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THE INFLUENCE OF BODY WEIGHT AND BODY COMPOSITION INFORMATION ON INITIAL EXERCISE MOTIVATION IN FEMALE EXERCISE INITIATES WITH OVERWEIGHT AND OBESITY

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***Abstract*:** The study purpose was to examine the impact of providing individualized body composition information (intervention condition; $n = 40$) versus body weight information (standard control condition; $n = 40$) on motivational regulations in overweight female exercise initiates about to commence an exercise program. The Behavioral Regulation in Exercise Questionnaire-2 was completed prior to and following the information provision. Results revealed a significant increase in introjected regulation for the intervention condition indicating that the body composition information may have reinforced previous feelings of self-imposed pressure and a sense of obligation to start exercising. Implications for motivating new exercisers are discussed.

***Keywords*:** Body composition, Exercise motivation, Self-determination theory.

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Ideals of an improved appearance and weight loss often serve as motives for instigating a lifestyle behaviour change such as exercise (Ingledew & Markland, 2008; King, Hopkins, Caudwell, Stubbs, & Blundell, 2009). Research has shown that women in particular can be susceptible to the nuances of societal messages promoting achievement of the 'ideal body' (Lin & Reid, 2009); thus, it is not surprising that people desire, and actually attempt, to lose weight in very large numbers (Bish, Blanck, Serdula, Marcus, Kohl, & Khan, 2005). A primary focus on weight - a number on a scale - as the single measure of success is often problematic. In an exercise context, low weight loss, frequently associated with disappointment and depreciated self-esteem, could lead to poor adherence, not to mention a view that exercise is ineffective (King et al., 2009). Teixeira, Silva, Mata, Palmeira, and Markland (2012) have outlined the problems presented when exercise initiates regard exercise and diet primarily as a means to an end (weight loss). For example, the importance of engaging in the process of becoming physically fit, exercising, and eating healthy may be minimized which could undermine behaviour modification. Moreover, individuals focused on fast results may be less inclined to continue with their efforts in the absence of appreciable change (Teixeira, Silva, et al., 2012).

Rather than focus on weight, exercise initiates would be better to consider their body composition (Esmat, 2012). Body composition reveals the relative proportions of fat and lean mass (i.e., bones, tissues, organs, and muscle) in the body. Essential fat is the minimal amount of fat necessary for normal physiological function. For females, essential fat values are typically considered to be 12 percent. Fat above the minimal amount is termed non-essential fat. It is generally accepted that a range of 20-32 percent for women is considered satisfactory for good health. A body composition within the recommended range suggests an individual is at less risk of developing obesity-related diseases such as diabetes, high blood pressure, and even some cancers (Esmat, 2012).

It has been posited that interventions for new exercisers (i.e., initiates) should be guided by theory (Thorgerson-Ntoumani & Ntoumanis, 2006). Motivation is an important determinant of adherence to exercise (Keele-Smith & Leon, 2003), and one theory that has been identified as a useful framework for understanding the motivation of exercise initiates (e.g., Rodgers, Hall, Duncan, Pearson, & Milne, 2010) is self-determination theory (SDT; Deci & Ryan, 1985, 2002; Ryan & Deci, 2000, 2001). According to SDT, motives (or regulations) reside along a continuum and range from amotivated, to controlled (e.g., external and introjected regulation) to volitionally endorsed (e.g., identified and intrinsic regulation; Deci & Ryan, 1985; Ryan & Deci, 2000). Amotivation is the state of lacking the intention to act (Deci & Ryan, 2002). External and introjected regulations are underpinned by

controlled motivation stemming from the expectation of rewards or the avoidance of negative emotions, such as guilt or shame. Identified and intrinsic regulation are regarded as more self-determined and autonomous; that is, they reflect motivation that emanates from valuing the behaviour itself as well as its outcomes, and enjoyment of the activity for its own sake (Deci & Ryan, 2002). There is considerable research demonstrating that people who report more self-determined motives also report more regular physical activity, as well as more positive physical and psychological outcomes of physical activity participation (e.g., Mullan & Markland, 1997; Wilson & Rodgers, 2002, 2004).

In a recent review exploring the topics of motivation and self-regulation with regards to weight management (Teixeira, Silva, et al., 2012), it was suggested that the outcomes selected in obesity treatment warrant renewed attention. The authors note that weight change is most reported and used consistently to determine the efficacy of an intervention; however, this focus often negates the fact that many individuals choose to maintain an exercise regimen in the absence of any definitive weight change. For example, after experiencing health and wellness benefits through physical activity, an individual may be more autonomously motivated for that particular outcome despite a small decrease in weight (Teixeira, Silva, et al., 2012). Individuals commencing a weight loss program often do so with specific goals in mind (e.g., to improve appearance, for health or fitness purposes, to please others; Ryan & Deci, 2000; Teixeira, Silva, et al., 2012). Very often, exercise interventions begin with a physical assessment which includes measuring body weight. While a focus on motives such as weight loss and improving appearance has been associated with less self-determined regulations (Markland & Ingledew, 2007), little is known to date about the motivational effects of providing more personalized body composition information at the outset of an exercise program. Some research has indicated that in an exercise context, health and fitness motives are related positively to more autonomous regulations (i.e., are endorsed as personally important) and are typically unrelated to more controlling regulations (Ingledew & Markland, 2008; Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Because health and fitness motives have been associated with increased exercise participation when compared to weight/appearance motives (Ingledew & Markland, 2008), it may be the case that providing body composition information to exercise initiates will have a positive motivational impact via shifting the focus from a number on a scale, to changes in fat mass and lean mass (i.e., health and quality of life).

In light of the fact that weight loss has been identified as a common motivator among women who are initiating an exercise program, and the relationship that has been observed between health and fitness motives and more self-determined

regulations, the purpose of the present study was to compare the impact of providing body weight plus individualized body composition information (intervention condition) versus providing body weight information only (standard control condition) on the behavioural regulations of female exercise initiates with overweight and obesity. In comparison to the standard control condition, it was hypothesized that the supplementary provision of personalized body composition information (i.e., the intervention) would enhance self-determined motivation to a greater degree as a function of increasing awareness regarding the physiological changes (i.e., health/fitness benefits) that can occur as a result of exercise beyond weight loss. More specifically, it was expected that changes would occur following the intervention pertaining to exercising for personal health and fitness reasons (i.e., identified regulation would increase; Markland & Ingledew, 2007). For individuals receiving body weight information only, it was anticipated that identified regulation would remain unchanged.

Given the attributes of the intended population (i.e., female exercise initiates wanting to begin an exercise program) as well as the short duration of the intervention (i.e., 15 minutes), it was not expected that significant changes would be observed in amotivation, external, introjected, and intrinsic regulation in either the standard control or intervention groups. The reasoning for this was fourfold. As recruited individuals were interested in beginning an exercise program, it was presumed that they possessed some degree of intent and would not be amotivated. Because the information was not provided by an individual of personal significance to the participant, changes in external regulation were not expected; concomitantly, it was also anticipated that introjected regulation would remain unchanged as the intervention was not expected to influence emotions such as guilt or shame. Similarly, it was not expected that changes to intrinsic regulation would be observed given the short duration of the intervention. That is, it is unlikely that the individuals would immediately internalize and inherently enjoy participating in physical activity when they had only received the intervention, and not even started to actually exercise.

METHOD

Participants

Healthy sedentary female initiates with overweight and obesity who wanted to begin an exercise program were recruited. For the purposes of this study, sedentary was

defined as self-reported participation in leisure time physical activity averaging less than one time in a typical week over the past six months (Martin Ginis, Burke, & Gauvin, 2007). Inclusion criteria required that the women were aged 18 to 45, not pregnant or planning pregnancy, and had a body mass index (BMI) greater than 25kg/m2. The Physical Activity Readiness Questionnaire (PAR-Q; Canadian Society for Exercise Physiology, 2002) was administered to ensure that no health conditions precluding exercise existed. Those who passed the PAR-Q and wished to participate were booked for the baseline assessment and allocated randomly to one of two groups: body weight information only or body weight plus body composition information. In total, 292 women were screened to determine eligibility: 124 of these women fit all of the inclusion criteria; 44 individuals chose not to participate, citing reasons such as unavailability during the lab testing hours and lack of interest. Thus, a total of 80 women were randomized with 40 participants assigned to each condition. The ethics review board of the university where the research was conducted approved the study and all participants provided informed consent prior to participating.

Measures

After completing a demographic information form, the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2; Markland, 2000; Markland & Tobin, 2004) was administered to each participant. The BREQ-2 is intended to explore reasons underlying peoples' decisions to participate, or not participate in physical exercise, and contains five subscales measuring external (e.g., "I exercise because other people say I should"), introjected (e.g., "I feel guilty when I don't exercise"), identified (e.g., "I value the benefits of exercise"), and intrinsic (e.g., "I exercise because it's fun") regulation as well as amotivation (e.g., "I don't see why I should have to exercise"). Following the stem, "Why do you engage in exercise?" participants responded to each item on a 5-point scale anchored at the extremes by (0) Not true for me and (4) Very true for me. Previous research supports the BREQ-2's factor structure and subscale reliability (Cronbach's alpha = .73; Markland & Tobin, 2004). The reliability of each BREQ-2 subscale was found to be acceptable for the present study at both of the time periods examined (Cronbach's alphas = .69 - .92 for baseline; .79 - .96 for post intervention).

In order to capture participant attitudes toward their physical selves, the Multidimensional Body-Self Relations Questionnaire (MBSRQ; Brown, Cash, & Mikulka, 1990; Cash, 2000) was administered. The MBSRQ is a well-validated measure that has been utilized previously in populations with overweight and obesity (e.g., Annis, Cash, & Hrabosky, 2004; Foster, Wadden, & Vogt, 1997), and contains 69-items comprising 10 subscales that evaluate body appearance, health, and physical functioning.

Because ideations of enhancing appearance and attempts at weight loss are often motivators for instigating an exercise regimen (Ingledew & Markland, 2008), the Appearance Orientation (AO) subscale has been reported for the purposes of the present study. AO describes the extent to which one invests in her appearance. High scorers pay attention to their appearance, perform extensive grooming behaviours, and generally place more importance on how they look. Previous research supports the internal consistency of the AO subscale (e.g., Cronbach's alpha = .84 - .90; Pearson & Hall, 2013).

Dual Energy X-Ray Absorptiometry (DXA) was used to assess body composition, providing a direct calculation of weight, total fat, fat-free mass, lean tissue, and bone density by body region for each participant.

Procedures

Assessment

Once the nature of the study was explained and informed consent was obtained, the baseline behavioural regulation measures were completed; this took approximately 30 minutes. Participants then prepared for a sub-maximal fitness test which followed procedures outlined by The American College of Sports Medicine (2000). The fitness test lasted approximately 15 minutes, after which each participant was directed to the DXA suite to undergo the body composition analysis. Prior to starting the scanner, the researcher explained the pending procedure, noting specifically the length (8-12 minutes depending on the participant's BMI) and the importance of remaining as still as possible. The DXA portion of the assessment lasted approximately 15 minutes.

Intervention

Following fitness testing and analysis of body composition, participants met individually with the researcher immediately to review different types of information depending on group allocation. All participants were also provided with a brochure during this private consultation which was created for the study, and based upon widely available material developed by the Public Health Agency of Canada (2003) regarding exercise.

Body composition intervention group. Participants were provided with the aforementioned brochure and asked to review the content on their own time. They were then provided with a handout entitled "Understanding your Body Composition" which detailed physiological changes and associated benefits that can occur as a result of exercise (e.g., increase in muscle mass, decrease in body fat, increased metabolism,

etc.). The researcher reviewed this information with participants, followed by the provision of personalized DXA body composition measures. Body composition values were provided in percentages and included: region body fat, fat-free mass, android body fat (the fat contained in the abdominal region), and gynoid body fat (the fat contained in the hip and thigh region). Body weight presented in pounds and obtained from DXA was also provided. Directly following the provision of DXA information, participants were asked to complete the BREQ-2 again. This intervention portion of the assessment took approximately 15 minutes.

Body weight standard control group. Although body composition measures were taken using DXA, these results were not relayed to participants in the body weight standard group. In order to control for contact time, the researcher reviewed the educational brochure with these participants followed by the provision of body weight (in pounds) obtained by DXA. The BREQ-2 subscales were then administered in the same manner as in the body composition intervention group.

Data analysis

Univariate analyses of covariance (ANCOVA) were used to examine the effect of differential information provision on the BREQ-2 regulations between the two groups post-intervention (i.e., at time two). Although randomization occurred, the time one scores were included in the analysis as a covariate for each regulation in order to control for the significant differences in baseline values between groups. The assumption for homogeneity of regression slopes was tested and met.

RESULTS

The women scored relatively high on the AO subscale of the MBSRQ (Brown et al., 1990) having a mean score of 3.48 (SD = .58) on 5-point rating scale. No significant differences (p > .05) were found between groups at baseline for the various descriptive characteristics (e.g., age, height, weight, BMI, waist circumference, fat mass, fat-free mass) and for AO. The descriptive statistics for all measures at baseline are given in Table 1.

In order to examine the magnitude of the effects among the dependent variables in relation to the research question, partial eta squared (η_p^2) values were examined whereby 0-0.1 represents a weak effect, 0.1-0.3 a modest effect, 0.3- 0.5 a moderate effect, and > 0.5 a strong effect (Tolmie, Muijs, & McAteer, 2011). As hypothesized, no significant between-group differences were observed for amotivation, external, and intrinsic regulation (p > .05). The results for introjected regulation revealed significant

Table 1. Baseline descriptive statistics of participant characteristics, AO, and the behavioural regulations

Variable	Body Weight Information (n = 40)	Body Composition Information (n = 40)
Age (yr)	34.3 (7.8)	32.5 (7.4)
Height (in)	64.9 (2.5)	64.6 (2.2)
Weight (kg)	78.7 (14.5)	81.5 (14.1)
BMI (kg/m2)	28.4 (4.4)	29.7 (5.0)
Waist Circumference (in)	36.8 (4.8)	37.4 (4.5)
Fat (kg)	32.4 (9.9)	34.3 (10.4)
Fat-Free Mass (kg)	43.7 (5.4)	44.6 (5.4)
AO	3.53 (.52)	3.42 (.64)
Amotivation	.23 (.40)	.31 (.63)
External	.95 (.98)	.90 (.77)
Introjected	1.93 (1.0)	1.42 (1.0)
Identified	2.60 (.66)	2.13 (.73)
Intrinsic	2.09 (1.1)	1.72 (1.0)

Values are expressed as means (standard deviation). Correlations among the behavioural regulations ranged from -.42 to .52 and were in accord with previous research (e.g., Wilson, Rodgers, & Fraser, 2002).

differences between groups, $F(1, 77) = 4.59$, $p < .05$, partial $\eta^2 = .056$, with the body composition condition (adjusted mean = 1.64) scoring significantly higher in comparison to the body weight group (adjusted mean = 1.33) post-intervention. Unexpectedly, for identified regulation no significant effects were observed, $F(1, 77) = 1.19$, $p = .27$, partial $\eta^2 = .015$. Adjusted means for the two groups were 2.27 (body composition) and 2.13 (body weight), respectively.

DISCUSSION

The present study examined the extent to which communicating different types of information impacted behavioural regulations as proposed by SDT among female exercise initiates with overweight and obesity. Since a common motive for beginning an exercise program is weight loss, it was hypothesized that the supplementary provision of personalized body composition information would enhance the more autonomous regulation, identified, as a function of increasing awareness regarding the positive physiological changes and health benefits that can occur as a result of exercise. This hypothesis was not supported. Rather, the results revealed that for overweight and obese women new to exercise, providing body composition information beyond scale weight produced an immediate increase in introjected regulation and had no significant effect on identified regulation.

One possible explanation for this finding is that the body composition information may have served to reinforce and heighten previous feelings of self-imposed pressure and a sense of obligation to start exercising (Markland & Tobin, 2004). Gorin, Pinto, West, Niemeier, Fava, and Wing (2008) examined whether baseline levels of autonomous and controlled regulations and changes in regulations over 6 months were associated with 6-month weight outcomes in overweight women. They reported that higher controlled regulation at baseline was associated with less weight loss, and that an increase in autonomous regulation and a decrease in controlled regulation over the 6-month period predicted more weight loss. After reviewing the literature, Teixeira, Silva, et al. (2012) concluded that in an exercise context, there is no indication that introjected regulation is conducive to improved weight control, particularly in the long-term. Given these findings, the present results would suggest that body composition information should not be provided to overweight and obese exercise initiates as it will likely increase introjected regulation.

It is noteworthy that some previous research has found introjected regulation to be associated positively with exercise behaviour in the short-term (e.g., Pelletier, Fortier, Vallerand, & Briere, 2002; Thogersen-Ntoumani & Ntoumanis, 2006). Moreover, research has shown that individuals who start exercising for less self-determined reasons (e.g., to lose weight or to improve appearance) gradually alter their motives, and continue to exercise for more self-determined reasons (e.g., physiological and psychological well-being; Ingledew, Markland, & Medley, 1998). Thus, it may be argued that engaging new exercisers by providing information that promotes less self-determined, but nevertheless, self-motivated involvement could create a foundation from which the experience of more autonomous regulations, and therefore continued participation, would emerge. However, in our research the participants had already decided they wanted to start exercising and thus volunteered for the study. That is, our new exercisers were already committed to start exercising and the evidence suggests that heightening introjected regulation would not be advisable in this population (i.e., high in weight/appearance concerns; Teixeira, Silva, et al., 2012). Having said that, holding controlled motivations in the longer term is not necessarily problematic, motivationally speaking, as long as self-determined regulations are also held (Teixeira, Carraça, et al., 2012).

Finally, it is worth considering that the provision of body composition information per se may not necessarily be detrimental to motivation but rather it may depend on how it is presented. The supplementary provision of personalized body composition information can be seen as providing greater structure to the feedback given to participants in comparison to giving scale weight alone. Vansteenkiste, Williams, and Resnicow (2012) have argued that providing structured information in health care settings can enhance clients' competence, but if it is not provided in a manner that is

supportive of autonomy the chances that the information will promote autonomous motivation is low. Thus, future research attention should be paid to the way in which such information is provided to exercise initiates in order to optimize motivation for prolonged engagement.

CONCLUSION

It is no surprise that the prevalence of societal overweight and obesity has risen dramatically in recent years. In light of the subsequent comorbidities associated with these conditions and resultant burden on the health care system, identifying methods to enhance physical activity levels is imperative for attenuating this impact on both micro and macro levels. The present study aimed to engage women new to exercise through exploring motivational regulations in association with the provision of different types of personalized body composition information. While it was hypothesized that focusing on the physiological changes that can result from exercise would elicit improvements in more autonomous forms of motivation (as opposed to maintaining an emphasis on weight exclusively), results revealed that for this population, providing body composition information beyond scale weight produced an immediate increase in introjected regulation which may have heightened previous feelings of self-imposed pressure to start exercising. While some research supports the positive association between less autonomous regulations and exercise behaviour in the short term, future research should explore alternative methods of information provision in accordance with participant values and learning styles in order to enhance the likelihood of adherence to exercise in the long term.

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