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ARTICLE

Effect of Exercise and Sham Exercise Trackers on Perceived Workout Intensity and Mood in College Students

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ABSTRACT

Exercise is an essential contributor to both physical and mental health and is a significant part of a person's overall lifestyle. With the increasing popularity of exercise trackers, researchers were interested in the effects of sham exercise trackers on perceptions of workouts and affect. Researchers predicted participants wearing a sham Fitbit band would report greater perceptions of workout intensity, challenge, and satisfaction compared to those without sham Fitbit bands. In addition, those wearing sham Fitbit bands were predicted to report greater positive affect and lower negative affect than those without bands. One hundred twenty student participants (60 in each group; one group with a sham Fitbit and one group with no Fitbit) were recruited from campus workout classes of Zumba, spinning, and body sculpting. Participants worked out and completed a PANAS survey, plus other workout perception questions. When using a sham Fitbit, participants believed the workout was more intense, physically challenging, and they were more satisfied with their workout. However, presence of a sham Fitbit band did not significantly affect mood. Results suggest that knowledge of wearing an exercise tracker, even without any workout data feedback, has an effect on workout perceptions, but has little effect on mood.

1. Introduction

Exercise is a very important part of health and well-being, which allows people to feel content and balanced in life [1]. Exercise is defined as an activity requiring some form of physical effort that is carried out to sustain or improve health and fitness [2]. There are many benefits from exercising on a regular basis [3], such as weight control, strengthening bones and muscles, reducing risk of heart disease and certain cancers, managing blood sugar, and improving mental health and mood [4,5]. There has been an increase in the use of personal exercise trackers to monitor physical health in the past several years. While research has shown that wearing exercise trackers increases physical activity [6], there is less known about the expectations of exercise trackers on mood and perceived workout intensity. This current study investigates how the assumed presence of a Fitbit while exercising impacts college students' exercise perceptions and affect.

Exercise has been shown to help treat mental health

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issues, including mood and anxiety disorders [7,8]. In some cases, depression can be treated with a simple exercise plan that may be more efficient and is not associated with many of the negative side effects of medication [9]. For example, researchers [10] found benefits for treating major depressive disorder were best when an individual participated in physical activity for at least 20 minutes, three times a week. Focusing on ways to increase physical activity is very important today since growth in technology has resulted in the decline of physical activity due to modernization of transportation and less physical requirements of employment [10].

Exercise is an essential contributor to both physical and mental health and is a significant part of a person's overall lifestyle [11]. In one study, students from an undergraduate physical education course were asked to take a 20 minute walk. This short walk resulted in a significant change in the participants' moods in all dimensions of well-being [11]. Researchers [12] explained that exercise during adolescence has an effect on the happiness and mood in a person's life. Both research teams concluded that exercise during adolescence was a significant predictor of positive moods and overall happiness. The results from these studies should be considered an additional incentive for both adolescent and adult exercise [12]. Furthermore, a healthy and physically active lifestyle has also been associated with better academic performance among first year college students [13].

Exercisers have discovered that a key to modern physical health is the use of an exercise counting apparatus. The purpose of the exercise counting apparatus, or tracker, is to examine the relationship between physical medicine and the regulation of muscular activity performance. Exercise trackers today can measure heart rate, oxygen levels, distance covered, calories burned, and other useful health statistics. Physical medicine is defined as any alternative treatment to drug treatment or surgery that can benefit a person's health [14], such as exercises to strengthen muscles and joints related to dexterity, strength, and mobility. The exercise counting apparatus can be viewed as a therapeutic tool, which also makes it an effective alternative to therapy [15]. A modern example of this is the Fitbit. The Fitbit is a band worn around an individual's wrist and is described as a wireless sensor technology that has the potential to increase overall physical and mental health while inspiring users throughout the process. The Fitbit has many features including tracking steps, distance, calories burned, hourly activity, sleep monitoring plus many more functions that boost an individual's health. Many people around the world have used the Fitbit to change their life physically and mentally [16].

Research on the first Fitbit showed that participants were more engaged with their exercise activity when using the Fitbit tracker, which explained their increase in moderate to vigorous physical activity [17]. A positive association between self-monitoring and physical activity change was discovered. Participants experienced a higher level of physical activity while wearing the Fitbit compared to traditional methods because of baseline confidence level, meaning they went into exercising with more confidence than the group with no Fitbits or form of exercise tracking [17]. The current study will focus on expanding this literature by also experimentally examining the believed effect of using a Fitbit on mood, workout intensity, and workout satisfaction.

Exercisers in this previous study [17] experienced the sham effect. The sham effect is an intervention that seems to be a real medical treatment, but is not [14]. A Fitbit is similar to a sham effect in that it is a medical treatment that does not directly apply medicine, but instead applies the effect of physical medicine to help people feel healthier physically and mentally. An example of this effect is people working out for an hour and expecting to see immediate results, such as a change in their abs or improved muscle tone, or simply telling a group of workers with physically active jobs that their work is exercise, managed to improve their health. Exercise training provides a physical benefit, but part of the benefit comes from the belief that exercising is making you healthier, both mentally and physically. Past research has shown that participants can increase their self-perception as regular exercisers, and decrease physical effects, such as blood pressure [14,18].

There is a need for research specifically aimed at the role of the sham effect in exercise training. However, there has not been direct research on the sham effect in terms of a Fitbit and changes in perceptions of exercise and mood. The purpose of the current study is to examine the relationship between the Fitbit, exercise perceptions, and mood. Given the existing literature, the study hypotheses were that when participants were randomly assigned to believe they were using a Fitbit, participants would be more likely to perceive their workout to be more intense, more physically challenging, and more satisfying than participants not using a Fitbit. In addition, those who believed they were using a Fitbit were predicted to report increases in positive affect and decreases in negative affect compared to participants not assigned to using a Fitbit.

2. Method

2.1 Participants

This study included 120 college students who attended workout classes at the university's recreation center in the

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southeastern United States. There were 118 women and 2 men who participated in the study. While there are more women than men who attend the university in general, the organized workout classes are almost exclusively attended by women. All of the 120 participants were chosen randomly from the six workout classes. These classes were offered at the university recreation center and were free for all students. The classes that were used in this study were spinning, Zumba, and total body sculpting. The spinning classes were offered Monday-Friday at lunchtime and at nighttime, Zumba was offered Monday-Thursday at nighttime, and total body sculpting was offered on Tuesday and Thursday nights. Participant ages ranged from 18 to 25 (M = 19.89, SD = 1.59). Forty-five participants identified as freshmen, 27 were sophomores, 23 were juniors, and 25 seniors. The study included 99 White/Caucasian participants and 21 Black/African American participants. Participation was voluntary, as these college students had already chosen to participate in the workout class. No students were excluded. All participants agreed to take part in the study and were treated in accordance to the American Psychological Association's ethical standards and guidelines [19].

2.2 Materials

Participants completed the Positive and Negative Affect Schedule (PANAS) [20] to measure their moods at the end of the workout session. For each item, participants were asked to indicate how they feel, on a 5-point scale, at the present moment. Some examples of the words on the PANAS [20] were upset, hostile, alert, ashamed, and inspired. The 5-point scale consisted of 1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, and 5 = *extremely*. In addition to the PANAS, other questions on the post-workout survey the researchers created specifically for this study included "How intense was your workout?", "How physically challenging was your workout?", and "How satisfied are you with your workout?" on a 10 point scale. Participants were also asked "Do you regularly wear an exercise tracker when you workout?" For the experimental group, participants were given a Fitbit flex band, with no actual tracker included, and were instructed to wear this while working out. Participants were not told this was a sham; they believed it was an actual exercise tracking device that would provide data for the researchers. A demographic survey included questions to measure participant year in school (freshman, sophomore, junior, or senior), age, and sex (male or female).

2.3 Procedure

The present study used an experimental design. Data were collected in the spring of the academic semester from Zumba, spinning, and body sculpting classes at the university fitness center. There were two Zumba classes, two spinning classes, and two body-sculpting classes. In one of the respective classes participants were given a sham exercise tracker, and in the other class they were not given an exercise tracker. The researcher read a verbal consent to the participants. In the class that required an exercise tracker, the researcher placed the sham Fitbit on participants' wrists, keeping hidden the fact that no sensor was included. After their workout, participants completed a post-workout survey along with a demographic survey. Upon completion, the researcher instructed participants to hand in their surveys to the researcher on the way out of class. For those who used an exercise tracker while working out, the experimenter removed the tracker on their way out of class. No participants questioned the fact that the sensor was missing from the Fitbit band and no participants wore their own exercise tracker during the study. Data was collected in a workout room setting and completed surveys were collected individually from each participant. The post-workout survey took approximately 10 minutes for participants to complete. There was a debriefing statement at the bottom of the survey which thanked participants for their participation and explained the purpose of the study.

3. Results

Survey questions were averaged across groups for the questions related to workout intensity, how physically challenging the workout was, and how satisfied the participant was with the workout. Positive and negative affect scores were calculated from the PANAS [20]. Separate 2 (Sham Fitbit: present or absent) X 3 (Exercise class: Zumba, spinning, or body sculpting) factorial analysis of variance (ANOVA) tests were conducted to analyze the dependent variables of positive affect, negative affect, and responses to the workout. A $p < .05$ was used to determine statistical significance.

For the dependent variable of positive affect, there was not a significant main effect for the sham Fitbit, $F(1,118) = 1.69$, $p = .20$. The participants who wore the sham Fitbit ($M = 4.26$, $SD = .82$) reported slightly higher positive affect ratings than the participants who did not wear the Fitbit ($M = 4.08$, $SD = .64$). The main effect for exercise class was not significant, $F(2,118) = .25$, $p = .78$. The positive affect responses for students exercising by Zumba ($M = 4.21$, $SD = .71$), spinning ($M = 4.20$, $SD = .81$), and body sculpting ($M = 4.10$, $SD = .71$) were all similar. The interaction effect was also not statistically significant, $F(2, 118) = .45$, $p = .64$.

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For the dependent variable of negative affect, there was not a significant main effect for the sham Fitbit, $F(1,118) = 2.40$, $p = .12$. The participants who wore the sham Fitbit ($M = 1.07$, $SD = .22$) reported slightly lower negative affect ratings than the participants who did not wear the Fitbit ($M = 1.15$, $SD = .31$). The main effect for exercise class was not significant, $F(2, 118) = .30$, $p = .74$. The negative affect responses of students exercising by Zumba ($M = 1.13$, $SD = .36$), spinning ($M = 1.12$, $SD = .23$), and body sculpting ($M = 1.09$, $SD = .20$) were all similar. The interaction effect was also not statistically significant, $F(2,118) = .77$, $p = .47$. See Figure 1 for results for positive and negative affect by sham Fitbit condition.

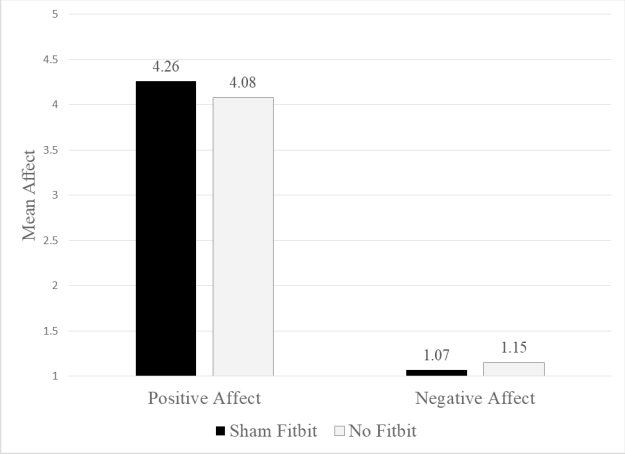

Figure 1. Mean positive and negative affect by sham Fitbit condition

For the dependent variable of workout intensity, there was a significant main effect for the sham Fitbit, $F(1, 118) = 7.57$, $p < .001$. The participants who wore the sham Fitbit ($M = 8.23$, $SD = 1.21$) reported a higher workout intensity than the participants who did not wear the Fitbit ($M = 7.65$, $SD = 1.23$). The main effect for exercise class was significant, $F(2, 118) = 8.35$, $p < .001$. The workout intensity ratings of students exercising by Zumba ($M = 7.58$, $SD = 1.12$), spinning ($M = 8.55$, $SD = .99$), and body sculpting ($M = 7.70$, $SD = 1.42$) were all different, with spinning rated as more intense than the other exercise options. The interaction effect was not statistically significant $F(2, 118) = .08$, $p = .92$.

For the dependent variable of how physically challenging the participant's thought the workout was, there was a significant main effect for the sham Fitbit, $F(1, 118) = 9.11$, $p < .001$. The participants who wore the sham Fitbit ($M = 8.15$, $SD = 1.80$) reported higher physically challenging workout perception scores than the participants who did not wear the Fitbit ($M = 7.30$, $SD = 1.60$). The main effect for exercise class was significant, $F(2,118) = 14.78$, $p < .001$. The perceptions of how physically challenging the workout was different for students exercising by Zumba ($M = 6.80$, $SD = 2.08$), spinning ($M = 8.67$, $SD = .1.02$), and body sculpting ($M = 7.70$, $SD = 1.47$). The interaction effect was not statistically significant, $F(2, 118) = .14$, $p = .87$.

For the dependent variable of workout satisfaction, there was a significant main effect for the sham Fitbit, $F(1, 118) = 4.69$, $p = .03$. The participants who wore the sham Fitbit ($M = 9.05$, $SD = 1.31$) reported higher satisfaction with the workout scores than the participants who did not wear the Fitbit ($M = 8.52$, $SD = 1.38$). The main effect for exercise class was not significant, $F(2,118) = 1.65$, $p = .20$. The perceptions of workout satisfaction for students exercising by Zumba ($M = 8.48$, $SD = 1.55$), spinning ($M = 9.00$, $SD = 1.26$), and body sculpting ($M = 8.88$, $SD = 1.24$) were all similar. The interaction effect was not significant, $F(2, 118) = .14$, $p = .87$. See Figure 2 for results for workout intensity, physical challenge, and satisfaction.

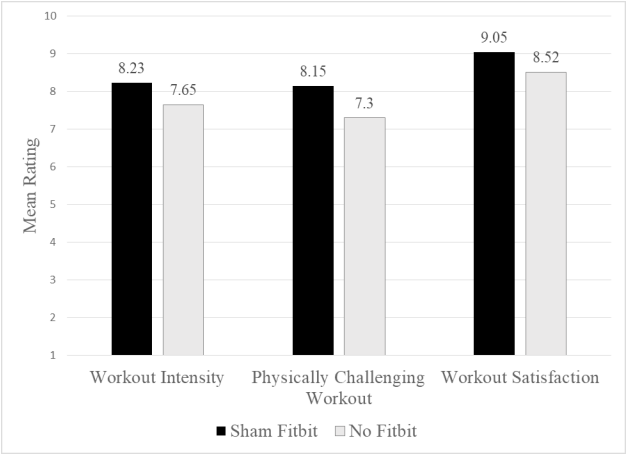

Figure 2. Mean workout rating by sham Fitbit condition

4. Discussion

The present study predicted that working out with a sham Fitbit would make a person perceive the exercise to be more intense, physically challenging, and satisfying than those who did not wear a Fitbit. These hypotheses were all supported. Participants wearing the sham Fitbit felt that the exercise was more intense, they were more physically challenged, and they felt more satisfied with the workout. The hypothesis that wearing a Fitbit during exercise would increase positive affect and reduce negative affect was not supported. Although positive affect did increase and negative affect did decrease in the sham Fitbit condition compared to the no Fitbit condition, these differences were not statistically significant.

The results of the current study are important because

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they demonstrate that perceptions of workouts can be changed just by believing your exercise performance is being monitored. One of the strengths of the current study was that exercise classes were standardized and took place in the same room at around the same time of day, so the participants in both experimental groups shared a similar environment, which consequently avoided a potential confound. The simplicity and short duration of the survey (typically 5-10 minutes) was also a strength of this study. The participants volunteered for these workout classes and there were no incentives. This is a strength because external rewards can diminish intrinsic enjoyment [21]. Based on these findings, exercisers should consider investing in technology to monitor their exercise so they can achieve their physical and psychological goals. While affect was not significantly different between groups, there are many explanations why mood did not differ between groups. Additionally, there are some important factors which limit the generalization of these results.

Although none of the participants indicated they suspected the sensor in the sham Fitbit was not authentic, participants may have known it was not a real Fitbit. Also, although none of the participants used their individually owned exercise tracker during the study, 48 out of the 120 participants (40%) indicated that they regularly do use an exercise tracker during workouts. This could have potentially influenced the results of this study. If some of the participants are used to wearing an exercise tracker, and generally always wear one when they workout, then their mood levels may have been different than those participants who never wear one. Future studies can be used to target participants who do not have past experience with exercise trackers, such as Fitbits. This could prevent this confound from occurring and could possibly yield significant results with respect to changes in affect.

The current study used a convenience sample. The sample was limited to university students in the United States, almost exclusively women, so future research could focus on better generalizing to the population by sampling more men and students from multiple universities. This future research could potentially provide more ethnic diversity and a broader range of exercise classes offered. More comparative research can be done when a more diverse population is available. In the current study, spinning was rated as more intense and physically challenging than Zumba or body sculpting. This was a surprising finding, although the difference did not lead to any interactions with sham Fitbit presence.

Another limitation of this study was participant mood was only measured after the workout was completed. Participants could have completed the PANAS [20] before and after the workout to compare changes, although the study would have taken more time, and this repeated measure may have given away the true purpose of the study. Using the long form PANAS [22] would cover more mood terms, and adding additional questions about stress and mental health to a survey may lead to a better understanding of who the exerciser is and what they are dealing with in their lives [4,7-9]. Participants may also exercise often, and taking a class such as Zumba, body sculpting, or spinning, was not going to affect their mood because it was such a common experience.

Another limitation was the use of empty Fitbits, which was used as a sham effect. Using real Fitbits or other exercise trackers could be used to provide accurate feedback from the workout classes. Having the available information of workout performance would allow researchers to see the real performance of participants instead of relying on self-report perceptions. In addition, if participants were provided with their actual workout data they may have reported altered mood and workout perceptions based on expectations. Additional studies could also be conducted by focusing on athletes instead of casual college exercisers and investigating where the exercise was completed. Research has compared indoor and outdoor exercise sessions and found outdoor environments were perceived as more calming, making outside environments especially important to stress-reduction [23].

5. Conclusion

In conclusion, the results of this study suggest wearing a sham Fitbit can make people believe their exercise program was more intense, physically challenging, and satisfying. This is an important finding that can be used to help people increase their motivation for exercising, and these results may be especially important for people who are struggling with stress and mental health issues. Purchasing and using a Fitbit, or similar exercise tracking device, can increase satisfaction with workouts and thereby make people more likely to continue to exercise in the future.

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