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ORIGINAL ARTICLE

Relatedness support enhances motor learning

Daniela H. Gonzalez[1] · **Suzete Chiviacowsky**[1]

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Abstract The present experiment was designed to test the effects of practice with relatedness support on motor learning. Forty-five young adults practiced a task in which they were required to learn to swim the front crawl stroke for one length in an indoor swimming pool (25 m) using 50% of the maximal speed. In the relatedness support condition (RS group), the instructions emphasized acknowledgement, caring, and interest in the participants' experiences, while in the relatedness thwart condition (RTh group), instructions emphasized disinterest in the participant as a person. A third, neutral condition (Control group) did not receive specific relatedness instructions. One day after practice, participants completed retention and transfer tests. The RS group demonstrated greater improvement in performance during practice and enhanced learning relative to the RTh and Control groups, while the RTh group showed decreased learning compared with the Control group. Furthermore, RS participants reported higher motivation and greater positive affect than the RTh and Control groups. The present findings demonstrate that relatedness support enhances the learning of motor skills. They also highlight motivational and affective effects that are observed when learners are provided with relatedness support.

✉ Suzete Chiviacowsky
suzete@ufpel.edu.br

[1] Escola Superior de Educação Física, Universidade Federal de Pelotas, Rua Luís de Camões, 625, CEP, 96055-630 Pelotas, RS, Brazil

Introduction

Since Lewthwaite and Wulf's (2010, 2012) reviews on the importance of recognizing that motor behaviour is an amalgam of "socio-cognitive-affective-motor" behaviour, a growing number of experiments in the motor learning area have examined the effects of a variety of motivational factors on motor learning. Movement can be considered a product of processes arising from the dynamic interaction between behaviour, the brain, bodily processes, and changes in the social and physical world (Glenberg, 2010). While numerous experiments over the past years have examined the role that cognition is thought to play during the learning of motor skills (Schmidt & Lee, 2011), recent studies have provided converging evidence that socio-cognitive-affective variables can have a direct impact on motor learning. Studies have shown, for instance, that the induction of different mindsets or beliefs about personal capabilities, through various factors, such as conceptions of ability (Drews, Chiviacowsky & Wulf, 2013; Lewthwaite & Wulf, 2010), stereotype threat (Cardozo & Chiviacowsky, 2015; Heidrich & Chiviacowsky, 2015), and competence evaluation feedback (Chiviacowsky & Drews, 2016; Wulf, Chiviacowsky, & Lewthwaite, 2010, 2012), has been shown to affect the learning of motor skills.

Deci and Ryan's (2000, 2008) Self Determination Theory and their conceptualization of psychological human needs (autonomy, competence, and relatedness) have been acknowledged as providing a useful framework for contemplating categories of motivational variables in motor learning research (e.g., Chiviacowsky, Wulf & Lewthwaite, 2012; Lewthwaite & Wulf, 2012; Sanli, Patterson, Bray, & Lee, 2013). Autonomy refers to the need to control or be the agent of one's action instead of feeling pressured or controlled; competence implies the need to feel oneself as capable of skilfully mastering challenges in one's environment rather than feeling ineffective and incompetent; and relatedness represents the need to experience satisfaction regarding interpersonal acceptance and closeness rather than feeling alienated or ostracized (Ryan, 1995). These fundamental human needs are considered as necessary conditions for human psychological growth, integrity and well-being; they are thought to be universally relevant within all people and all cultures and the absence or suppression of any one is considered harmful to an individual (Deci & Ryan, 2000).

In fact, providing learners with autonomy support during practice has been observed to benefit motor learning through different variables and tasks and in different populations. In these studies, one group of participants is normally provided with the chance to make choices in relation to a given practice variable, for example, feedback (Aiken, Fairbrother, & Post, 2012; Chiviacowsky & Wulf, 2002; Chiviacowsky, Wulf, Medeiros, Kaefer, & Tani, 2008; Janelle, Barba, Frehlich, Tennant, & Cauraugh, 1997), video demonstration (Wulf, Raupach, & Pfeiffer, 2005), number of practice trials (Lessa & Chiviacowsky, 2015; Post, Fairbrother, Barros, & Kulpa, 2014), or task difficulty (Andrieux, Danna, & Thon, 2012), while another group is deprived of these choices. One proposed explanation for these benefits to learning is that autonomy support increases motivation (Deci & Ryan, 2000; Lewthwaite, Chiviacowsky, Drews, & Wulf, 2015; Wulf & Lewthwaite, 2016), including raising learners' perceptions of competence (Chiviacowsky, 2014; Wulf, Chiviacowsky, & Cardozo, 2014; Wulf, Chiviacowsky, & Drews, 2015). Other explanations are that autonomy support allows learners to modify the practice setting to meet individual needs and preferences (Chiviacowsky & Wulf, 2002; Laughlin, Fairbrother, Wrisberg, Alami, Fisher, & Huck, 2015), encourages error estimation (Carter, Carlsen, & Ste-Marie, 2014; Chiviacowsky & Wulf, 2005), and promotes deeper processing of relevant information (Chen & Singer, 1992; Janelle, Kim, & Singer, 1995; Watkins, 1984).

Likewise, perceptions of competence have been shown to play an important role in motor learning. For instance, it has been observed that learners prefer to receive feedback after more effective rather than less effective trials (Chiviacowsky & Wulf, 2002, 2005; Fairbrother, Laughlin, & Nguyen, 2012; Patterson & Carter, 2010) and that, indeed, feedback provided after more successful than unsuccessful trials is more effective for learning (Badami, Vaezmousavi, Wulf, & Namazizadeh, 2012; Chiviacowsky & Wulf, 2007; Saemi, Porter, Varzaneh, Zarghami, & Maleki, 2012). Increasing learners' perceptions of competence through social or temporal comparison (Ávila, Chiviacowsky, Wulf, & Lewthwaite, 2012; Chiviacowsky & Drews, 2016), or through the use of task-specific performance criteria that challenge while providing opportunities to demonstrate success (Chiviacowsky & Harter, 2015; Chiviacowsky et al., 2012; Palmer, Chiviacowsky, & Wulf, 2016; Trempe, Sabourin, & Proteau, 2012), have also been shown to increase the learning of motor skills. Different underlying mechanisms have also been proposed to explain competence support effects on motor learning. Besides the theoretical view that improving and demonstrating one's abilities is fundamentally satisfying and motivating (Deci & Ryan, 2000; White, 1959), it has also been suggested that individuals confronting less doubt about their own competence tend to not occupy themselves with self-evaluative concerns (Bandura, 1982; Bandura & Wood, 1989; Sarason, 1984; Wine, 1971), which are considered counterproductive to motor performance and learning (McKay, Wulf, Lewthwaite, & Nordin, 2015; Wulf & Lewthwaite, 2016). Confident learners may also set higher performance goals (Bandura, 1997; Bandura & Locke, 2003; Locke & Latham, 2006), which in turn have the potential to affect the effort and attention paid during performance (Bandura 1997; Bandura & Jourden, 1991), thereby resulting in performance gains (West, Dark-Freudeman, & Bagwell, 2009; West & Thorn, 2001; West, Welch, & Thorn, 2001).

As observed, while a substantial number of experiments investigating the needs for autonomy and competence have supported the idea that psychological needs must be met to optimize motor skill learning (Deci & Ryan, 2000, 2008; Lewthwaite & Wulf, 2012; Ryan, 1995), to date no research has investigated the impact of the social-relatedness need on motor learning. In addition to autonomy and competence, relatedness is also considered essential to human growth and has an important influence on affective states and intrinsic motivation (Deci & Ryan, 2000; Ryan, 1995). The need for social relatedness has been described from many theoretical different perspectives, with its construct being linked, for example, with long-term impacts of secure versus insecure infant attachments to caregivers (Ainsworth, 1979), with buffering mechanisms developed from positive social support and acting against potential adverse effects of stressful events (Cohen & Wills, 1985), and with academic outcomes linked to feelings of belonging resulting from school climate and quality of teacher-student relationships (Klem & Connell, 2004). Studies have suggested that the extent and quality of social relationships have a critical impact on longevity as well as psychological and physical health (House, Landis, & Umberson, 1988). For example, greater relatedness to others, such as parents, teachers, peers, or coaches, has been directly associated with higher levels of positive affect and intrinsic motivation (Ryan, Stiller, & Lynch, 1994; Sheldon & Filak, 2008), enjoyment (Mueller, Georges, & Vaslow, 2007), engagement (Furrer & Skinner, 2003; Slater & Tiggemann, 2010; Williams, Whipp, Jackson, & Dimmock, 2013), and perceived competence and well-being (Wilson & Bengoechea, 2010).

Given the positive outcomes of relatedness support observed in a number of studies in different academic areas, we consider the possibility that this variable can also play an important role in the motor learning process. Greater perceived relatedness may increase learners' affective and motivational states, perhaps leading to increased enjoyment, effort given to learning the task, and memory consolidation, thereby benefiting motor learning. However, thwarting perceived relatedness can potentially cause deleterious learning effects. To date, it is still largely unknown whether social relatedness has the potential to benefit motor learning, including the example of young adults learning a swimming task. The objective of the present experiment was, therefore, to examine the effects of practice with relatedness support on the learning of a sport motor skill. Three groups of participants practiced a swimming motor task and received instructions emphasizing acknowledgement, caring, and interest in the participants' experiences (relatedness support [RS] group), instructions emphasizing disinterest in the participant as a person [relatedness thwart (RTh) group] or no specific relatedness instructions (Control group). The learning of a critical swimming speed is considered an important aspect in helping to improve not only the technical aspects of swimming but also swimming economy and control of training load intensity (Chatard, Lavoie, & Lacourl, 1990; Dekerle, Sidney, Hespel, & Pelayo, 2002).

To assess whether the manipulated relatedness support influenced individuals' affective states compared with the relatedness thwart and control conditions, a positive affect questionnaire (PANAS; Watson et al., 1988), including words describing positive feelings or emotions, was utilized at the end of the practice phase. They were asked to rate these words on a scale from 1 (not at all) to 5 (extremely) depending on "how they feel at the present moment". In addition, participants completed a modified version of the IMI questionnaire (McAuley, Duncan, & Tammen, 1989), reporting motivation levels and feelings of competence, enjoyment, effort, and relatedness; they were asked to indicate, for example, how motivated they were to learn the task and how competent they felt while swimming on a scale from 1 (not at all) to 10 (very). We hypothesized that the relatedness support condition would result in enhanced levels of positive affect, higher scores in the motivation questionnaire, and enhanced learning of the motor task compared with the other two conditions. There is also a possibility that the relatedness thwart condition would show poorer results than the Control condition.

Methods

Participants

Forty-five young adults (24 males, 21 females), with a mean age of 25.13 years (SD 8.5 years), participated in this experiment. The individuals were enrolled in intermediate swimming classes, had been involved in swimming for 2.6 years on average, and were familiar with the pool, but did not swim competitively. They were not aware of the specific purpose of the study, gave their informed consent, and the study was approved by the university's institutional review board.

Task and procedure

The participants were required to learn to swim the front crawl stroke for one length in an indoor private swimming pool (25 m) using 50% of the maximal speed. Participants performed the task individually with the experimenter present and without other individuals in the experimental setting. Each person was first asked to complete one trial as fast as possible to establish their maximal individual speed, with a stopwatch being used for the measurement. The timer was initiated when the participant's feet left the wall and stopped when the participant first touched the wall on the other side. After completing the consent form, participants were randomly assigned to the Relatedness support (RS), Relatedness thwart (RTh), and Control groups. Immediately prior to the participant beginning their acquisition trials, and following general information about the task, the manipulated relatedness groups received instructions emphasizing interest (RS group) or disinterest (RTh group) in the participants' experiences. The relatedness support (versus relatedness thwart) manipulation was based on procedures of a previous study (Sheldon & Filak, 2008) that followed the conceptual relatedness need definition offered by Deci and Ryan (2000). Participants in the RS group heard: "One thing you need to know is that to us, everybody is unique. We care about each person as an individual, and are trying to understand each person's learning style. So, I hope you'll share your experiences with me after we're done". In contrast, the RTh condition participants heard: "Another thing you need to know is that to us, everybody is the same. We aren't really concerned about you as an individual, we only care about your performance in our experiment, that is, the data. So, please keep your observations to yourself during the process". Reminders were provided for both groups after the first block of six trials during the practice phase. Participants in the RS condition were told: "Just to remind you: remember, we care about you and your individual learning style.

So, please be sure to remember what you were thinking and feeling, so we can discuss your reactions later". For participants in the RTh condition, the experimenter said: "Just to remind you: remember, we're not really interested in your reactions and individual learning style. So, please keep your questions and observations to yourself, as we go through the procedure". Participants assigned to the control condition did not receive any kind of relatedness instructions.

The practice phase consisted of 24 trials, while the retention (also 50% of the maximal speed) and transfer (75% of the maximal speed) tests were performed 1 day after the practice phase; these consisted of six trials each, without feedback. All participants were permitted inter-trial intervals of 40 s (s). Feedback was verbally provided in 33% of the trials (the first and fourth trials of each six-trial block) during practice and involved the time taken to perform the trial (e.g., 28 s). Immediately after the end of the practice phase, as in previous research (e.g., Whitehead & Corbin, 1991; Wulf et al., 2012), both groups completed a customized motivational questionnaire adapted from the Intrinsic Motivation Inventory (IMI; McAuley et al., 1989). Specifically, participants were asked to rate their levels of motivation, enjoyment, effort, perceived competence, and perceived relatedness (serving also as a manipulation check) on a scale from 1 ("not at all") to 10 ("very"). Examples of the items included are: "I enjoyed doing this activity very much", "After practicing this task for a while, I felt pretty competent", and "I put a lot of effort into this task". In addition, participants filled out a positive affect questionnaire (PANAS; Watson et al., 1988), including ten words describing positive feelings or emotions. They were asked to rate them on a scale from 1 (not at all) to 5 (extremely) depending on "how they feel at the present moment".

Data analysis

Absolute errors (AE) in swimming temporal accuracy were calculated before being averaged across blocks of six trials. The practice data were analyzed in a 3 (groups) $\times$ 4 (blocks) analysis of variance (ANOVA) with repeated measures on the last factor, while separated one-way ANOVAs were used for the retention and transfer tests as well as for each item of the customized motivational questionnaire. Variable (VE) and constant (CE) errors were also calculated and analyzed as AE (Appendix 1). Results of the ten-item PANAS scale were averaged and also analyzed in a one-way ANOVA. A Tukey post hoc test was used for follow-up analysis. To indicate effect sizes for significant results, we used partial eta-squared values (η_p^2). The alpha was set at .05 for all analyses.

Results

Temporal accuracy

Practice. The average maximum swimming times of participants in the RS, RTh, and Control groups were 16.48 (SD = 2.38 s), 18.11 (SD = 2.32 s), and 16.71 (SD = 1.81 s), respectively. Participants in both groups reduced their AEs (see Fig. 1) during the practice phase. While the groups showed similar performance in the first block of practice, F (2, 42) = .27, $p > .05$, $\eta_p^2 = .64$, the RS group demonstrated less error relative to the RTh and Control groups at the end of practice. The main effect of block, F (3, 126) = 59.92, $p < .001$, $\eta_p^2 = .58$, was significant. Post hoc tests confirmed differences between block 1 and all of the other blocks, $p < .01$, and between block 2 and blocks 3 and 4, $p < .01$. The main effect of group, F (2, 42) = 6.38, $p < .01$, $\eta_p^2 = .23$, was also significant, while the group $\times$ block interaction, F (6, 126) = 1.17, $p > .05$, was not significant. Post hoc tests following the main effect of group confirmed that lower AE scores were produced during practice by the RS group relative to the RTh, $p < .05$, and Control groups, $p < .01$.

Retention. As can be observed in Fig. 1, the RS group (M = 1.56, SD = .67) produced lower AEs relative to the Control (M = 2.45, SD = .89) and RTh groups (M = 3.16, SD = 1.24) during the retention test. The group main effect was significant, F (2, 42) = 10.37, $p < .01$, $\eta_p^2 = .33$. Post hoc tests confirmed that the RS group had smaller AEs than the RTh, $p < .01$, and Control, $p < .05$ groups.

Transfer. Differences in AEs can also be observed in the transfer test (Fig. 1), where the RTh ($M = 3.66$, SD = 1.17) group underperformed the RS ($M = 2.27$, SD = 1.75) and Control ($M = 2.36$, SD = .65) groups. The group main effect was significant, F (2, 42) = 5.60, $p < .01$, $\eta_p^2 = .21$. Post hoc tests confirmed that the RS and Control groups had smaller AEs than the RTh group, $p < .05$,

Positive affect

Immediately after the practice phase, the groups differed in terms of positive affect. The RS ($M = 3.46$, SD = .57) group reported a higher level of positive affect relative to the Control ($M = 2.88$, SD = .16) and RTh groups ($M = 3.04$, SD = .51). The main effect was significant, F (2, 42) = 6.53, $p < .01$, $\eta_p^2 = .23$. Post hoc tests confirmed differences between the RS group and the Control and RTh groups, $p < .05$.

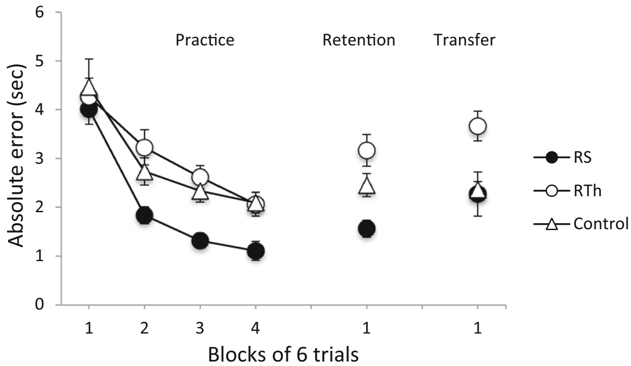


Fig. 1 Absolute error (second) during practice, retention, and transfer for the Relatedness Support (RS), Relatedness Thwart (RTh), and Control groups. *Error bars* indicate standard errors

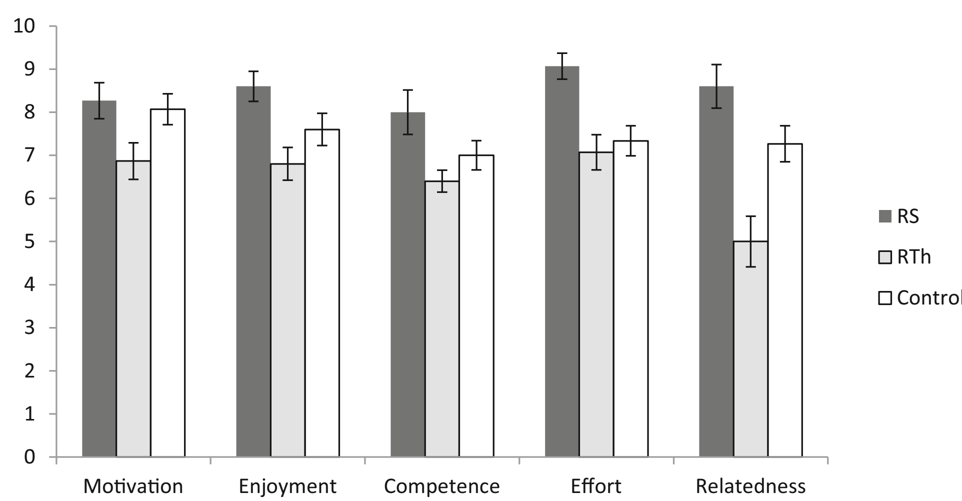
Questionnaire results

Following the practice phase, the groups differed (see Fig. 2) in terms of motivation, F (2, 42) = 4.48, $p < .05$, $\eta_p^2 = .14$; enjoyment, F (2, 42) = 5.84, $p < .01$, $\eta_p^2 = .21$; and perceived competence, F (2, 42) = 4.30, $p < .05$, $\eta_p^2 = .17$, with RS participants demonstrating higher levels and RTh participants demonstrating lower levels than the Control group. Post hoc tests confirmed differences between the RS and RTh participants, $p < .05$. Differences were also observed in terms of effort, F (2, 42) = 9.15, $p < .01$, $\eta_p^2 = .30$, with RS participants demonstrating significantly higher levels than both the RTh and Control participants. Post hoc tests confirmed differences between the RS group and the other two groups, $p < .01$. The groups also differed in perceived relatedness, F (2, 42) = 12.68, $p < .01$, $\eta_p^2 = .37$, with RS and Control participants demonstrating higher levels than RTh participants. Post hoc tests confirmed these differences, $p < .01$. A follow-up analysis comparing RS and Control groups showed increased perceived relatedness for the former group relative to the Control group, F (1, 28) = 4.04, $p = .05$, $\eta_p^2 = .13$.

Discussion

The present experiment was designed to examine whether practice with relatedness support, with instructions emphasizing acknowledgement and interest in the learners' experiences, would be beneficial to the learning of a motor task compared with practice in neutral or thwarted relatedness conditions. In line with several studies in different domains (e.g., Furrer & Skinner, 2003; Mueller et al., 2007; Ryan, Stiller, & Lynch, 1994; Sheldon & Filak, 2008; Wilson & Bengoechea, 2010), providing learners practice with relatedness support led to more effective outcomes relative to conditions where relatedness was not fully supported. As predicted, the RS group showed significantly greater swimming temporal accuracy by the end of practice and, more importantly, more effective motor learning (i.e., retention and transfer performance) in comparison with the RTh and Control groups. In addition, RTh participants showed decreased learning relative to Control participants, demonstrating that thwarting participants' relatedness need is as impactful as enhancing it. The results are in agreement with previous experiments examining the effects of autonomy (Chiviacowsky, 2014; Chiviacowsky et al., 2012; Lewthwaite, Chiviacowsky, Drews, & Wulf, 2015; Patterson, & Carter, 2010; Post, Fairbrother, & Barros, 2011; Ste-Marie et al., 2013; Wulf, Chiviacowsky, & Drews, 2015) and competence support (Ávila, et al., 2012; Badami, et al., 2012; Chiviacowsky & Drews, 2014, 2016; Chiviacowsky & Harter, 2015; Palmer, et al., 2016; Saemi, Wulf, Varzaneh, & Zarghami, 2011) on motor skill learning. In line with previous literature, the findings suggest that all three psychological needs matter in motor learning contexts. Practice contexts that satisfy at

Fig. 2 Questionnaire results of the Relatedness Support (RS), Relatedness Thwart (RTh), and Control groups. *Error bars* indicate the standard errors



least one of the three needs will potentially result in enhanced motor learning relative to practice where needs are thwarted.

A suggested explanation for the benefits of practice with relatedness support for learning is that it creates more intense affective and motivational experiences for learners (Deci & Ryan, 2000; Ryan, 1995). The current experiment demonstrates that, in fact, the relatedness support condition experienced by RS group participants influenced their affective and motivational levels. At the end of practice, their ratings of positive affect and motivation were higher than those of RTh and Control group participants. Similar affective and motivational outcomes have also been observed in experiments testing the effects of practice supporting the competence and autonomy needs on motor skill learning (e.g., Chiviacowsky, 2014; Chiviacowsky et al., 2012; Hooyman, Wulf, & Lewthwaite, 2014; Stevens, Anderson, O'Dwyer, & Williams, 2012). Greater motivational and positive affective states may consequently elicit a response in the dopaminergic system with the potential to influence motor performance through memory consolidation and neural pathway development (Wulf & Lewthwaite, 2016), possibly benefiting learning. Positive affect has, in fact, been associated with dopamine release and has been found to improve cognitive performance in persons with Parkinson's disease (Ridderinkhof, van Wouwe, Band, Wylie, Van der Stigchel, van Hees, Buitenweg et al., 2012). Dopamine also contributes to the consolidation of motor memories (Sugawara, Tanaka, Okazaki, Watanabe, Sadato, 2012; Wise, 2004). Thus, relatedness support may promote the constitution of effective neural connections that facilitate performance and result in more effective learning. Why differences in learning effects between RS and Control participants were observed only in retention, but not in transfer, is not clear. There is a possibility that the new challenge of swimming at a greater speed may have benefitted Control participants. The new target could have optimized their level of motivation for the task, thus decreasing potential performance differences between the two groups. Even so, the same challenge manifested itself in an inferior performance under the RTh condition during transfer, with a less effective performance observed in this group relative to the RS and Control groups.

In conclusion, the present findings provide the first evidence that the satisfaction of the learners' psychological relatedness need has the potential to enhance motor learning. The results also highlight the importance of motivational and affective factors for the learning of motor skills. It is evident that learners are sensitive to their experience of social relatedness during practice, responding differently to high or low levels of perceived relatedness. Instructions emphasizing interest, acknowledgement and caring with regard to the participants' experiences can potentially result in higher motivation, positive affect and motor learning in comparison with neutral-relatedness instructions, and particularly instructions emphasizing disinterest in the participant as a person. The findings may also have implications for practical situations; for instance, instructors or coaches could develop practice environments, where learners can feel socially related. These learning environments could include conditions, where, for example, learners feel genuinely liked, connected, and respected, as well as having their improvements valued. Such practice contexts may have the potential to enhance positive affect, perceived competence, enjoyment, interest, and perhaps persistence in the long run, as well as learning.

The present experiment studied young adults learning a novel crawl-swimming task (swimming at 50% of the maximal speed). It is suggested that future studies could test the generalization of the present results in the learning of different populations and kinds of tasks. Moreover, an earlier study (Wulf, Chiviacowsky, & Cardozo, 2014) showed that the combination of practice supporting autonomy and competence needs results in positive additive effects on motor learning related to practice considering only one or none of the needs. Thus, it would be interesting to explore whether the combination of relatedness support with practice conditions supporting the other psychological needs (autonomy and competence) would lead higher levels of learning compared to conditions that disregard such combinations.

Compliance with ethical standards

Conflict of interest Author Daniela Hollweg Gonzalez declares that she has no conflict of interest. Author Suzete Chiviacowsky declares that she has no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

Appendix

Variable error The groups reduced the variability (VE) across practice. The main effect of block, F (3, 126) $= 38.12$, $p < .001$, $\eta_p^2 = .47$, and the group × block interaction, F (6, 126) $= 3.61$, $p < .05$, $\eta_p^2 = .14$, were significant, while the main effect of group, F (2, 42) $= 1.36$, $p > .05$, was not significant. VEs were also different between the RS ($M = 1.13$, SD $= .64$), RTh ($M = 1.91$, SD $= 1.04$), and Control ($M = 1.17$, SD = .45) groups during the retention test. The group main effect was significant, F (2 42) = 4.87, $p < .05$, $\eta_p^2 = .18$. Post hoc tests confirmed higher variability for the RTh group relative to the other groups, $p < .05$. There was no difference between the RS and Control groups, $p > .05$. VEs were also different between the RS ($M = 1.22$, SD = .56), RTh ($M = 1.88$, SD = .78), and Control ($M = 1.17$, SD = .46) groups during transfer. The group main effect was significant, F (2 42) = 5.22, $p < .01$, $\eta_p^2 = .20$. Post hoc tests confirmed higher variability for the RTh group relative to the other groups, $p < .05$.

Constant errors CEs also decreased across the practice phase. The main effect of block, F (3, 126) = 54.79, $p < .001$, $\eta_p^2 = .56$, was significant. The main effect of group, F (2, 42) = 4.68, $p < .05$, $\eta_p^2 = .18$, was significant, while the group × block interaction, F (6, 126) = 1.45, $p > .05$, was not significant. Post hoc tests showed lower CEs for the RS group relative to the RTh group. Differences in CEs between the RS ($M = 1.33$, SD = 1.08), RTh ($M = 2.91$, SD = 1.36), and Control ($M = 2.34$, SD = 1.06) groups can also be observed during retention. The group main effect was significant, F (2, 42) = 6.95, $p < .01$, $\eta_p^2 = .25$. Post hoc tests showed that the RS group had smaller CEs than the RTh group, $p < .01$, and marginally smaller CEs than the Control group, $p = .058$. Differences in CEs between the RS ($M = 2.24$, SD = 1.77), RTh ($M = 3.57$, SD = 1.35), and Control ($M = 2.36$, SD = .64) groups can also be observed during transfer. The group main effect was significant, F (2, 42) = 4.50, $p < .05$, $\eta_p^2 = .17$. Post hoc tests showed that the RS and Control groups had smaller CEs than the RTh group, $p < .05$.

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