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Overweight Stereotype Threat Negatively Impacts the Learning of a Balance Task

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Several studies have demonstrated the detrimental effects of stereotype threat on the performance of academic and motor skills, while little attention has been given to the effects of stereotypical conditions on motor learning. The objective of the current study was to investigate the effects of overweight stereotype threat on women learning a balance task. Participants practiced 10 trials of a dynamic balance task and their learning was observed in a retention test one day later. Before practice, the stereotype threat (ST) group received instructions introducing the task as influenced by individual differences, whereby overweight people usually present worse outcomes. For the reduced stereotype threat group (RST), instructions informed them that the task was not influenced by individual differences. Participants also filled out a questionnaire measuring intrinsic motivation. The results showed that performance and learning, as well as perceived competence, were enhanced for participants of the RST group compared with participants of the ST group. The findings provide evidence that overweight stereotype threat affects the learning of motor skills.

Keywords: mindsets, motor learning, gender, competence, obesity

Recently, motor learning research has increased its focus on observing the effects of sociocognitive-affective variables, such as perceptions of competence (Chiviacowsky & Harter, 2015; Chiviacowsky & Wulf, 2007; Saemi, Wulf, Varzaneh, & Zarghami, 2011) or autonomy support (Chiviacowsky & Wulf, 2002; Fairbrother, Laughlin, & Nguyen, 2012; Lewthwaite, Chiviacowsky, Drews, & Wulf, 2015; Ste-Marie, Vertes, Law, & Rymal, 2013). Their impact on motor learning has been observed across a variety of practice conditions and populations (for a review see Lewthwaite & Wulf, 2012).

Stereotype threat is another important sociocognitive-affective variable that is considered to affect performance in several domains (Chalabaev, Sarrazin, Fontayne, Boiché, & Clément-Guillotin, 2013; Steele, 1997). Stereotype threat occurs when stereotypical beliefs about a determined group, relevant in a certain context, can compromise the performance of individuals who identify with this group (Steele

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& Aronson, 1995). It is considered a situation of a threat to identity that occurs when an individual fears being judged negatively, based on a negative stereotype in relation to a group (Steele, 1997; Steele & Aronson, 1995). Several studies have demonstrated the negative effects of stereotype threat in different areas of behavior; for example, performance related to memory (Chasteen, Bhattacharyya, Horhota, Tam, & Hasher, 2005), to the academic context (Schmader, 2002), and to motor behavior (Beilock & McConnell, 2004). These effects are usually observed in traditionally stereotyped populations such as African Americans (Steele & Aronson, 1995), women (Chalabaev, Sarrazin, Stone, & Cury, 2008), older adults (Hess, Aumann, Colombe, & Rahhal, 2003), and also in groups not usually seen as stereotyped, such as White people (Stone, Lynch, Sjomeling, & Darley, 1999).

Although research investigating the effects of stereotype threat on performance of academic and motor skills has received some attention (Chalabaev, Sarrazin et al., 2013), there are few studies in the motor domain verifying the role of this variable in people who are, or perceive themselves, as overweight (Seacat & Mickelson, 2009). However, stereotypes related to overweight people are numerous, and may cause physical and psychological risks (Puhl & Heuer, 2009). The findings of Friedman et al. (2005) showed that internalizing negative cultural beliefs related to weight is a predictor of psychological problems such as depression, self-esteem and body image issues, and general psychiatric symptoms. Individuals who perceive themselves as overweight, or have a negative body image, may be susceptible to weight stigma (Schmalz, 2010). For instance, it was observed that exposing overweight women to stereotype threat can influence intentions of exercising, eating habits (Seacat & Mickelson, 2009), and perceived competence to accomplish exercise (Schmalz, 2010), therefore potentially reducing levels of physical activity (Vartanian & Shaprow, 2008).

To date, only a few studies have analyzed the impact of stereotypical conditions on motor learning. In the study by Wulf, Chiviacowsky, and Lewthwaite (2012), the authors found that increasing the beliefs of older people in their own capabilities, through increasing their expectations for performance, is beneficial to the learning of a balance task, even if the stereotype related to age (in that case the decline of balance) was not explicitly manipulated. The effects of stereotype threat on motor learning were more directly analyzed in young adults learning a sport skill (Heidrich & Chiviacowsky, 2015). In this study, upon reducing the gender stereotypes in a dribbling task in soccer the feelings of self-efficacy were high and more effective performance and learning was observed compared with a condition in which the negative stereotype was activated.

The objective of the current study was to investigate the effects of overweight stereotype threat on women learning a balance task. Being able to move with a certain degree of motor skill is an indispensable requirement for active participation in different types of motor activities, sporting or otherwise. Since the study of Heidrich and Chiviacowsky (2015) is the only one that directly demonstrated a stereotype threat effect on learning, more specifically related to gender, it was considered important to investigate the effects of overweight stereotype threat on the learning of motor skills. In the current study, after conducting a pretest and before the first practice trial, participants of the stereotype threat group (ST) received instructions introducing the balance task as influenced by individual differences, whereby overweight people usually present worse outcomes, while participants of

the reduced stereotype threat group (RST) received instructions informing them that the task is not influenced by individual differences. In addition, immediately after practice and before the retention test, all participants reported their motivational levels, completing subscales of an intrinsic motivation questionnaire. Considering previous findings showing the impact of stereotype threat on motor learning and that perceptions of competence have already been found to be affected by stereotype threat conditions (Heidrich & Chiviacowsky, 2015; Kit, Mateer, Tuokko, & Spencer-Rodgers, 2014), it was expected that a group practicing with a reduced weight stereotype would present more effective balance learning and report higher levels of intrinsic motivation than a group in which the weight stereotype threat is activated.

Method

Participants

Twenty-three kinesiology students at a university in south Brazil (all females) with an average age of 21.9 (*SD* = 3.95) and a perception of being overweight (average BMI 26.1, *SD* = 3.79) were recruited for the study. Other stereotype threat experiments have also been conducted using similarly small samples (e.g., Chalabaev, Stone, Sarrazin, & Croizet, 2008; Chalabaev, Brisswalter, et al., 2013; Heidrich & Chiviacowsky, 2015; Hively & El-Alayli, 2014). To select the sample, an evaluator, who did not perform the experimental procedure, applied a questionnaire in which the participants were invited to self-report their body mass index (BMI) and fill out an adapted scale of perception and body image (Kakeshita & Almeida, 2006; Kakeshita, Silva, Zanatta, & Almeida, 2009). Three weeks later, those who perceived themselves as overweight, even without presenting a self-reported overweight BMI condition (BMI 25.0–29.9), according to the World Health Organization (2000), were invited to participate in the study. This resulted in 12 overweight participants who perceived themselves as overweight (overweight with overweight perception = OOP) (BMI *M* = 29.0, *SD* = 1.55) and 11 nonoverweight participants who perceived themselves as overweight (nonoverweight with overweight perception = NOP) (BMI *M* = 23.2, *SD* = 1.61). The participants did not know the purpose of the current study, did not have previous experience with the task, and consented to their voluntary participation by signing an informed consent form. The study was approved by the university's institutional review board.

Apparatus and Task

The task involved the participants maintaining themselves in a horizontal position on a stabilometer for as long as possible during the 60 s of each balance trial. The apparatus consisted of a wood platform, 130 cm long × 140 cm wide, that can oscillate up to 18° from the horizontal plane to the right or left side. A millisecond timer measured the time in balance (i.e., platform within ± 3° of horizontal).

The Intrinsic Motivation Inventory questionnaire (IMI) (validated by McAuley, Duncan, & Tammen, 1989) was used to evaluate the intrinsic motivation of the participants. This questionnaire uses different subscales related to the degree of interest, perceived competence, effort, value/usefulness, perceived stress, and

choice of participants while engaged in a particular activity. In the current study a questionnaire with 12 questions measuring three IMI subscales—perception of competence, enjoyment, and effort—was used. The interest/enjoyment subscale is considered to be the one that most closely represents the experience of intrinsic motivation (Moller, Deci, & Ryan, 2006). The perceived competence and effort subscales were also included because there is already evidence that stereotype threat conditions reduce estimates of performance (Steele & Aronson, 1995) and perceived self-efficacy (Heidrich & Chiviacowsky, 2015), as well as affect physical and mental effort (Stone et al., 1999).

Procedure

Participants were assigned quasi-randomly to two experimental conditions: stereotype threat (ST) and reduced stereotype threat (RST), equally divided for weight (group ST: 6 OOP, BMI M = 28.2, SD = 3.46 and 6 NOP, BMI M = 23.6, SD = 0.20; and group RST: 6 OOP, BMI M = 29.9, SD = 6.22 and 5 NOP, BMI M = 22.8, SD = 0.91). All were informed that the task consisted of maintaining the stabilometer platform in the horizontal position for as long as possible during the 60 s of each trial and that the study would assess the impact of overweight on the performance and learning of a balance task. Furthermore, the participants were instructed they would receive feedback related to the time in balance at the end of each trial. Before experimental manipulation, the participants were invited to perform one practice trial (pretest). After the practice trial, each group received an introductory text with information about the task. ST group participants received the following instructions: "This study involves learning a task consisting of remaining in balance on the platform for as long as possible during the 60 second trials. This task is usually influenced by individual differences such as height, weight, gender, etc. For example, overweight people generally produce worse results than people who are not overweight." RST group participants received the following instructions: "This study involves learning a task consisting of remaining in balance on the platform for as long as possible during the 60 second trials. This task is not influenced by individual differences such as height, weight, gender, etc." Similar expectancy instructions were used in previous studies (e.g., Chalabaev, Brisswalter, et al., 2013; Rydell, Rydell, & Boucher, 2010) to activate or reduce the stereotype relevance to the task-related situation. The evaluator reinforced these instructions before beginning the task. Fifteen seconds before beginning each trial, the participants were instructed to step onto the platform and keep the left side touching the ground. Once a start signal was given, the participants began to move the platform to the horizontal position and the data collection began. The practice phase consisted of ten 60-s trials, with a 90-s rest interval between trials. To assess the relatively permanent effects (in other words, learning the task), a retention test without feedback was conducted 24 hr later; this consisted of five 60-s trials, with 90-s breaks between each one.

After the practice phase and before the retention test, all the participants filled out the IMI questionnaire with subscales about the degree of interest/enjoyment, perceived competence, and effort/importance. The questionnaire consisted of four statements in each of the three subscales. For the interest/enjoyment subscale, the included items were: "I enjoyed doing this balancing task very much", "This

balancing task was fun to do", "I thought this was a boring balancing task", and "I would describe this balancing task as very interesting". The perceived competence subscale items were: "I think I am good at this balancing task", "I think I did well in this balance task, compared to other participants", "After doing this balancing task for a while, I felt very competent", and "I felt very skilled in this task". For the effort subscale, the following items were used: "I tried very hard to stay in balance", "I didn't try very hard to achieve a good time in balance", "I tried very hard in this activity", and "I did not spend much energy to balance myself during the trials".

Data Analysis

The dependent variable was the time in balance during each trial. The pretest data were analyzed in a one-way analysis of variance (ANOVA). In the practice phase the data were analyzed in 2 (groups: ST, RST) × 10 (trials), through the analysis of variance (ANOVA), with repeated measures in the last factor. The results of the retention test were analyzed in 2 (groups: ST, RST) × 5 (trials) through ANOVA, also with repeated measures in the last factor.

For the analysis of the values reported in the questionnaires, a Likert 7-point scale was used, ranging from 1 (not true) to 7 (very true). The subitems expressed negatively had their scoring reversed before the analysis. The average scores of all items of each subscale were calculated using separated one-way ANOVAs. The internal consistency of the subitems was determined by Cronbach's alpha coefficient. Alpha was set at .05 for all analyses.

Results

Time in Balance

The groups performed similarly on the pretest (see Figure 1, left) without statistically significant differences: $F(1, 21) < 1$. The time in balance increased in both groups during the practice phase (see Figure 1, left). The effect between trials was significant: $F(1, 189) = 12.08$, $p < .001$, $\eta_p^2 = .37$. The RST group showed more effective performance in comparison with the ST group and significant differences were found between groups: $F(1, 21) = 5.85$, $p < .05$, $\eta_p^2 = .22$. There was no interaction between groups and trials: $F(9, 189) < 1$.

In the retention test, without feedback, the RST group demonstrated a time in balance significantly longer than that of the ST group (see Figure 1, right): $F(1, 21) = 5.09$, $p < .05$, $\eta_p^2 = .19$. Furthermore, significant improvements were observed in the time in balance throughout the trials: $F(4, 84) = 7.20$, $p < .00$, $\eta_p^2 = .26$. The interaction between trials and groups was not significant: $F(4, 84) < 1$.

Questionnaire

The means and standard deviations of the averaged items of each subscale are shown in Table 1 (left column). After the practice phase, the RST and ST groups did not differ in the degree of any subscale: Fs$(1, 21) < 1$.

Twenty-four hours after the practice phase but before the retention test, the RST group reported higher values in the subscales, in general, than the ST group.

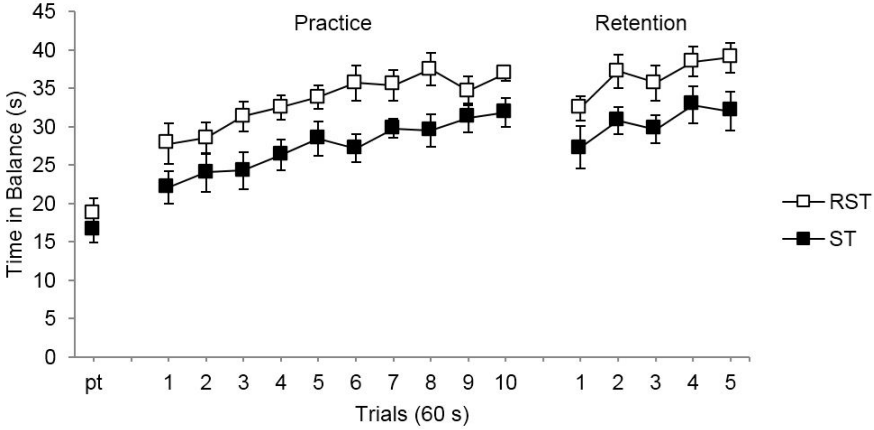

Figure 1 — Time in balance for the stereotype threat (ST) and reduced stereotype threat (RST) groups on the pretest (pt), during practice (day 1), and on the retention test (day 2). *Note*. Error bars indicate standard errors.

Table 1 Results of the IMI Questionnaire Subscales Completed Each Day (Means and Standard Deviations)

Subscales	After Practice		Before Retention Test	
	ST	RST	ST	RST
Enjoyment	6.2 (0.70)	6.5 (0.0)	6.1 (0.88)	6.6 (0.0)
Competence	3.9 (0.35)	4.0 (0.17)	3.6* (1.38)	4.5 (0.35)
Effort	5.6 (0.17)	5.8 (0.70)	5.4 (0.17)	5.9 (0.70)

Abbreviations: IMI = Intrinsic Motivation Inventory; ST = stereotype threat group; RST = reduced stereotype threat group.

Note. Significant group differences are indicated by *.

Through the analysis of different subscales, significant differences were observed in perceived competence, $F(1, 21) = 5.14$, $p < .05$, $\eta_p^2 = .18$, which also showed high internal consistency among the items ($\alpha = .93$). No differences were found in the interest subscale, $F(1, 21) = 2.60$, $p > .05$, and effort subscale, $F(1, 21) = 1.99$, $p > .05$. The means and standard deviations of each subscale are also found in Table 1 (right column).

Discussion

Participants receiving instructions reducing a weight stereotype threat showed improved performance and retention of a balance task compared with participants receiving instructions activating the stereotype. Differences between groups were

found as soon as the beginning of the practice phase, after the pretest, and when the different instructions were provided to the groups, remaining significant until the end of this phase. This finding demonstrates that this variable is able to produce immediate effects on performance. This result is in line with a previous study demonstrating that stereotypes can affect participants performing a balance task (Chalabaev, Stone, et al., 2008). However, in this gender stereotype threat study, performance effects were observed for a stereotype lift but not for a stereotype threat when compared with the control conditions. Earlier studies (e.g., O'Brien & Crandall, 2003) have observed that negative stereotypes can have an impact on performance, particularly when the task is perceived as difficult. While in the study conducted by Chalabaev, Stone, et al. (2008) the objective was to keep the platform in balance without touching the ground, the current study asked participants to keep the platform in balance without moving it beyond 3º of horizontal, clearly making the task more challenging. There is also a possibility that the effects of negative overweight stereotyping on the performance of balance tasks are simply stronger than the effects of gender stereotyping on the same task, especially for kinesiology students, as this population potentially values physical performance outcomes more and are more sensitive toward being overweight than other groups (e.g., O'Brien, Hunter, & Banks, 2007).

More importantly, differences in balance were found in the retention test, where the most lasting learning effects are typically observed. The findings are in agreement with the Heidrich and Chiviacowsky (2015) study, in which the effects of stereotype threat of gender on motor learning were investigated, indicating that this social-cognitive factor can significantly influence not only performance (Chalabaev, Brisswalter, et al., 2013; Hively & El-Alayli, 2014), but also the learning of motor skills.

The mechanisms that regulate the effects of stereotype threat on the learning of motor skills are not yet completely understood in the literature. Informing RST group participants that the task is not influenced by individual differences, such as weight, may have resulted in changing their beliefs about weight perception, in turn decreasing the existing stereotype. Previous studies in the academic field indicate that providing positive information, even if subtle (Shih, Ambady, Richeson, Fujita, & Gray, 2002), may raise performance expectations (Cadinu, Maass, Frigerio, Impagliazzo, & Latinotti, 2003). Similar results were also more recently found in the motor behavior domain, where participants receiving enhanced performance expectancies outperformed control groups regarding running efficiency (Stoate, Wulf, & Lewthwaite, 2012), as well as while learning a balance task (Wulf et al., 2012). On the other hand, the activation of the stereotype threat may have interfered with the performance and learning of the ST group. While the observed poorer performance and learning may have been related to the negative instructions used with an expectation to perform poorly, independent of being overweight or manifesting any stereotype, the fact that stereotype threat can impact individuals in whom the negative stereotypes are not internalized (Steele, 1997) weakens this possibility. An individual's susceptibility to a threat can derive not only from internal doubts about their ability (when the stereotype is already internalized) but also from the identification with the domain and the concern about being stereotyped as part of it (Steele, 1997). Thus, ST group participants probably feared being judged in

accordance with the activated overweight stereotype made relevant in the task-related situation, resulting in the observed hampered learning.

Several underlying mechanisms involving motivational, cognitive, and affective processes have been considered while explaining stereotypical condition effects on performance (Schmader, Johns, & Forbes, 2008). Individuals faced with a stereotype can bring an unnecessary and detrimental amount of conscious attention to their performance as a resource (Baumeister, 1984). When feeling pressured by a stereotype threat, individuals possibly practice controlling, step-by-step, the necessary movements for the task to ensure a positive outcome in performance, in this way hampering the automation of the movements (Beilock & McConnell, 2004). The effects of the stereotype threat on learning, however, could be explained by mechanisms other than explicit task monitoring processes. More recently, it has been suggested that turning attention to oneself may cause episodes of microchoking, reflected by an excessive attention to self-regulatory processes used to control negative thoughts and emotions, degrading motor learning (Wulf & Lewthwaite, 2010). Thus, there is a possibility that the stereotypical condition of the current study actually resulted, during practice, in decreased attention or explicit monitoring activity of beginners to important aspects of the task, whereby degrading learning.

It is also noteworthy that different levels of perceptions of competence were found between groups in the current study. Participants who received instructions that reduced stereotype threat reported a greater degree of perceived competence than the group with the threat activated. A similar result was found in the study of Heidrich and Chiviacowsky (2015). These findings are also consistent with results of studies evaluating the effects of stereotype threat on practical intentions to exercise and eating habits, showing that stereotype threat may lower perceptions of competence and, consequently, decrease the healthy behavioral intentions in overweight women (Seacat & Mickelson, 2009), causing susceptibility to evasion of physical exercise (Vartanian & Novak, 2011). It has already been found that self-efficacy is strongly connected to motor performance (Moritz, Feltz, Fahrbach, & Mack, 2000), even predicting learning (Chiviacowsky, 2014; Chiviacowsky, Wulf, & Lethwaite, 2012; Stevens, Anderson, O'Dwyer, & Williams, 2012; Wulf, Chiviacowsky, & Cardozo, 2014). In fact, the satisfaction of the competence need is considered to play a key role for optimal human psychological well-being, predicting better functioning and learning in several domains (Deci & Ryan, 2000, 2008).

The evidence found in the current study has important implications for intervention programs for people who perceive themselves as overweight or are overweight, considering that stereotype threat can directly interfere with the psychological well-being and physical health of these individuals (Schmalz, 2010). Reducing negative stereotypes related to weight can positively influence motor performance and learning in women, perhaps increasing their self-efficacy for physical activity, being an effective alternative to reduce risks in their motor behavior and health. The results provide initial support for the effects of weight stereotypes on learning. Future research could be conducted to investigate, with further depth, the effects of overweight stereotype threat on learning, as well as analyzing possible interactions with other factors that influence motor learning. It would also be fruitful to investigate if the results can be generalized to other kinds of tasks and different populations.

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