (2014). Effects of message framing on self-report and accelerometer-assessed physical activity across age and gender groups. *Journal of Sport & Exercise Psychology, 36*, 40-51.
- Lippke, S., Ziegelmann, J.P., & Schwarzer, R. (2004). Initiation and maintenance of physical exercise: Stage-specific effects of a planning intervention. *Research in Sports Medicine, 12*, 221-240. doi: 10.1080/15438620490497567
- Lithopoulos, A. (2014). *The effects of an expanded gain-framed message intervention on sport intentions and activity levels in middle aged adults* (unpublished Master's thesis). University of Ottawa, Ottawa, Canada.

- Lithopoulos, A., Rathwell, S., & Young, B.W. (2015). Examining the effects of gain-framed messages on the activation and elaboration of possible sport selves in middle-aged adults. *Journal of Applied Sport Psychology, 27*(2), 140-155. doi: 10.1080/10413200.2014.961618
- Lithopoulos, A., & Young, B.W. (2016). Sport gain-framed messages, possible selves, and their effects on adults' interest, intentions, and decision to register in sport. *International Journal of Sport and Exercise Psychology, 1*-14. doi: 10.1080/1612197X.2016.1216003
- Mann, T., Sherman, D., & Updegraff, A. (2004). Dispositional motivations and message framing: A test of the congruency hypothesis in college students. *Health Psychology, 23*, 330-334.
- McAuley, E. & Blissmer, B. (2000). Self-efficacy determinants and consequences of physical activity. *Exercise & Sport Sciences Reviews, 28*, 85-88.
- McCall, L.A., & Martin Ginis, K.A. (2004). The effects of message framing on exercise adherence and health beliefs among patients in a cardiac rehabilitation program. *Journal of Applied Biobehavioral Research, 9*, 122-135. doi: 10.1111/j.1751-9861.2004.tb00096.x
- Mistry, C.D., Sweet, S.N., Rhodes, R.E., & Latimer-Cheung, A.E. (2015). Text2Plan: Exploring changes in the quantity and quality of action plans and physical activity in a text messaging intervention. *Psychology & Health, 30*(7), 839-856. doi: 10.1080/08870446.2014.997731
- Morris, B., Lawton, R., McEachan, R., Hurling, R., & Conner, M. (2016). Changing self-reported physical activity using different types of affectively and cognitively framed health messages, in a student population. *Psychology, Health & Medicine, 21*(2), 198-207.
- Naylor, M.E., Gordon, B.S., & James, J.D. (2012). A societal perspective of sport: Scale development in two settings. *Journal of Global Scholars of Marketing Science: Bridging Asia and the World, 22*, 101-116. doi: 10.1080/12297119.2012.655140
- Nelson, M.E., Rajeski, J., Blair, S.N., Duncan, P.W., Judge, J.O., King, A.C., ... Castaneda-Sceppa, C. (2007). Physical activity and public health in older adults: Recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation, 116*, 1094-1105.

- O'Keefe, D.J., & Jensen, J.D. (2007). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of Health Communication, 12*, 623-644.
- Petty, R.E., Brinol, P., & Priester, J.R. (2009). Mass media attitude change: Implications of the Elaboration Likelihood Model of persuasion. In J. Bryant & M.B. Oliver (Eds.), *Media effects: Advances in theory and research* (3<sup>rd</sup> ed.) (pp. 125-164). New York, NY: Routledge.
- Prins, R.G., van Empelen, P., te Velde, S.J., Timperio, A., van Lenthe, F.J., Tak, N.I., Crawford, D., Brug, J., & Oenema, A. (2010). Availability of sports facilities as moderator of the intention-sports participation relationship among adolescents. *Health Education Research, 25*, 489-497. doi: 10.1093/her/cyq024
- Prochaska, J.O., & DiClemente, C.C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy, Theory, Research & Practice, 19*, 276-288.
- Rhodes, R.E. (2015). Building from the cracks of our foundational physical activity theories. Presented as the Keynote speaker at the Canadian Society for Psychomotor Learning and Sport Psychology, on October 16-18 in Edmonton, Alberta.
- Rhodes, R.E., & de Bruijn, G. (2013). How big is the physical activity intention-behaviour gap? A meta-analysis using the action control framework. *Health Psychology, 18*, 296-309.
- Rothman, A.J., Baldwin, A.S., Hertel, A.W., & Fuglestad, P.T. (2010). Self-regulation and behavior change: Disentangling behavioral initiation and behavioral maintenance. In K.D. Vohs (Ed.), *Handbook of self-regulation: Research, theory, and applications* (2<sup>nd</sup> edition) (pp. 106-122). New York, NY, USA: Guilford Press, 2010.
- Rothman, A.J., Martino, S.C., Bedell, B.T., Detweiler, J.B., & Salovey, P. (1999). The systematic influence of gain- and loss-framed messages on interest in and use of different types of health behavior. *Personality & Social Psychology Bulletin, 25*, 1355-1369.

- Rothman, A.J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behaviour: The role of message framing. *Psychological Bulletin*, *121*, 3-19.
- Rothman, A J., & Updegraff, J.A. (2010). Specifying when and how gain- and loss-framed messages motivate healthy behavior: An integrated approach. In G. Keren (Ed.), *Perspectives on Framing* (pp. 257-277). London: Psychology Press.
- Sallis, J.F., & Owen, N. (1999). *Physical Activity & Behavioural Medicine*. USA: Sage Publications.
- Schwarzer, R. (2008). Modeling health behaviour change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review*, *57*, 1-29.
- Sirriyeh, R., Lawton, R., & Ward, J. (2010). Physical activity and adolescents: An exploratory randomized controlled trial investigating the influence of affective and instrumental text messages. *British Journal of Health Psychology*, *15*, 825-840.
- Stanley, M.A., & Maddux, J.E. (1986). Cognitive processes in health enhancement: Investigation of a combined protection motivation and self-efficacy model. *Basic & Applied Social Psychology*, *7*, 101-113.
- Statistics Canada. (2013). *Annual Demographic Estimates: Canada, Provinces and Territories*. (Catalogue no. 91-215-X). Retrieved from <http://www.statcan.gc.ca/pub/91-215-x/91-215-x2013000-eng.pdf>
- Sweet, S., Brawley, L.R., Hatchell, A., Gainforth, H.L., & Latimer-Cheung, A.E. (2014). Can persuasive messages encourage individuals to create action plans for physical activity? *Journal of Sport & Exercise Psychology*, *36*, 413-423.
- Vallerand, J.R., & Young, B.W. (2014). Are adult sportspersons and exercisers that different? Exploring how motives predict commitment and lapses. *International Journal of Sport & Exercise Psychology*, *12*, 339-356. doi: 10.1080/1612197X.2014.932823

- van't Riet, J., Ruiter, R.A.C., Werrij, M.Q., & de Vries, H. (2010). Investigating message-framing effects in the context of a tailored intervention promoting physical activity. *Health Education Research, 25*, 343-354.
- Wangberg, S.C., Bergmo, T.S., & Johnsen, J. K. (2008). Adherence in Internet-based interventions. *Patient Preference and Adherence, 2*, 57-65.
- Webb, T.L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behaviour change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research, 12*, 1-18.
- Wegner, D.M. (1994). Ironic processes of mental control. *Psychological Review, 101*, 34-52.
- Wendel-Vos, G.C.W., Schuit, A.J., Saris, W.H.M., & Kromhout, D. (2003). Reproducibility and relative validity of the sport questionnaire to assess health-enhancing physical activity. *Journal of Clinical Epidemiology, 56*, 1163-1169.
- Wurm, S., Tesch-Romer, C., & Tomasik, M.J. (2007). Longitudinal findings on aging-related cognitions, control beliefs, and health in later life. *The Journals of Gerontology: Series B, Psychological Sciences & Social Sciences, 62*, 156-164.
- Young, B.W. (2011). Psycho-social perspectives on the motivation and commitment of Masters athletes. In N. Holt & M. Talbot (Eds.), *Lifelong engagement in sport and physical activity* (pp.125-138). London: Routledge and the International Council of Sport Science and Physical Education.
- Young, B.W., Bennett, A., & Séguin, B. (2015). Masters sport perspectives. In M.M. Parent & J-L Chappelet (Eds.), *Routledge handbook of sports event management: A stakeholder approach* (pp.136-162). London: Routledge.
- Young, B.W., & Medic, N. (2011). Veteraaniurheilijat: tutkimuksia merkittävästä panostuksesta, motivaatiosta ja mahdollisuuksista [Masters athletes: Studies on remarkable investments,

motives, and opportunities]. In Finnish Veterans' Athletic Association (Eds.), *Erilainen tapa vanheta [Different ways of aging in sport]* (pp. 45-58). Lappeenranta, Finland: KS-Paino.

ISBN: 978-952-92-9172-4

Young, B.W., Medic, N., Cameron, S., Theberge, I., & Latham, C. (2009, October). *Exploring perceived barriers to sport involvement amongst Ontario Senior Games participants.*

Presented at the meeting of the Canadian Society for Psychomotor Learning & Sport

Psychology, Toronto, ON.

## Statement of Contributions

As the lead investigator, I was responsible for designing the current study and research protocol, and applying for and obtaining REB approval from the University of Ottawa. I was also responsible for developing the online surveys, creating the messaging intervention videos, recruiting participants, cleaning and analyzing the data collected, interpreting the results from the analyses, and discussing the findings. My supervisor, Dr. Bradley Young, played a pivotal role by overseeing all stages of the research project, including providing feedback on the development of the research protocol, editing the REB application, refining the online survey measures, providing feedback on my interpretation of the results, and problem-solving throughout the entire process. One of my fellow lab mates, Scott Rathwell, assisted with the creation of the messaging interventions by providing the voice recordings for the male versions of the videos. Lastly, my two committee members, Dr. Michelle Fortier and Dr. Shaelyn Strachan, assisted with the development of the study and research protocol through critique and constructive criticism of the original proposal.



9. When it comes to achieving things that are important to me, I find that I don't perform as well as I ideally would like to do.

1	2	3	4	5
<i>Never true</i>		<i>Sometimes true</i>		<i>Very often true</i>

10. I feel like I have made progress toward being successful in my life.

1	2	3	4	5
<i>Certainly false</i>				<i>Certainly true</i>

11. I have found very few hobbies or activities in my life that capture my interest or motivate me to put effort into them.

1	2	3	4	5
<i>Certainly false</i>				<i>Certainly true</i>

**Appendix B: Letter of Information for study participants**

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Université d'Ottawa  
Faculté des sciences  
de la santé

École des sciences de  
l'activité physique

University of Ottawa  
Faculty of Health  
Sciences

School of Human  
Kinetics

Dear participant,

We have received permission to ask you to consider taking part in a research study and we thank you for your interest in this research. If you are an adult between the ages of 40 and 60 and can read, understand, and type in English, you are permitted to participate in this study. This study is a Master's thesis project with the School of Human Kinetics at the University of Ottawa. Its purpose is to examine the consequences of information about sport activity on the short-term physical activity levels of 40-60 year-old adults. By participating, you are contributing to a project whose findings may have implications for interventions that encourage middle-aged Canadians to be more active.

The entire study consists of three separate time points in which you will be required to complete a series of questionnaires online. This online survey is certified, safe and secure and only the investigators will have access to your information. The first time point should take you approximately 20 minutes to complete. Following completion of the first time point, you will receive an email seven days later inviting you to complete a second time point, which should take approximately 20 minutes to complete. Following completion of the second time point, you will receive an email one month later inviting you to the final time point, which should take approximately 15 minutes to complete.

To thank you for your contribution to the research project, you will be given the option to enter your email in a draw to win one of six cash prizes valued at \$50 each, even if you choose to withdraw from the study at any point, or elect not to take part in the second and third components of the study. All participants will be eligible to enter into this draw at each time point for which they consent to participate.\*

In accordance with the ethical procedures at the University of Ottawa, all the information you provide will remain confidential and all steps will be taken to ensure that only the researchers have access to your personal information. The data collected for this study will be published in scientific journals. When the final report is written, it will be done in such a way as to conceal the identity of all participants. Inferences will be based on information collected from group data and not from individual cases. The data will be kept for a period of ten years following collection. This ten year period will allow for publication of the data, and a period of time post publication, after which data will be destroyed.

Your participation is entirely voluntary and if at any time you wish to withdraw from the study, you may do so freely without penalty of any kind. There are minimal risks associated with this study. If, after completion of the study, you wish to withdraw, you may do so by contacting the researchers and your information will be subsequently destroyed. You also have the right to refuse to answer any questions that cause discomfort without penalty. If you agree to participate, all of the information that you provide will remain completely confidential. We may publish the findings from this research in the future, but all publications will pertain to data at the group level and will not include any personally identifiable information. If you have any questions about the survey or the nature of the study, please feel free to contact either of the investigators below.

*\*Upon completion of the study, six emails will be randomly selected amongst those who have entered and the winners will be informed by email. To win the prize, the person must correctly answer a skill-testing question. If the person cannot be reached within 14 days from the date of the draw, the prize will be awarded to the next email that is randomly selected and so on until all six prizes have been awarded. The odds of winning a prize will depend on the number of study participants that choose to enter their email into the draw. The prize must be accepted as awarded or forfeited. Your email that you provide when you enter the draw is collected for the purposes of contacting you if you are selected in the draw. Your email and the contact information you have provided will be kept confidential and then destroyed once the prizes have been awarded. We reserve the right to cancel the draw or cancel the awarding of the prize if the integrity of the draw or the research or the confidentiality of participants is compromised. This draw is governed by the applicable laws of Canada.*

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**Appendix C: Stage of Change Questionnaire**

**Please circle YES or NO below to each of the following statements.**

The term 'sport' refers to any form of physical activity performed with at least one other person that involves some degree of competition. Please consider both formal sporting activities (e.g., participation in a registered basketball league) and informal sporting activities (e.g., pick-up basketball with friends).

\*Note: 'Regular' participation refers to three or more times a week for at least 150 minutes each week

1. I currently participate in sport.

**YES**                      **NO**

2. I intend to participate in more sport in the next 6 months.

**YES**                      **NO**

3. I currently engage in regular sport.

**YES**                      **NO**

4. I have been regularly participating in sport for at least 6 months.

**YES**                      **NO**

## Appendix D: Research Ethics Board (REB) Certificate from the University of Ottawa

File Number: H06-15-17

Date (mm/dd/yyyy): 07/14/2015



**Université d'Ottawa** **University of Ottawa**  
 Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

**Ethics Approval Notice**  
**Health Sciences and Science REB**

**Principal Investigator / Supervisor / Co-investigator(s) / Student(s)**

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Bradley	Young	Health Sciences / Human Kinetics	Supervisor
Meagan	Littlejohn	Health Sciences / Human Kinetics	Student Researcher

**File Number:** H06-15-17**Type of Project:** Master's Thesis**Title:** Gain-framed messaging to promote adult sport: Added effects of efficacy-enhancing messages on psychological and behavioural outcomes

<b>Approval Date (mm/dd/yyyy)</b>	<b>Expiry Date (mm/dd/yyyy)</b>	<b>Approval Type</b>
07/14/2015	07/13/2016	Ia

**(Ia: Approval, Ib: Approval for initial stage only)****Special Conditions / Comments:**

N/A

**Appendix E: Short Questionnaire to Assess Health Enhancing Physical Activity (SQUASH)**

Think about an average week in the past months. Indicate the **sports** (this includes practices, training sessions, and competitions pertaining to a particular sport) you have been engaged in. Indicate **how many days per week** you performed the listed sports (in the days column). Indicate **how much time per week** you were engaged in these sports (in the minutes column). Lastly, indicate **how strenuous** these sports were for you (in the intensity column). *Light* refers to sports done with minimal effort; *moderate* refers to sports done with some effort, but are not exhausting; and *intense* refers to sports that make your heart beat rapidly and require significant effort. If you do not participate in any sports, please leave the table blank.

For example, if Frank (on average) plays soccer at a moderate intensity 3 days per week (a 1 hour game, plus two separate 1 hour practices), Frank would write 'soccer' in the sports column, he would write the number '3' in the days column, he would write the number '180' in the minutes column, and he would circle 'moderate' in the intensity column.

Name of sport (please type in yourself) <i>e.g., tennis, soccer, hockey, etc.</i>	Average number of days per week	Average number of minutes per session	Please indicate level of effort
1.			Light/ Moderate/ Intense
2.			Light/ Moderate/ Intense
3.			Light/ Moderate/ Intense
4.			Light/ Moderate/ Intense
5.			Light/ Moderate/ Intense
6.			Light/ Moderate/ Intense
7.			Light/ Moderate/ Intense
8.			Light/ Moderate/ Intense

**Appendix F: Godin Leisure Time Exercise Questionnaire (GLTEQ)**

**During a typical 7-day period, how many times on average do you do the following kinds of physical activity for more than 15 minutes during your free time?**

**Please indicate the number of days per week you engage in each of the following types of physical activity for more than 15 minutes per day.**

1. **STRENUOUS PHYSICAL ACTIVITY** (heart heats rapidly; e.g., running, jogging, hockey, football, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, long distance bicycling, etc.): \_\_\_\_\_
  
2. **MODERATE PHYSICAL ACTIVITY** (not exhausting; e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, dancing, etc.):  
\_\_\_\_\_
  
3. **MILD PHYSICAL ACTIVITY** (minimal effort; e.g., yoga, archery, fishing from river bank, bowling, horseshoes, snowmobiling, easy walking, etc.): \_\_\_\_\_







**Appendix J: Scheduling self-efficacy**

Assuming that you are motivated, in the next month, how confident are you that you can fit at least 30 minutes of moderate to heavy intensity SPORT PARTICIPATION into your weekly schedule:

	<b>Not Confident At All</b>				<b>Completely Confident</b>		
Once per week	1	2	3	4	5	6	7
Twice per week	1	2	3	4	5	6	7
Three times per week	1	2	3	4	5	6	7
Four times per week	1	2	3	4	5	6	7
Five or more times per week	1	2	3	4	5	6	7

**Appendix K: Outcome expectancies**

The statements below each highlight a potential benefit that may be attained from regularly participating in sport. For each statement, please indicate your current beliefs regarding how likely it is that you would experience the outcome by regularly participating in sport on a scale from 1 to 5:

1                      2                      3                      4                      5  
*Strongly disagree*                      *Neutral*                      *Strongly agree*

**Regularly participating in sport can:**

- a) Increase my strength, aerobic capacity, flexibility, and overall health.
- b) Help delay the negative effects of aging by making me feel youthful.
- c) Give me the opportunity to make new friends.
- d) Allow me to enjoy myself and have fun.
- e) Reduce my stress and tension to help me feel more relaxed.
- f) Help me develop new physical capabilities and prevent existing ones from declining.
- g) Stimulate me with thrills, challenges, and excitement.
- h) Give me opportunities to travel and see new places for training and/or competitions.

**Appendix L: Gain-framed messages**

*Preface to sport-promotion messaging video:* The Canadian Physical Activity Guidelines recommend that adults between the ages of 18-64 accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week. Many people reach these recommendations through traditional exercise methods (e.g., exercising at the gym), or by participating in what is known as **Masters sport**. **Masters sport** is organized sport for adults that involves formal enrollment in a club, league, program, or formal registration for a sport event. Masters sport is structured so that adults can be regularly involved in scheduled sport activities, such as competitions against other adults of a similar age. The degree of competitiveness varies widely, from weekly local practices, to international sports events that are held in different countries. Masters sport is an emerging phenomenon, and some say that it is the fastest growing sport cohort in the Western world. Our research with Masters sport participants indicate that there are numerous **advantages** that arise when people are **regularly involved** in adult sport for **extended periods of time**. We would now like you to watch a short video (approximately three minutes) that describes some of these advantages. Afterwards, we will ask you a few questions based on your thoughts regarding the video.

Involvement Opportunity	Message
Health and fitness	Many Masters athletes claim that their participation makes them feel <b>fitter and healthier</b> . If you get involved in Masters sport, you too can increase your aerobic capacity, strength and flexibility, and overall health.
Delay the effects of aging	Many Masters sport participants tell us that they continue to do it because it helps <b>delay the effects of aging</b> . Masters sport can give you a chance to retain a youthful look and feel.
Social affiliation	Masters sport participants tell us that it provides great opportunities for <b>fellowship with other likeminded individuals</b> . If you get into Masters sport, you too will also make many friends whom you can interact with on a regular basis.
Enjoyment	Participants in Masters sport tell us that it is a way for them to <b>enjoy themselves and have fun</b> . If you get involved in Masters sport, you too will learn to love the game again, like you did years ago.
Stress relief	Masters participants indicate that, oftentimes following training, they feel calmer and more relaxed. If you get involved in Masters sport, you too can significantly <b>reduce stress and tension</b> .
Improve physical skills	Masters sport gives people chances to <b>develop new physical capabilities</b> and to prevent existing ones from declining. If you get involved, you too will have opportunities to work on techniques and strategies in sport.
Excitement	Participants tell us that Masters sport helps prevent them from ever being bored. You too will find yourself constantly <b>stimulated by thrills and challenges</b> in training and competition.
Travel	Many participants tell us that it lets them break away from the same daily routine by offering chances for away games, tournaments, or training camps. You too will be more likely to <b>travel and see new places</b> through adult sport.
Achieve competitive goals	Masters participants tell us that they regularly have opportunities to <b>pursue their competitive goals</b> . If you take up Masters sport, you too can compare yourself against your own standards and can test your skills against others.

*Note.* The messages appeared in a randomized order

**Appendix M: Neutral messages added to the start of the GFM alone group**

Message
The Canadian Physical Activity guidelines recommend that adults between 18 and 64 years old accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week.
Generally speaking, Masters sport is organized sport for adults, which involves formally registering for a program, league, organization, club, team, or event. Masters sport is often organized in five-year age groups.
It is generally accepted that the origins of Masters sport began in the mid-1960s. The ‘godfather’ of Masters track-and-field is considered to be David Pain from California who established the very first ‘Masters Mile’ event in 1966.
The first World Masters Championships took place in Toronto in 1975 where 1,400 competitors participated. Ten years later, the first World Masters Games also took place in Toronto and hosted 8,305 competitors.
The International Masters Games Association organizes the World Masters Games. This organization is run by various members from individual sporting associations around the world, as well as members from the International Olympic Committee.

*Note.* The messages appeared in a randomized order

**Appendix N: ‘Efficacy-enhancing’ messages**

Barrier to sport participation	Message
Lack of time (interferes with other obligations)	When first thinking about joining adult sport, others <b>just like you</b> were not so sure they could find time for it because of other commitments. However, with a little bit of <b>scheduling and planning</b> , they soon found that they could do it. <b>YOU TOO</b> can find the time to get involved in Masters sport!
Lack of motivation	When first thinking about joining adult sport, others <b>just like you</b> worried that they didn’t have enough drive to get involved. However, by <b>committing to a sport that was right for them and setting goals</b> , they soon discovered they could motivate themselves. <b>YOU TOO</b> can become motivated and begin participating!
Negative attitude (feeling “too old”)	When first thinking about joining adult sport, others <b>just like you</b> worried that it was not for people their age. However, by <b>keeping an open mind and adopting a positive attitude, they tried it out</b> and discovered it’s for people of all ages. <b>YOU TOO</b> can give Masters sport a try regardless of your age!
Lack of facilities and/or opportunities in home neighbourhood	When first considering participating, other people <b>just like you</b> did not know of opportunities for adult sport in their community. By <b>seeking out information</b> , they found the right program and facility to get involved in Masters sport. <b>YOU TOO</b> can easily find an opportunity that’s close by and right for you!
Lack of encouragement from family and/or friends	When first considering taking up Masters sport, many others <b>just like you</b> felt little encouragement from family and friends. However, by <b>sharing with others why participating is important to them</b> , they were able to recruit support. <b>YOU TOO</b> can gain encouragement from others to begin participating in sport again!

*Note.* The messages appeared in a randomized order; The phrase, “When first thinking about joining adult sport, others **just like you** faced barrier *x*” is designed to induce a vicarious experience for the recipient. Indicating how these referent others overcame barriers provides examples of a mastery experiences. Ending each message with, “**YOU TOO** can overcome barrier *x* to begin participating in sport” is designed to induce an imaginal experience.

**Appendix O: Request for a sport-related newsletter**

We are currently in the planning stages of creating an e-mail newsletter for sport enthusiasts, which described a wide variety of adult sport opportunities that are currently offered in your area of residence. Furthermore, those who would like to receive the newsletter will have the option of receiving sport information that is specifically tailored to their own interests. For example, subscribers will have the option to receive information about sports that are typically played during certain seasons of the year (e.g., winter only), and they will also have the option to receive information about different types of sports in which they would be most interested (e.g., team sports only).

**Would you like to receive such a newsletter? Please circle your response below:**

**YES**

**NO**

**Please type in your town/city/community of residence: \_\_\_\_\_**

**Appendix P: Goal-setting self-efficacy**

Over the next month, how confident are you that you can:

	<b>Not Confident At All</b>				<b>Completely Confident</b>		
Set realistic goals to increase your sport participation to at least 30 minutes of moderate to heavy intensity <b>THREE</b> times per week.	1	2	3	4	5	6	7
Set realistic goals to increase your sport participation to at least 30 minutes of moderate to heavy intensity <b>FOUR</b> times per week.	1	2	3	4	5	6	7
Set realistic goals to increase your sport participation to at least 30 minutes of moderate to heavy intensity <b>FIVE</b> times per week.	1	2	3	4	5	6	7
Set realistic goals to increase your sport participation to at least 30 minutes of moderate to heavy intensity <b>SIX</b> times per week.	1	2	3	4	5	6	7
Develop a plan for reaching your sport participation goals.	1	2	3	4	5	6	7
Follow through with your sport participation goals, even though it may be difficult at times.	1	2	3	4	5	6	7



