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Is My Exercise Partner Similar Enough? Partner Characteristics as a Moderator of the Köhler Effect in Exergames

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Abstract

Objective: Recent research has shown the Köhler motivation gain effect (working at a task with a more capable partner where one's performance is indispensable to the group) leads to greater effort in partnered exercise videogame play. The purpose of this article was to examine potential moderators of the Köhler effect by exploring dissimilarities in one's partner's appearance, namely, having an older partner (compared with a same-age partner) and having a heavier-weight partner (compared with a same-weight partner).
Subjects and Methods: One hundred fifty-three male and female college students completed a series of plank exercises using the "EyeToy: Kinetic™" for the PlayStation® 2 (Sony, Tokyo, Japan). Participants first completed the exercises individually and, after a rest, completed the same exercises with a virtually present partner. Exercise persistence, subjective effort, self-efficacy beliefs, enjoyment, and intentions to exercise were recorded and analyzed.
Results: A significant Köhler motivation gain was observed in all partner conditions (compared with individual controls) such that participants with a partner held the plank exercises longer ($P < 0.001$) and reported higher subjective effort ($P < 0.01$). These results were unmoderated by partner's age and weight, with one exception: Males tended to persist longer when paired with an obese partner ($P = 0.08$).
Conclusions: These results suggest that differences in age and weight do not attenuate the Köhler effect in exergames and may even strengthen it.

Introduction

The health benefits of exercise are widely known; however, people often do not exercise at high enough intensity levels or for long enough to gain and maintain those benefits.[1,2] Unfortunately, the longer and more vigorous the physical activity, the lower the chances of maintaining an exercise regimen.[3] Therefore, individuals may need motivational strategies to help keep them engaged.

One engaging activity many people choose over exercising is playing videogames. Although videogames are a sedentary activity, developers are building games that require people to move their bodies in order to succeed: "Exergames." In the past decade, many exergames have been developed, and initial research suggests the movement they produce is similar to light-to-moderate intensity exercise, significantly increasing heart rate and energy expenditure.[4–6] However, it is not yet understood how well these games take advantage of group dynamics principles (e.g., the indispensability of an individual's effort for determining group performance) that may help improve task motivation, and the exploration of this specific area is relatively new.[7] Therefore, it is worth exploring if using these principles within exergames can improve motivation.

Research has shown that there are benefits to exercising with others, such as higher motivation.[8] Typically, however, people in exercise groups are simply exercising individually alongside other people. Group interdependence could be accomplished by creating teams where progress is determined jointly by group members. One effective pattern of interdependence produces the "Köhler effect,"[9,10] in which the least able group member exhibits a motivation gain (relative to individual performance) as a result of two processes: Unfavorable "social comparisons" with more able group members and being "indispensable" for the group's success.[11] These motivation gains are strongest in "conjunctive tasks,"[12] or settings where the performance of the least capable group member is critical for group success.[13,14]

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A series of recent studies have used the Köhler effect with exergames. The first showed that exercising with a more capable, virtually present partner led to a 24 percent improvement on the length of time people held plank exercises.[7] Additional studies found that having a virtually presented partner under conjunctive task demands resulted in persistence improvements of 125 percent (on an interactive stationary bike)[15] and 48 percent (on plank exercises).[16] Overall, these studies suggest applying the Köhler effect to group exergame play may be an effective method for increasing effort.

In Köhler's original studies[9,10] and in most Köhler effect research,[17] young adults of the same age, gender, and race have been paired together. However, it would complicate exergame play if one had to locate partners or design software-generated partners similar in appearance. But if exercise partners did not need to look like the player, creating effective exercise groups would be simpler.

The few studies that have introduced differences between teammates have shown that such differences can matter. For example, on a physical persistence task, there was a much stronger Köhler effect for males paired with a superior female partner (versus a superior male partner), which was attributed to males' traditional sex roles about being outperformed by females.[18] Similarly, being paired with an out-group member (versus an in-group member) resulted a stronger Köhler effect.[19] Here, intergroup comparisons appeared to boost motivation.

There is considerable evidence that similarity breeds liking,[20] and it seems plausible that one might more readily compare with or be more concerned about one's indispensability to a well-liked other. Research testing this has shown that receiving feedback that one's partner is similar to them and likes them improves attitudes toward one's partner but does not moderate the Köhler effect.[21] However, having an incomparable partner (e.g., someone far superior in ability) can undermine the effect.[22,23] For example, the usual effect was obtained for students working at a vigilance task when they could assume their partner was similar in age.[24,25] However, when subjects were told explicitly that their partner was either 11 years younger or older, no effect was observed.[24] It was speculated that large age differences made social comparison difficult, nullifying the Köhler effect.

Experiment Overview

In the present experiment, we explored the effect of partner similarity in exergame play. We tested whether college students would be more or less motivated to exercise with a more-capable and older (approximately 25 years older) partner compared with a similar-aged partner. If the age gap led participants to feel incomparable to their partner, we would expect attenuation of the Köhler effect. But if participants viewed the older adults as a salient out-group or one that normatively should not be their superiors, we would expect the opposite.

Another interesting aspect of similarity in the context of exercise is perceived fitness level, and a salient perception of fitness is weight. Although obesity is not equal to a lack of fitness, obese individuals are stereotyped as being inactive, lacking coordination, and without endurance.[26–28] We paired participants with either similar-weight (non-obese) or heavier-weight (obese) partners. There are reasonable arguments for expecting participants to feel more challenged to keep up with a heavier partner or to feel disengaged from such a partner. Given this ambiguity, we advanced no explicit hypotheses but considered the effects of dissimilarities in partner age and weight to be open research questions.

Subjects and Methods

Design and participants

Participants were 153 undergraduate students (78 females, 75 males; $M_{age} = 20.07$, $SD = 2.18$) who completed the experiment in return for course credit. (Sample size was determined based on a power analysis and indicated 150 participants were necessary. We did not cancel the sessions of subjects who were already signed up, so we ended with three extra female participants.) None of the participants appeared to have a body mass index (BMI) that would be considered obese. Participants were randomly assigned to conditions within a 2 (Partner's Relative Age: Similar, Older) × 2 (Partner's Relative Weight: Similar, Heavier) × 2 (Participant Gender) + 2 (Male and Female Individual Controls) design (Fig. 1).

		Male Participants		Female Participants	
Individual Controls		No Partner		No Partner	
Dyads	Partner Weight	Partner Age		Partner Age	
		Similar	Greater	Similar	Greater
	Similar	Similar Age & Similar Weight Male	Older Age & Similar Weight Male	Similar Age & Similar Weight Male	Older Age & Similar Weight Female
	Greater	Similar Age & Heavier Male	Older Age & Heavier Male	Similar Age & Heavier Female	Older Age & Heavier Female

FIG. 1. Experimental design.

Procedure

Participants arrived at the lab individually, signed a consent form, and watched a video demonstrating the exercises they would perform (five abdominal plank exercises: front plank, two side planks, and two one-legged planks). All exercises were completed using the PlayStation® 2 (Sony, Tokyo, Japan) "EyeToy: Kinetic™" exergame, which features a virtual trainer demonstrating the exercises. This exergame includes a small camera that projects the player's image onto the screen, allowing interactions with the game via movement. Participants were instructed to hold each plank for as long as possible and were given short breaks between each exercise.

Participants then completed Block 1 (each plank exercise once) individually. Afterward, participants in the control condition were told the average time they held the planks and that they would complete the same set of exercises again (Block 2) after a 10-minute rest.

Participants in the experimental conditions, however, were told they would complete the exercises again, only with a same-sex partner connected to the lab through the Internet. Similar to previous research,[7] participants were introduced to their partner over a simulated Skype connection. Participants were led to believe they were interacting live with another person; however, their partner was a confederate whose video content had been prerecorded.

The introductions had the partner providing personal background information (e.g., age, favorite television shows), followed by participants responding in kind. Which partner participants met depended on their experimental condition. The similar-age conditions presented students who said they were college sophomores (actually in their early 20s), whereas the older-age conditions presented adults who said they were 48 years old (actually in their early 50s). The similar-weight conditions presented normal-weight partners ($19\,kg/m^2 < BMI < 25\,kg/m^2$), whereas the heavier-weight conditions presented obese partners ($BMI \geq 30\,kg/m^2$).

Following the introductions, participants were truthfully given the average of how long they had held the plank exercises on Block 1 and falsely told how long their partner had held the plank exercises. Because previous research has indicated stronger Köhler motivation gains when the discrepancy is moderate, participants were told their partner held the exercises 40% longer.[16] Thus, participants were led to believe they were the inferior group member.

Participants in the partner conditions were also told that during Block 2 their performance would be measured using a team score. The team score was defined by the time of the person who quit first. Therefore, when one person stopped exercising, the other person must stop, and the team's score would be the length of time the first person lasted. This made the task a conjunctive task, where the team's performance depended on the inferior member.

During Block 2, an ostensibly live video of the partner doing the same exercises was displayed for the participant to see. This was actually a series of prerecorded videos that could be looped, which meant the confederate always held the exercises longer than the participant. Thus, participants were continually outperformed by their partner. Upon completing Block 2, participants completed a questionnaire, were thanked, and were debriefed.

Measures

Persistence. Persistence was the total number of seconds a plank was held from when participants moved into position to the moment they quit, measured using a stopwatch. Block scores were calculated by taking the sum of how long participants held all exercises.

Ratings of perceived exertion. Perceived exertion was measured using the Borg Ratings of Perceived Exertion (RPE) scale.[29] The scale ranges from 6 to 20, where 6 is "no exertion at all" and 20 is "maximal exertion." Participants were asked to rate their total feeling of exertion immediately before quitting the exercise. Participants were also asked to rate how much effort they put into the task on an 8-point scale (from 1 = absolute minimum effort to 8 = absolute maximum effort) following completion of the experiment.

Self-efficacy beliefs. Self-efficacy (SE) was measured at three points during the experiment: Before Block 1, before Block 2, and after all exercises were completed. The measure consisted of five items, one for each plank exercise. The items were then summed for an overall SE score across the exercises within a trial block. Participants recorded how many seconds they believed they could hold each exercise. The second measurement point occurred directly after participants were told how long they held each exercise during Block 1. Participants in the team conditions were already introduced to their partners and knew how long their partner allegedly held each exercise.

Intention to exercise and enjoyment. Following Block 2, participants were asked to rate on a 7-point scale how true the following statement was: "I intend to exercise tomorrow for at least 30 minutes" (from −3 = not at all true for me to +3 = completely true for me). Task enjoyment was measured using the 8-item version of the Physical Activity Enjoyment Scale regarding how they felt about the task (e.g., from 1 = loved it to 7 = hated it).[30]

Results

Persistence

Because the five exercises were small variations of one another, the total persistence across all five exercises was computed. The primary dependent variable was the difference score between both blocks (Block 2 − Block 1), which would show any changes in persistence while controlling for individual differences in strength and fitness. (This approach produced the same results as using the Block 1 scores as a covariate in the analysis of the Block 2 scores.) The data were analyzed in a 2 (Partner's Relative Age: Similar, Older) × 2 (Partner's Relative Weight: Similar, Heavier) × 2 (Participant Gender) between-subjects analysis of variance on the difference scores (using the pooled error term from all 10 conditions), supplemented with two planned contrasts involving the individual controls (viz., an individual control versus all-dyads contrast [Contrast 1] and a test of whether Contrast 1 was moderated by subject gender [Contrast 2]).

The mean of persistence difference scores in all dyad conditions (21.48 seconds, SD = 83.41) was significantly greater than the mean in the individual control conditions (−44.25

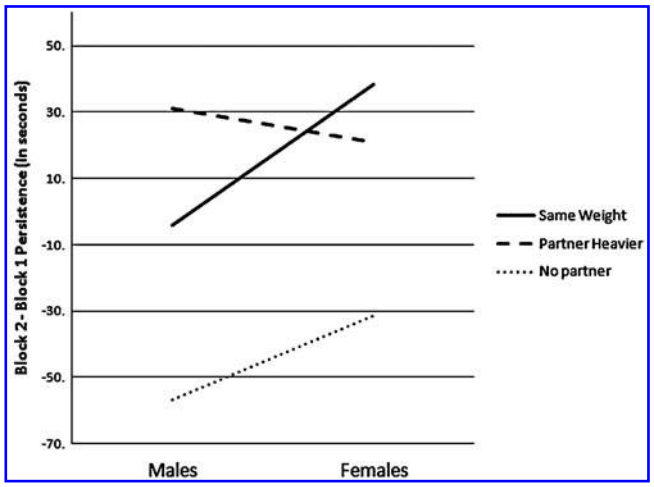

FIG. 2. Sex × partner weight interaction trend.

seconds, SD = 52.74) ($F_{1,143} = 17.17$, $P < 0.001$); this effect was not moderated by participant gender. Thus, collectively the partner conditions exhibited a significant Köhler motivation gain effect, as did each partner condition (all $P < 0.02$ in planned contrasts). In total, during Block 2, participants in the dyad conditions held the planks approximately 65 seconds longer compared with the individual controls. Comparisons within dyad conditions yielded only one marginally significant effect: The Partner Weight × Gender interaction ($F_{1,143} = 3.52$, $P = 0.063$), plotted in Figure 2 (along with the male and female controls, for comparison). Females were unaffected by the relative weight of their partner, whereas males tended ($P = 0.08$) to have a lower difference score (−4.25 seconds, SD = 51.73) (i.e., to show a smaller, although still significant, motivation gain) when their partner was the same weight than when he was heavier (31.0 seconds, SD = 45.46).

Ancillary analyses

We were interested to see if the significant motivation gains observed were accompanied by changes in subjective effort, SE, intention to exercise, or task enjoyment. Initial analyses were more inclusive and included individual controls (using a five-level Condition factor); a separate analysis on dyads was also performed (using a 2 × 2 Condition analysis).

RPE. The 5 (Condition) × 2 (Gender) × 2 (Block) of RPE scores showed a Block main effect ($F_{1,136} = 86.37$, $P < 0.001$), qualified by a Condition × Block interaction ($F_{4,136} = 4.08$, $P < 0.01$). To the same degree across all the dyad conditions, RPE scores were significantly ($P < 0.001$) higher at Block 2 (14.98) than at Block 1 (14.25), whereas these scores did not change significantly across blocks for control individuals (Block 1 = 14.05, Block 2 = 14.13). On the post-experimental rating of how much effort had been exerted, there were no significant effects.

SE. As pertaining to SE measures, Bandura[31] states, "Evidence of validity relies heavily on construction validation" (p. 45). SE theory posits that SE about an upcoming task should be related to actual performance on that task.[31] In our study, the correlations between participant SE and persistence scores are significant (for Block 1, $r = 0.29$, $P < 0.001$; for Block 2, $r = 0.51$, $P < 0.001$), supporting the construct validity of the SE items.

In both analyses, in which the preperformance SE score was included as a covariate, the only significant effect to emerge was a Gender main effect ($F_{1,139} = 11.51$, $P < 0.001$), in the more inclusive analysis. Males generally reported greater SE at these exercises (M = 192.06 seconds, SD = 82.84) than females (M = 145.52 seconds, SD = 81.80).

Intention to exercise and enjoyment. In the more inclusive analysis, there was a Condition × Gender interaction effect ($F_{4,142} = 3.22$, $P < 0.02$); there was no significant gender (or any other) effect among the dyad conditions, whereas among individual controls, males reported a significantly ($P < 0.001$) stronger intent to exercise (2.71) than females (0.31). However, when genders were combined, there were no differences between the individual controls and any of the dyad conditions (all P values > 0.25). Additionally, the initial, more inclusive analysis resulted in no significant effects for task enjoyment.

Discussion

The primary objective of this study was to explore whether dissimilarity in age or weight between oneself and one's more capable partner moderates the Köhler effect in exercise groups. For females, the Köhler effect was replicated, and its magnitude was unaffected by the age or weight of their partners. Overall, females with partners persisted 61.2 seconds longer at Block 2 than female individuals, a 35.1 percent gain. For males, their effort was unaffected by the age of their partner but was marginally ($P = 0.08$) moderated by their partner's weight. When working with a similar-weight partner, males persisted 52.7 seconds longer at Block 2 (versus individuals, a 21.1 percent gain), but when their partner was obese, males persisted 87.9 seconds longer (a 35.1 percent gain). If one were to discount this trend as statistically insignificant by conventional standards, males still showed an overall gain of 70.3 seconds, a 28.1 percent improvement.

Unlike previous research,[7] the greater persistence observed in dyads in this study was accompanied by a boost in subjective reports of physical exertion. Nevertheless, the observed motivation gain in dyads was *not* accompanied by a change in task enjoyment, SE, or intention to exercise outside the study. These results are encouraging for the application of the Köhler effect to exercise groups; even participants who realized they were exercising at a higher intensity did not enjoy the task any less.

Prior research suggested that partner dissimilarity could attenuate the Köhler effect if one's partner was viewed as too dissimilar or incomparable.[22–24] Neither aspect of dissimilarity (age or weight) produced such an attenuation effect here. Other research suggested that dissimilarity could boost the Köhler effect when it either engendered competition or expectations that one should be more capable than one's partner.[18,19] Neither was the case for our females, but there was a trend for a weight dissimilarity effect for males. When the task requires physical endurance, it seems plausible that young, healthy males could see heavier males as members of a disfavored out-group and expect to outperform them. However, it should be noted this potential accentuation of the Köhler effect in males paired with overweight partners only

approached statistical significance and thus may be an interesting area for future research.

It is interesting to note that dissimilarity in age eliminated the Köhler effect in a previous study,[24] but showed no such pattern here. However, two very different tasks were used; prior research used a novel computer vigilance task. It might be easier to conclude that one's partner is incomparably better at such a task when that partner is younger (e.g., "children are raised on computers and hence excel at their use") or older (e.g., "an adult might work at such an interface daily and hence excel at it"). The task here was a simple series of abdominal exercises, and there is less reason to assume that a more capable older partner is incomparably superior. As such, the relevance of partner dissimilarities for the Köhler effect likely depends upon the task and whether those dissimilarities have clear implications for the desire to compare successfully and not fail the group.

In the realm of exergames, our results suggest that exercising with a partner who is older or heavier is unlikely to attenuate the effect and may even accentuate it. In general, if partner characteristics do not remove the goals of comparing favorably with one's partner or holding up one's responsibility to the group, most variations in partner characteristics do not attenuate the effect. This robustness to partner characteristics is an advantage of using the Köhler effect to boost exercise motivation—It does not seem to depend upon having one's partner fit into some narrow range of characteristics. Another advantage of the Köhler effect is its magnitude in exercise groups. Here, we observed improvements over individual exercisers of 28 percent to 35 percent. In previous research, improvements ranged between 25 percent and 125 percent, gains that compare favorably with the effects typically reported in physical activity intervention studies.[32]

Our findings suggest both immediate and longer-term questions for future research. It would be interesting to examine other partner dissimilarities besides age and weight, such as different goals for participating in group exercise or a partner's physical disability. An obvious but unstudied question is whether a computer-generated partner, rather than a real but absent human partner, can produce substantial motivation gains.

Beyond comparing human and software-generated partners, studying different types of virtual partners may also be of benefit. For example, many exergames use competent, lean, and fit virtual trainers to demonstrate the exercises. Altering their appearance/ability to be only moderately better or moderately fit may alter any subsequent motivation gains. Other characteristics of the virtual partner could be manipulated, too. For example, a virtual partner who provides motivating comments may strengthen the motivation gain and therefore persistence.

Although we are optimistic that this paradigm could be adapted to additional forms of exercise, there are limitations to the present research. First, BMI was not measured objectively for participants in the study. Therefore, it is impossible to determine exactly how participants' BMI compared with the BMI of their virtual partners. Although we noted that no participants appeared to have a BMI above $25\,kg/m^2$ and thus should have viewed the normal BMI confederates as similar and the obese confederates as heavier, we do not know what the participants thought of their partners' weight relative to their own.

Another limitation to the present study is the use of college student volunteers. Even though overweight and obesity are problems on college campuses,[33,34] the majority of volunteers in this study were relatively physically fit in appearance; hence it remains unclear how sedentary or obese individuals would react to having a virtual partner. This does, however, provide an interesting avenue for future research. If the sample population were obese individuals, would one's partner's relative weight moderate the Köhler effect? Would obese individuals show comparable motivation gains when paired with another obese confederate versus a thinner confederate?

Other potential limitations include the setting and task. The research took place in a lab, which could limit its generalizability to real-world conditions. However, because the experimental set-up led participants to believe they were interacting with another student over the Internet, it is plausible this set-up could be incorporated into future exergames. Because modern gaming systems allow people to play games with each other from all over the world via the Internet, expanding this to exercising with a partner seems very plausible. The particular exercise task we used might also be a limitation, as the only exercises used were five plank exercises. Thus, these findings may not generalize to other types of exercise (although it should be noted the basic Köhler effect has been observed with stationary cycling[15]). Future researchers should consider using different types of exercise.

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References

1. Troiano RP, Berrigan D, Dodd KW, et al. Physical activity in the United States measured by accelerometer. Med Sci Sports Exer 2008; 40:181–188.
2. U.S. Department of Health and Human Services. *2008 Physical Activity Guidelines for Americans.* Publication Number U0036. Washington, DC: Physical Activity Guidelines Advisory Committee; 2008.
3. Dishman RK. The problem of exercise adherence: Fighting sloth in nations with market economies. Quest 2001; 53:310–317.
4. Staiano AE, Calvert SL. Exergames for physical education courses: Physical, social, and cognitive benefits. Child Dev Perspect 2011; 5:93–98.
5. Biddiss E, Irwin J. Active video games to promote physical activity in children and youth: A systematic review. Arch Pediatr Adolesc Med 2010; 164:664–672.
6. Peng W, Lin J, Crouse J. Is playing exergames really exercising? A meta-analysis of energy expenditure in active video games. Cyberpsychol Behav Soc Netw 2011; 14:681–688.
7. Feltz DL, Kerr NL, Irwin BC. Buddy up: The Köhler effect applied to health games. J Sport Exer Psychol 2011; 33:506–526.
8. Dishman RK, Buckworth J. Increasing physical activity: A quantitative synthesis. Med Sci Sports Exer 1996; 28:706–719.

9. Köhler O. Kraftleistungen bei einzel- und gruppenarbeit [Physical performance in individual and group work]. Industrielle Psychotechnik 1926; 3:274–282.
10. Köhler O. Über den gruppenwirkungsgrad der menschlichen körperarbeit und die bedingung optimaler kollektivkraftreaktion [On group efficiency of physical labor and the conditions of optimal collective performance]. Industrielle Psychotechnik 1927; 4:209–226.
11. Kerr NL, Messé LM, Seok D, et al. Psychological mechanisms underlying the Köhler motivation gain. Pers Soc Psychol Bull 2007; 33:828–841.
12. Steiner ID. *Group Process and Productivity.* New York; Academic Press; 1972.
13. Hertel G, Niemeyer G, Clauss A. Social indispensability or social comparison: The why and when of motivation gains of inferior group members. J Appl Soc Psychol 2008; 38:1329–1363.
14. Weber B, Hertel G. Dispositional influences on motivation gains in virtual teams. Presented at General Online Research Conference, Hamburg, Germany, March 10–12, 2008.
15. Irwin BC, Scorniaenchi J, Kerr NL, et al. Aerobic exercise is promoted when individual performance affects the group: A test of the Köhler motivation gain effect. Ann Behav Med 2012; 44:151–159.
16. Feltz DL, Irwin BC, Kerr NL. Two-player partnered exergame for obesity prevention: Using discrepancy in players' ability as a strategy to motivate physical activity. J Diabetes Sci Technol 2012; 6:1–8.
17. Kerr NL, Hertel G. The Köhler group motivation gain: How to motivate the 'weak links' in a group. Soc Personal Psychol Compass 2011; 5:43–55.
18. Lount RB Jr, Messé LA, Kerr NL. Trying harder for different reasons: Conjunctivity and sex composition as bases for motivation gains in performing groups. Z Socialpsychol 2000; 31:221–230.
19. Lount R, Phillips K. Working harder with the out-group: The impact of social category diversity on motivation gains. Organ Behav Hum 2007; 103:214–224.
20. Byrne D. The ubiquitous relationship: Attitude similarity and attraction: A cross-cultural study. Hum Relat 1971; 24: 201–207.
21. Kerr NL. The experimental study of group motivation gains: Overview and critique of the study of the Köhler effect. Presented at 1st Annual INGRoup Conference, Pittsburgh, PA, July 29, 2006.
22. Messé LA, Hertel G, Kerr NL, et al. Knowledge of partner's ability as a moderator of group motivation gains: An exploration of the Köhler discrepancy effect. J Personal Soc Psychol 2002; 82:935–946.
23. Mussweiler T. Comparison processes in social judgment: Mechanisms and consequences. Psychol Rev 2003; 110:472–489.
24. Seok DH. Exploring self-efficacy as a possible moderator of the Köhler discrepancy effect [MS thesis]. East Lansing, MI: Department of Psychology, Michigan State University, 2004.
25. Wittchen M, Schlereth D, Hertel G. Indispensability effects under temporal and spatial separation: Motivation gains in a sequential task during anonymous cooperation on the Internet. Int J Internet Sci 2007; 2:12–27.
26. Poon M, Tarrant M. Obesity: Attitudes of undergraduate student nurses and registered nurses. J Clin Nurs 2009; 18: 2355–2365.
27. Rukavina PB, Li W, Rowell MB. A service learning based intervention to change attitudes toward obese individuals in kinesiology pre-professionals. Soc Psychol Educ 2008; 11:95–112.
28. Berryman DE, Dubale GM, Manchester DS, Mittelstaedt R. Diatetics students posses negative attitudes toward obesity similar to nondiatetics students. J Am Diet Assoc 2006; 106:1678–1682.
29. Borg G. *Borg's Perceived Exertion and Pain Scales.* Champaign, IL; Human Kinetics; 1998.
30. Kendzierski D, DeCarlo KJ. Physical activity enjoyment scale: Two validation studies. J Sport Exer Psychol 1991; 13:50–64.
31. Bandura A. *Self-Efficacy: The Exercise of Control.* New York: W.H. Freeman and Company; 1997.
32. Williams SL, French DP. What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour—And are they the same? Health Educ Res 2011; 26:308–322.
33. Laska MN, Pasch KE, Lust K, et al. The differential prevalence of obesity and related behaviors in two- vs. four-year colleges. Obesity 2011; 19:453–456.
34. Desai MN, Miller WC, Staples B, Bravender T. Risk factors associated with overweight and obesity in college students. J Am Coll Health 2008; 57:109–114.

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