



Sex-Specific Response to Incremental Decline in Intersession Recovery during Multi-session Resistance Exercise

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Abstract

The principle of individuality appears considerably evident when analyzing sex-specific response to exercise. Previous investigations recognize females as more fatigue resilient than males during repeated sprint performance. Additionally, new research emphasizes females elicit elevated lift quality at various one-repetition maximum percentages than established norms. However, to the best of our knowledge, no investigations have examined the sex-specific responses to incremental decline in intersession recovery during multi-session resistance training. **PURPOSE:** The aim of this study was to examine differences in lift quality, expressed as repetitions completed, between males and females during resistance training when exposed to different intersession recovery time. **METHODS:** Fourteen resistance trained males (n = 7) and females (n = 7) participated in five resistance training sessions. Session-one consisted of one-repetition maximum (1RM) testing of squat (SQ) and bench press (BP). Sessions 2-5 were considered working sessions, with four sets of SQ and BP executed in the following order: 1 set of 8 repetitions @55% 1RM; 1 set of 6 repetitions @ 65%, 1 set of 4 repetitions @ 75% 1RM, and 1 set of as many repetitions as possible (AMRAP) @ 85% 1RM. A 10-minute rest period was allotted between SQ and BP. Upon completion of BP, a 5-minute recovery period was provided before participants completed 4 sets of 2-repetitions in reserve (RIR) for three assistance lifts (barbell reverse lunge, overhead press, and bent-over row), performed in circuit training fashion with no rest between exercises and 90s rest between circuits, designed to elicit standard resistance training session fatigue. In order, 72hrs, 48hrs, 24hrs, then 6hrs rest were assigned as the 4 times points of intersession recovery. Repetitions completed during SQ and BP AMRAP sets were recorded as lift quality. A 2 (sex) x 4 (session) mixed factorial ANOVA ($p < .05$) was used to determine the sex-specific responses to resistance training. **RESULTS:** No significant main effect was revealed between sex and session performance for SQ and BP. However, a significant mean effect was recognized between SQ and BP session performance for males $F(3, 2.749) = 4.41, p = .010, \eta_p^2 = .269$. Additionally, when repetitions were collapsed across all sets, an independent samples t-test reveal females overall repetitions completed (9.93 ± 6.57 reps) was significantly higher than males (7.0 ± 2.05 reps), $t(110) = 3.183, p < .001$. **CONCLUSION:** While no significant differences were recognized for individual session repetitions between sexes, when all repetitions were collapsed, females completed significantly more total repetitions than males. Additionally, practical significance showcased females' outperformed males mean repetitions completed during individual sessions. Females, furthermore, performance did not significantly decline across sessions for neither SQ nor BP, while males experiences significant performance changes. These results mirror findings from previous investigation regarding females possessing a greater work capacity than males at equivalent percentage 1RM. Concerning upper body work capacity, both sexes performance trended similarly when exposed to incremental decreases in intersession rests. However, lower body work produced by females trended upward and opposite to male performance as intersession recovery decreased. Moreover, these findings suggest females possess greater work capacity than males, particularly during lower body exercises, supporting the necessity of an alternative approach to resistance training programming for females.

Introduction

- The principle of individuality appears considerably evident when analyzing sex-specific response to exercise.
- Previous investigations recognize females as more fatigue resilient than males during repeated sprint performance.
- Additionally, new research emphasizes females elicit elevated lift quality at various one-repetition maximum percentages than established norms.
- However, to the best of our knowledge, no investigations have examined the sex-specific responses to incremental decline in intersession recovery during multi-session resistance training.

Methods

Participants:

- N = 14 (7 men, 7 women)
- All resistance trained for past 6 months

Descriptive Characteristics:

Variable	Men (n=7)	Women (n=7)
Height (in)	70.9 ± 2.6	65.3 ± 3.5
Total Body Mass (lbs)	189.9 ± 15.7	155.6 ± 28.4
Body Fat (%)	20.4 ± 5.4	17.6 ± 9.7
Max Squat (lbs)	350.7 ± 32.7	213.6 ± 43.3
Max Bench (lbs)	267.9 ± 41.7	112.9 ± 18.2

Procedures

Forms/Approval

- IRB approval, Informed consent completed
- All participants familiarized to procedures and equipment

Testing Sessions

- 5 testing sessions.
- Session 1 – 1RM for squat and bench using the NSCA standardized procedures.
- Sessions 2 and 5 Squat and Bench Press Procedures
 - 1 set of 8 repetitions @55% 1RM;
 - 1 set of 6 repetitions @ 65%;
 - 1 set of 4 repetitions @ 75% 1RM;
 - 1 set of as many repetitions as possible (AMRAP) @ 85% 1RM.
 ***A 10-minute rest period was allotted between SQ and BP.
- Sessions 2 and 5 Assistance Exercise Procedures
 - Exercises: Barbell Reverse Lunge, Overhead Press, and Bentover Row
 - 4 sets of 2-repetitions in reserve (RIR) performed in circuit training
 - No rest between exercises
 - 90s rest between circuits
 ***Designed to elicit standard resistance training session fatigue.

- In order, 72hrs, 48hrs, 24hrs, then 6hrs rest were assigned between sessions.

Measured Variables:

- Lift Quality – Number of Repetitions Completed during AMRAP Sets

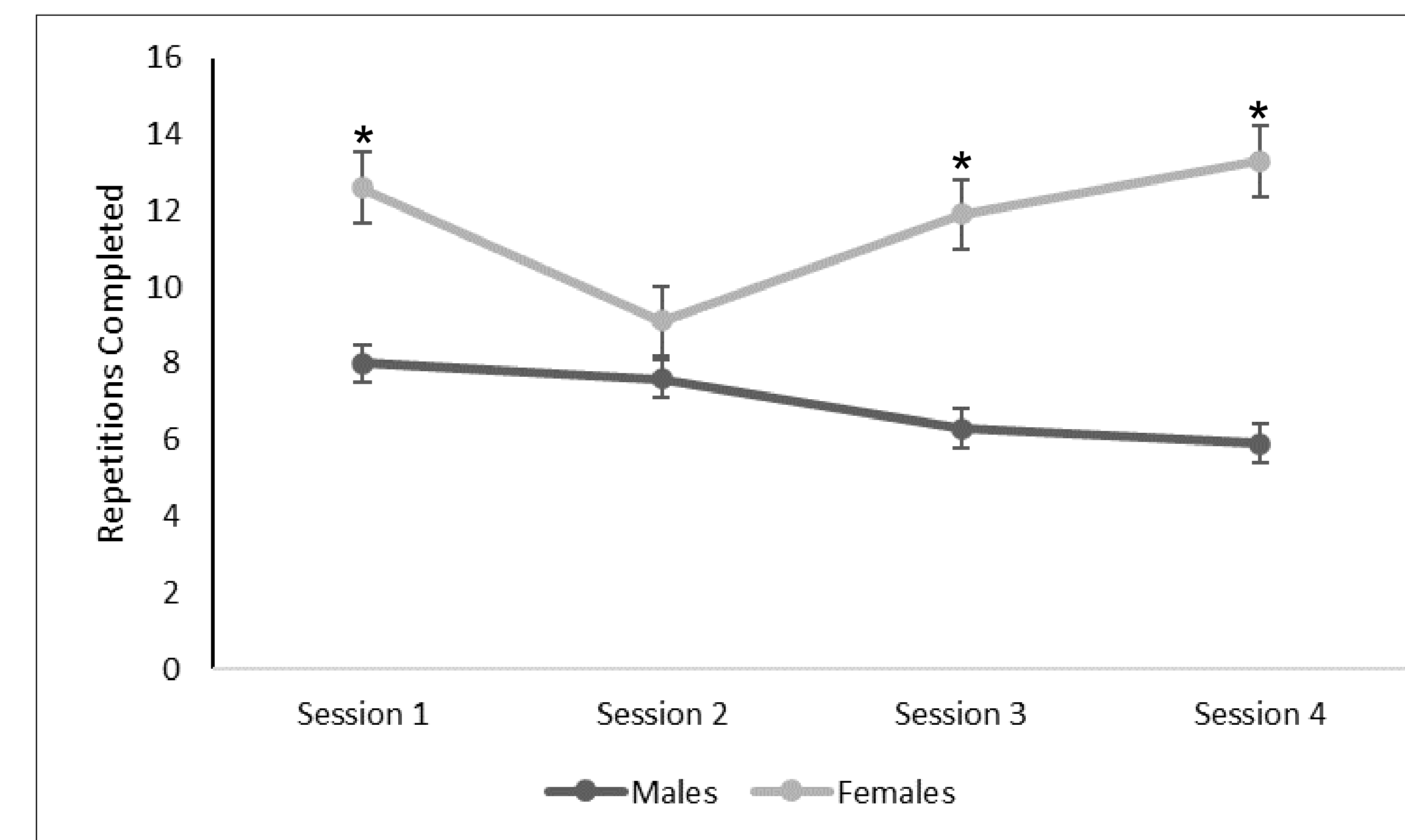
Statistical Analyses:

- A 2 (sex) x 4 (session) mixed factorial ANOVA ($p < .05$) was used to determine the sex-specific responses to resistance training.
- Bonferroni post-hoc analyses were performed when appropriate

Results

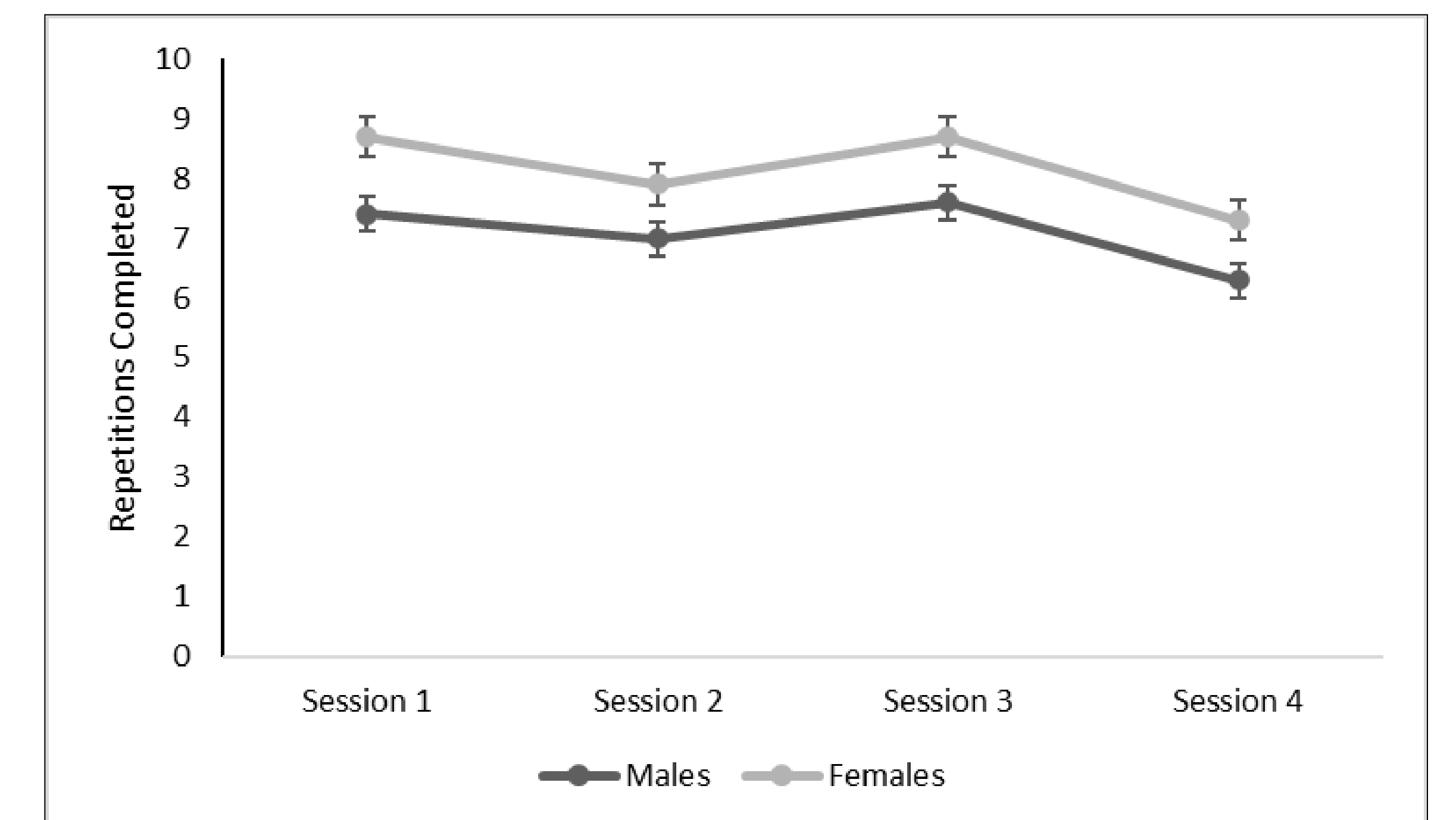
No significant main effect was revealed between sex and session performance for SQ and BP. However, a significant mean effect was recognized between SQ and BP session performance for males $F(3, 2.749) = 4.41, p = .010, \eta_p^2 = .269$. Additionally, when repetitions were collapsed across all sets, an independent samples t-test reveal females overall repetitions completed (9.93 ± 6.57 reps) was significantly higher than males (7.0 ± 2.05 reps), $t(110) = 3.183, p < .001$.

Figure 1. Sex-Specific Lift Quality Differences During Squat



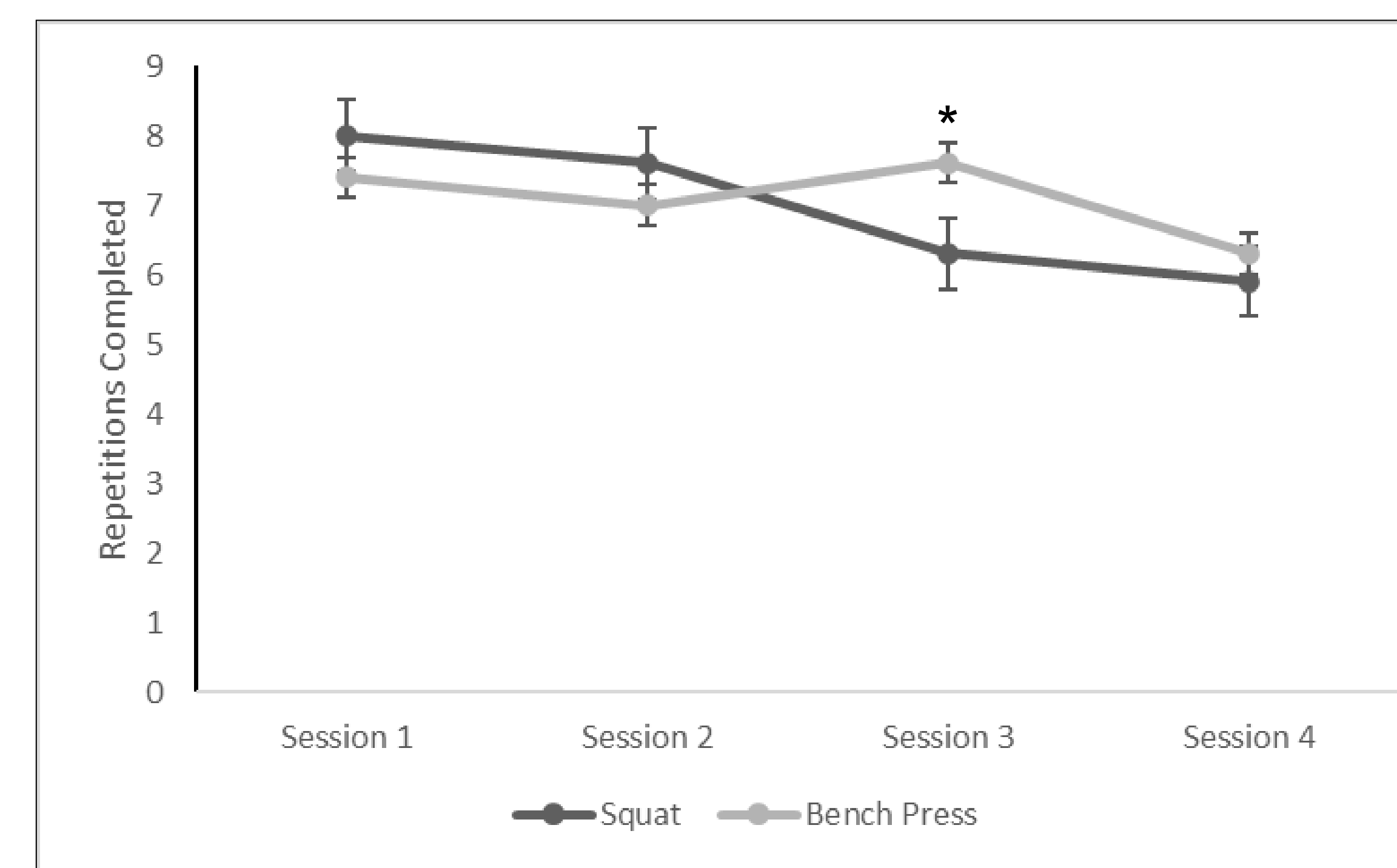
* Significantly different at $p < 0.05$

Figure 2. Sex-Specific Lift Quality Differences During Bench



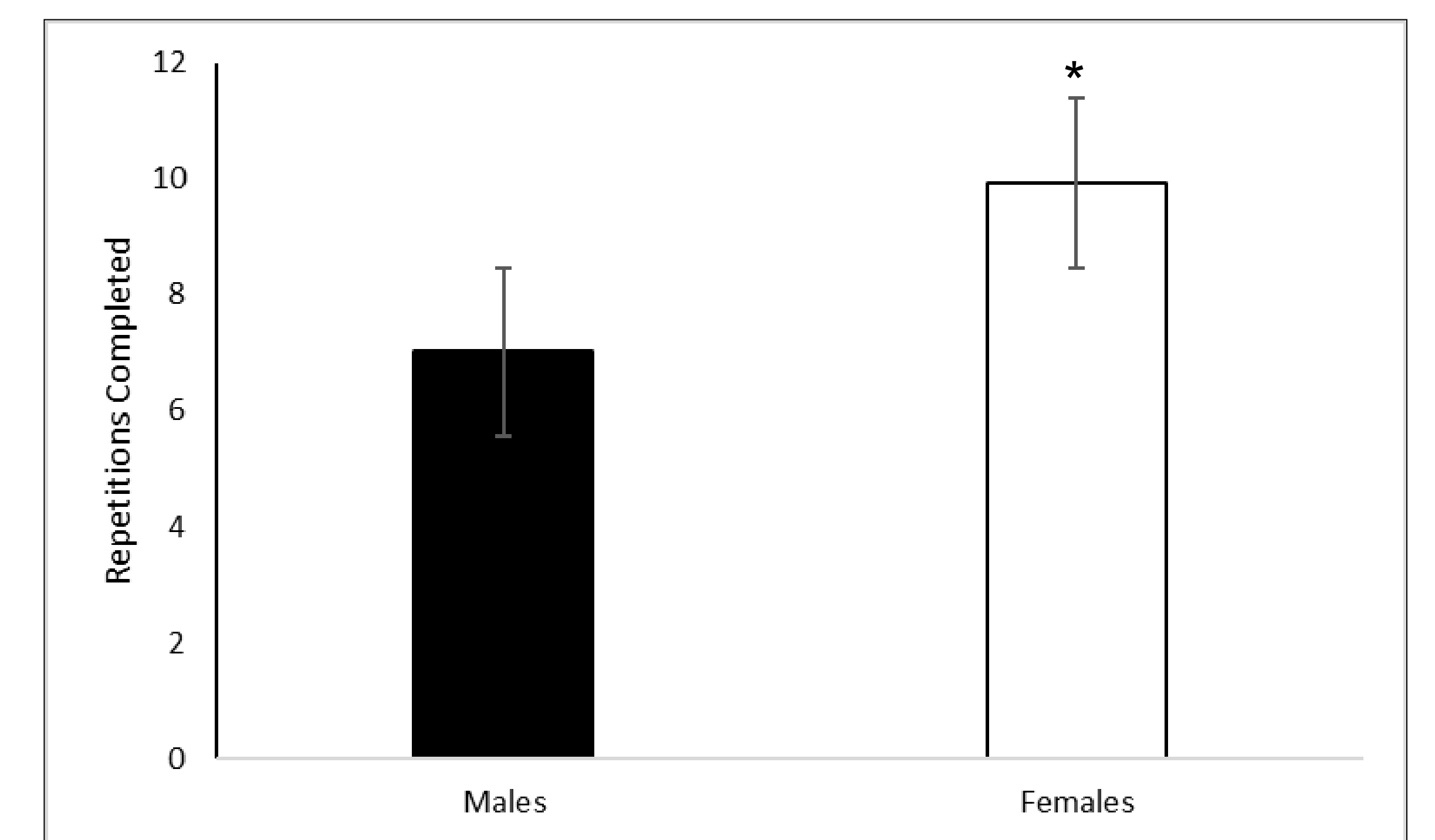
* Significantly different at $p < 0.05$

Figure 3. Male Differences in Lift Quality Differences Between Squat and Bench Press



* Significantly different at $p < 0.05$

Figure 4. Sex-Specific Lift Quality Differences for Combined Squat and Bench Press



* Significantly different at $p < 0.05$

Conclusions and Practical Applications

- While no significant differences were recognized for individual session repetitions between sexes, when all repetitions were collapsed, females completed significantly more total repetitions than males.
- Additionally, practical significance showcased females' outperformed males mean repetitions completed during individual sessions. Females, furthermore, performance did not significantly decline across sessions for neither SQ nor BP, while males experiences significant performance changes.
- These results mirror findings from previous investigation regarding females possessing a greater work capacity than males at equivalent percentage 1RM.
- Concerning upper body work capacity, both sexes performance trended similarly when exposed to incremental decreases in intersession rests.
- However, lower body work produced by females trended upward and opposite to male performance as intersession recovery decreased.
- Moreover, these findings suggest females possess greater work capacity than males, particularly during lower body exercises, supporting the necessity of an alternative approach to resistance training programming for females.