



*Original Research*

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## **The Effect of a Single Bout of Surfing on Exercise-Induced Affect**

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### ABSTRACT

*International Journal of Exercise Science 10(7): 989-999, 2017.* Exercise-induced affect (EIA) has been well documented and is often composed of positive affect, negative affect, tranquility, and fatigue. Research on EIA has focused on mainstream sports such as running, walking, or cycling; however, no research has evaluated the influence of action sports participation in activities such as surfing on EIA. The current study examined the effect of a single 30-min surfing bout on EIA in 107 adult volunteers. An additional purpose was to determine if change in affect was similar based on surfing history, surfing frequency, and surfing skill level. To assess EIA, each participant completed the Physical Activity Affect Scale (PAAS) prior to and immediately following the 30-min surf session. Dependent *t*-tests were used to examine differences between pre- and post-test EIA. For the secondary purpose, a change score (PAAS posttest-PAAS pretest) was computed for each subscale. One-way ANOVAs were performed to determine differences among comparisons of surfing history, surfing frequency, and surfing skill level, and the change score for each of the 4 subscales. EIA was significantly altered by surfing, with significant improvements in positive affect and tranquility, and significant reductions in negative affect and fatigue. There were no significant differences among surfing history, surfing frequency, and surfing skill level, and positive affect, negative affect or tranquility. However, there were significant differences between fatigue and surfing history, surfing frequency, and surfing skill level. The results indicate that a single 30-min surfing bout may provide positive benefits for the participant. Implications for future surfing research and EIA are discussed.

**KEY WORDS:** Positive affect of surfing, tranquility of surfing, psychology

### INTRODUCTION

It has been determined that physical activity has a positive impact, not only on an individual's physical well-being, but also on one's psychological state (24). Exercise-induced affect (EIA) has been well documented and explored in the recent past and is often composed of positive affect, negative affect, tranquility, and fatigue. Positive affect is the positive feelings created by a specific stimulus, while negative affect is the negative feelings created by a specific stimulus (7, 14, 23). Affect can be described as the positive or negative feelings created by a specific stimulus (8, 31). Russell's two-dimensional model of affect (31) is widely accepted in the

physical activity/exercise domain. The model consists of two bipolar axes representing affective valence (pleasure-displeasure) and activation (arousal-sleepiness). These two dimensions of affect form quadrants based on the different combinations of valence and activation (8). Russell's model has been supported by numerous different studies including Thayer's (36). Thayer suggested that exercise is capable of regulating mood due to the enhancement of energetic arousal and the reduction of tense arousal (19).

Researchers have used different self-report measurement tools to assess EIA. Each has advantages and disadvantages but, although debated (10), have been accepted as tools to measure EIA. Profile of Mood States (POMS) (18) is used to measure affect and is not specific to exercise. Since POMS is not specific to exercise, several additional exercise specific self-report tools were developed and three of the most common are: Exercise-induced Feeling Inventory (EFI), Subjective Exercise Experiences Scale (SEES), and Physical Activity Affect Scale (PAAS). The use of PAAS is beneficial as it combines aspects of the EFI and SEES into a single instrument without increasing the number of items in the scale (19). The PAAS is a self-report measure consisting of 12 items in which the individual rates his/her current affect on a 5-point Likert scale ranging from 0 = "do not feel" to 4 = "feel very strong" (14). The instrument contains four main subscales assessing positive affect, negative affect, tranquility, and fatigue each containing three items. Its multi-dimensional configuration is grounded on models of valence and arousal (8, 20), and evidence has supported its validity and reliability (8,20). In addition, strengths of using the PAAS has been found in its invariance (4) and theoretical support by the circumplex model (15). Internal consistency (alpha) for the PAAS has ranged from .736 to .913. Lox et al. (19) found Cronbach Alpha coefficients of .94 (positive affect), .86 (negative affect), .91 (fatigue), and .84 (tranquility).

Single (i.e., acute) bouts of exercise have been shown to increase positive affect (7, 8, 9, 32, 34, 35), energy (36), tranquility (1, 30), and positive well-being (37) while decreasing negative affect (8, 28), depression (2, 3, 5), anxiety (37), and fatigue (27). Yeung (38) analyzed nearly two decades (1976-1995) of peer-reviewed literature evaluating the effects of acute physical activity on affective mood states. Activities included in the review were swimming, aerobics, rowing, cycling, running, weight training, walking, and a step test. Of the 81 studies reviewed, over 85% reported some degree of measured enhanced EIA.

Several research studies have investigated the effects of a single short-term (< 60 mins) bout of exercise. Daley and Welch (7) used the SEES to determine if more time spent exercising on a cycle ergometer influenced EIA. One group cycled for 15 mins while the other for 30 mins and the authors concluded that EIA was increased regardless of exercise duration. Hansen, Stevens, and Coast (12) using the POMS found improvements in vigor, fatigue, and total mood occurred after just 10 mins of cycle ergometer exercise. Reed and Ones (30) conducted a meta-analysis of 158 research studies examining the effects of single bouts of aerobic exercise on EIA. The authors found there were no differential effects of exercise duration on post-exercise affect. In fact, after single bouts of exercise lasting in duration from 7 to 60 mins, the post-exercise affect scores were within 0.20 of a standard deviation (*SD*). A study using PAAS investigated the difference in affect in participants completing a brief walking session or a less

common exercise, hula-hoop, session (33). The results supported greater improved affect in the less common exercise condition. Therefore, the research supports that a single exercise session lasting 60 mins or less positively affects EIA.

Several studies have investigated effects of exercise intensity or no exercise at all (i.e. a control group) on affect. Hogan, Mata & Carsten (13) studied cognitive performance and affective experience immediately following a single bout of moderate exercise. The participants were randomly assigned to one of two experimental conditions: (a) 15 mins of moderate exercise, or (b) 15 min of no exercise/control. Momentary affect experience was measured before and after the sessions. The data supported that exercise is associated with increased levels of high-arousal positive affect and decreased levels of low-arousal positive affect relative to the control condition. Toskovic (37) also investigated the effects of a single bout of Taekwondo on college-aged (ages 18 to 21 years) students' mood states vs students in a non-exercise class. Twenty male and female college-aged students enrolled in a 75 mins Taekwondo activity class as well as 20 male and female college-aged students enrolled in a 75 mins general lecture class completed the POMS (23) both immediately before and after the respective class. The results of this study indicated that participation in a single bout of dynamic Taekwondo can produce immediate positive changes in mood. In another study employing the POMS, McGowan, Talton, and Thompson (22) examined the effects of a single bout of weight lifting on the mood states of college-aged students. The experimental group participated in a weight lifting class while the control group listened to a lecture on sport psychology and took a short quiz. The results indicated differences between the groups' posttest subscale scores as well as significant differences in the experimental groups' subscale scores from pretest to posttest. The authors concluded that college students tended to exhibit significant decreases in negative affect following a single weight-training workout. These studies support that exercise has a positive effect on well-being compared with no exercise.

It has long been believed by surfers that positive affect is increased and that negative affect is decreased following a bout of surfing. However, such claims have been viewed with skepticism by non-surfers and members of the scientific community due to the lack of quantitative experimental research conducted in the psychological area of the sport. Fuchs and Shomer (11) completed a qualitative study which examined surfers' subjective experiences and established five central themes: 'a Surfing Lifestyle', 'The Addiction of Surfing', 'Competition: The Surfing Paradox', 'Sharing vs. Crowd Control', and 'Tranquil Mind: Surfing for a Balanced Life'. The theme that is of interest to this study is the last one listed, "Tranquil Mind: Surfing for Balanced Life" (11) which suggests that surfing is a way to maintain life balance when one is stressed due to external demands.

Additional qualitative studies include Caddick, Smith and Phoenix (5) who explored the effects of surfing on combat veterans experiencing posttraumatic stress disorder and found their well-being was enhanced by regular participation in the sport. Finally, Morgan (25) explored the utility of a surf program meant to shape resilience in disadvantaged children and found that participation in the activity improved both the physical health and psychological

resilience in vulnerable children. Therefore, previous qualitative research has indicated that participation in surfing has positive psychological effects.

Ultimately, the research on EIA has focused on mainstream activities such as running, walking, or other forms of aerobic exercise; however, no research has been found pertaining to the influence of participating in action sports such as skateboarding, snowboarding, and specifically surfing on affect. Surfing and other action sports are considered less common and may have a greater impact on affect (33). According to the Ainsworth's Compendium of Physical Activity scale (1), surfing is a moderate intensity activity and research has shown that moderate intensity activities have an increased positive affect (20, 29); therefore, a study of the effect surfing has on EIA is needed.

In addition, there have been no quantitative research studies examining the influence of surfing on EIA. Therefore, the primary purpose of this study was to examine EIA states, using PAAS, of male and female surfers prior to and immediately following a single 30-min bout of surfing. Specifically, it was predicted that positive affect and tranquility would increase and negative affect and fatigue would decrease after a single 30-min session of surfing. A secondary purpose was to determine if change in affect was similar based on surfing history, surfing frequency, and surfing skill level.

## **METHODS**

### *Participants*

This study implemented a quasi-experimental design since it compared pretest and posttest data on one group of participants. Participants were recruited from the parking lot of a popular Southern California beach surfing site during the hours of 6:00 to 11:59 A.M. during the peak summer months. To qualify for the study, individuals had to be over the age of 18 with previous surf experience. Beyond that there were no additional inclusion or exclusion criteria. There were 107 volunteer participants, 91 males and 16 females between the ages of 18 and 58 years ( $M$  age =  $28.14 \pm 8.27$  years). All participants possessed their own surfing equipment (e.g., surfboard, leash, and wetsuit).

### *Protocol*

All participants completed an approved Institutional Review Board (IRB) informed consent document and a General Demographics Questionnaire (GDQ). The GDQ was a self-report questionnaire consisting of five items on gender, age, years surfing, perceived surfing ability, and average frequency of surfing. The authors created the GDQ to quantify and better understand the surfing history and surfing-related behaviors of each participant. Due to the nature of recruiting participants from a parking lot where they were preparing to engage in exercise, the instruments that were used had to take minimal time to complete. The GDQ took no more than two minutes to complete. EIA was assessed using the PAAS (19) which sets out to measure "right now" EIA. The PAAS was utilized due to its brevity, ease of use, and emphasis on EIA. In addition, strengths of using the PAAS has been found in its invariance (4) and theoretical support by the circumplex model (15) compared to other multi-item

measurement scales. Participants completed the GDQ and the PAAS pretest immediately before commencement of the 30-min surf session and then the PAAS posttest immediately after completing the 30-min surf session. All participants completed the questionnaires individually. The primary researcher was available to address any questions or concerns. Their participation was voluntary, and they were not offered any compensation. There were lifeguards patrolling and/or on-duty while the study was conducted to minimize participant risk while surfing.

Data collection took place in the same parking lot where the participants were recruited. Individuals voluntarily chose to surf at this location and were preparing to surf when recruited by the researcher to participate in this study. Participants were asked if they would be interested in participating in a surfing research study. If they replied no, the researcher respected the response and left. If participants agreed and acknowledged they understood the purpose of the study, they were asked to complete the informed consent document. Participants were issued a wristband with an identification number printed on it. The identification number was also printed on the participants' GDQ, PAAS pretest and PAAS posttest to maintain anonymity and confidentiality. When the participants were ready to enter the ocean and begin surfing, they completed the GDQ and the PAAS pretest.

Upon completion of the GDQ and PAAS pretest, the participants were fitted with a Vestal Crusader digital wristwatch with a pre-established alarm set to sound 30 mins after activated. The participants were instructed to immediately return to the shoreline and exit the ocean upon hearing the alarm sound. Once the 30-min surfing session was completed and the participants returned to the shoreline, they were met by the researcher and completed the PAAS posttest. After completing the PAAS posttest, the participants were thanked for their participation.

#### *Statistical Analysis*

Prior to statistical analysis, the raw data were examined to ensure reliable data entry. Data were analyzed for normality and homogeneity of variances. Once established, a series of dependent sample t-tests were conducted to examine whether significant differences existed between pretest-posttest scores of the PAAS. All effect sizes (*ES*) were calculated using the mean difference divided by the pooled standard deviation. A change score (PAAS posttest-PAAS pretest) was computed for each subscale. One-way ANOVAs were performed to determine differences between pairwise comparisons of ability level, years of surfing, surfing frequency, and the change score for each of the four subscales. Bonferroni posthoc tests were completed to determine which pair(s) were significantly different. All statistical tests were computed using SPSS version 22 (IBM SPSS, Armonk, NY). Significance was set *a priori* at  $p < .05$ .

## **RESULTS**

As previously mentioned, 107 adults (91 males and 16 females), participated in the study. A significant difference between the PAAS pretest and the PAAS posttest was found for all four subscales (see Table 1). The data indicated that positive affect and tranquility significantly

increased after surfing, while negative affect and fatigue significantly decreased after surfing. Both positive affect and fatigue had large effect sizes while negative affect was moderate and tranquility was small.

**Table 1.** Pretest vs. Posttest EIA (N=107).

EIA Scale	Pretest EIA (M±SD)	Posttest EIA (M±SD)	T <sub>statistic</sub>	p-value	Effect Size
Positive Affect	5.9±2.6	9.8±2.1*	-12.9	0.00	1.2
Negative Affect	2.0±2.4	0.4±0.9*	6.9	0.00	0.7
Tranquility	5.8±2.7	8.6±2.3*	3.3	0.00	0.3
Fatigue	3.9±3.1	2.6±2.8*	-9.2	0.00	0.9

\* p < 0.05

Additional demographic information obtained from the self-reported GDQ included surfing history, surfing frequency, and surfing skill level (see Table 2).

**Table 2.** Demographics and Change Score Comparisons.

	Number of Participants	Positive Affect (M±SD)	Negative Affect (M±SD)	Tranquility (M±SD)	Fatigue (M±SD)
<b>Surfing History</b>					
< 1 year	9	2.8±4.0	-1.1±2.8	1.9±3.0	4.1±5.5*
1-3 years	9	4.2±2.8	-1.7±3.8	4.0±3.2	-0.9±1.6
4-6 years	14	3.6±2.5	-1.9±1.7	3.0±2.6	-1.5±2.8
7-9 years	21	4.5±3.8	-1.4±2.4	3.5±3.7	-1.7±3.5
>10 years	54	3.7±2.8	-1.6±2.3	2.3±2.8	-2.0±3.8
<b>Surfing Frequency</b>					
1X/ month	26	2.9±3.3	-1.0±2.7	2.0±2.2	1.3±4.9*
1-3X/month	11	5.5±2.7	-2.6±2.3	4.6±3.8	-3.4±3.2
1X/week	16	4.3±2.7	-2.2±2.0	3.4±3.2	-2.8±3.2
2-4X/week	33	4.1±3.4	-1.8±2.8	2.6±3.3	-1.9±3.4
5+X/week	21	3.3±2.5	-1.0±1.3	2.1±2.8	-1.1±3.2
<b>Surfing Skill Level</b>					
Beginner	10	2.6±3.8	-1.5±3.7	1.6±2.6	4.0±5.1*
Intermediate	12	4.3±2.6	-1.3±2.2	4.0±3.0	-1.3±1.6
Intermediate- Advanced	31	4.2±3.0	-1.9±2.4	2.4±3.2	-2.1±2.7
Advanced	38	4.0±3.0	-1.9±2.2	3.4±2.6	-2.0±4.3
Expert	16	3.2±3.1	-0.4±1.8	1.4±3.3	-1.4±3.8

\* p < 0.05

PAAS change score means and standard deviations for the PAAS subscales and demographic categories are also presented in Table 2. There were no significant differences among surfing history, frequency, and skill level for the subscales of positive affect, negative affect, and tranquility. However, there were significant differences found with fatigue and surfing history, frequency, and skill. Participants who surfed less than one year showed significantly higher fatigue than those participants who have surfed more than one year ( $F=5.41; p = 0.001$ ).

There were no significant differences among any of the other surfing history levels. Individuals who surfed less than once a month showed higher levels of fatigue than those who surfed more frequently ( $F=4.99$ ;  $p = 0.001$ ). There were no significant differences among any of the other surfing frequency categories. Lastly, beginners showed significantly higher levels of fatigue following a 30-min surf session than intermediate, intermediate-advanced, advanced and expert surfers ( $F=5.82$ ;  $p = 0.00$ ). There were no significant differences among any of the other levels of ability.

## **DISCUSSION**

The primary purpose of this study was to determine the effect a single 30-min surfing bout had on EIA states of male and female adult surfers. It was hypothesized that the participants' positive affect and tranquility would significantly increase while negative affect and fatigue would significantly decrease. The data support these working hypotheses as significance was determined for each of the PAAS subscales. Based on the effect sizes for positive affect and fatigue the results were very meaningful. Therefore, the results provide evidence that a single bout of surfing significantly alter EIA. Our findings are consistent with the existing literature regarding EIA and single bouts of short term exercise (6, 21, 26).

Results indicated a meaningful change in fatigue scores, providing evidence that fatigue was significantly decreased after the participants had surfed. These results are in alignment with Pierce and Pate who also found a decrease in fatigue following an acute aerobic dance session (22). One possible explanation for these results is that the participants surfed in the morning. Some of the participants may have reported feeling fatigue when they completed the pretest simply because he/she may have just woken up. Another explanation may be the participant had an anticipated affective response of decreased fatigue after surfing. This possible response is support by the work of Kwan, Stevens, and Bryan (17).

Our results did show that individuals who were beginners, surfed less than once a month, or surfed for less than one year did experience higher fatigue levels following the 30-min surf session. This increase in fatigue may be due to a possible lack of conditioning for the activity. It may also stem from not having a good session and not meeting the anticipated affective response (17)

There was also a significant increase in tranquility from pretest to posttest which is consistent with previous research (38). It can be concluded that tranquility significantly increased after the 30-min surfing session. Although not significant, the trend was that tranquility increased less for beginners and experts. This may be due to overall exhaustion in the beginner surfer and the surf session not meeting expectation in the expert surfer. The results illustrate that the sample population reported significantly altered EIA after a single 30-min bout of surfing. The results support the notion that surfing may be a sport that positively alters EIA. The present study adds to the small body of knowledge for surfing to be considered as a sport modality with the potential to significantly improve psychological factors similar to what is observed with running, cycling, and walking.

Due to the nature and design of this study, there were several limitations. The findings of this study lacked variability due to the sample population consisting of only adult surfers between the ages of 18-58 whom surfed in Southern California during the summer months and cannot be generalized to other populations. This study also did not include a control group and did not utilize random sampling; therefore, causation cannot be assumed. Future EIA studies on surfing may wish to include random sampling and a control group.

Another limitation was that variables such as, but not limited to, ocean conditions, surfing conditions, wave size, time of day, wind speed and direction, swell size, swell direction, size of surfing crowd, and current strength or direction could not be controlled and may have affected the outcome of the study. Although condition variables are thought to be very important and something that needs to be controlled, until very recently this was not possible. Technological advancements have created wave pools that produce consistent waves of many sizes and shapes for as long as needed. In addition, in task affect was not measured due to the participant completing the surf session in open water. This is an acknowledged limitation and in task data may have provided insight to whether participants experienced a rebound effect (16). Surfers seem to enjoy the activity whether conditions are favorable or not (11). Fuchs and Schomer (11) conducted a qualitative research study aiming to explore and understand surfers and the role surfing plays in their lives. For those who surfing has become a part of who they are, the conditions do not much matter. Good or bad they will go out and surf because doing it makes them feel good. They may catch a lot of waves or only a few and the tranquil feelings are still the same (11).

Given the limitations in the current study, future research expanding upon the results of the current study is needed. To determine causality, integration of a control group is recommended. It is also necessary to study other surfing and non-surfing populations to determine if the current findings can be generalized. It may be valuable to measure the exact intensity of surfing using a heart rate monitor and explore whether surfing at different intensities elicits changes in EIA. Lastly, incorporating wearable technologies that would allow for measurement of in task affect would strengthen the findings.

Although these findings provide numerous possibilities for future research, the present study provides useful information pertaining to the positive psychological effects of a single 30-min bout of surfing. It is hoped that future work in this area will serve to further develop our understanding of the sport of surfing as well as of the psychological effects of participation. Understanding how EIA changes when participating in outdoor settings is important as some people prefer exercising outside. Surfing is different than any other previously examined activity and more importantly it had not been studied in this capacity prior to this research study. Thus, the conclusions from this study provide a foundation supporting the psychological benefits associated with surfing.

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