BASES/PC8

An investigation of the relationship between breast kinematics and subjective ratings of breast support during treadmill activity

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Background: Numerical analogue scales are often used in breast biomechanics research to assess factors associated with an increase or decrease in perception of a variable. For example, correlations between breast comfort and breast kinematics have revealed a negative relationship (Scurr et al., 2010: Journal of Sports Sciences, 28(10), 1103–1109). Previous research calculated correlation coefficients between ratings of perceived breast support and vertical breast displacement during a variety of vigorous activities, showing significance in less than half of the bra conditions tested (Lawson & Lorentzen, 1990: Clothing and Textile Research Journal, 8(4), 55–60). It was suggested that perception of support is more multifaceted than merely a feeling of vertical motion. It was therefore hypothesised that subjective rating of support would show a stronger correlation with three dimensional breast kinematics than vertical displacement alone during treadmill activity.

Purpose: The aim of this investigation was to assess the relationship between participant's subjective assessment of breast support and 3D breast kinematics during treadmill activity.

Methods: Following institutional ethical approval, 12 participants of bra size 34D, 36C and 38B took part in treadmill activity in a no bra and everyday bra condition. Breast kinematic data were recorded according to Scurr et al's (2010) protocol. After each trial, participants rated their perceived breast support using a numerical analogue scale of 0 to 10. Spearman's Rho correlation coefficients were calculated between subjective ratings and breast displacement, velocity and acceleration in a vertical, mediolateral and anteroposterior direction.

Results: A moderate relationship was found between subjective rating and; displacement in the anteroposterior ($r_s = -.545$, $p = .000$) and vertical directions ($r_s = -.430$ $p = .003$), velocity in all three dimensions ($r_s = -.365$, $p = .012$; $r_s = -.325$, $p = .026$; $r_s = -.418$, $p = .003$ for anteroposterior, mediolateral and vertical respectively) and acceleration in the mediolateral ($r_s = -.405$, $p = .005$) and vertical direction ($r_s = -.484$, $p = .001$).

Discussion: In accordance with previous research, the results show that greater breast movement is associated with lower subjective ratings of support (Lawson & Lorentzen, 1990). In addition, the results show that subjective ratings of breast support are more closely correlated with 3D breast kinematics than just vertical displacement, as past research has assessed, which accepts the hypothesis. This indicates that women's perception of breast movement is influenced by 3D breast kinematics. Sports bras should therefore be designed to limit breast movement in three dimensions, not only to improve women's comfort but also to increase their perception of the support provided by the bra.

Conclusion: The results suggest that measures of perceived breast support may be used as an additional source of feedback on brassieres performance, alongside breast kinematic data. Use of this method of rating scale in breast biomechanics research is encouraged as a measure of perceived breast support due to the correlation with 3D breast kinematics.

BASES/PC9

The effect of Rating of Perceived Exertion (RPE) on the exercise-mood relationship

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Background: A considerable amount of literature attests to the benefits associated with regular exercise on physiological well being (Berlin & Colditz, 1990: *Am J Epidemiol* 32, 62–628). However despite this many people do not partake in the minimum recommended amount of exercise (30 minutes per day a minimum of five times per week) (ACSM, 2007: Guidelines for exercise testing and prescription). There is now recognition within exercise psychology literature of immediate improvements in mood state following aerobic exercise, which may bode well for attracting the sedentary population. Despite this there is scant research investigating the effects of perceived exertion on the mood changes associated with exercise.

Purpose: This study was designed to examine the effect of rating of perceived exertion (RPE) on the relationship between exercise and mood, in a natural exercise setting.

Method: Thirty participants consisting of 24 males and 6 females completed a one mile run, the positive and negative affect scale (PANAS) was administered before and after exercise to give pre and post scores for both positive and negative mood. Rating of perceived exertion was also reported after exercise using Borg's perceived exertion scale and participants were separated into high, medium and

low groups based on their (RPE) score. 2 × 3 (Time × RPE group) mixed analysis of variance, with repeated measures on the first factor, examined the effects of exercise on positive mood subject to (RPE) group.

Results: Overall participants reported significant improvements in both positive and negative mood state in response to exercise; the high (RPE) group demonstrated the greatest improvements in positive mood whereas the moderate (RPE) group demonstrated the greatest improvements in negative mood.

Discussion: This study demonstrates that an acute bout of aerobic exercise can facilitate improvements in both positive and negative mood. The findings have implications for the prescription of exercise designed to maximize mood improvement and thus capitalize on the improvement to subsequently improve exercise participation and adherence. Exercise programs may wish to encourage participants to work at a moderate to high level of exertion.

Conclusion: The results also have implications for clinical psychologists giving more support for exercise as an effective treatment for depression. Future research should focus on establishing a correlation between people who experience improved mood in response to exercise and subsequent exercise adherence.

BASES/PC10

The effect of breast support on ventilation and breast comfort perception at the onset of exercise

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Background: Previous research has advocated the use of a sports bra when exercising due to the reduction in breast movement and discomfort they provide, especially for larger-breasted women (Scurr et al., 2010; Journal of Sport Sciences, 29(1), 55–61). One study has investigated the effect of breast size on respiratory function during sub-maximal running (Bowles et al., 2005: Medicine & Science in Sports & Exercise, 37(9), 1633–1640), yet it is not known how different levels of breast support may affect ventilation and comfort in larger-breasted women during exercise.

Purpose: The purpose of this exploratory study was to investigate the influence of breast support on ventilation and breast comfort at the onset of treadmill running.

Methods: Following institutional ethical approval, 9 larger-breasted (cup sizes D to E, mode 34 DD) female participants were recruited (mean age 25, s = 4 years, height 1.69, s = 0.03 m, mass 72.31, s = 7.83 kg). Participants were required to run on a treadmill (1) for two minutes (9.3 km · h^{-1}, 1% incline) in three breast support conditions: no bra (NB), everyday bra (EB) and sports bra (SB), in a random order. An online gas analyser system (2) recorded ventilatory variables breath-by-breath and was averaged every 15 s. Ten minutes rest was given between breast support conditions. Immediately after each treadmill test breast comfort was rated using a 0.1 m visual analog scale. Two-way repeated measures ANOVAs were used to assess differences in ventilatory variables across time points and support conditions; Wilcoxon signed-ranks tests were used to compare breast comfort data across support conditions. The alpha level was 0.05 unless a Bonferroni adjustment was applied.

Results: Breathing frequency (breaths · min^{-1}) and the ventilatory equivalents for oxygen (VE/VO_2) were lower with no support ($P < 0.001$, $\eta^2 = 0.78$; $P = 0.002$, $\eta^2 = 0.65$) compared with both supported conditions. Tidal volume (L) was higher with no support ($P = 0.006$, $\eta^2 = 0.47$) compared with both supported conditions. In contrast, these ventilatory variables did not differ between bra conditions ($P > 0.05$). Breast comfort was different between all conditions ($P = 0.007$), with the SB rated as the most comfortable ($P = 0.017$). Participant's comments on running bare-breasted included; ''Sometimes I held my breath when thinking about the discomfort'' and ''It felt harder to run…I felt my body tense up''.

Discussion: Physiological results suggest that when participants ran bare-breasted breath-holding may have occurred; this could be linked to the greater amount of discomfort felt in this condition. Comments from participants suggest that breath-hold may be happening due to upper body muscle tension; future research should investigate the effect of breast support on muscle activity in the thoracic region. Despite differences in breast comfort between the two bra conditions, bra type did not affect ventilatory variables. As the sports bra did not have an adverse effect on ventilation, the use of a sports bra for sub-maximal running is promoted due to the higher level of breast comfort experienced.

Conclusion: The results suggest that wearing breast support changed ventilatory variables at the onset of running, compared to bare-breasted running. This study utilised a 2 minute run as this was the longest some participants could manage bare-breasted. As this preliminary investigation did identify ventilatory adaptations, but it is rare for women to run with no breast support, future