An Experimental Test of Cognitive Dissonance Theory in the Domain of Physical Exercise

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The present study examined cognitive dissonance-related attitude change in the domain of exercise. Experimental participants made a decision to perform a boring exercise task (stepping on a bench/chair) under three different conditions: a free-choice condition \( n = 33, \text{Male} = 17, \text{Female} = 16, \text{Age} = 14.57 \), under a no-choice/control condition \( n = 28, \text{Male} = 15, \text{Female} = 13, \text{Age} = 14.50 \), and under a condition that compelled participants to practice bench/chair stepping (forced-choice condition) \( n = 31, \text{Male} = 15, \text{Female} = 16, \text{Age} = 14.61 \). Results showed that participants in the free-choice condition reported more positive attitudes than participants in the control condition and participants in the forced-choice condition. Ancillary analysis indicated that cognitive dissonance is experienced as an aversive state, and that the amount of frustration that participants experienced immediately after the free-choice paradigm predicted attitudes.

While young people generally know that physical exercise is beneficial to health, few actually participate in regular physical exercise (Pate, Pratt, Blair, & Haskell et al., 1995; WHO, 1998). In this case, physically inactive individuals would be expected to experience some sort of mismatch between their beliefs and their behavior. According to Festinger and Carlsmith (1959), if an individual freely chooses to perform a behavior, which is discrepant from his/her attitude, the person tends later to realign his/her attitudes toward her/his choice. Over 50 years of research in social psychology has tested and confirmed this now classic attitude change effect that can be readily explained by Festinger’s cognitive dissonance theory. In the domain of exercise, cognitive dissonance theory has not been tested experimentally, and for this reason the purpose of the present study was to examine dissonance-related attitude change in the domain of leisure time exercise. In the present study, we use the term physical activity as an umbrella term that includes any bodily movement produced by skeletal muscles.

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that results in energy expenditure (Pate, 1995). We use the term exercise with reference to *structured physical activity* whose purpose is to incur a health benefit (Pate et al., 1995). Exercise therefore is a subtype of physical activity. The term leisure time describes the context in which physical activity or exercise occurs (Hagger & Chatzisarantis, 2005). Depending on age, leisure time can refer to after-school (for young people) or after-work (for adults) physical activity.

**COGNITIVE DISSONANCE THEORY**

The core notion of cognitive dissonance theory concerns psychological inconsistencies between various cognitions. According to Aronson (1968), a cognition Y is inconsistent from another cognition Z when expectancies about the dissonant cognition Z do not logically follow from the cognition Y. Cognitive dissonance theory posits that when a person holds two such cognitions (i.e., inconsistent ideas, beliefs, opinions), the person will experience cognitive dissonance—a negative drive-like state (Festinger & Carlsmith, 1959). The magnitude of dissonance aroused in regard to a particular cognition is a function of the number of dissonant and consonant cognitions with the one in question, with each cognition being weighted for its importance (Aronson, 1968). Since the occurrence of dissonance is unpleasant, people strive to reduce it by adding consonant cognitions, de-valuing dissonant cognitions, and/or changing one or both cognitions to make them more consonant with each other. To illustrate, if a sedentary person, who finds exercise boring, holds a belief that physical inactivity causes heart disease and obesity, he/she experiences dissonance. Assuming that the person is not suicidal (Aronson, 1968), his/her cognition that ‘I am a sedentary person’ is psychologically inconsistent with his/her cognition ‘sedentary lifestyle causes heart disease.’ One way to reduce dissonance in such a situation is to change his/her initial position and report that exercise is not that boring after all (or that physical exercise is interesting). In this way, the dissonance has effected an attitude change.

**EXPERIMENTAL PARADIGMS FOR INDUCING COGNITIVE DISSONANCE**

This dissonance-related attitude change has been demonstrated for a wide variety of issues and through a wide variety of experimental paradigms (Brehm, 1956; Fazio, Zanna, & Cooper, 1977; Festinger & Carlsmith, 1959; Girandolla, 1997). Brehm’s (1956) classic ‘free choice’ paradigm requires participants to choose between two options. Brehm observed that following a decision people enhanced their liking of the chosen option and downgraded their evaluation of the rejected option. This so-called ‘spreading of alternatives effect’ can be easily explained on the basis of cognitive dissonance theory.

Following a difficult choice, such as choosing not to be sedentary by choosing to engage regularly in physical activities, cognitions about negative attributes of the preferred option (i.e., exercising) are dissonant with having chosen it, and cognitions about the positive aspects of the rejected option (i.e., being sedentary) are dissonant with having rejected it. To reduce dissonance, people engage in two types of change. First, people emphasize the positive attributes of the chosen option and de-emphasize the negative attributes of the chosen option. To illustrate, a sedentary person who chooses to exercise regularly will start entertaining beliefs that physical exercise is beneficial to health and downplay beliefs that regular participation in physical activities is difficult to achieve. By simultaneously emphasizing positive attributes and deemphasizing negative attributes of exercise, attitudes toward exercise become more positive, and cognitions about exercise become more consonant with having chosen it.
Second, cognitive dissonance theory proposes that people can reduce dissonance by emphasizing the negative attributes of the rejected option and deemphasizing the positive attributes of the rejected option. To illustrate, a sedentary person who chooses to exercise will start entertaining beliefs that a sedentary lifestyle involves health risks and downplay beliefs that a sedentary lifestyle is relaxing and enjoyable. By simultaneously emphasizing the negative attributes and deemphasizing the positive attributes of sedentary lifestyle, attitudes toward sedentary lifestyle will become more negative and cognitions about sedentary lifestyle more consonant with having rejected it.

Research using this free-choice paradigm has generally documented results consistent with cognitive dissonance theory (see Aronson, 1968; Brehm, 1956). A conclusion that emerges from previous research is that when alternatives are not very attractive people are more likely to attach value to the preferred alternative than devalue the rejected alternative, whereas people are more likely to devalue the rejected alternative than value the preferred alternative when the alternatives are attractive (Shultz, Leveille, & Lepper, 1999). In addition, research has documented that people start spreading their evaluation of alternatives before making a decision and increase spreading of alternatives after the decision (Brownstein, Read, & Simon, 2004). Finally, one clear trend evident in contemporary research is that people can reduce dissonance by increasing confidence in their knowledge that decisions associated with the choice of the preferred alternative is the correct decision (Blanton, Pelham, Dettart, & Carvallo, 2001).

A second experimental paradigm that has been used in cognitive dissonance experiments requires participants to exert a great deal of effort to gain admission to a dull task (Aronson, 1968). This so-called ‘effort justification’ paradigm induces dissonance in the following way: the cognition that people have worked hard to gain access to a task or outcome is dissonant with the cognition concerning negative aspects of the task. To reduce dissonance, people usually distort perceptions of the task in a positive direction (Gerard & Mathewson, 1966). To illustrate, a sedentary person who has worked hard to obtain entrance to an unattractive gym is likely to endorse the positive aspects of that particular gym or even find the gym attractive. This is because, in doing so, the person reduces dissonance between the knowledge that “I worked hard to obtain entrance in a gym” and the knowledge that “the gym is unattractive.”

A third experimental paradigm proposed by cognitive dissonance theory is the ‘induced compliance’ paradigm that requires participants to advocate (or enact) a position that is contrary to a previous held attitude (Festinger & Carlsmith, 1959). Typically, some participants are led to believe that they have little choice over engaging in an activity (forced-choice participants) whereas some other participants are presented with an option to engage or not to engage in an activity (free-choice participants). This paradigm induces dissonance, among free-choice participants, because the knowledge that a person believes X (i.e., exercise is boring) is not congruent with the knowledge that the person has chosen it. To reduce dissonance people usually realign their attitudes toward the advocated position. To illustrate, a person who chooses to engage in a boring exercise task, such as bench-stepping or stair climbing, will report that bench-stepping is not boring after all because the knowledge that bench-stepping is boring is incongruent with having chosen it.

Interestingly, Festinger and Carlsmith (1959) proposed that the more reason people have for engaging in the counter-attitudinal activity (i.e., larger the reward and pressure or lower the perceived choice), the less dissonance they experience and consequently there is less need for attitude change. It is predicted therefore that forced-choice participants who have not been presented with an option to endorse, either behaviorally or verbally, the counter-attitudinal position will not display dissonance-related attitude change. This is because the knowledge that a person has endorsed a counter-attitudinal position does fit together with the knowledge
that the person has been pressured to endorse the counter-attitudinal position. Conversely, the less justification people have for their dissonant behavior, the more dissonance people experience and the more they are motivated to change their opinion to the direction of the advocated position. To illustrate, a sedentary person who chooses to exercise by practicing bench-stepping will experience greater dissonance and report more positive attitudes toward bench-stepping than a person who has been forced to engage in bench-stepping. This is because the knowledge that bench-stepping is boring is inconsistent with having chosen it, whereas the knowledge that bench-stepping is boring is consistent with having been forced to bench-step.

In social psychology, the induced compliance paradigm has been extensively investigated in various contexts such as food choice and political opinion (see Aronson, 1968; Green, 1974). Research utilizing the induced compliance paradigm has generally confirmed Festinger’s propositions and supported a positive relationship between perceived choice with attitude and intention change (Fazio, Zanna et al., 1977; Simmons, Webb, & Brandon, 2004). In addition, research has shown that young people engage in dissonance-related attitude change (Leenders & Brukman, 2005), and that the magnitude of cognitive dissonance increases when initial attitudes are made salient (Green, 1974; Ross & Shulman, 1973), when people engage in two dissonant behaviors rather than one behavior (Girandola, 1997), when counter-attitudinal advocacy is believed to result in aversive consequences of which counter-attitudinal advocates are responsible (Cooper & Worchel, 1970; Jones, Brehm, Greenberg, Siman, & Nelson, 1996; Scher & Cooper, 1989), and among people who are characterized by a preference to display consistency between beliefs, thoughts, and behaviors (Nail, Correll, Drake, Glenn, Scott, & Stuckey, 2001).

Further, theoretical accounts of cognitive dissonance effects have indicated that dissonance is experienced as a specific drive-like aversive state manifested in feelings of mental frustration (Shaffer, 1975) and not as a general state of arousal (Zanna, Higgins, & Taves, 1976), and that the self-concept is implicated in dissonance-related attitude change (Aronson, 1968; Blanton & Pelham et al., 2001; Gibbons, Eggleston, & Benthin, 1997; Steele, 1988; Stone, 2003). Finally, Fazio et al. (1977) have shown that self-perception processes, the ability to infer personal attitudes on the basis of observations of one’s own behavior and on the basis of variables that control behavior (Bem, 1972), cannot fully account for dissonance-related attitude changes, and that cognitive dissonance theory and self-perception theory are complementary: cognitive dissonance occurs when the position held is in a latitude of rejection, whereas self-perception processes operate when the position held is in a latitude of acceptance and when internal information is weak, ambiguous, or difficult to interpret (see also Green, 1974; Ross & Shulman, 1973; Shaffer, 1975).

OVERVIEW OF THE STUDY AND RESEARCH HYPOTHESES

Although dissonance-related attitude change has been investigated extensively in a number of contexts, very few studies have tested cognitive dissonance theory in the domain of exercise. A literature search using PsychINFO and Sport Discus did not reveal any experimental study focusing on exercise and/or sport. For example, two studies were not empirical but reviews (Goldstein, 1985; Harris, 1977). Two other studies were not direct experimental tests of cognitive dissonance theory but used cognitive dissonance theory to explain empirical observations (Vingerhoets & Buunk, 1987; Kaill, 1999). One study utilized cognitive dissonance theory to explain the relationship between exercise therapy and assertiveness (Cooper, 1980).
That said, a number of studies did evaluate effectiveness of experimental manipulations and/or of exercise interventions in changing attitudes and behavior; however, those studies were either atheoretical or were based on theories of rational decision-making such as the theory of planned behavior (Hardeman, Johnston, Johnston, Bonetti, Wareham, & Kinmonth, 2002). For example, in a recent randomized trial, Jones, Courneya, Fairey, and Mackey (2005) have shown that an intervention, which was based on tenets of the theory of planned behavior (Ajzen, 1991), was successful in changing breast cancer survivor’s attitudes, subjective norms, perceptions of control, and intentions to exercise. Similarly, Chatzisarantis and Hagger (2005) pointed out that a persuasive message that was based on tenets of the theory of planned behavior successfully changed attitudes and intentions to exercise of young people (see also Courneya & McAuley, 1994; Estabrooks & Carron, 1998; Jones, & Courneya et al., 2005; Lencher & de Vries, 1995). However, it is important to note that none of these studies evaluated the impact of choice and cognitive dissonance on attitudes. Although studies applying theories of rational decision-making are important (Ajzen, 1991), the next step in exercise research is to develop and test experimental manipulations based on alternative theoretical frameworks such as that proposed by cognitive dissonance theory (Hagger & Chatzisarantis, 2005).

Investigations of cognitive dissonance theory in the domain of exercise and sport are also important because, in addition to shedding light upon cognitive mechanisms involved in attitude change, such investigations test new practices for attitude and behavior change. For example, one implication of cognitive dissonance theory is that exercise interventions that minimize pressure and enhance sense of choice are more likely to facilitate attitude and behavioral change than interventions that pressure sedentary people to adopt a physically active lifestyle (Festinger & Carlsmith, 1959). This is because social pressure minimizes cognitive dissonance and corresponding attitude change, whereas the provision of choice increases the magnitude of dissonance and corresponding change (Festinger & Carlsmith, 1959). Interventions can also facilitate a sense of choice by providing sedentary people with an option to decide whether or not to adopt an active lifestyle (Fazio et al., 1977).

Another implication of cognitive dissonance theory is concerned with development of effective persuasive messages (Aronson, 1968; Simmons et al., 2004). Often interventions fail to facilitate an active lifestyle because people can justify sedentary behavior on a number of factors. For example, a sedentary young person who learns, as a result of an intervention, that a sedentary lifestyle involves major health risks experiences dissonance between the knowledge that “she/he is sedentary” and the knowledge that “a sedentary lifestyle involves major health risks.” However, this person may reduce dissonance not by choosing to change his/her lifestyle but through a passive option of adding new cognitions such as cognitions that regular participation in physical exercise is difficult to achieve. Alternatively, a sedentary young person may defy the persuasive message and convince him/herself that young people are not vulnerable to disease. Indeed, as others have shown (Hagger, Chatzisarantis, & Biddle, 2001), beliefs reflecting vulnerability to disease do not figure in young people’s beliefs about exercise. Cognitive dissonance theory can prevent operation of such undesirable dissonance-reducing mechanisms by targeting the most appropriate cognitions. For example, persuasive messages that challenge negative attitudes toward exercise and advocate the vulnerability of young people to disease may motivate young people to resolve this dissonance by choosing to change their lifestyle rather than by reflecting on cognitions that a sedentary lifestyle does not pose an immediate threat to their health (Simmons et al., 2004).

Finally, interventions based on cognitive dissonance theory may be useful in developing confidence and self-esteem (Aronson, 1968; Blanton et al., 2001). Often, sedentary individuals do not change their lifestyle because they lack confidence and/or they are characterized by low self-esteem (Hagger & Chatzisarantis, 2005). Here, low self-esteem and lack of confidence
are the consonant cognitions supporting sedentary lifestyle. Interventions based on cognitive dissonance theory can help develop confidence and self-esteem because a sedentary person who experiences dissonance, by choosing to exercise, can resolve dissonance by changing cognitions related to confidence and self-esteem. That is, according to recent formulations of cognitive dissonance theory (Blanton et al., 2001; Stone, 2003), a sedentary person who chooses to exercise can resolve dissonance by increasing confidence of her/his ability to exercise and/or by formulating a positive view of her/himself as being physically worthy and competent (Blanton et al., 2001).

Considering the implications of cognitive dissonance theory to the promotion of exercise, we conducted two studies, a pilot study and a main study, to investigate dissonance-related attitude change in the domain of physical exercise. We chose bench-stepping as our target activity because according to Festinger and Carlsmith (1959) dissonance-related attitude change is likely to be more marked with respect to boring tasks (see also Fazio et al., 1977). We also focused on young people given the declining levels of exercise participation and associated increases in obesity levels that characterize this population (WHO, 1998).

The purpose of the pilot study was to investigate young people’s attitudes toward bench-stepping. Because bench-stepping is a monotonous activity, we expected young people to find bench-stepping a boring task. The main study used an induced-compliance paradigm to test core assumptions of cognitive dissonance theory in the domain of exercise. It was hypothesized that participants who freely chose to perform a boring exercise task (free-choice participants) would report more positive attitudes and stronger intentions to exercise than participants who were pressured to perform a boring task (forced-choice participants) and participants in a control group (no choice/control participants) \((H_1)\). Another hypothesis examined in this study was concerned with the experience (phenomenology) of cognitive dissonance. Zanna et al. (1976) demonstrated that cognitive dissonance is experienced as a specific drive-like state manifested in feelings of mental frustration. Shaffer (1975) also documented that the amount of mental frustration that is experienced as a function of counter-attitudinal advocacy was associated with attitude for free-choice participants and not for forced-choice participants.

The present study examined these hypotheses by measuring mental frustration immediately after a choice was given. It was hypothesized that free-choice participants would report more frustration than forced-choice participants and participants in the control group \((H_2)\). In addition, it was hypothesized that mental frustration would be positively associated with intentions and attitude for free-choice participants and not for forced-choice participants or for participants in the control group \((H_3)\).

**METHOD**

**Pilot Study**

In the pilot study research participants were 30 pupils \((Male = 15, Female = 15, Mean Age = 14.85, [SD = .928])\). Prior to data collection, we obtained informed consent from the head teachers of the schools who were asked to act in *loco parentis*, in accordance with Psychological Society guidelines. Although parents were not asked to complete a consent form, a letter explaining procedures and risks associated with the study was posted to them. In this letter, parents were provided with the option to sign and post the letter back if they wished to refuse participation of their children. However, none of the parents declined participation.

The pilot study was run in small groups of 15 participants. After participants arrived, an experimenter explained that he/she was interested in young people’s opinion about several health issues including exercise. Thereafter, each participant watched a video in which a
person practiced bench/chair stepping for a minute. After watching the video, the experimenter explained to the participants that we were interested in understanding young people’s opinions about practicing bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during leisure time. Based on Godin and Shephard (1985), the experimenter also provided a definition of leisure-time activity, and highlighted that we were interested in bench-stepping during leisure time. To ensure that the meaning of leisure-time activity was understood by the pupils, the experimenter probed pupils to ask questions and give examples of leisure-time activities. Thereafter, all pupils were prompted to report their opinion about bench-stepping on a questionnaire measuring attitudes toward bench-stepping.

In accordance with previous research testing the core assumptions of cognitive dissonance theory (Fazio et al., 1977; Festinger & Carlsmith, 1959), we measured affective attitudes. We used Festinger and Carlsmith’s (1959) measures of attitudes to facilitate comparison between our study and previous studies testing the core assumptions of cognitive dissonance theory. The item measuring affective attitudes asked participants to report how interesting they expected practicing bench/chair stepping to be (e.g., For me, practicing bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks during my leisure time...). The affective attitude was assessed on an 11-point semantic differential scale ranging from (−5) “extremely dull” to (+5) “extremely interesting” (Festinger & Carlsmith, 1959).

In addition to measuring affective attitudes, we also measured intentions; an indicator of cognitive attitudes (Ajzen, 1991; Simmons et al., 2004). We measured intentions because of the strong relationship that this construct displays with affective attitudes and to obtain an alternative indicator of attitudes (Hagger, Chatzisarantis, & Biddle, 2002; Hagger & Chatzisarantis, 2005). The item measuring cognitive attitudes was assessed on a 7-point scale ranging from (1) “strongly disagree” to (7) “strongly agree” (Ajzen, 2003). Participants responded to the following statement: “I intend to practice bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks during my leisure time.” It is important to note here that previous research with children and adults has successfully used these measures of affective and cognitive attitudes toward exercise (Chatzisarantis, Biddle, & Meek, 1997; Courneya, Plotnikoff, Hotz, & Birket, 2000; Hagger et al., 2001; Hagger & Chatzisarantis, 2005). In the pilot study, the reliability of affective and cognitive attitudes was satisfactory (α = .78).

Main Study

Research Participants

In the main study, participants were 91 students (Male = 46, Female = 45, Mean Age = 14.53, SD = .702) who were recruited from two schools. As with the pilot study, we obtained informed consent from the head teachers of the schools. A letter explaining procedures and risks (i.e., induction of dissonance, and frustration) associated with our study was also posted to the parents, and parents were provided with the option to decline participation by returning the letter. None of the parents declined participation.

The experiment employed a one-way factorial design in which there was a free-choice condition (n = 32, Male = 16, Female = 16) a no-choice/control condition (n = 28, Male = 15, Female = 13), and a condition that compelled participants to practice bench/chair stepping (forced-choice condition) (n = 31, Male = 15, Female = 16, Age = 14.61). To ensure that extraneous variables (i.e., personality characteristics) did not affect the results of the study, participants were randomly assigned to the conditions. We chose a random design rather than direct measurement of variables as a means of controlling influences from external factors because, as Bargh and Chartrand (2000) suggest, the measurement of psychological
variables (i.e., self-esteem, behavior) could prime factors that may potentially interfere with the cognitive dissonance process.

Procedure

The experiment was run individually. After a participant arrived, the experimenter explained that he/she was interested in students’ opinions about several health issues including exercise. After these remarks, each participant watched a video in which a person practiced bench/chair stepping for a minute. To ensure that the meaning of leisure-time activity was understood by the pupils, the experimenter probed pupils to ask questions and give examples of leisure time activities. After watching the video, the experimenter informed each participant that the study required him/her to actually practice bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during leisure time. At this point the experimenter also stated that when practicing bench/chair stepping participants were required to wear an instrument called a tri-track that tracks the intensity and duration of physical movement. This procedure was implemented to prevent false commitment (Green, 1974). That is, in this way, the participants’ decisions to practice bench/chair stepping were made harder, more responsible, and realistic (see also Festinger & Carlsmith, 1959). In addition, this procedure reassured participants that there was no way for them to ‘cheat’ the experimenter. Immediately after the briefing, the experimental manipulations were conducted. Manipulations took the form of written text contained in a questionnaire.

Choice Manipulation

The presence or absence of a consent form constituted the choice manipulation (see also Fazio et al., 1977; Snyder & Ebbesen, 1972). Specifically, instructions for participants in the free-choice condition read:

Now, you are to make a decision about whether or not to practice bench/chair stepping, for 3 days per week, for at least 20 minutes each time, over the next three weeks during your leisure time. The choice is up to you.

The consent form read (see also Fazio et al., 1977)

I understand the nature of the study in which I am being asked to participate.
I truly choose to practice bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during my leisure time.

In the forced-choice condition, participants were not allowed to sign a consent form and the instructions emphasized that participants did not have much choice:

Now you do not have much choice and you should practice bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during your leisure time.

Control Condition

A control condition was included in the experiment to determine how interesting practicing of bench-stepping was (practicing bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during leisure time) for the participants. Participants in the control condition were treated identically in all respects to participants in the forced-choice and free-choice conditions except that they were not forced or given freedom of choice to
practice bench/chair stepping. Specifically instructions for participants in the control group read:

Now we ask you to practice bench/chair stepping 3 days per week, for at least 20 minutes each time, over the next three weeks during your leisure time.

**Dependent Variables**

Immediately after the manipulations of perceived choice, all participants reported mental frustration and how much choice they felt they had over their decision to practice bench/chair stepping (perceived choice). Perceived choice was measured through two items and by asking participants to report how much freedom and responsibility they had over their decision to practice bench/chair stepping (e.g., “I was free to decide not to practice bench/chair stepping 3 days per week, for at least 20 minutes each time, over the next three weeks, during my leisure time”). Items were measured on 7-point scales ranging from (1) “strongly disagree” to (7) “strongly agree.” The Cronbach’s alpha reliability for measures of perceived choice was satisfactory ($\alpha = .84$). For this reason, responses to items of perceived choice and perceived responsibility were averaged to form a composite score of perceived choice.

Participants also indicated their mental frustration on a 7-point scale that asked them report how they felt “right now” (Shaffer, 1975; Zanna et al., 1976). Finally, participants were asked to indicate cognitive (intentions) and affective dimensions of attitudes (Festinger & Carlsmith, 1959; Simmons et al., 2004). The items measuring affective and cognitive attitudes were identical to the items used in the pilot study (Chatzisarantis et al., 1997). In the main study, the reliability of affective and cognitive attitudes was satisfactory ($\alpha = .77$).

To ensure that questions regarding perceived choice, mental frustration, and attitudes were uniform in targeting the same type of bench/chair stepping (i.e., bench/chair stepping, 3 days per week, for at least 20 minutes each time, over the next three weeks, during my leisure time), all items were phrased in a way that reflected the same activity (i.e., bench/chair stepping), the same target toward which activity was directed (i.e., 3 days per week, for at least 20 minutes per time), the same time (i.e., over the next three weeks) and the same context (i.e., during my leisure time) (Ajzen & Fishbein, 1980). In addition, participants were prompted to use this definition of bench/chair stepping in responding to questions.

Upon completion of the self-report measures, all participants were debriefed and the purpose of the experiment explained to them. In addition, participants were informed that tri-tracks would not be provided to them because the experiment had actually been completed, and that participants did not have to actually practice bench/chair stepping.

**Data Analysis**

In the pilot study, we determined whether bench/chair stepping was not a very interesting activity by comparing the mean score of affective attitudes observed in the present study

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1Participants were also asked to report feelings of anxiety and stress. Because experimental groups did not display statistically significant differences on these emotions, indicators of anxiety and stress were excluded (see also Zanna et al., 1976). The alpha reliability of items measuring mental frustration, anxiety, and stress were satisfactory ($\alpha = .75$).
with mean scores of affective attitudes reported in Festinger and Carlsmith’s (1959) study, which investigated a boring task. It was concluded that pupils found bench/chair stepping boring if the arithmetic mean observed in the present study did not differ from mean score reported in Festinger and Carlsmith’s (1959) study. We utilized Cohen’s $d$ to estimate these differences between our study and Festinger and Carlsmith’s study on affective attitudes.

In the main study, we conducted a multivariate analysis of variance to examine whether participants who freely chose to perform a boring physical exercise task (free-choice participants) reported more positive attitudes and stronger intentions than participants who were pressured to perform a boring task (forced-choice participants) and participants in a control group (no choice/control participants) ($H_1$). In this multivariate analysis of variance, membership in the experimental (free choice group) versus the two control conditions (forced-choice group and no-choice/control group) was used as an independent variable whereas intentions and attitudes were the dependent variables.

We also performed an analysis of variance to examine the extent to which free-choice participants reported more mental frustration than forced-choice participants and participants in the control group ($H_2$). In this analysis of variance, membership in the experimental (free choice group) versus the two control conditions (forced-choice group and no-choice/control group) was the independent variable and the measure of frustration was the dependent variable. Finally, we conducted two hierarchical regression analyses to examine whether mental frustration was positively associated with intentions and attitude for free-choice participants and not for forced-choice participants or for participants in the control group ($H_3$). In these regression analyses either attitudes or intentions were used as the dependent variable, whereas mental frustration (first step), a contrast-code that represented membership in the free-choice condition (free choice contrast) versus the two other conditions (second step), and a product term that represented the interaction between free-choice contrast code and mental frustration (free-choice contrast code x mental frustration) were used as independent variables (Aiken & West, 1991). The third hypothesis of the present study was considered substantiated when, in the third step of analysis, the interaction between mental frustration and free-choice contrast contributed to the prediction of attitudes and intentions over and above main effects of mental frustration and the free-choice contrast code.

**RESULTS**

**Pilot Study**

The arithmetic mean of affective attitudes toward bench/chair stepping ($M = -1.32$, $SD = 3.22$) was low and toward the negative pole of the scale. In addition, the arithmetic mean of affective attitudes toward bench/chair stepping was comparable to the mean score of affective attitudes reported in Festinger and Carlsmith’s (1959) original experiment. This is because the difference between affective attitudes observed in our study and affective attitudes observed in Festinger and Carlsmith’s study was not statistically significant ($d = .03$, $p > .05$) and conformed to a small effect size (Cohen, 1988). Because Festinger and Carlsmith (1959) did not employ a measure of cognitive attitudes, it was not possible to compare our study and the study conducted by Festinger and Carlsmith on cognitive attitudes. However, in the present pilot study, the arithmetic mean of cognitive attitudes indicated ambivalent intentions ($M = 3.45$, $SD = 1.34$). Overall, results of the pilot study support the conclusion that young people found bench/chair stepping a relatively boring task.
Main Study

Tests for Outliers and Normal Distribution

Prior to data analyses, we screened the observed data for outliers and normal distribution. A Machalanobis distance test did not identify any multivariate outliers given that the chi-square values describing the distance of each case from the centroid of the remaining cases were lower than 18.47 (Tabachnick & Fidell, 1989). The distribution of scores for affective attitudes, cognitive attitudes, perceived frustration, and perceived choice were also normal given that the standardized values of skewness and kurtosis for these psychological variables (perceived choice, perceived frustration, affective, and cognitive attitudes) were either lower or greater than 1.96 (Tabachnick & Fidell, 1989). Overall, results of the present analysis suggest an absence of outliers and normality of distribution of scores for the psychological variables.

Manipulation Checks

In the free-choice condition the mean response to the perceived choice construct was high ($M = 5.18, SE = .299$), whereas the mean response for forced-choice ($M = 3.51, SE = .303$) and control conditions ($M = 4.33, SE = .319$) suggested less freedom of choice. Analysis of variance on these data revealed a statistically significant effect for choice ($F(2) = 7.709, p < .05, h^2 = .15$). The size of the effect ($h^2$) of experimental conditions on perceived choice was also large (Cohen, 1988). Post-hoc analysis indicated that the choice manipulation was successful: Participants in the free-choice condition reported higher levels of perceived choice than participants in the forced-choice ($t(61) = 3.97, p < .05, d = .89$) and control ($t(58) = 1.94 = , p = .056, d = .52$) conditions.

How Interesting was Bench/Chair stepping?

Mean responses to attitude items of interest and intentions are presented in Table 1. These results are the ones most directly relevant to dissonance-related attitude change, which was experimentally created. Box’s M test for homogeneity of dispersion matrices confirmed homogeneity of variance-covariance matrices of cognitive and affective attitudes ($F(6) = 1.44, p > .05$). A multivariate analysis of variance on these data revealed a significant effect for experimental conditions on both affective (interest) and cognitive attitudes (intention) ($F(4) = 13.208, p < .05, h^2 = .10$). The effect size ($h^2$) of experimental conditions on affect and cognitive attitudes conformed to Cohen’s (1988) strong effect size. In accordance with the first hypothesis of the present study ($H_1$), planned comparisons revealed that free-choice participants reported stronger intentions (cognitive attitudes) to practice bench/chair stepping ($t(85) = 3.97, p < .05, d = .86$) and that practicing bench/chair stepping was a more interesting activity ($t(88) = 3.10, p < .05, d = .72$) compared to forced-choice participants. Similarly, free-choice participants found practicing bench/chair stepping a more interesting activity ($t(88) = 2.41,$

<table>
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<tr>
<th>Table 1</th>
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<tr>
<td>Effects of Experimental Manipulations on Attitudes</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Forced choice condition</td>
</tr>
<tr>
<td>Control condition</td>
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<tr>
<td>Free choice condition</td>
</tr>
</tbody>
</table>


and reported stronger intentions to practice bench/chair stepping \( t(85) = 3.03, p < .05, d = .81 \) than participants in the control group. In short, when participants had choice over whether to engage in a boring and monotonous exercise task, their private opinion tended to change toward a positive direction. The greater the choice (and the less the social pressure), the greater the change of the private opinion.

**Is Cognitive Dissonance Aversive?**

Measures of mental frustration from the present experiment; allow one to estimate whether cognitive dissonance is aversive. In accordance with the second \( (H_2) \) hypothesis of the present study, an analysis of variance on measures of frustration revealed a main effect for experimental conditions on frustration \( (F(2) = 2.86, p = .060, h^2 = .06) \), which was significant at .06 alpha level. However, the size of the effect of experimental conditions on frustration conformed, once again, to Cohen’s (1988) strong effect size. Planned comparisons revealed free-choice participants to report higher levels of mental frustration \( (M = 6.00, SE = .33) \) than forced-choice participants \( (M = 4.78, SE = .33) \) \( (t(87) = 2.32, p < .05, d = .59) \). There was also a trend for free-choice participants to report higher levels of mental frustration than participants in the control group \( (M = 5.16, SE = .344) \). However, this trend was significant at .10 alpha level \( (t(87) = 1.64, p = .103, d = .47) \).

**The Relationship of Mental Frustration with Attitudes and Intentions**

Cognitive dissonance theory also predicts that dissonance-related attitude change is produced by mental frustration and by perceived choice. Hence, cognitive dissonance theory would call for positive relationships between mental frustration with intention and attitude scores for free-choice participants \( (H_3) \). Since social pressure is not believed to produce cognitive dissonance, cognitive dissonance theory anticipates negative relationships (or no relationships) between mental frustration with intention and attitude scores for forced-choice participants and for participants in the control group \( (H_3) \).

The hierarchical regression analyses testing this hypothesis revealed mental frustration to contribute to the prediction of intentions \( (F(1) = 6.300, p < .05) \) and attitudes \( (F(1) = 13.537, p < .05) \) (see Table 2). The free-choice contrast code improved prediction of intentions \( (\Delta F(1) = 6.22, p < .05) \) and attitudes \( (\Delta F(1) = 12.930, p < .05) \) by 5.7% and 10.8%, respectively. In the third step of the analysis, the interaction between mental frustration x free-choice contrast code improved prediction of attitudes \( (\Delta F(1) = 7.661, p < .05) \) and intentions \( (\Delta F(1) = 20.251, p < .05) \) by 7.2% and 14.8%, respectively. As expected by dissonance theory, probing of the interactions revealed mental frustration to be positively associated with attitudes \( (\beta = .261, p = .156) \) and intentions \( (\beta = .356, p = .058) \) for free-choice participants. The relationships between mental frustration with attitudes \( (\beta = -.361, p < .05) \) and intentions \( (\beta = -.578, p < .05) \) were negative for forced-choice participants and for participants in the control group (see Figures 1a & 1b).

Finally, it is important to note that residual analysis supported normality, linearity, homoscedasticity, and independence of residual variances of attitudes and intentions. That is, normal probability plots of residuals in which expected values of affective and cognitive attitudes were plotted against their actual values supported assumptions of normality of residuals. In addition, plots of errors of prediction for affective and cognitive attitudes against their respective predicted scores indicated that standard deviations of errors of prediction were approximately equal for all predicted scores of affective and cognitive attitudes (Tabachnick & Fidell, 1989). What is more, the autocorrelations of residual variance of cognitive \( (r = .19, p > .05) \) and affective attitudes \( (r = .11, p > .05) \) with the sequence of cases supported independence of residuals (Tabachnick & Fidell, 1989). Finally, the correlation
Figure 1. (a & b). The Moderating Effects of Free-Choice on the Relationships Between Mental Frustration with Attitudes and Intentions.

matrix between observed variables did not suggest any multicollinearity effects or singular variables given that none of the correlations exceeded .80 (Tabachnick & Fidell, 1989).

DISCUSSION

The purpose of the present study was to examine core assumptions of cognitive dissonance theory in the context of physical exercise and a young population. Because dissonance-related attitude change is more likely to operate with regards to boring tasks, the first step of our research was to determine whether young people found our target activity (bench/chair stepping) boring. The pilot study clearly demonstrated that indeed pupils found bench/chair stepping a boring task given that mean scores for affective attitudes were comparable with mean scores reported in previous research investigating boring tasks (Festinger & Carlsmith,
Table 2
Regression Analyses Predicting Intentions and Attitudes from Mental Frustration and Free-choice

<table>
<thead>
<tr>
<th>Steps</th>
<th>Beta</th>
<th>t</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction of Attitudes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Mental frustration</td>
<td>-.260</td>
<td>-2.510</td>
<td>.057*</td>
</tr>
<tr>
<td>2. Mental frustration</td>
<td>-.199</td>
<td>-1.921</td>
<td>.111*</td>
</tr>
<tr>
<td>Free choice contrast code</td>
<td>.258</td>
<td>2.494*</td>
<td></td>
</tr>
<tr>
<td>3. Mental frustration</td>
<td>-.075</td>
<td>-.682</td>
<td>.171*</td>
</tr>
<tr>
<td>Free choice contrast code</td>
<td>.317</td>
<td>3.106*</td>
<td></td>
</tr>
<tr>
<td>Free choice contrast code × mental frustration</td>
<td>.296</td>
<td>2.768*</td>
<td></td>
</tr>
<tr>
<td>Prediction of Intentions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Mental frustration</td>
<td>-.373</td>
<td>-3.679*</td>
<td>.129*</td>
</tr>
<tr>
<td>2. Mental frustration</td>
<td>-.299</td>
<td>-3.088*</td>
<td>.237*</td>
</tr>
<tr>
<td>Free choice contrast code</td>
<td>.349</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mental frustration</td>
<td>-.121</td>
<td>-1.265</td>
<td>.381*</td>
</tr>
<tr>
<td>Free choice contrast code</td>
<td>.424</td>
<td>4.765*</td>
<td></td>
</tr>
<tr>
<td>Free choice contrast code × mental frustration</td>
<td>.423</td>
<td>4.500*</td>
<td></td>
</tr>
</tbody>
</table>

Note. Parameters with an asterisk are significant at .05 alpha level.

1959); a finding that allows direct comparison between results of the present study and previous studies testing core assumptions of cognitive dissonance theory.

In accordance with initial hypotheses, the main study also provides the first empirical support for cognitive dissonance theory in the context of physical exercise. Findings related to attitude change revealed that participants in the control condition reported relatively weak intentions and that practicing bench/chair stepping to be a rather dull task (see Table 1). It will be recalled that the experimental task was purposefully arranged to be boring because dissonance is likely to operate when tasks tend to be either extremely dull or extremely interesting (Fazio et al., 1977). In the free-choice condition, where more dissonance was created by giving participants freedom of choice to decide whether or not to practice bench/chair stepping, there is evidence for attitude change. In this condition, the average rating for interest was in the positive side of the scale and the average rating for intention was relatively high (see Table 1). In the forced-choice condition, where less dissonance was created experimentally, there was no evidence for attitude change. In this condition, the average rating for interest was toward the negative pole of the scale and the average rating for intentions indicated ambivalence (see Table 1). In short, results related to attitude change corroborate cognitive dissonance theory (Festinger & Carlsmith, 1959) and suggest that dissonance-related attitude change helps understand attitudinal processes with respect to a specific exercise task.

Equally compelling were results related to the experience (phenomenology) of cognitive dissonance. The analysis of variance showed that when participants chose to practice bench/chair stepping (i.e., a boring activity), they experienced higher levels of mental frustration than when they were forced to practice bench/chair stepping. Thus it appears that participants who were given freedom to make a counter-attitudinal decision, and consequently participants who experienced dissonance as a result of this free decision, were more mentally frustrated than participants who were forced to make a counter-attitudinal decision—a finding that is in agreement with assumptions underlying cognitive dissonance theory that predicts mental frustration to be a defining characteristic of cognitive dissonance (Shaffer, 1975; Zanna et al., 1976).
In addition, the regression analyses revealed positive relationships between mental frustration and attitude scores of interest and intentions in the free-choice condition but not in the other two experimental conditions. Taken together, these findings are very much in line with cognitive dissonance theory and suggest that attitudes are motivated by a need to reduce aversive arousal only when people feel personally responsible for counter-attitudinal decisions: The more choice people perceive to have over performance of counter-attitudinal behavior, the more mental frustration they experience and the more likely they are to realign their attitudes toward the advocated position as a result of perceived choice and mental frustration. In contrast, when people are forced to (or simply are asked to) make a decision that is contrary to their attitudes, mental frustration is low because, as Festinger and Carlsmith (1959) have suggested, the amount of dissonance and frustration decreases as the amount of social pressure increases.

The finding that free-choice participants reported higher levels of frustration than participants in the forced-choice and the control conditions also rules out self-perception processes as an alternative explanation for the observed attitude change (Bem, 1972). According to Bem’s (1972) theoretical analysis, the experience of cognitive dissonance and corresponding internal drive-like states are not necessary for attitude change. From this perspective, it is possible attitude statements are based on individuals’ observations of their own behavior and on the external stimulus conditions that reinforce this behavior. This is especially true when people choose to perform a counter-attitudinal behavior. For example, according to self-perception theory, in the free-choice condition participants change their attitudes to be consistent with their counter-altitudinal decision because in this condition people view their behavior or decision as a true (credible) reflection of their attitudes. In the forced-choice conditions, however, behavior cannot be viewed as a credible source of information for inferring attitudes because in those conditions behavior is under the control of social pressure. As a consequence, in the forced-choice condition, people do not use their behavior to infer personal attitudes and therefore there is no attitude change. Results of the present study rule out operation of self-perception processes because free-choice participants actually experienced frustration, and the amount of frustration that they experienced was associated with attitude scores.

Results of the present study also rule out the possibility that attitude change has been reinforced by an expectation to elicit aversive consequences. In particular, several researchers have argued that counter-attitudinal advocacy is not necessary for cognitive dissonance and that cognitive dissonance occurs to the extent that people are led to believe that counter-attitudinal behavior leads to some undesirable consequences (e.g., harm to an esteemed other) (Cooper & Worchel, 1970; Scher & Cooper, 1989). Thus from this perspective, free-choice participants will display attitude change, regardless of whether they make dissonant or consonant decisions, if they are led to believe that their decision has negative repercussions for an esteemed other. The design of our experiment rules out this alternative explanation because it is random and therefore controls for influences of unmeasured factors such as perceptions related to aversive consequences. In addition, unlike other cognitive dissonance experiments (Cooper & Worchel, 1970; Festinger & Carlsmith, 1959; Scher & Cooper, 1989) our research design did not lead participants to believe that their decision would elicit negative consequences. In fact, we purposefully did not ask participants to engage in any actual counter-attitudinal behavior (i.e., write an essay in favor of bench/chair stepping) to reinforce the idea to participants that their behavior (decision) would not bring about any aversive consequences (i.e., influence others’ opinion about exercise). Therefore, results of the present study are more in line with the view that aversive consequences are not necessary for dissonance-related attitude change (Jones, & Brehm et al., 1996).
That said, we confess that we do not believe that self-perception processes and cognitive processes related to “aversive consequences” do not operate in the context of physical exercise. As others have argued, self-perception theory and cognitive dissonance theory can be appropriately applied to its own specialized domain (Zanna et al., 1976). Self-perception theory can explain attitudinal shifts when exercise behavior reflects a position that is relatively acceptable for the individual, whereas cognitive dissonance may explain attitudinal shifts when exercise behavior reflects a position that is not acceptable for the individual (Zanna et al., 1976).

More critical still, we doubt that cognitive dissonance theory provides an all-encompassing framework for understanding the voluminous literature on attitude change (Wood, 2000). For instance Deci, Eghrari, Patrick, and Leone (1994) have demonstrated that reduction of aversive states that are experienced as a result of dissonance (through acknowledgement of conflict) increases attitude change. However, we do believe that cognitive dissonance, with the different emphasis on the different models, can help understand a host of other important exercise-related process and outcome variables such as self-esteem, confidence, group cohesion, and interpersonal conflict.

To illustrate, Aronson (1968) has suggested that the self-concept is implicated in dissonant-related attitude change. Specifically, it has been argued that counter-attitudinal behavior leads to cognitive dissonance and attitude change because acting inconsistently with personal attitudes implies a trait that is strongly discrepant with one’s self-image or with the impression one wants to project to the outside world (i.e., appear intelligent and not stupid and dishonest). From this perspective, people with low self-esteem do not experience the cognitions “I believe the task is dull” and “I decided to engage in a dull task” as dissonant. Indeed, those cognitions are perfectly consonant (Aronson, 1968). What is dissonant in this situation is the cognition that “I am a reasonable and intelligent person” and the cognition that “reasonable and intelligent people do not do boring tasks.”

Similarly, in the context of physical exercise, it can be suggested that the cognition “I am obese and physically inactive” and the cognition “obesity and physical inactivity causes heart disease” are not dissonant for a person who would be considered “suicidal” or had negative self-regard. What is dissonant in those situations is the cognition “I am a worthy person who does not want to die” and the cognition “my physical inactivity causes heart disease.” From this analysis, a first good step in motivating obese people to undertake exercise is to re-affirm a positive view of their physical self and/or make them feel uncertain about their negative self image (Steele, 1988)².

In conclusion, the unique contribution of the present study is concerned with the confirmation of dissonance-related attitude change in the context of exercise and the confirmation of the processes by which cognitive dissonance influences attitudes toward exercise. In addition, the present study is the first to demonstrate, in the context of exercise, that cognitive dissonance is aversive and rule out the possibility that self-perception processes and cognitive processes related to “aversive consequences” can account for dissonance-related attitude change. Given that all a theory can do is to generate research, we hope that the present

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²For obese people, the cognition “I am obese” is also dissonant with the cognition “I exercise.” This dissonance may explain why obese people prefer to distort cognitions related to health risks of physical inactivity rather than engage in physical activity. That is, if obese people become physically active then additional dissonance is created between their behavior and self-image (for obese people do not exercise). Therefore, a good first step in promoting exercise among obese individuals would be again to re-affirm a positive view of their physical self.
findings will encourage young researchers to apply different experimental paradigms (i.e., free choice paradigm, effort paradigm, double forced compliance paradigm; Brehm, 1956; Fazio et al., 1977; Girandola, 1997) to the domains of exercise and sport with the view to test different "self" models of cognitive dissonance theory (Aronson, 1968; Steele, 1988) and explain important phenomena such as attitudes, physical self-esteem, and overconfidence.

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