The Influence of Exercise Environment and Gender on Mood and Exertion

Abstract

This study examined the influence of exercise environment and gender on post-exercise mood and exertion. College student participants (55 females, 49 males) were instructed to pedal a stationary bike at a moderate pace for 20 minutes. Participants were randomly assigned to one of three laboratory conditions: (1) exercising in front of a mirror and posters showing ideal fit body types (i.e., celebrity male and female personal trainers), (2) exercising in front of a mirror only, or (3) a control condition in which participants exercised without a mirror or posters. The Activation-Deactivation Adjective Check List (AD-ACL), measuring exercise-induced mood states, was administered both before and after exercise. Average bike speed throughout the exercise session measured exertion. Mirrors and posters of ideally fit celebrities did interact with gender on post-exercise tension in that women felt most tense after exercising in front of the mirror and posters while men were most tense after exercising in front of the mirror only. Exercise exertion was also impacted by experimental condition such that participants rode significantly faster in the mirror and posters condition. There was no significant interaction of gender and condition on exercise exertion, but women pedaled fastest in the mirror and poster condition relative to the other conditions. Results suggest that exercise exertion and tension reduction are partially a by-product of gender and exercise environment.

Keywords: Exercise; health; gender; exercise environment, emotions, exertion, mirrors

Physical exercise yields a myriad of psychological benefits. It has been associated with a number of positive effects including mood enhancement (Berger & Motl, 2000), improved self-evaluation (Plante, Gores, Brecht, Carrow, Imbs, & Willemsen, 2007), improved visual-spatial memory and increased positive affect (Stroth, Hille, Spitzer, & Reinhardt, 2009), and increased creativity (Oppezzo & Schwartz, under review). While national standards exist to recommend how much, how often, and how intensely one should engage in physical activity (e.g., Garber, Blissmer, Deschenes, Franklin, Lamonte, Lee, Nieman, & Swain, 2011), no guidelines exist regarding the environmental and social conditions that best suit subgroups of the exercising population. The most widely accepted advice appears to be "whatever conditions make you do it." However, there is reason to believe that certain environmental conditions, such as the presence of a mirror or ideally fit models, may moderate the psychological benefits that an exercise session imparts. Additionally, the impact of these environmental variables may influence males and females differently. The current research investigates the effects of a mirror and fit-ideal body images on subjective post-exercise mood and exercise exertion among male and females college students.

The Influence of Exercise Mirrors

Most gyms or group exercise classes use mirrors. Although mirrors aid exercisers in correcting form, research has uncovered several negative effects of mirrors in exercise behavior as well. The presence of mirrors can heighten one's awareness of physique (Katula, McAuley, Mihalko, & Bane, 1998). Self-awareness theory (Duval & Wicklund, 1972) states that anything that causes focus on the self will increase self-awareness. If there is a perceived discrepancy between the actual and ideal self on salient characteristics such as fitness, negative affect may occur. Observing oneself in the mirror, especially with the comparison of ideal fit body type

images, can lead to negative mood and most especially for women (Fejfar & Hoyle, 2000). Additionally, because women are more likely than men to report body-image dissatisfaction and engage in methods to reduce or maintain their weight (Garner, 1997), it is plausible that the presence of mirrors during exercise may highlight body-image dissatisfaction for females more than males. We therefore hypothesize that the presence of a mirror will lead to differences in post-exercise mood, especially in women, compared to exercising without a mirror. We also hypothesize that this will be exacerbated by the presence of ideal body fit images, by highlighting the discrepancy between actual and ideal self.

Several studies have examined the interaction of mirrors and gender during exercise and have shown negative effects. For example, Martin-Ginis, Jung, & Gauvin (2003) found that sedentary women felt significantly worse (i.e., decreased tranquility, decrease in positive engagement) when exercising in front of a mirror compared to those exercising in a no-mirror condition. Likewise, Katula et al. (1998) found that moderately active women experienced significantly lower exercise self-efficacy (i.e., confidence in ability to exercise) than men when exercising in a mirrored lab with body image concerns predicting self-efficacy. However, in a later follow-up study, Katula and McAuley (2001) found that highly active women exercising in front of a mirror experienced higher exercise self-efficacy while in the no-mirror condition. Therefore, research suggests that moderately active to sedentary women experience less positive or more negative mood when exercising in a mirrored environment compared to highly active women and compared to men.

The Influence of Ideal Fit Body Images

The covers of fitness magazines and the majority of models in popular culture typically convey an ideal image of a fit physique that most people cannot realistically attain (Brownell,

1991). While the images may have the intention of offering exercise and health inspiration, they often have the opposite effect. Sociocultural norms for appearance as depicted by mass media have negative effects on women's self-evaluation (Grabe, Ward, & Hyde, 2008). Because the ideal is unrealistic to attain yet still typically conveyed as the cultural standard of body shape, form, and fitness, it highlights the contrast between a woman's actual body and the ideal, which leads to feelings of incompetence and negative affect (Myers & Crowther, 2009). One meta-analysis found that women felt worse about their body after exposure to thin ideal images while thin-ideal internalization is a risk factor for body image and eating disorders (Cafri, Yamamiya, Brannick, & Thompson, 2005).

While most of this research has been conducted with women, there is some evidence of an association between negative body images and exposure to ideal male images (Barlett, Vowels, & Saucier, 2008), and people's inability to obtain the "perfect body" has led to an increased prevalence of negative body image in both men and women (Garner, 1997). When exposed to images of muscular male models, men who frequently went to a gym reported higher levels of self-enhancement but men who did not exercise frequently reported a more negative perception of their physical appearance (Halliwell, Dittmar, & Orsborn, 2007).

Acute exercise has been shown to reduce the negative affective states associated with body image disturbance, such as anxiety and depression (Berger & Motl, 2000; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). However, these beneficial effects might be mitigated with the presentation of fitness posters and exercise mirrors. Fallon & Hausenblas (2005) found that an acute bout of moderate intensity exercise was not able to significantly reduce the anxiety, depression, or body dissatisfaction generated by viewing media pictures of ideal female physiques compared to quiet rest. We therefore hypothesize that exercising in the

presence of media images depicting body ideals would dampen the potential mood boosting effects of exercise compared to exercising without the images, especially for women.

The Influence of Exercise Mirrors and Ideal Body Images on Exertion

To our knowledge, no formal studies have investigated the effects of mirrors on exercise exertion. Additionally, despite assumptions that ideal body types would inspire people to exert more energy during exercise, no studies have formally demonstrated this relationship. We hypothesize that the presence of ideal fit body images may increase exercise exertion compared to conditions with mirrors or with no stimuli; however, we do not believe exercise intensity reflects a positive mood state, an important distinction. If true, the choices to inspire exercise intensity may be at the cost of diminishing some of the psychological benefits of exercise.

Methods

Participants

One hundred and four undergraduate students (49 males, 55 females) at a private, West Coast university participated in the study (Mean age = 18.83, *SD* = 0.91). The participants received research credit for an introductory psychology course. This study met ethical guidelines and requirements approved by the university's institutional review board (IRB).

Procedures and Design

Participants were randomly assigned to one of three experimental conditions: control, mirror, or mirror + poster (m + p). Participants exercised on a stationary bicycle facing a wall, a mirror, or a mirror plus two fitness posters, respectively. The two posters were of a highly fit male and highly fit female celebrity fitness trainer.

The current experiment was advertised as an exercise study among a list of other psychology studies as part of an undergraduate survey course requirement. Once enrolled,

participants were notified that the study involved a brief exercise session and were advised to wear comfortable exercise clothing. A research assistant escorted the participant into the laboratory where the exercise bike was set up according to their experimental condition. Participants then read and signed consent forms and were reminded of their right to decline participation. Next, participants completed a pretest on current mood states (AD-ACL) and anthropomorphic measures such as age and gender. Participants were then told they would be exercising on a stationary bike at a moderate pace (i.e., 70% maximum heart rate) for 20 minutes. Every five minutes participants' speeds were recorded. After 20 minutes, participants dismounted and completed a post-test that once again measured their mood state (AD-ACL). Participants were then debriefed about the general purpose of the study.

Measures

Mood states. Mood was assessed using the Activation-Deactivation Adjective Check List (AD-ACL; Thayer, 1978; Thayer, 1986). The AD-ACL is a reliable and valid self-report checklist often used in exercise research to collect information on immediate mood states (i.e., tension, energy, tired, calm) that are associated with exercise behavior (Kosteva, Salata, Krishnan, Howe, Weber, Rubenfire, & Jackson, 2012; Thayer, 1978; Thayer, 1986). The AD-ACL has acceptable test-retest reliability (r = 0.8 and above). The AD-ACL uses a four-point scale that measures levels of mood activation on a continuum. For example, given the word "active," participants are asked to rate "definitely feel," "feel slightly," "cannot decide," or "definitely do not feel." Among college students, Kamarudin and Omar-Fauzee (2007) found that both males and females experienced decreased feelings of stress and tension following physical activity. There were three questions assessing each mood; the scores for the relevant questions were summed to provide one score for each mood state.

Exercise Exertion. Participants' exertion was measured by their bike speed (MPH) assessed every 5 minutes. These four speed ratings were averaged to indicate average exertion level.

Results

Analyses are presented by outcomes, looking first at the effects of environmental and individual influences on post-exercise mood. For both outcomes, environmental condition (control, mirror, mirror + poster) was examined, followed by the individual factors of gender. Since average heart rates did not differ significantly by experimental condition (F (2, 82) = 1.92, p = .15) we assumed that the participants were able to follow the exercise exertion instructions equally.

Post-Exercise Mood

One important question in this study is what did the exercise session do to mood states, regardless of condition or gender? Paired t-tests indicated that all mood states significantly changed following exercise. Relaxation increased [Mean pre-exercise = 5.8 (SD = 1.89), Mean post-exercise = 6.5 (SD = 1.81), t (103) = 2.98, p < .01]. Energized feelings increased [Mean pre-exercise = 11.0 (SD = 3.12), Mean post-exercise = 14.5 (SD = 3.38), t (103) = 11.10, p <.001]. Feelings of being tired decreased [Mean pre-exercise = 12.7 (SD = 4.12), Mean post-exercise = 8.76 (SD = 3.18), t (103) = -10.76, p < .001]. Feelings of tension increased [Mean pre-exercise = 8.6 (SD = 2.87), Mean post-exercise = 9.4 (SD = 2.64), t (101) = 2.13, p < .05]. Finally, feelings of calmness decreased [Mean pre-exercise = 12.4 (SD = 3.12), Mean post-exercise = 9.1 (SD = 3.11), t (102) = -8.95, p < .001].

Were these emotional changes mitigated by experimental condition or gender? With gender and condition as between-subjects factors in an ANCOVA (using pre-exercise mood

scores as a covariate), there was a significant interaction of gender x condition for feelings of tension [F (2.95) = 4.27, $p < .05$]. There was no main effect for condition [F (2, 95) = .31, $p > .05$] and no main effect for gender [F (1, 95) = .001, $p > .05$]. Females felt the most tense in the mirror + poster condition, whereas men felt most tense in the mirror only condition (means displayed in Figure 1). There were no significant main effects for condition or gender or interactions of gender x condition for the remaining mood assessed (i.e., relaxation, energized feelings, tiredness, or calmness).

Exercise Exertion

There was a significant effect for condition on average exercise speed or exertion [F (2,101) = 3.70, $p < .05$]. Post-hoc contrasts demonstrated that participants exercised significantly faster in the mirror + poster condition than the control condition ($p < 05$), but the mirror only condition did not significantly differ from the control condition ($p > .05$). With both gender and condition as between-subjects factors, the main effect of condition remained [F (2, 98) = 3.6, $p < .05$], and there was a main effect of gender as well [F (1,98) = 5.29, $p < .05$]; males [Mean speed = 29.16 MPH (SD = 0.81)] exercised faster than females [Mean speed = 25.44 MPH (SD = 1.31)]. There was no significant interaction of condition x gender on average speed, however [F (2, 98) = 1.47, $p > .05$]. However, a closer look at the means suggests that women pedaled at a slower speed than men in the control and mirror condition, but were at a comparable speed to males in the mirror + poster condition (see Figure 2 for means).

If women were pedaling the fastest yet feeling the most tense in the mirror + poster condition, a natural question is if the feeling of tension is just a proxy for exercise exertion. However, a post-hoc analysis found no correlation between tension ratings and average speed, (r

= -.07, $p > .05$); neither is there a correlation between the two variables when gender is used as a grouping variable.

Discussion

The changes in mood state after an acute bout of exercise found in the current study are consistent with previous research demonstrating the psychological boost exercise can provide (Berger & Motl, 2000; Plante et al., 2007; Stroth, Hille, Spitzer, & Reinhardt, 2009). Surprisingly, while acute exercise typically reduces stress, in our study it increased feelings of tension post-exercise. Further exploration showed that this change was associated by an interaction of gender by experimental environment condition. Women felt the most tense post-exercise, although they exercised the most intensely, in the mirror + poster condition. Men felt the most tense after exercising in front of a mirror alone, and the fitness poster images did not impact their mood. This is consistent with research showing that ideal body image exposure puts females at a unique emotional risk (Fallon & Hausenblaus, 2005; Grabe et al., 2008). These results indicate that the presence of a mirror and ideal media images may be detrimental to the potential tension reduction that acute exercise has to offer, especially for females.

The gender differences in tension by condition are noteworthy. Women felt less tense than men in the mirror only condition; it was only when the presence of an ideally fit female body was placed alongside the mirror reflection that women felt more tense. It is plausible that the poster primed self-comparison, a phenomenon women are especially vulnerable to (Grabe et al., 2008). Future studies should include a measure of self-comparison. One possibility is asking participants to indicate the position of their perceived actual self and perceived ideal self on a fitness scale. We would hypothesize the gap would be greater for men in the mirror only condition, and greater for females in the mirror + poster condition.

We do not have a explanation for why exercise exertion is not correlated with feelings of tension. There may be a personality variable explaining why the mirror + poster condition may be inspiring for some women, but tension inducing for others. Future studies should investigate what personality traits may buffer potentially detrimental characteristics of exercise environments.

There are several limitations of the current work. The study was conducted at a private, West Coast university where the culture is generally one of fitness and high physical activity. However, this is conservative to the hypotheses; it is possible the effects would be more pronounced in a population where regular exercise and fitness was not the norm. Also, the study was conducted in a laboratory setting; in a gym there are arguably many other types of stimuli in view during aerobic activity. It could be argued, however, that only a mirror and two posters is conservative compared to a gym environment; there would be not only more mirrors and more fitness images (on TVs and in magazines), but also actual fit others, which could amplify the mood and physical outcomes we found in the present laboratory based study environment. Finally, a limitation of the current design is that baseline emotions were assessed in the lab room, where participants could see a mirror or poster if present, and therefore anticipate exercising in this situation. The next study iteration should assess the mood states outside of the exercise environment, rendering the between-subjects changes in emotional states more commensurate.

The implications of this study are not far from the conclusions of other research showing emotional harm from popularized, unattainable ideals (Garner, 1997); while pictures of fit, ideal bodies are pervasive, they are not only not inspiring, but potentially decrease the mood-boosting properties that exercise can naturally bring. Practically speaking, the results suggest exercisers should consider their exercise environment when choosing to optimize tension reduction in their

workouts. This could have the side-effect of increased enjoyment of exercise behaviors, which could subsequently increase or decrease exercise frequency. Also, gym owners may pay more attention to decisions regarding interior aesthetics knowing they could affect both the physical performance and the subjective experiences of clients, even subconsciously. Perhaps health clubs would do well to consider the clientele to whom they cater while planning mirror and poster placement, because, as this study suggests, social and physical environmental factors do seem to measurably affect exercise performance and mood state.

References

Bartlett, C. P., Vowels, C. L., & Saucier, D. A. (2008). Meta-analyses of the effects of media images on men's body-image concerns. *Journal of Social and Clinical Psychology, 27*(3), 279-310.

Berger, B. G., & Motl, R. W. (2000). Exercise and mood: A selective review and synthesis of research employing the Profile of Mood States. *Journal of Applied Sport Psychology, 12,* 69-92.

Brownell, K. D. (1991). Personal responsibility and control over our bodies: When expectation exceeds reality. *Health Psychology, 10(5),* 303-310.

Cafri, G., Yamamiya, Y., Brannick, M., & Thompson, J. K. (2005). The influence of sociocultural factors on body image: A meta-analysis. *Clinical Psychology: Science and Practice, 12*(4), 421-433.

Duval, S., & Wicklund, R. A. (1972). *A theory of objective self-awareness.* New York: Academic Press.

Fallon, E. A., & Hausenblas, H. A. (2005). Media images of the "ideal" female body: Can acute

Fejfar, M. C., & Hoyle, R. H. (2000). Effect of private self-awareness on negative affect and self-referent attribution: A quantitative review. *Personality and Social Psychology Review, 4,* 131-142.

Garber, C. E., Blissmer, B., Deschenes, M., Franklin, B. A., Lamonte, M. J., Lee, I., Nieman, D. C., Swain, D. P. (2011). Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromata fitness in apparently healthy adults: Guidance for prescribing exercise. *Medicine & Science in Sports & Exercise, 43(7)*, 1334-1359.

Garner, D. M. (1997). The 1997 Body Image Survey Results, *Psychology Today,* 30-44, 75-80, 84.

Grabe. S., Ward, L. M., Hyde, J. S. (2008). The role of the media in body image concerns among women: A meta-analysis of experimental and correlational studies. *Psychological Bulletin, 134*(3), 460-476.

Halliwell, E., Dittmar, H., & Orsborn, A. (2007). The effects of exposure to muscular male models among men: Exploring the moderating role of gym use and exercise motivation. *Body Image, 4*, 278-287.

Kamarudin, K, & Omar-Fauzee, M. S. (2007). Attitudes towards physical activities among college students. *Pakistan Journal of Psychological Research, 22*, 43-54.

Katula, J. A., McAuley, E., Mihalko, S. L., & Bane, S. M. (1998). Mirror, mirror on the wall... Exercise environment influences on self-efficacy. *Journal of Social Behavior & Personality, 13*, 319-332.

Katula, J. A., & McAuley, E. (2001). The mirror does not lie: Acute exercise and self-efficacy. *International Journal of Behavioral Medicine, 8,* 319-326.

Kosteva, A., Salata, B., Krishnan, S. M., Howe, M., Weber, A., Rubenfire, M., & Jackson, E. (2012) Physician variation in perceived barriers to personal health. *International Journal of General Medicine, 5*, 53–57.

Martin-Ginis, K. A., Jung, M. E., & Gauvin, L. (2003). To see or not to see: Effects of exercising in mirrored environments on sedentary women's feeling states and self-efficacy. *Health Psychology, 22*(4), 354-361.

Myers, T. A., & Crowther, J. H. (2009). Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology, 118*(4), 683-698.

Oppezzo, M. A., and Schwartz, D. L. *Give your ideas some legs: The positive effect of walking on creative thinking*, under review.

Petruzzello, S. J., Landers, D. M., Hatfield, B. D., Kubitz, K. A., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise. Outcomes and mechanisms. *Sports Medicine, 11*(3), 143-82.

Plante, T. G., Gores, C., Brecht, C., Carrow, J., Imbs, A., & Willemsen, E. (2007). Does exercise environment enhance the psychological benefits of exercise for women? *International Journal of Stress Management, 14(1)*, 88-98.

Stroth, S., Hille, K., Spitzer, M., & Reinhardt, R. (2009). Aerobic endurance exercise benefits memory and affect in young adults. *Neuropsychological Rehabilitation, 19*(2), 223-243.

Thayer, R. (1978). Factor analytic and reliability studies on the activation-deactivation adjective check list. *Psychological Reports*, *42*, 747-756.

Thayer, R. (1986) Activation-deactivation adjective check list: Current overview and structural analysis. *Psychological Reports*, *58*, 607-614.

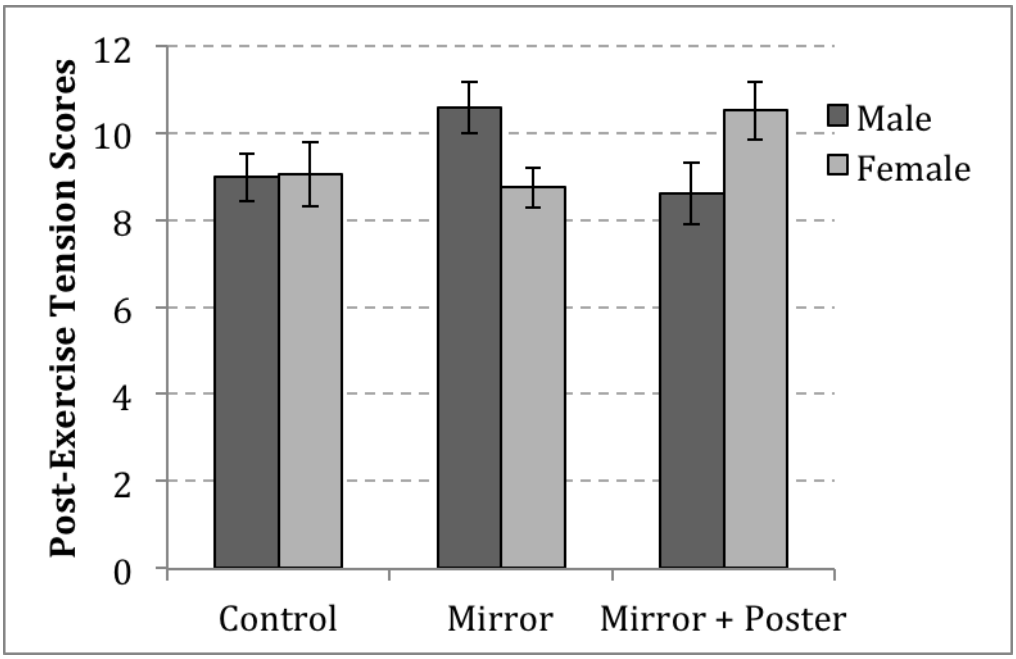

Figure 1. Post-exercise tension ratings by condition for males and females. Females felt most tense in the Mirror + Poster condition, whereas men felt most tense in the Mirror only condition. Error bars are +/- SE of the respective mean.

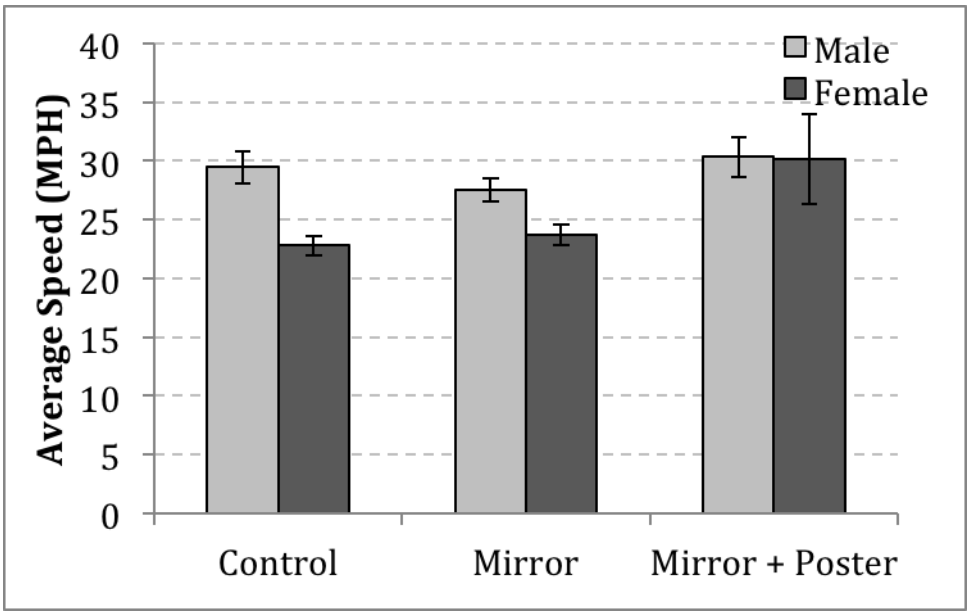

Figure 2. Average speed in each condition by gender. Female participants pedaled the fastest when exercising in front of the mirror and fitness posters. Error bars are +/- SE of the respective mean.