



Original Research

The Effect of Moderate Intensity Aerobic Exercise on Affect and Exercise Intention in Active and Inactive College Students

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ABSTRACT

International Journal of Exercise Science 12(5): 1070-1079, 2019. Physical activity has long been established as an essential behavior for vital physical and psychosocial health outcomes (16, 18), but lack of physical activity is still a rampant problem worldwide (7). Numerous factors influence physical activity participation, including affect, a measure of well-being. Research has found that affect increases following an exercise session, though some recent studies have discovered that affect tends to be lower when measured during exercise (14). Therefore, the purpose of this study was to explore the differences in affect between active and inactive college students during exercise. A total of 72 participants cycled for 30 minutes at 65-75% of their age-predicted maximal heart rate and completed the previously validated positive and negative affect scale (PANAS; 24) near the end of the exercise bout. Following the exercise session, participants completed measures to assess future exercise intention. No significant difference was found in affect between active and inactive individuals, suggesting that affect during exercise may not be a deterrent to physical activity as previously thought. However, a significant gender difference was present in positive affect. Namely, males reported experiencing higher levels of positive affect than females during the exercise bout, which may indicate that the males enjoyed the exercise more than females. Given these gender discrepancies, practitioners may need to consider using different training techniques or interventions for males and females.

KEY WORDS: Emotional well-being, exercise barriers, physical inactivity, exercise adherence

INTRODUCTION

Regular physical activity is known to decrease risk of cardiovascular disease, diabetes, obesity, anxiety, and depression (11, 16). Physical inactivity is a rampant problem worldwide, with approximately two-thirds of the adult population not meeting minimum recommendations for physical activity (7) and 68% of American adults classified as overweight or obese (15). Exercise, or lack thereof, has become an increasingly larger concern in regard to the college student population, where rates of exercise participation have been known to decline and weight gain is also observed (5, 14). There are a number of factors that influence exercise participation, with one of those factors being affect, a measure of well-being. Research on affect has found that affect increases following an exercise session, however, some recent studies have also found that when

measured during exercise, affect tends to be lower (14). In other words, while exercise may make people feel better afterwards, if they are not enjoying themselves, this could explain their lack of exercise participation. However, there are few studies to date that have examined affect during exercise, so more research in this area is necessary. Therefore, the purpose of this study was to explore the differences in affect during exercise between active and inactive college students. Examining specific differences in affect during exercise between active and inactive college students will advance the research in this area. Additionally, this research could also lead to the improved design of exercise interventions and strategies to increase physical activity in college students.

An individual is considered to be physically active when they have been engaging in physical activity for at least 30 minutes per day, three days per week for three months (1). Exercise adherence is achieved when a person participates in consistent exercise for at least six months (1). College students are of particular interest when discussing exercise adherence, given that research has often found a decline in exercise participation as students transition from high school to college (5). Research conducted in 1995 by the National College Health Risk Behavior Survey found that less than two thirds of students partook in sufficient amounts of physical activity (5). The level of activity by college students was reported to be lower than reported by high school students during the same year. As noted by Douglas (as cited in 5), data collected through a seven-day physical activity recall found that 64.7% of high school students had participated in vigorous activity during the previous week. These statistics depict the exercise deficit after this transition from high school to college. Research on variables affecting exercise participation is imperative to assist in developing effective physical activity interventions for this population. In particular, aerobic exercise has been found to yield a multitude of physical and psychological benefits that can promote exercise adherence.

According to the American College of Sports Medicine (ACSM), moderate intensity aerobic exercise is reached once a person's heart rate reaches 40-59% heart rate reserve or 64-76% of their age predicted maximal heart rate (220-age). Exercise should be at an intensity that elicits an evident increase in heart rate and breathing (1). The individual should have the ability to comfortably maintain this intensity of exercise for an extended period of time (i.e., 45 min). Furthermore, moderate intensity exercise is well within a person's capability for exercise, making moderate intensity exercise achievable for most individuals.

There are numerous benefits to moderate intensity aerobic exercise. In addition to physical and physiological benefits of regular aerobic exercise, a multitude of psychosocial benefits can be gained as well. For example, aerobic exercise has been associated with a decreased risk of depression, stress, and anxiety, and improvement in mood, emotions, well-being, and affect (14).

Affect can be defined as "a more general 'valenced' response, that is, a good-bad or pleasure-displeasure feeling" (14). Watson et al. (25) suggest that positive and negative affect are characterized by the level of subjective pleasure or displeasure, energy, and concentration.

Research examining the relationship between exercise and affect is valuable, as it provides insight into exercise participation tendencies, such as exercise mode preference and enjoyment factors. Therefore, knowledge of what exercise variables invoke positive and negative affect allows us to understand potential barriers for exercise participation. For example, Boucher and Trenske (4), found that the influence of music and sensory deprivation on perceived exertion and affect during exercise was load dependent. Meaning, as more music or sensory deprivation was applied, perceived exertion decreased, and affect became more positive. In another study (3), trained and untrained individuals were administered the Positive and Negative Affect Scale (PANAS; 25) during three, 10-minute exercise bouts at mild, moderate, and vigorous intensities. The results from this study indicated that trained individuals experienced increased levels of positive affect during moderate and vigorous intensities, while the untrained did not. However, untrained individuals did experience lower levels of negative affect during the exercise bouts (3). This study suggests that individuals that regularly partake in exercise may feel better during an exercise bout than those who do not. Rudolph and Butki (22) analyzed affective responses to short bouts of exercise to address the common exercise participation barrier of time. Results showed that a 10-minute bout of aerobic exercise on a treadmill was an adequate amount of time to produce increased levels of positive affect in the participants (22). Furthermore, studies such as Puente and Anshel (20), also found a significant relationship between positive affect and enjoyment with self-determined regulation of exercise. This further justifies the importance of affect as a factor determining a person's exercise participation. Mood, a subcategory of affect, has also been found to influence exercise participation.

Emotions and moods fall under the realm of affect. Emotions are states that result from an individual's appraisal of the impact an object, person, or event will make on their goals or well-being. Examples of emotions include fear, guilt, and pride. Moods are subjective states, have cognitive foundation, and can determine behavior (14). Some of the differences between emotions and moods include: (a) moods are classified under a longer period of time, while emotions are brief, (b) rationale behind emotions are more easily identified, while moods are fleeting and usually unexplainable, (c) emotions tend to be more intense and diverse than moods (14).

Mood has also been suggested to be a contributing factor in whether or not a person adheres to exercise. As mentioned previously, it is highly unlikely that people will participate in an activity that they do not enjoy (14). Studies (e.g., 17) have found the distraction hypothesis to be a useful tool in improving mood. This theory suggests that mood may improve during and after exercise if exercise participants are distracted from negative stimuli. One study (19) found that a cognitive-behavioral stress management program had a positive effect on athlete's acclimatization to high intensity exercise training. Participants who engaged in the program experienced less stress, which is associated with negative affect, when beginning an exercise program of high intensity. Another study (23) found that there was an increase in tension-anxiety following high intensity exercise; subsequently, there was a decline as participants recovered. Mental fatigue showed a similar response, while low intensity exercise reduced anxiety, and high intensity remained unchanged (23). Though mood may influence students' exercise participation, perceived exertion could also serve as a contributing factor.

Perceived exertion may also correlate with negative emotions and affective states. Exercise difficulty and comfort levels may affect perceived exertion and should be considered when studying affect levels during exercise as well. Hardy and Rejeski (10) found that how a person feels (affect) can differ from what they feel (perceived exertion). A moderate relationship was found between ratings of perceived exertion (RPE) and affect at mild and vigorous intensities of aerobic exercise, but no significant correlation was found between RPE and moderate intensity (10). Therefore, at a moderate intensity, discomfort may not significantly influence a person's affective domain. Depending on how perceived exertion affects the affective domain, there may be an association between levels of perceived exertion and exercise participation.

Previous studies have laid the framework to reproduce and further investigate the effects of exercise on the affective domain. Further research on affect during exercise should refrain from providing distractions such as music, verbal encouragement, or visual mediums (television, phone, etc.), in order to accurately depict participants' affect during exercise. This will decrease the number of variables presented in the study and allow for a more accurate analysis of the effects of exercise on specifically the affective domain. Furthermore, studies should focus on college students, male and female, active and inactive, as differences between these groups may provide further insight of exercise barriers and interventions necessary. As there are few studies to date that have examined affect during exercise, more research in this area is necessary. Therefore, the purpose of this study was to explore the differences in affect during exercise between active and inactive college students. Examining specific differences in affect during exercise between active and inactive college students will advance the research in this area and could also lead to the improved design of exercise interventions and strategies to increase physical activity in college students. The following research questions guided this study:

- 1) Is there a difference in affect between active and inactive college students during moderate-intensity exercise?
- 2) Is there a difference in affect between males and females during moderate-intensity exercise?
- 3) Is there a relationship between level of affect during moderate-intensity exercise and future exercise intention?

METHODS

Participants

An *a priori* power analysis was performed using G*Power 3.1 to determine the sample size needed for the study. Given the estimated effect size of 0.75 identified from previous studies on affect (e.g., 8) it was determined a sample size of at least 62 participants should be obtained. A total of 72 students ($n = 41$ male; $n = 31$ female) who predominately identified as Hispanic ($n = 42$) participated in this study. The remainder of the participants identified as Caucasian ($n = 25$), Black ($n = 2$), and Asian ($n = 2$). Just over half of the participants ($n = 38$) reported engaging in regular physical activity, while the remainder ($n = 34$) were classified as inactive. The PANAS is a 20-item measure of affect, consisting of two subscales - positive affect and negative affect (25). The PANAS has been found to have both high internal consistency and validity (25). The PANAS is completed using a 5-point Likert scale with anchors of 1 (very slightly or not at all) to

5 (extremely) to assess how intensely individuals currently feel each emotion descriptor. An example of a negative affect item is "distressed," while "happy" is an example of a positive affect item. Cronbach's *alphas* for the present study were .899 for the positive affect subscale and .763 for the negative affect subscale.

A rate independent cycle ergometer (Lode Corival; Groningen, Netherlands) was used for the exercise bouts.

The Exercise Intention Index (modified from 6; 12) is an 8-item measure of exercise intention. The Exercise Intention Index is completed using a 7-point Likert scale with anchors of 1 (strongly disagree) to 7 (strongly agree) to assess the extent individuals intend to participate in exercise following the study. The Cronbach's *alpha* for the current study was .829.

The Exercise Ratings Index (modified from 6; 12) is a 2-item measure of comfort and difficulty. The Exercise Ratings Index is completed using a 7-point Likert scale with anchors of 1 (uncomfortable/difficult) to 7 (comfortable/easy) to assess the level of discomfort individuals experience throughout the exercise bout.

Protocol

Following institutional review board approval, convenience and snowball sampling were used to recruit college students from a medium regional university in the south-central United States. More specifically, participants were recruited by contacting university faculty and asking faculty to share a recruitment flier with their students. Snowball sampling was also used by encouraging participants to recruit other individuals to participate as well. Once participants contacted the principal investigator, they were scheduled an appointment in the university's human performance laboratory. Participants were scheduled individual sessions for privacy and validity purposes and were informed of the requisite attire (athletic attire and closed toed shoes appropriate for exercise).

Prior to participation, participants provided informed consent, then completed a health history questionnaire and exercise participation survey. Based on guidelines set by American College of Sports Medicine (1), only participants who did not require medical clearance prior to engaging in moderate exercise were allowed to participate in the study. Additionally, pregnant females or participants who were taking medication that could alter their exercise heart rate were also excluded from participating. Prior to beginning the exercise bout, participants were fitted with a heart rate monitor (Polar FT1, Bethpage, NY). Exercise intensity was determined using 65-75% of participants' age predicted maximal heart rate yielding a moderate intensity. The PANAS was then explained to participants prior to engaging in the exercise bout, as they were to complete the scale verbally during the exercise. The cycle ergometer was then adjusted to the height of each participant. Participants then cycled for 30 minutes at a moderate intensity. During the first two minutes, participants exercised at 50 watts. Depending on participants' heart rate after this initial stage, the work rate progressed at 25-50 watts every two minutes until the his/her heart rate reached 65-75% of the previously calculated age predicted maximal heart rate. This typically took between two to four stages (4-8 min total time) to reach. Once the target

heart rate range had been reached, participants continued steady state exercise at the corresponding work rate for 22-26 min (depending on how many stages were required to yield the target heart rate). After completing 28 minutes of cycling, participants were then instructed to continue pedaling and verbally complete the PANAS displayed to them via a large poster board. After the 30 minutes of exercise had been completed, the participant was given the option to cool down and cycle with no resistance. Following the exercise session, the participants were asked to complete a short survey that asked about his/her intention to participate in exercise in the future. Additionally, participants were asked to complete another short survey asking about the amount of discomfort he/she experienced during the exercise session, as well as how difficult he/she found the exercise bout to be in order to control for possible apparatus (i.e., seat) discomfort.

Statistical Analysis

Per Tabachnick and Fidell's (24) recommendations, data were initially screened for normality. Reliability analyses were performed on the PANAS subscales and the exercise intention measure. Descriptive data (e.g., means, standard deviations) were calculated for all variables using SPSS v. 25. Mann-Whitney U tests were conducted to assess differences between gender and activity level on the dependent variables (affect and exercise intention). A Spearman rank-order correlation was performed to assess the association between level of affect and exercise intention. An alpha level of .05 was used for indication of statistical significance.

RESULTS

No significant differences were observed between inactive and active participants on amount of discomfort experienced ($U = 492.5, p = .078$) or on level of difficulty ($U = 731.5, p = .324$). Likewise, no significant differences were observed between males and females on amount of discomfort experienced ($U = 413, p = .063$) or on exercise difficulty ($U = 842.5, p = .067$). Thus, amount of discomfort experienced during the exercise session and level of difficulty of the exercise did not impact the results of the present study.

There was no significant difference between active and inactive individuals on positive affect scores ($U = 664.5, p = .834$). Similarly, there was no significant difference between active and inactive individuals on negative affect scores ($U = 720, p = .397$). Medians, means, and standard deviations are provided in Table 1.

Table 1. Activity level and affect.

Activity Level	n	Positive Affect		Negative Affect		Exercise Intention	
		Median	Mean \pm SD	Median	Mean \pm SD	Median	Mean \pm SD
Inactive	41	33	33 \pm 9	13	15 \pm 5	6	5 \pm 1
Active	31	35	32 \pm 8	13	13 \pm 3	7	7 \pm 1

A significant difference was found between males and females on positive affect scores ($U = 440, p = .026$) as males scored significantly higher on positive affect than females. There was no significant difference between males and females when comparing negative affect scores ($U = 514.5, p = .163$). Medians, means, and standard deviations are provided in Table 2.

Table 2. Gender and affect.

Gender	n	Positive Affect		Negative Affect		Exercise Intention	
		Median	Mean \pm SD	Median	Mean \pm SD	Median	Mean \pm SD
Male	41	34*	34 \pm 7	14	14 \pm 4	6	6 \pm 1
Female	31	28*	29 \pm 9	11	14 \pm 5	7	6 \pm 1

Note: * $p \leq .05$

No significant relationship was observed for positive affect and exercise intention ($r_s(70) = 0.098$, $p = .415$). Likewise, no significant relationship was also found for negative affect and exercise intention ($r_s(70) = -0.058$, $p = .629$). Affect was not related to exercise intention in this study.

DISCUSSION

Although there was no significant difference between active and inactive individuals on affect scores, the data still provides useful information. While previous research has found that active individuals often feel more positively and less negatively than those who are inactive during a short bout of exercise (e.g., 9), the data suggests that individuals from both groups in the present study felt generally the same. This information is valuable to the fitness professional, as similar interventions and training may generate similar results for both active and inactive populations. Meaning, that the barrier for exercise participation in our sample was not what was previously thought to be affect during exercise.

There was a significant difference between men and women when comparing positive affect. Men experienced more positive affect than women during the exercise bout. This could mean that males enjoyed the exercise more than females. Additional research is necessary to determine if enjoyment is the reason for this difference, however other studies have found support for this. According to a study done by Azevedo, Araújo, Reichert, Siqueira, da Silva, and Hallal (2), men consistently displayed higher activity levels than women, with 47.9% of the men, but only 24.6% of the women, reporting enjoyment as the main reason for participation. Given these gender discrepancies, practitioners may need to consider using different training techniques or interventions for males and females. For example, practitioners may need to employ techniques aimed at improving affect, such as allowing exercisers to self-select music (13) in females more so than males.

No significant relationship between affect and future exercise intention was found during the present study. Participants who experienced higher levels of positive affect did not indicate any greater intention to exercise in the future than those who experienced lower positive affect. Likewise, participants who experienced lower levels of negative affect did not report any greater intention to exercise in the future than those who experienced higher levels of negative affect. Contradictory, a study conducted by Helfer et al. (12) found positive affect post-exercise correlated with higher levels of exercise intention. This may be due to the fact that they measured affect post-exercise while our study focused on affect during exercise. Future studies should further explore the affect and exercise intention relationship when assessing affect during exercise.

Despite the interesting findings, there are potential limitations in this study. One potential limitation could be social desirability response bias (21). Social desirability is the tendency for individuals to provide responses mirroring socially desirable traits rather than the latter (26). This may have occurred given the PANAS was completed verbally. Another potential limitation may be the PANAS instrument. While it has been used in previous exercise studies, is not an exercise specific measure of affect. The mode of exercise used for the study may be another potential limitation. For example, some participants may have preferred a treadmill to the cycle ergometer, therefore, making the exercise bout less enjoyable. Furthermore, rather than allowing participants to choose their preferred mode of exercise, participants were assigned to the cycle ergometer. Previous research, such as Ekkekakis et al. (9), found that seeking input from participants may impact affective scores. Positive affect scores may have increased and negative affect scores decreased if participants were allowed to choose their preferred mode of exercise. Additionally, while the determination of moderate intensity using 65-75% of participants' age predicted maximal heart rate was more convenient for our study, as it is a quick estimation, using the heart rate reserve or reserve volume of oxygen uptake method would have been more accurate.

Despite these limitations, the results from this study provides valuable information for the fitness professional. Namely, given there was no significant difference between active and inactive individuals on positive and negative affect scores, similar interventions and training may generate similar results for both inactive and active populations. Additionally, given the gender discrepancies found for positive affect, practitioners may need to consider using different training techniques or interventions for males and females. Finally, as there was no relationship between affect and future exercise intention in this study, professionals in the fitness industry may find it useful to rely on alternative methods to increase exercise intentions and exercise adherence.

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