

Presence of Observers Increases One Repetition Maximum in College-age Males and Females

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ABSTRACT

Int J Exerc Sci 4(3) : 199-203, 2011. Purpose: To determine if the presence of observers affects muscular strength performance in college-age males and females. Methods: Twenty-five women and 24 men participated in the study. Two counter-balanced trials were performed in which participants completed 1-RM tests in bench press and leg press. During one trial, two members of the opposite gender observed the 1-RM tests. During the other trial there were no observers, other than the tester. Results: 1-RM for females increased 3.4 ± 0.8 lbs on bench press ($p<.001$) and increased 9.2 ± 3.8 lbs on leg press ($p=.025$) when observers were present. 1-RM for males increased 4.2 ± 1.1 lbs on bench press ($p=.001$) and increased 18.8 ± 5.2 lbs on leg press ($p=.002$) with observers present. There was no difference in the percent increase in 1-RM between males and females for either leg press ($p=.71$) or bench press ($p=.08$). Conclusion: College-age males and females lifted more weight during a 1-RM test when observers were present.

KEY WORDS: Motivation, muscular strength, performance

INTRODUCTION

The nature of humans is to act differently when being observed (3, 5, 8, 9, 12). Research in this area has examined performance in areas of cognitive abilities such as attention, speed of information processing, and verbal fluency (5). The common theme found throughout the results of these studies shows a decrease in performance with the presence of an observer (3, 5, 8, 9). When considering third-party observation and crowds, some studies have sought to control the population of observers to determine if a specific crowd affects performance (3, 8, 9). If part of the crowd were significant-others, such as family or best friends, the individual's level of performance decreased

for both mental and physical tests (3, 8, 9). A further study controlled the observing population by gender and compared the individual's charitable contributions with the same-gender observer, opposite-gender observer or with no observation. Results found that women showed no bias toward any observers when it came to charity. Men also showed no difference in charity between same gender observer and no observer; however, when men felt like they were being watched by women their charitable contributions significantly increased (i.e. being watched by women, men compulsively performed more) (6). The majority of these tests pertain to the field of neuro-psychology, the mental processes, and how they affect performance in the workplace or on standardized tests

(5,8, 9). However, others have looked at the effects of third-party observation on physical performance (2-4, 11, 12). Observation and/or crowds can have either a beneficial or detrimental effect on physical performance, depending on the task. If the test is on a well-learned or simple skill, such as throwing a ball, the individual performs better with observers (i.e. throws the ball harder) (2, 4, 12). However, if the individual is performing a newly-learned or complex skill like juggling, his or her performance level tends to decrease when observers are present (2, 3, 11). This failure to perform is more commonly known as "choking" in athletic performance, yet it rarely occurs if the individual is highly experienced at the task performed (11).

It is clear that behavior and/or performance is affected by the presence of observers; however, few studies have determined if observation has an effect on physical performance, and no know studies have investigated the effect of observers on muscular strength. Therefore, the purpose of this study was to determine if the presence of observers had an effect on muscular strength in the simple skill of one repetition maximum (1-RM) bench press and 1-RM leg press in college-age males and females.

METHODS

Participants

The study population consisted of a convenience sample of 51 participants (26 males and 25 females ages 19-24 yrs.) Two males dropped out due to illness unrelated to study, resulting in 24 males who completed the study. The inclusive criterion for participation in this study was

resistance training of at least two times a week for at least six weeks prior to participation. The exclusion criterion for participation in this study was any upper or lower extremity injury within the past eight weeks. Written informed consent and a completed health history questionnaire were obtained upon the first meeting with the participants. All data collection was completed after approval by the university Institutional Review Board.

Instrumentation

A standard supine barbell bench press was used as the primary tool of measuring maximal upper body muscular strength. For the lower body a Cybex International Seated Leg Press (model #4605-90 Medway, MA) was used for measuring maximal muscular strength. Concurrent validity has been established for the bench press by Pearson correlation coefficients for the males ($r = 0.95$) and females ($r = 0.80$). The test-retest reliability is known to be for the men ($r = 0.99$, 1.4%) and women ($r = 0.93$, 3.5%) (10). Height and weight were collected by self-report on each participant's health history questionnaire.

Protocol

The participants performed two trials, one with observers present during the 1-RM tests (Observer trial) and one without observers present during the 1-RM tests (No Observer trial). The trials were counter-balanced such that half of the participants performed the Observer trial first and half of the participants performed the No Observer trial first. During the Observer trial two individuals of the opposite gender of the participant were present in the weight room as the participant completed their 1-RM tests. For example, if the participant was a female the two observers

were males. Also present for each trial was the male principal investigator. Thus, during the Observer trial the principal investigator and two additional observers were present, and during the No Observer trial only the principal investigator was present. The observers were in close proximity of the participants as each individual performed his or her 1-RM. Each participant was told that the observers were assisting with data collection. The participants did not know the observers.

Time between trials ranged from two to seven days to ensure adequate rest and to prevent strength gains due to outside exercise programs. Each participant performed a 1-RM on the bench press and leg press during each trial following established guidelines (1). Briefly, the warm-up protocol consisted of 5-10 repetitions of a light-to-moderate weight. After a one-minute rest period, two heavier warm-up sets of 3-5 repetitions were performed with a two-minute rest between sets. Each participant rested two to four minutes and performed the 1-RM attempt with proper technique. If the lift was successful, the participant rested for another two to four minutes, increased the load 5-10%, and attempted another lift. If the participant failed to perform the lift with correct technique, he or she rested two to four minutes and attempted a weight 2.5-5% lower. This process of increasing and decreasing the weight continued until a maximum lift was performed and maximal muscular strength was determined (1). The participants performed no resistance training prior to the testing sessions and the same pre-test regimen from the first trial was applied to the second trial specific to each participant (7). In addition, no verbal encouragement was given to the

participants in order to prevent any form of bias and to keep the treatment between participants as uniform as possible.

Statistical Analysis

A Repeated Measures Analysis of Variance was used to determine changes in 1-RM values between the Observer trial and the No Observer trial for both males and females. Multivariate analysis of variance was used to compare males and females with regard to percent changes from the No Observer trial to the Observer trial. The alpha level for the tests was set a priori at 0.05.

RESULTS

Data are reported as mean \pm SEM. As presented in Figure 1, 1-RM bench press and leg press increased significantly for both males and females in the presence of observers. Bench press increased an average of 3.4 \pm 0.8 lbs ($p<.001$) for females with observers present and increased 4.2 \pm 1.1 lbs ($p=.001$) for males. 1-RM leg press increased an average of 9.2 \pm 3.8 lbs ($p=.025$) for females with observers present and males increased 18.8 \pm 5.2 lbs ($p=.002$). The percent increases in 1-RM for both exercises and genders are depicted in Figure 2. The percent increase in 1-RM in the Observer trial was not significantly different between males and females for the leg press ($p=0.71$) or bench press ($p=0.08$), indicating the presence of observers affected males and females equally.

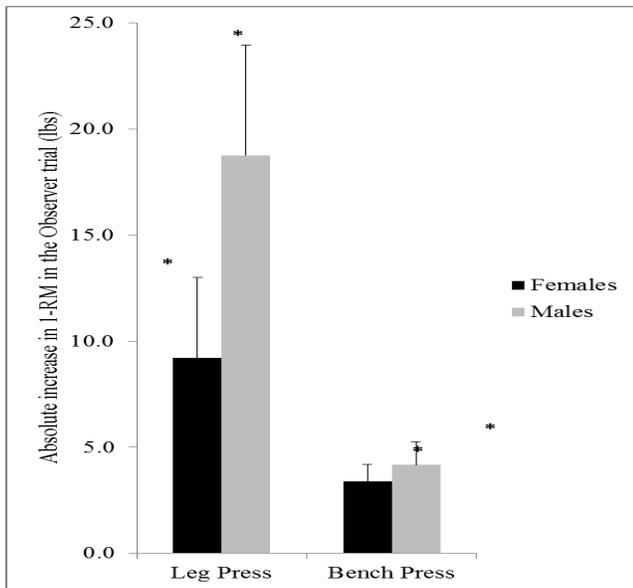


Figure 1. Absolute increase in 1-RM Leg Press and Bench Press for both males and females in the Observer trial. Bars represent the average absolute amount of additional weight lifted when observers were present. * represents a significant increase in 1-RM in the Observer trial compared to the No Observer trial ($p < 0.05$).

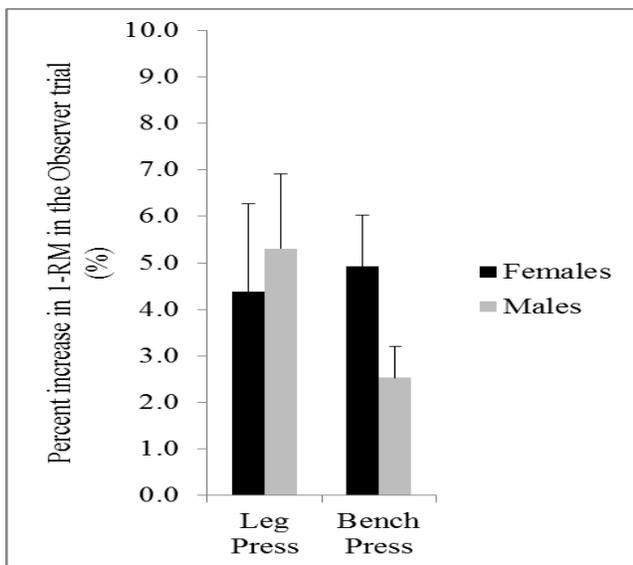


Figure 2. Relative increase in 1-RM Leg Press and Bench Press for both males and females in the Observer trial. Bars represent the percent increase in weight lifted with observers present. The percent increase in 1-RM with the observers present was not significantly different between males and females for the Leg Press ($p = 0.71$) or bench press ($p = 0.08$).

DISCUSSION

The purpose of this study was to determine if the presence of observers had an effect on muscular strength in the 1-RM bench press and 1-RM leg press in college-age males and females. The main finding of our study was that individuals of college age lifted more weight in a 1-RM test on the bench press and leg press when observers were present. Additionally, there was no gender effect, as both males and females increased their 1-RM the same relative amount.

This study was unique because there has been no other study which investigated the effects of observers on physical performance, namely muscular strength. However, the results do support the findings of previous studies that investigated the effect of crowds/observation on the performance of simple tasks such as the six-minute walk test, which show an increase in performance with observation or when others are present (2, 4, 12). Unrelated to physical performance, males have been shown to significantly increase their charitable contributions when being watched by the opposite gender versus same gender observer and no observer. Alternatively, females showed no significant change in charitable contributions within any observation group (6). The hypothesis of our study was based off these findings, indicating that males and females may respond differently to the presence of observers. However, it is logical to assume that factors influencing charitable giving may greatly differ from those that affect physical performance. Thus, it appears males and females are equally affected by the presence of observers when performing physical tasks.

The results showed an increase in 1-RM with opposite gender observers; however, we cannot definitively conclude that the opposite gender (as opposed to general observers) was the true source of the increase in 1-RM since same gender influence was not tested. Thus, it is possible that it was simply the presence of observers that influenced the changes in 1-RM, not the fact that these observers were of the opposite gender. Nonetheless, this is the first known study to investigate the effect of observers on muscular strength, and the results are clear that having observers present increased the amount of weight lifted. To further this research, a third trial testing the effects of same gender observers should be conducted. Future research could also include sport-specific or high-skill exercises, such as a free-throw shot in basketball or a drive in a golf swing. Additionally, all the participants in this study were non-athletes, so a comparison between athletes and non-athletes is warranted. Because most athletes perform in front of crowds, the presence of observers likely would have a different effect compared to non-athletes.

In conclusion, the data shows that both males and females will increase their 1-RM if an observer is present. Additionally, it appears that males and females are equally influenced by the presence of observers when performing tests of maximal strength.

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