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Dependability Of Exertion And Muscle Pain Ratings During Resistance Training In Veterans With Chronic Pain

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Chronic muscle pain (CMP) is a primary complaint of US Veterans of the Persian Gulf War (GWV) currently suffering from Gulf War illness, a chronic multisymptom condition. Although the research literature often characterizes Veterans as stoic, previous research in our lab has demonstrated that GWV with CMP report greater perceived exertion (RPE) and muscle pain during exercise compared to healthy GWV. Given the potential use of these ratings as tools for monitoring and prescribing exercise intensity in patient groups, it is important to quantify their dependability and relationships to symptoms as training progresses.
PURPOSE: To evaluate the dependability (i.e., reliability) and sources of variance in RPE and muscle pain ratings across 16 weeks of resistance exercise training (RET), as well as their association with self-reported pain symptoms in GWV with CMP.
METHODS: Twenty-six GWV with CMP completed 16 weeks of individualized RET initiated at a low intensity (25-35% of est. max.) with progression as tolerated. Each session consisted of 10 exercises with 2 sets of each. RPE (6-20) and muscle pain (0-10) were reported for each set at its completion. Ratings at weeks 2, 9, and 15 were evaluated separately using generalizability theory, a technique which quantifies the dependability of responses and apportions their variability to the conditions of the testing procedure (i.e., respondents, sets, and exercises). Daily pain symptoms were also recorded for each session. Associations between symptom scores and RPE and muscle pain were calculated using Spearman's rho.
RESULTS: Generalizability coefficients were very high for both measures at each time point ($\xi\rho^2$>0.89) indicating a high level of dependability. Respondents were the greatest source of variance throughout. Variance due to exercises, however, was reduced with training progression. No significant relationships between pain symptoms and RPE or muscle pain were noted at any time point (ρ: -0.28 - 0.34; p>0.05).
CONCLUSIONS: RPE and muscle pain ratings exhibit a high degree of dependability for GWV with CMP during exercise, even with training adaptations. This finding supports the use of these ratings as tools for monitoring and prescribing exercise intensity in this population.
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Tracking Fatigue With The Rpe Scale After A Standardized Submaximal Warm-up

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Fatigue can influence the performance in negative way, especially when it is not adequately monitored and there is not an appropriate workload to rest ratio, thus resulting in non-functional overreaching and overtraining.
PURPOSE: To investigate the relationship between Hooper index (HI) taken before training session and rate of perceived exertion (RPE) after a submaximal standardized warm-up in healthy active adults.
METHODS: 15 subjects performed a 15-day training protocol with standardized warm-ups. Before all training sessions HI was administered, while at the end of the warm-up RPE was measured using the Borg category-ratio-10 scale. Subjects performed standardized 7-minute warm-ups at light intensity (30-39% heart rate reserve) including mobility (ankle, pelvis, wrist, arm) and aerobic exercises (jogging on place, jumping jack, running back and forth, kicking run, pungiball and side run). Relationship between HI and RPE responses were analyzed via linear mixed model (LMM) using HI and RPE values as fixed effects while the random effects were represented by the subjects' individual response. R-squared (R^2) was calculated and likelihood-ratio test used to compare the LMM with the linear regression analysis.
RESULTS: LMM (p=.015; R^2=.20) had an estimated standard deviation for the random intercepts of 1.79AU (95%CI: 1.15-2.78) with standard error of .40. Likelihood-ratio test showed that LMM offered a significant (Chi^2:30.96; p<.0001) improvement over a linear regression with only fixed effects, meaning that the intercepts were significantly different between subjects. To clarify the relationship between RPE and HI, combining the fixed and random intercepts, an equation was developed: $HI = 8.30 + 0.79 \times RPE + U0_j + \varepsilon_i$
CONCLUSIONS: The results of this study demonstrate that HI and post warm-up RPE change in parallel during periods of increased training, suggesting that HI and RPE could be efficient and more practical to investigate non-functional fatigue during submaximal warm-ups. This information can be used to regulate and adapt the workload during period of training and conditioning to avoid non-functional overreaching or overtraining.

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IMPACTS OF COOL-DOWN DURATION ON PERCEPTIONS OF EXERTION AND ACCOMPLISHMENT

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Psychological responses to exercise can be highly variable and have been shown to predict future exercise behavior. Research to date has focused primarily on the intensity of the primary exercise session and has not yet evaluated the potential impacts of altered cool-down duration and autonomy on pleasure responses.
PURPOSE: Test the impact of cool-down duration on perception of exertions and accomplishment.
METHODS: 12 participants (6 females, 6 males; BMI = 24 $\pm$ 4; age = 23 $\pm$ 6) completed 4 continuous, heavy, intensity exercise trials after maximal exercise testing. All trials were composed of a 2-minute warm-up followed by 20 minutes of continuous heavy exercise 10% above ventilatory threshold, followed by different cool-down durations: 1-minute, 5-minutes, 10-minutes, and self-selected. Variables of interest were accomplishment, autonomy, and remembered exertion.
RESULTS: Repeated measures ANOVA revealed no differences in remembered exertion immediately and 24 hours after exercise (p = .658 and p = .655). There were also no differences in accomplishment post exercise between the different cool-down durations (p = .281). Exploratory effect size calculations yielded small effects for all comparisons (Cohen's d < .2).
CONCLUSION: Early findings suggest that there were no differences among cool-down durations for remembered exertion and accomplishment. This demonstrates that the provision of autonomy and manipulation of cool-down durations will not significantly change the perception of remembered exertion and accomplishment following intense continuous exercise. Findings should be interpreted with caution and future analysis of the full data set after adequate power is achieved will further illuminate this issue.

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Differential Effects Of Exercise Induced Muscle Damage On Multiple Noxious Stimuli

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Many clinical musculoskeletal pain conditions are characterized by chronic inflammation. Inflammation leads to the release of inflammatory cytokines that activate or sensitizes nociceptors leading to pain sensitivity. An unresolved issue is whether inflammation affects all nociceptors in a similar manner. Exercise induced muscle damage in the days following a bout of eccentric exercise has been proposed as a valid model of simulating clinical inflammatory pain to be used in healthy samples.
PURPOSE: We sought to induce localized inflammation using eccentric exercise to test various painful stimuli (pressure, thermal, and electrical) regarding an individual's pain sensitivity in a limb that was eccentrically exercised versus a limb that was not exercised.