

GOING THE DISTANCE: EFFECTS OF EXERCISE PARTNER SEX AND
ATTRACTIVENESS ON PERFORMANCE AND HEALTH OUTCOMES

by

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Abstract

This study aimed to determine whether or not the presence of a potential mate would influence partnered exercise performance. It is known that people are more likely to maintain exercise routines when they exercise with a partner, but most studies have not examined the influence on the sex of the partners on their exercise routines. We predicted that exercising with a partner of the opposite sex would improve exercise performance; specifically exercise intensity, duration, and distance traveled on average in exercise routines. In addition participant weights and lung capacities were used to measure the strength of this relationship and serve as physiological dependent variables. These effects would also interact with participant relationship status, and perceived partner attractiveness among participants with partners. Some participants were assigned to partners of the same sex, others were assigned to partners of the opposite sex, and two control groups (one male and one female) exercised alone. Participants were instructed to perform cardiovascular exercise routines of their choosing for a 28-day period and to record their exercise activities for data analysis at the end. In support of the hypotheses, partners of opposite sexes exercised at greater intensities than partners of the same sex or participants who exercised alone. There was also a significant interaction between relationship status and condition such that participants who were single and assigned to an opposite sex partner traveled significantly further on average than those across all other conditions. Partner attractiveness was also correlated with improvements in BMI and lung capacity.

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Going the Distance: Effects of Exercise Partner Sex and Attractiveness on Performance and Health Outcomes

"If you look good, you feel good. If you feel good, you play good. If you play good, they pay good." Deion Sanders knew the power of presentation and how it impacted not only himself, but how he was perceived and marketed as an individual throughout his lucrative and iconic career as a professional athlete in two sports. He knew that his appearance gave him power and used it accordingly in order to further his career and goals. Presentation and appearance are opportunities to influence how one is perceived everyone around them. Appearance is what makes someone both socially and romantically desirable to other individuals, and how people present themselves gives insight to their personality and provides a basis for which to judge one another from a superficial level. People oftentimes wish to present themselves to one in other in a manner that will most impress their peers, and they will seek ways to improve themselves in order to appear a more desirable social resource to others as well as make themselves a favorable mate selection to their desired sex (Kenrick et al., 2002). In doing so they are trying to regulate others' perceptions of themselves using strategies known as impression constructions (Howle et al., 2015). Some personal improvements are social, such as surrounding oneself with other desirable people, while others are physical and involve improvements to one's physique.

One of the best ways people can physically regulate others' perceptions of themselves is self-improvement through regular exercise. By exercising, people are aiming to make themselves not only healthier individuals, but also more attractive to both potential mates and others with whom they interact in social environments. Therefore it is of utmost importance to

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understand exactly what can and will improve exercise behaviors so that maximal results may be achieved. One such method of improving exercise routines is through exercising with a partner.

Having an exercise partner is known to facilitate exercise behaviors and people are more likely to exercise when they have a partner than when they exercise alone (Gellert et al. 2011). Even having another individual present while exercising is likely to increase exercise performance as well. Social Facilitation Theory suggests that simply having someone present during motor activity performance enhances these behaviors (Triplett 1898), so one may assume that the same or similar effects should apply to exercise behaviors. As demonstrated by Baker et al. the presence of an attractive female during male weightlifting routines enhanced their exercise performance (2012). To clarify, not only having someone present will improve these behaviors but the sex of those present also matters when engaging in exercise activities. It is still unknown however, how the sex of one's exercise partner will influence their exercise performance. Will opposite-sex partners work more efficiently together than same-sex partners, or will sex differences have a negative impact on exercise routines? The current research aims to explore this question in order to better understand how people can further improve their exercise behaviors beyond simply having an exercise partner.

It is not only important to understand why people exercise, but also how exercise behaviors commonly differ among males and females. There are various motivations to engage in regular exercise, which include social, extrinsic, and intrinsic motivations. Social motives to exercise are often extrinsic in nature as they are actions taken in order to gain external reward, whereas engagement in sports is more often motivated intrinsically, or for more personal enjoyment (Kilpatrick et al., 2010). With respect to exercise motives, men and women are quite different from one another. While men are more motivated to exercise for the purposes of

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competition and social displays, women tend to focus on weight management (Kilpatrick et al., 2010). These differences in exercise motives are known to impact exercise behaviors as well. Men tend to focus on strengthening and enlarging their torso and abdominals, whereas women are more likely to focus their routines towards toning their lower body and improving their thigh-to-waist ratios (Mealey, 1997). It should also be noted that these self-presentational motives are strengthened in the presence of the opposite sex in an exercise environment (Lamarche & Gammage, 2010). With this being said, it is only natural to wonder how men and women will impact one another's exercise behaviors, and what differences can be observed when men and women exercise together versus people exercising alone or with members of their own sex.

One factor that may prevent regular exercise in both sexes is social physique anxiety (SPA). Hart et al. define this as "anxiety experienced in response to others' evaluations of one's own physique" (1989). It can be argued that SPA may serve as either a motive or a deterrent to maintaining regular exercise. On the one hand, if individuals experience anxiety due to others' opinions of their physique it may motivate them to exercise. On the other hand, SPA may prevent those individuals from exercising in areas where others may see them due to fear of being judged by others in the gym. (Hart et al. 1989). The current study will examine the role that SPA plays in partnered exercise. Of particular interest is the differential effects of SPA that might be observed when comparing exercise behaviors among partners of the same sex and opposite sex as it has been shown that effects of SPA have been shown to increase in magnitude in the presence of the opposite sex). This research showed that when women are exercising in the presence of a male they reported to have stronger feelings of SPA than when they were without a male's company (Gammage et al., 2004). The relationship between SPA and exercise performance is complex and the research is still somewhat ambiguous regarding the extent of the

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relationship between SPA and mating motives. The current research aims to clear up this nebulous relationship.

Social anxiety and exercise behaviors have an interesting relationship already, but not much is known about the effects of partnered exercise with respect to social anxiety. It is currently known that voluntary exercise can help decrease social anxiety behaviors in animal populations (Tal-Krivisky et al., 2015). Given that having an exercise partner facilitates exercise behaviors (Gellert et al., 2011), it is natural to assume that partnered exercise may be able to further decrease social anxiety behaviors normally experienced. It could also be predicted that having an exercise partner may increase social anxiety behaviors, thus making individuals not want to exercise as often as they would alone. These two speculations should be carefully observed in the current research, as further exploration is necessary.

In addition to anxiety-related behaviors, another factor that may prevent regular exercise is one's Self Efficacy (SE). Previous research suggests that people who exercise more also tend to have higher levels of SE than those who do not (Rogers et al., 2008). Partners that differ in SE may interact differently than those who are evenly matched with respect to SE.

While some social factors may either promote or inhibit exercise specific behaviors involved in mate selection, it is also important to look into personality traits that influence one's desire to engage in sexual behaviors or spend time with the opposite sex. One such measure of sexual restriction is an individual's sociosexual orientation. Individuals' sociosexual orientations serve as a predictor of opposite sex friend (OSF) preferences and these preferences tend to differ between men and women. Males with an unrestricted sociosexual orientation tend to value attractiveness in females, and females with an unrestricted sociosexual orientation value physical prowess and resources (Lewis et al., 2012). When observing behavioral interactions between

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men and women, sociosexual orientation serves as a valuable predictor, especially in interactions such as exercise behaviors where men and women are often working to increase their value as a potential mate. In addition to one's sociosexual orientation, relationship status will also serve as a helpful predictor the extent to which individuals will spend time with members of the opposite sex at their own free will (Mealey, 1997). These personal attributes are among several that will be examined in the current research on partnered exercise.

Competitiveness is another personality trait that will likely influence partnered exercise performance. Individuals who are more competitive in nature are known to exercise at higher intensities in the presence of others than those who are less competitive (Snyder et al., 2012). Having an exercise partner alone may influence exercise behaviors, but controlling for competitiveness among partners will be of particular interest in the current research because it will show what types of individuals may benefit from partnered exercise, and those whom may not benefit with respect from competitiveness. It has been shown that naturally competitive individuals benefit from exercising in competitive environments, but the same effect is not true for those with noncompetitive personalities (Song et al., 2013). One important question that may arise from this is: Does partner competition differ from general competition? Are exercise partners more likely to compete with one another than individuals not distinguished as partners? Men are generally more competitive with respect to winning in athletic events whereas women tend to show higher levels of competitiveness in their work (Gill, 1986). Same-sex male exercise partners will likely differ from same-sex female partners in overall competitiveness given the athletic nature of the study, but interactions between male and females will be of particular interest.

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Lastly, one's social motives are also important to consider with respect to exercise behaviors. Social motives differ among age and sex and should be expected to interact differentially with respect to exercise behaviors and exercise performance (Neel et al., 2015). Given the nature of the current research social motives such as mate-seeking and affiliation behaviors should be considered when questioning motives to engage in exercise with a partner of the same or opposite sex.

With the potential individual differences that may influence exercise performance and behaviors established three hypotheses were formulated to test the effects of having an exercise partner on exercise performance and are as follows:

Hypothesis 1: When assigned to exercise with a partner of opposite sex, participants will exercise more frequently, for longer periods, and at higher intensities, and will display improvements in health-related outcomes (lung capacity and BMI) (compared to those assigned to have a partner of the same sex or have no partner).

Hypothesis 2: Participants who are not involved in a romantic relationship will display the changes described in Hypothesis 1 but participants who are involved in a romantic relationship will not display these changes.

Hypothesis 3: There will be a positive correlation between partner attractiveness and exercise performance among participants who were assigned to an opposite-sex partner but not among those who were assigned to a same-sex partner.

This research aims to answer these questions while controlling for alternative explanations that can be attributed to individual characteristics of the participants involved and

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predicts that mating motives will be the primary source of influence with respect to the manipulation.

Method

Participants

Students enrolled in introductory psychology class at East Carolina University who had a smartphone with a data plan and were capable of safely engaging in moderate, regular cardiovascular exercise ($n = 216$). 104 of these participants were male, 112 were female, and ages ranged from 18-26 ($M_{\text{age}} = 18.8$, $SD_{\text{age}} = 1.4$). They were offered credit for participating as an incentive, as they are required to participate in a certain amount of research activities as part of their enrollment in introductory psychology. Participation in this study offered the full amount of credit required. Participants also had the option of participating in other studies and tasks, which would alternatively satisfy these requirements.

Design

A 3x2 between-subjects factorial design (partner condition x participant sex) was employed in this experiment. Male and female participants were randomly assigned to engage in cardiovascular exercise over a four week period with either no partner, a same-sex partner, or an opposite-sex partner. This produced five different group types: Same-sex male partners, same-sex female partners, opposite-sex partners, solo males, and solo females. The solo conditions served as a control.

Procedure

Participants who had been randomly assigned to have a partner arrived at the lab at the same time as their assigned partner, who was another participant in the study. Participants who were randomly assigned to the control condition arrived at the lab alone. Those who were in the partner conditions were unaware of having a partner until they were told so after consenting to

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the research. Upon partner assignment /consent, participants were instructed to perform regular cardiovascular exercise routines of their choosing. All participants were free to choose how long, how often, and where they would exercise for a 28 day period immediately following their consent to the research.

Information on their exercise routines was recorded using the GPS-enabled 'Map My Walk' smartphone application by Under Armor®. In addition, participants were given a paper log with which to record their exercise data with columns for date of exercise, distance traveled, exercise duration, and any additional notes they wished to record about their exercise routines.

Their weights were then measured and recorded in pounds using a digital scale (Escali Glass Health Monitor) and lung capacities were recorded using an electronic handheld spirometer (Contec Medical Systems Co. SP10). Three measurements were taken with the spirometer, which included Forced Vital Capacity (FVC), the forced expiratory volume in the first second (FEV₁), and the peak expiratory flow (PEF). The FVC simply represents the total volume of air expelled from the participants' lungs while the FEV₁ is the volume of air expelled in the first second of measurement. Both the FVC and FEV₁ are measured in Liters. The PEF is a measurement in liters per second (L/s) of the highest rate of air flow expelled into the spirometer (Spirometry Tests). Height was recorded as well using self-report for the purpose of calculating participant BMI.

After 28 days had elapsed, participants were scheduled to report back to the lab at the same time of day as their first session. Their weights and lung capacities were measured and recorded once again and the participants filled out a series of questionnaires, which included items on demographic information, relationship status, perceived partner attractiveness, and self-attractiveness.

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Several individual difference variables were measured via self-report during the follow-up session immediately prior to the conclusion of the study: the Achievement Motivation Scale (AMS), the Social Physique Anxiety Scale (SPAS), the Social Interaction Anxiety Scale (SIAS), Self Efficacy (SE), the Mate-Seeking and Affiliative motivation subscales from the Fundamental Social Motives Inventory (FSMI), and the Sociosexual Orientation Inventory (SOI).

The AMS used in this research consisted of various subscales including one with which to measure participant competitiveness and achievement (Cassidy & Lynn, 1989). This served the purpose of determining whether exercise performance was affected by the experimental manipulation or if an individual's competitiveness explained effects found when exercising with a partner.

The SPAS is used to measure anxiety pertaining to one's personal opinions of their physique relative to social norms. Questions are designed to examine how comfortable participants are with their bodies both in general and in social settings (Hart et al., 1989). The SIAS, another scale used to measure anxiety behavior assesses anxiety experienced in social settings while controlling for generalized anxiety and social phobias that may alternately explain socially restrictive behavior (Mattock & Clarke, 1998). The SOI is used for the purpose of determining how restricted one's sociosexual orientation may be. An unrestricted orientation is characterized by having many sexual partners, and a very restricted sociosexual orientation is characterized by having only one sexual partner in one's lifetime (SOI Super). The FSMI examines various social motives and the relationship of these motives to measure individual differences. The selections from the FSMI used in this particular study included the FSMI subscales for affiliation (group), affiliation (independence), and mate seeking (Neel et al., 2015). Participants were also asked to rate their partner's and their own physical attractiveness.

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Participants rated both themselves and their partner's face, body, and overall attractiveness on a scale from 1 to 7. Questions on SE were for the purpose of measuring one's willingness to accomplish general goals.

These various scales were used to control for individual differences among participants to ensure that the experimental manipulation was the source of differences observed in the exercise data among the conditions. This helped eliminate confounds or alternate explanations that may have otherwise explained significant results shown in the data, while also allowing for the opportunity to search for interactions among the exercise data and individual differences of the participants.

Following the questionnaires, the exercise logs with all of the participants' exercise information were collected. Following the completion of the questionnaires, participants received a debriefing where researchers probed for suspicion and informed the participants of the true purpose of the experiment.

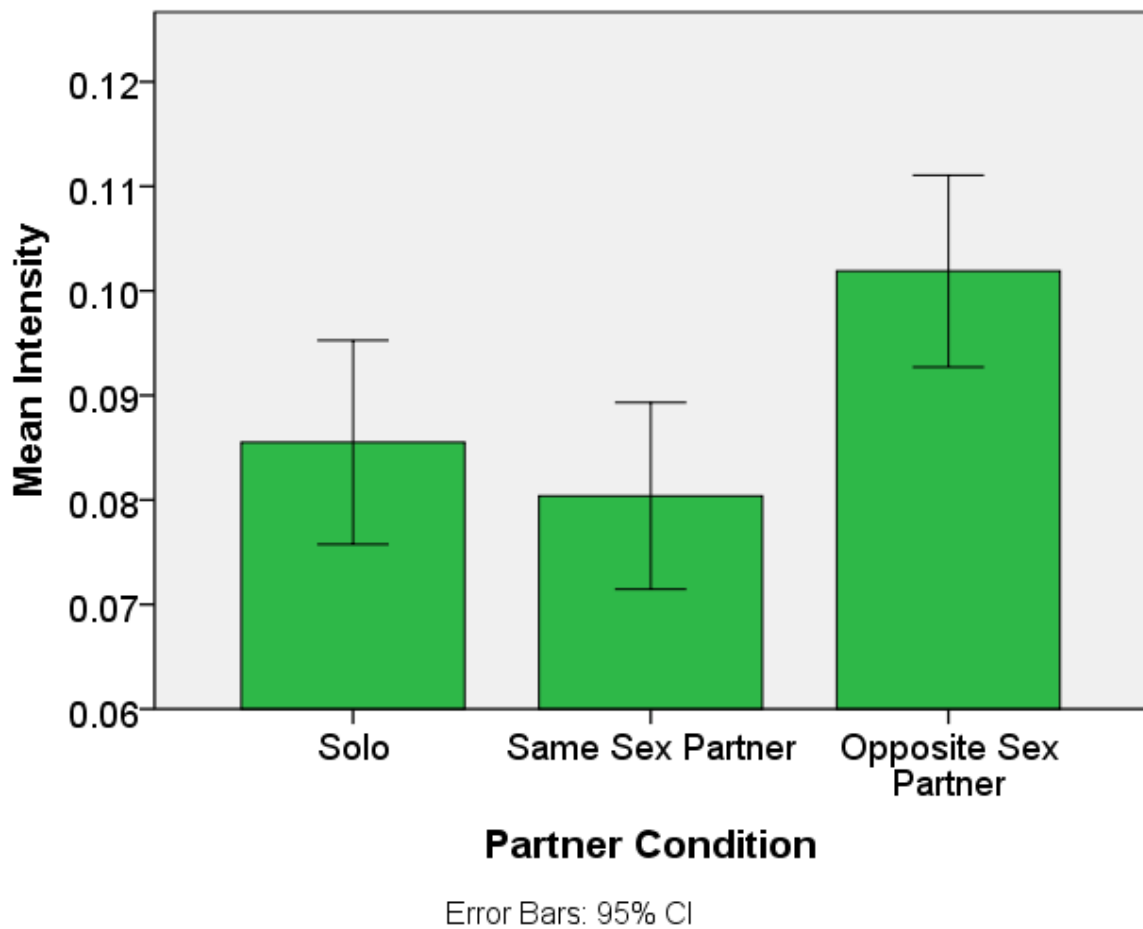
Results

Hypothesis 1 was supported via a one-way ANOVA in that there was a significant main effect among partner condition and exercise intensity such that participants with an opposite-sex partner exercised at higher intensities than participants with a same-sex partner or those who exercised alone $F(1, 96) = 7.713$ $p = .007$. This result is depicted in figure 1. Female participants were found to have exercised at significantly greater intensities when exercising with an opposite-sex partner than females across all other conditions, however, when controlling for partner exercise intensity they exercised at greater intensities when exercising with an opposite-sex partner than did those assigned to a same-sex partner $F(1, 52) = 7.324$, $p = .009$. No main effects were found for average distance traveled per workout among conditions with respect to

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hypothesis 1. Subsequent analyses also revealed that solo participants exercised more often ($M = 11.52$, $SD = 7.21$) than participants with partners ($M = 8.79$, $SD = 5.78$), $t(147.22) = 2.90$, $p = .011$. There were also no main effects observed with respect to lung capacity.

Figure 1

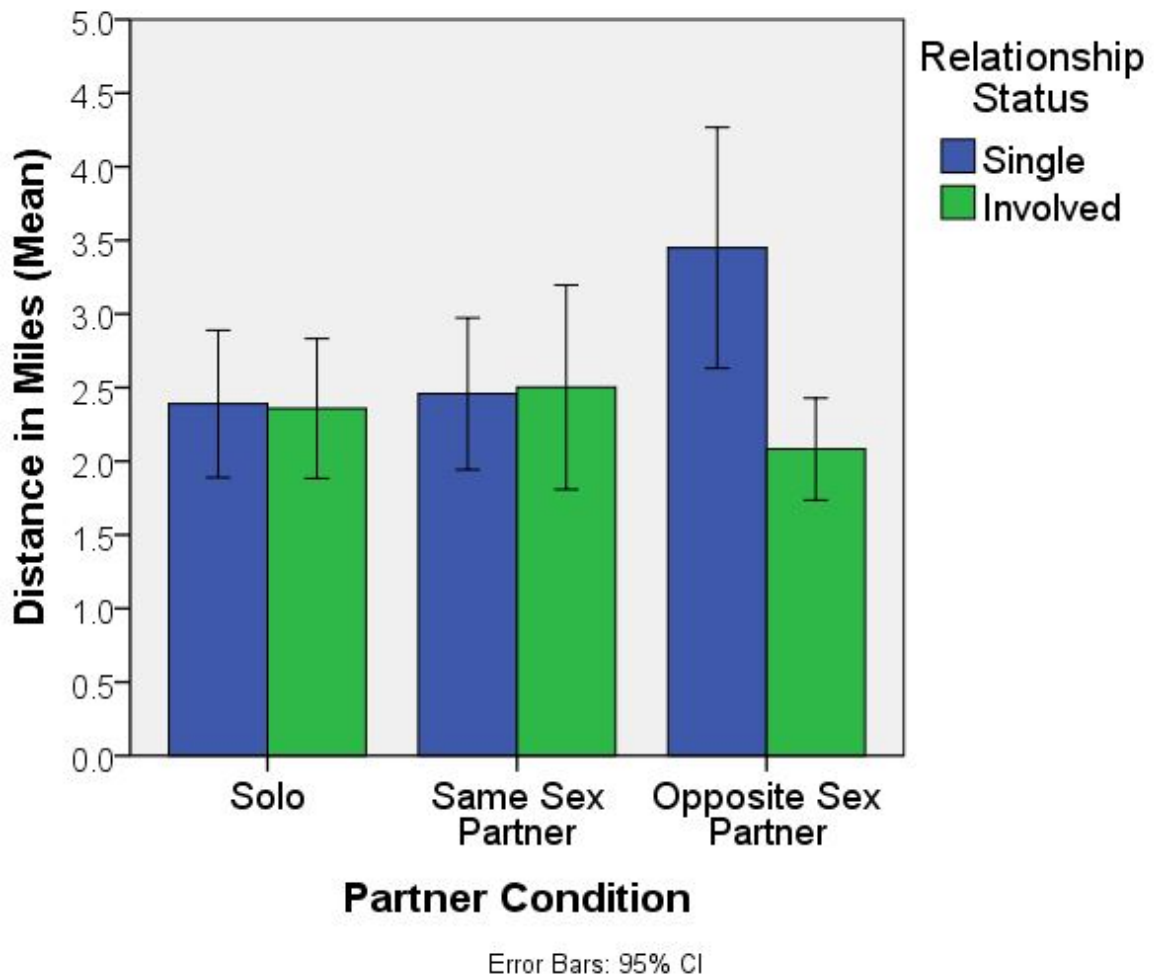


Hypothesis 2 was supported in that there was a significant interaction between partner condition and relationship status, $F(2, 177) = 3.704$, $p = .027$, such that participants who were single and assigned to an opposite sex partner travelled a significantly greater average distance per workout ($n = 29$, $M = 3.45$ miles, $SD = 2.15$) compared to participants in all other conditions ($n = 154$, $M = 2.36$ miles, $SD = 1.42$). This result is depicted in figure 2.

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Participants who were assigned to exercise with an opposite sex partner, who were currently involved in a romantic relationship spent less time exercising with their partner as shown by a t-test ($t(56) = 2.319, p = .02$). No other main effects or significant interactions were found with respect to hypothesis 2.

Figure 2



A general test of Hypothesis 3 failed to provide support in that opposite-sex partner attractiveness was not associated with improved exercise performance. However, in support of Hypothesis 3, among men who were assigned to female partners, there was an inverse relationship between perceived partner attractiveness and BMI reduction ($r(29) = -.38, p = .04$),

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indicating that men who were assigned to exercise with more attractive female partners lost more weight. A similar correlation between BMI change and partner attractiveness was not observed among women with male partners ($r(27) = .24, p = .23$). Furthermore, partner attractiveness was positively correlated with improvements in lung capacity (FVC) but only for participants with an opposite sex partner ($r(56) = .30, p = .03$).

A supplemental analysis revealed that female exercise frequency was positively correlated with perceived partner attractiveness in the same-sex partner condition ($r(35) = .34, p = .046$). A similar relationship was not observed for men with a same-sex exercise partner ($r(18) = .04, p = .89$).

Only participants who reported having a strictly heterosexual sexual orientation were used in the data analyses. This was determined by the results from the SOI questionnaire. The sample size for participants who did not identify as strictly heterosexual was small ($n = 21$) and did not allow for reliable statistical power in the data analyses.

Discussion

Partners of the opposite sex exercised at greater intensities than partners of either the same-sex or participants who exercised alone. For female participants in this condition there was a significant difference in exercise intensity as they exercised at higher intensities than females of the other conditions. Male participants with opposite-sex partners, however, did not display this significant difference among male participants of the other conditions. It is important to note the possibility of differences in natural male and female exercise behaviors driving this effect. If males tend to exercise at greater intensities than females, which our data showed, then it was possible that female participants in the opposite sex partner condition were exercising to match the intensity of their male partners; however, when controlling for partner intensity the effects

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remained significant. This means that the manipulation was in fact the source of the differences observed in the data, and it can be argued that in support of our hypothesis the effects were driven by mating motives induced by partner condition.

Solo participants exercised at higher frequencies compared to participants with partners, which contrasts both the hypotheses of this study and past research. An explanation for this finding is that it is that given the nature of the study design it was simply much easier for solo participants to exercise on their own time rather try and coordinate schedules with another individual. One way to control for this or determine the strength of this relationship would be to conduct the study across a longer time period. Exercise partners did not know one another prior to the study so it may have taken some time getting used to working out with a new person. Another possible explanation for this finding is to consider that participants very likely did not know one another prior to consenting in the research, and exercising with a new acquaintance may yield different results than exercising with a friend or a familiar individual. Future research should ask participants if they had known one another prior to the study. It would also be very interesting to replicate this research with participants who knew one another prior to consenting in one condition and participants who had just met in another condition. Differences among these conditions could determine whether it is more beneficial to exercise with a friend or perhaps with someone new.

Participants who were not currently involved in a (romantic) relationship traveled significantly greater distances when paired with an opposite-sex partner than those currently involved in a committed relationship. One speculation for this relationship is that participants involved in a relationship were limiting their efforts as a means of maintaining their present relationship. As the data showed, participants in the opposite-sex partner condition who were

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involved in a relationship also spent less time with their exercise partner. This difference supports the relationship maintenance speculations. The opposite can be hypothesized for the single participants in that they were exercising for greater distances influenced by mating incentives with someone whom they may have seen as a potential romantic partner.

As observed by the data, perceived partner attractiveness also yielded results of interest such as BMI reduction in males with an opposite-sex partner and improvements in lung capacity for opposite-sex partners as well. These results support that mating motives are a possible source of influence for exercise and health improvements, particularly in the presence of an attractive individual. Female partners were also more likely to exercise when paired with a same-sex partner whom they viewed as attractive, which does not fully support the mating-motive-oriented hypothesis. Female attractiveness either way seemed to drive much of the data.

There are several general limitations to consider with respect to the current research. First and foremost, this study used a convenience sample with participants ranging from ages 18-26, meaning that this sample may not be wholly representative of adult populations. A replication of this study recruiting participants of older adult ages could help strengthen the validity of this research. Time was also another important limitation to consider with respect to main effects. With a data collection period of 28 days it may have been difficult to observe significant changes in participant BMI and lung capacities. Replication of this study across a longer time period would be a wise decision in order to fully observe individual health changes among participants as one month is a potentially short time duration to see significant impacts of the manipulation on factors such as weight and lung capacity changes.

The results of this study indicate that for optimal improvements of exercise performance in cardiovascular exercise, it is best to exercise with a partner of the opposite sex, particularly for

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single individuals. Partner attractiveness is also important in improving exercise behaviors as well as achieving optimal results. Further research and replication of this data with a higher level of control from the experimental design would help strengthen these findings in order to fully determine that this is in fact the preferred way to exercise for those seeking to improve their exercise behaviors and health.

References

- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497–529.
- Cassidy, T., & Lynn, R. (1989). A multifactorial approach to achievement motivation: The development of a comprehensive measure. *Journal of Occupational Psychology*, 62(4), 301-312.
- Gellert, P., Ziegelmann, J. P., Warner, L. M., & Schwarzer, R. (2011). Physical activity intervention in older adults: Does a participating partner make a difference? *European Journal of Ageing*, 8(3), 211-219. doi:10.1007/s10433-011-0193-5
- Gill, D. L. (1986). Competitiveness among females and males in physical activity classes. *Sex Roles*, 15(5-6), 233-247. doi:10.1007/BF00288314
- Hart, E. A., Leary, M. R., & Rejeski, W. J. (1989). The measurement of social physique anxiety. *Journal of Sport & Exercise Psychology*, 11(1), 94-104.
- Haugen, T., Johansen, B. T., & Ommundsen, Y. (2014). The role of gender in the relationship between physical activity, appearance evaluation and psychological distress. *Child and Adolescent Mental Health*, 19(1), 24-30. doi:10.1111/j.1475-3588.2012.00671.x
- Howle, T. C., Dimmock, J. A., Whipp, P. R., & Jackson, B. (2015). The self-presentation motives for physical activity questionnaire: Instrument development and preliminary construct validity evidence. *Journal of Sport & Exercise Psychology*, 37(3), 225-243. doi:10.1123/jsep.2014-0134
- Kilpatrick, M., Hebert, E., & Bartholomew, J. (2005). College students' motivation for physical activity: Differentiating men's and women's motives for sport participation and exercise. *Journal of American College Health*, 54(2), 87-94. doi:10.3200/JACH.54.2.87-94

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Lamarche, L., & Gammage, K. L. (2010). The effects of leader gender on self-presentational concerns in exercise. *Psychology & Health, 25*(7), 769-781.

doi:10.1080/08870440902866886

Mealey, L. (1997). Bulking up: The roles of sex and sexual orientation on attempts to manipulate physical attractiveness. *Journal of Sex Research, 34*(2), 223-228.

doi:10.1080/00224499709551887

Neel, R., Kenrick, D. T., White, A. E., & Neuberg, S. L. (2015). Individual Differences in Fundamental Social Motives. *Journal Of Personality And Social Psychology,*

doi:10.1037/pspp0000068

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W.

(1982). The Self-efficacy Scale: Construction and validation. *Psychological Reports, 51*(2), 663-671. doi:10.2466/pr0.1982.51.2.663

Snyder, A. L., Anderson-Hanley, C., & Arciero, P. J. (2012). Virtual and live social facilitation while exergaming: Competitiveness moderates exercise intensity. *Journal of Sport & Exercise Psychology, 34*(2), 252-259.

Song, H., Kim, J., Tenzek, K. E., & Lee, K. M. (2013). The effects of competition and competitiveness upon intrinsic motivation in exergames. *Computers In Human Behavior,*

29(4), 1702-1708. doi:10.1016/j.chb.2013.01.042

Spirometry Tests. (n.d.). Retrieved December 7, 2015, from

<http://www.spirometry.guru/spirometry.html>

Tal-Krivisky, K., Kronfeld-Schor, N., & Einat, H. (2015). Voluntary exercise enhances activity rhythms and ameliorates anxiety- and depression-like behaviors in the sand rat model of

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circadian rhythm-related mood changes. *Physiology & Behavior*, 151, 441-447.

doi:10.1016/j.physbeh.2015.08.002