



## Original Article

# Psychological effects of physical activity: A quasi-experiment in an indigenous community



Yi-Chun Sun<sup>a,\*</sup>, Chin-Ling Chao<sup>b</sup>, Ma-Na Huang<sup>b,c</sup>

<sup>a</sup> Department of Public Health, Tzu Chi University, Hualien, Taiwan

<sup>b</sup> Wan Rung Health Station, Wan Rung Township, Hualien, Taiwan

<sup>c</sup> Hualien County Health Bureau, Hualien, Taiwan

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## ABSTRACT

**Objectives:** In addition to physical health benefits, being physically active or exercising can also have psychological benefits. We explored the psychological effects of an exercise intervention in this quasi-experiment.

**Materials and Methods:** Residents in Ma-Yuan village in Wan Rung township in Hualien county, Taiwan were recruited to participate in a fitness program ( $n = 31$ ). Residents from the same village but geographically segregated areas served as a control group ( $n = 44$ ). Participants from both groups filled out a pretest questionnaire at the beginning of the intervention, and a post-test questionnaire 1 week after the conclusion of the intervention.

**Results:** Analysis of the pre- and post-test survey data showed that after the intervention, participants in the intervention group, but not those in the control group, experienced less negative affect. In addition, participants in the intervention group had more positive attitudes toward some aspects of exercising.

**Conclusion:** Future intervention promoting exercise or physical activity targeting indigenous people could stress the emotional benefits of exercising, as it may be more congruent with indigenous cultural values.

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## 1. Introduction

Being physically active has always been one of the main foci in public health. The benefits of physical activity are well documented. Nevertheless, the focus is disproportionately on physical health and from the medical standpoint (e.g., reducing the risk of metabolic syndrome or cardiac vascular disease). Consequently, health professionals often stress this aspect of the benefits when educating or encouraging the general public to make exercise a part of daily life. However, another benefit of staying physically active is mental health [1]. Evidence from clinical observation has shown that being physically active is related to a higher quality of life [2]. Research evidence has also shown that physical activity in leisure time is positively associated with quality of life in females [3]. More specifically, sedentary behavior is a risk factor for depression among college students [4]. Although another study found that being

physically active or sedentary was unrelated to negative affect, people who were very active or moderately active experienced more positive affect than those with a sedentary lifestyle [5]. Although the evidence is somewhat mixed, these results show that being physically active is related to affective experiences. People are generally more perceptive of changes in their affective experiences than of their metabolic status; therefore, focusing on the psychological benefits might be a more persuasive reason for the general public to be physically active or start exercising.

In addition to affective experiences, we believed that being physically active can also change people's attitudes toward being active or exercising. According to the theory of cognitive dissonance [6], people change attitudes to maintain consistency between their own attitudes and behavior. Therefore, we expected that once people started and continued exercising, their attitudes toward exercising would become more positive.

In this paper, we reported the results of a quasi-experiment on the psychological effects of exercising conducted in Ma-Yuan village in Wan Rung township in Hualien county, Taiwan. In this quasi-experiment, we implemented an exercise intervention, and conducted a pretest and a post-test to evaluate the psychological effects of this intervention. This intervention was, on one hand, an

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\* Corresponding author. Department of Public Health, Tzu Chi University, 701, Section 3, Chung-Yang Road, Hualien, Taiwan. Tel.: +886 3 8565301x2291; fax: +886 3 8574179.

E-mail address: [yichun@mail.tcu.edu.tw](mailto:yichun@mail.tcu.edu.tw) (Y.-C. Sun).

answer to a need (losing weight) voiced by residents in Ma-Yuan village and, on the other hand, to echo one of the health promotion policies of the Health Department in Taiwan.

## 2. Materials and methods

### 2.1. Study design

To examine the psychological effects of exercising, a fitness program (intervention) was set up with the help of staff from the Wan Rung Health Station. A control group was also formed for comparison purposes. To avoid contamination between the intervention and control groups, we recruited participants in the intervention group from the Ma-Yuan tribal area, which is one of the four areas in Ma-Yuan village, and participants in the control group from the other three areas (i.e., Dee-Bon, Da-Ma-Yuan, and Dong-Guan), which are geographically segregated from Ma-Yuan and from each other. Specifically, these four areas are located within the same mountain region, with a mountain road as their connection to each other and to the outside world. Ma-Yuan is 7 km, 8 km, and 11 km from the other three areas, respectively.

The psychological effect of the intervention was evaluated through survey data. Participants in the intervention group filled out questionnaires in the first couple of weeks of the fitness program (pretest) and 1 week after the program was concluded (posttest). Participants in the control group also filled out the same questionnaires during the same periods.

### 2.2. Intervention

The intervention was a 3-month fitness program (from September 2003 to December 2003), which included physical activities such as indigenous traditional dancing, folk dancing, and stretching as exercise. Participants met three times a week for 1.5 hours in the evening to exercise under the supervision of a professional fitness instructor. Participants in the control group were unaware of this fitness program, but were offered an opportunity to participate in a similar one upon completion of this study.

### 2.3. Participants

All participants were Bunun residents in Ma-Yuan village. Participants in the intervention group were recruited during local gatherings or church activities. Participants in the control group were matched in age (in the range of 10 years) to those in the intervention group. Eligible candidates were invited to participate in the study and filled out the pretest and posttest questionnaires.

### 2.4. Survey questionnaire

The survey questionnaire was designed to evaluate the effects of the intervention and to be filled out by participants in the intervention and control groups in September 2003 and December 2003. In addition to demographic information, subjective physical health, affective experiences, and attitudes toward exercising were also included in the questionnaire.

In subjective physical health, participants were asked to rate their bodily flexibility, energy level, change in appetite, quality of sleep, health in general, and health compared to others of the same sex and similar age. Because the Cronbach's  $\alpha$  of these six items was 0.85, we averaged them, with a higher average score indicating better subjective physical health.

A Positive Affect and Negative Affect scale [7] was used to assess participants' positive and negative affect during the previous week. The internal consistency of the positive affect subscale and negative

affect subscale was 0.86 and 0.90, respectively. Therefore, we used the average score to represent participants' affective experiences, with a higher average score indicating a higher positive or negative affect.

We assessed participants' attitudes toward exercise from five aspects. Fourteen exercise-related statements were designed for this purpose. Participants indicated the extent to which they agreed with these statements on 5-point scale (from "strongly disagree" to "strongly agree"). Among these, three statements assessed whether exercise is for certain people (e.g., exercising is for people who want to lose weight; Cronbach's  $\alpha = 0.80$ ), three statements assessed preferences for other activities over exercising (e.g., I would rather watch TV than exercise; Cronbach's  $\alpha = 0.83$ ), three statements assessed passive attitudes toward exercising (e.g., Exercising is a waste of time; Cronbach's  $\alpha = 0.75$ ), three statements assessed the perceived annoying consequences of exercising (e.g., Exercising is tiresome; Cronbach's  $\alpha = 0.74$ ), and one statement assessed the degree to which participants liked friends and family to start exercising regularly. With good internal consistency, average scores were computed to represent participants' attitudes toward exercising on the four aspects that included more than one statement. All responses were coded, so that lower average scores indicated more positive attitudes. That is, a lower average score indicated less agreement that exercise is for certain people, less preference for other activities over exercising, less passiveness about exercising, and less perception that exercise is annoying. However, a higher score indicated participants would like friends and family to start exercising regularly.

### 2.5. Procedure

All questions in the questionnaire were translated into the Bunun language for participants who were more comfortable using it. Two interviewers (one local volunteer and one of the authors of this article (MNH)) who speak the language took part in the data collection. Prior to the data collection, they met twice to seek consistency in translating the questions. During the survey, participants were interviewed after acknowledging the purpose of the survey and signing the informed consent.

### 2.6. Statistical analyses

To evaluate the psychological effects of the intervention, the data collected were analyzed with repeated analysis of variance (ANOVA). The independent variable (i.e., intervention vs. control) was the between-subjects variable and the dependent variable (i.e., pretest and posttest) was the within-subjects variable. This analysis procedure allowed us not only to test the intervention effect (to test the difference between the intervention and control groups by examining the main effect on the between-subjects variable) and the time effect (to test the difference between pretest and posttest by examining the main effect on the within-subjects variable), but also to examine the interaction between the intervention effect and time effect. That is, the interaction allowed us to examine whether the change pattern of the dependent variables (i.e., subjective physical health, affective experiences, and attitudes toward exercise) from pretest to posttest was different for the intervention and control groups.

When there was a significant main effect for the between-group variable, we also performed analysis of covariance (with the pretest as a covariate) to examine the differences between the intervention and control groups in the posttest to clarify the effects of the intervention. When an interaction effect was present, we performed paired *t* tests (one for the intervention group and one for the control group) to clarify the nature of the interaction.

**Table 1**  
Demographic characteristics of participants.

	Intervention group (n = 31)	Control group (n = 44)
Age (M/SD)	41.19/10.02	39.95/12.01
Education level (n)		
Elementary	18	23
Junior high	9	9
Senior high	4	6
Professional school or college	0	3
Marital status (n)		
Single	0	5
Married	28	34
Employment status (n)		
Employed	21	12
Unemployed	1	5
Housewife	9	26

M = mean; SD = standard deviation.

### 3. Results

There were 36 women and one man out of 45 residents who indicated interest during recruitment who actually participated in the fitness program. The survey data from the man and those with incomplete data were excluded from analysis, leaving 31 women in the intervention group. There were 44 women in the control group who participated in the survey and provided complete data for analysis. There was no difference in age, education level, or marital status between these two groups (Table 1). However, more participants in the control group categorized themselves as housewives.

#### 3.1. Differences between the intervention and control groups

In subjective physical health, repeated ANOVA revealed a significant main effect for the between-subjects variable and an interaction effect. That is, the subjective physical health of the

participants in the intervention group was significantly better than those in the control group ( $F_{(1,72)} = 49.2, p < 0.001$ ). However, the significant interaction effect ( $F_{(1,72)} = 4.80, p < 0.05$ ) indicated that the change pattern of subjective physical health from pretest to posttest was different for the intervention and control groups. There was a slight decrease in subjective physical health in the intervention group, but a slight increase in the control group (Table 2). However, the result from analysis of covariance revealed that the differences between the intervention and the control grouping observed in the posttest were no longer significant ( $F_{(1,71)} = 3.18, p = 0.079$ ) once the pretest score was analyzed as a covariate ( $F_{(1,71)} = 23.83, p < 0.001$ ). These results indicated that the difference between the intervention and control groups in the posttest was mainly from the difference between these two groups in the pretest.

The effect of intervention on participants' positive affect was different from that on their negative affect. The only significant effect on positive affect was a main effect on the between-subjective variable ( $F_{(1,71)} = 74.87, p < 0.001$ ). That is, in both the pretest and the posttest, participants in the intervention group experienced more positive affect than those in the control group. By contrast, the only significant effect on negative affect was an interaction between the between-subjects variable and the within-subjects variable ( $F_{(1,72)} = 4.70, p < 0.05$ ; Table 2). Further paired *t* tests revealed that, although there was no difference from pretest to posttest for participants in the intervention group ( $t_{(29)} = 0.61, p = 0.548$ ), there was an increase for those in the control group ( $t_{(43)} = -3.24, p < 0.01$ ).

In attitudes toward exercising, we performed repeated ANOVA for each of the four aspects. First, repeated ANOVA showed no significant main effect on the aspect that exercising is for certain people. That is, there was no difference between the intervention and control groups, and no difference from pretest to posttest. However, the interaction approached significance ( $F_{(1,72)} = 3.52, p = 0.065$ ). Paired *t* tests showed that the attitude of "exercising is for certain people" tended to remain the same from pretest to posttest for participants in the control group, but there was a slight

**Table 2**  
The mean and standard deviation of dependent variables in each condition and the *p* value of the effects in repeated ANOVAs.

	Pretest		Posttest		Results of repeated ANOVA		
	M (SD)		M (SD)		<i>B</i>	<i>W</i>	<i>I</i>
Subjective health							
Intervention	3.89 (0.75)		3.68 (0.82)		<0.001	0.492	0.032
Control	2.85 (0.59)		2.96 (0.30)				
Positive affect							
Intervention	3.61 (0.54)		3.49 (0.69)		<0.001	0.381	0.498
Control	2.74 (0.41)		2.73 (0.46)				
Negative affect							
Intervention	2.34 (0.93)		2.22 (0.88)		0.058	0.334	0.033
Control	2.38 (0.54)		2.69 (0.48)				
Attitude (first aspect): exercising was for certain people							
Intervention	2.15 (0.97)		1.68 (0.74)		0.125	0.074	0.065
Control	2.14 (0.79)		2.15 (0.82)				
Attitude (second aspect): preferring other activities over exercising							
Intervention	2.45 (1.38)		2.47 (0.73)		0.725	0.069	0.042
Control	2.80 (0.74)		2.22 (0.93)				
Attitude (third aspect): passive toward exercising							
Intervention	2.15 (1.02)		1.73 (0.70)		0.022	0.004	0.825
Control	2.42 (0.64)		2.06 (0.73)				
Attitude (fourth aspect): considering the consequences of exercising annoying							
Intervention	2.25 (0.95)		1.85 (0.82)		0.668	0.003	0.877
Control	2.30 (0.73)		1.93 (0.72)				
Would like friends and family to start exercising regularly							
Intervention	4.61 (0.96)		4.23 (1.06)		<0.001	<0.001	0.028
Control	3.84 (0.83)		2.66 (1.28)				

*B* = main effect for between-subjects variable; *I* = interaction effect between between-subjects and within-subjects variable; *W* = main effect for within-subjects variable.

decrease for those in the intervention group ( $t_{(30)} = 2.36, p < 0.05$ ). Because losing weight was the need voiced by participants, we were particularly interested in examining whether participants' views on exercising and losing weight were affected by their participation in the fitness program. The results revealed that the difference was only on "exercise is for people who want to lose weight" (Table 3). Whereas participants in the control group did not change the extent to which they agreed with this statement, participants in the intervention group were less likely to agree with it in the posttest.

In the aspect of preferring other activities over exercising, the only significant effect was the interaction ( $F_{(1,72)} = 4.27, p < 0.05$ ; Table 2). Paired  $t$  tests showed there was no change from pretest to posttest for the intervention group ( $t_{(30)} = -0.13, p = 0.901$ ), but participants in the control group indicated higher preference for exercising in the posttest compared with the pretest ( $t_{(42)} = 3.40, p < 0.01$ ).

There were two significant main effects but no significant interaction in passive attitudes about exercise. As shown in Table 2, the significant main effect for the between-group variable indicated that participants in the intervention group were less passive about exercising than those in the control group ( $F_{(1,72)} = 5.52, p < 0.05$ ), but the significant main effect for the within-group variable indicated that both groups had less passive attitudes about exercising in the posttest ( $F_{(1,72)} = 9.02, p < 0.01$ ). The non-significant interaction indicated that this pattern of change between pretest and posttest was similar for the two groups ( $F_{(1,72)} = 3.52, n.s.$ ).

Repeated ANOVA revealed a main effect for the within-group variable in perceived annoying consequences of exercising. That is, participants in both groups were less likely to consider the consequences of exercise annoying in the posttest ( $F_{(1,71)} = 9.46, p < 0.01$ ). No other main effect or interaction was significant (Table 2).

Last, there were two main effects and an interaction when participants were asked if they would like friends and family to start exercising regularly. As shown in Table 2, participants in the intervention group liked friends and family to start exercising regularly more than those in the control group ( $F_{(1,73)} = 47.40, p < 0.001$ ). Although the significant main effect for the within variable (change from pretest to posttest) was also significant ( $F_{(1,73)} = 19.46, p < 0.001$ ), further analysis indicated that the difference between pretest and posttest was mainly attributable to a decrease from pretest to posttest in the control group ( $t_{(43)} = 5.03, p < 0.001$ ).

#### 4. Discussion

In this paper, we reported the results of an exercise intervention targeting Bunun women in Ma-Yuan village in Wan Rung township in Hualien. Based on the pretest and the posttest data gathered

**Table 3**  
The mean and standard deviation of statements in the first aspect of attitude toward exercising in each condition and the results of paired  $t$  test.

	Pretest M (SD)	Posttest M (SD)	$t$	$p$
Exercising is for people who want to lose weight				
Intervention	2.48 (1.53)	1.52 (0.81)	2.78	0.009
Control	2.36 (1.18)	2.16 (0.91)	0.91	0.367
Exercising is for the elderly				
Intervention	2.23 (1.54)	1.77 (1.06)	1.45	0.156
Control	2.30 (1.10)	2.26 (0.93)	0.22	0.824
Exercising is for rich people				
Intervention	1.74 (1.29)	1.74 (0.97)	0.00	1.000
Control	1.70 (1.00)	1.98 (0.93)	-1.34	0.188

from participants in the intervention and the control groups, this intervention did make some changes in participants' experiences with and attitudes toward exercising. First of all, although the intervention did not make a difference in the participants' positive affect experience, it did make a difference in their negative affect experience. After the intervention, participants in the intervention group experienced less negative affect in daily life than those in the control group. This result echoed previous findings [4] that people who led a sedentary lifestyle were more likely to experience depression. Compared with a previous study, we did not find the exercise intervention to have an impact on the participants' positive affect [5]. However, considering that participants in our study were from a disadvantaged group, exercising to lessen negative affect may be more important than to increase positive affect.

The initiation of this intervention was partly attributable to the residents' desire to lose weight. Therefore, most people joined the fitness program in this study with the belief that exercising is for certain people. However, this belief changed among participants in the intervention group (Table 2). This implied that participants might have experienced other benefits from this fitness program so they changed their attitude that exercising only serves the purpose of losing weight.

Similarly, participants in the intervention group held less passive attitudes about exercise in the posttest. Judging from the means (Table 2), the change in this belief was more evident in the intervention group; nevertheless, the result of paired  $t$  tests was not significant. This could be because the passiveness of belief among participants in the intervention group was more divergent in the pretest (standard deviation = 1.02). This also indicated that after the intervention, participants were not only less passive about exercising—their attitudes were also more congruent with each other.

Although there were results indicating the positive effect of the intervention, some of the results were unexpected. For example, we found that not only participants in the intervention group, but also those in the control group, considered the consequences of exercise less annoying in the posttest. However, considering that the pretest was conducted in September when it is still hot in Taiwan and the posttest in December, the result might not reflect any effect of intervention, but it seemed reasonable. When it became cooler, the annoying consequences of exercising were less likely to occur. Consequently, participants in both groups considered them less annoying. This was found in the supplementary analyses. Paired  $t$  tests on three individual statements about this aspect showed that the differences between pretest and posttest were in the following two statements: "Exercising makes people smelly" and "Exercising is tiresome." There was no difference in the statement "I am concerned about being laughed at when exercising."

Although some promising results regarding the psychological effect of an exercise intervention was found in this study, some aspects of this study deserve further clarification. First of all, this study was conducted in 2003, which may cause some concern. However, because the effects of exercising are not time-sensitive, we believe that the results of this study are still valid today. Second, the intervention reported in this study was conducted in an indigenous community for 3 months. Three months is a very short period for solid results to appear in an exercise intervention. However, the fact that the participants in the fitness program managed to sustain the program for almost a year after the study concluded made us believe that the psychological effects reported here were meaningful. Last, differences in employment status between the intervention and the control group, which was based on the participants' self-categorization (Table 1), may cause some concern. However, after further examining the jobs participants specified in the survey, it was suggested that the effects of these

differences may be minimal. First, seven of 26 participants in the control group who categorized themselves as housewives also worked in their family business (grocery store) or worked at odd jobs as opportunities presented themselves. Second, in both the intervention and control groups, three-quarters of the jobs (77.78% and 75%, respectively) were temporary and involved labor. That is, these were either temporary help needed in activities held in their village or local work opportunities (typically on a 6-month basis) made available through the Public Service Employment Expansion Program from Central Government Agencies. Although the first discovery did not change the fact that more participants in the intervention group were employed, the second discovery indicated that the nature of the jobs or work was similar in the groups. Therefore, we believe the difference in employment status was not a serious issue. We also believe the fact that the majority of participants had temporary jobs and jobs in their own neighborhood might have contributed to the 70–75% attendance in the 3-month intervention program.

Unfortunately, we may not have captured the most important feature of this intervention that made participants want to continue it on their own. For example, indigenous people greatly value interpersonal relationships. According to interview data, indigenous people consider being healthy not as being without illness, but as having good mental health and harmonious interpersonal relationships [8]. Therefore, the feature of the intervention that attracts participants to stay and continue may be the interpersonal relationships that are established or social support received in the fitness program. But we failed to include sensitive measures to measure this aspect in this study.

Based on the results of this study, we believe that in the future, exercise or physical activity intervention targeting indigenous

people should focus on the psychological aspect of the benefits (particularly the affective experiences). This aspect of the benefits is not only easier for people to detect, but is also more congruent with indigenous cultural values.

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