Constraints to Exercise: Attitudinal Antecedents and Motivational Consequences

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Abstract

The purpose of this study was to test Iso-Ahola and St. Clair's (2000) theoretical model of exercise motivation, according to which attitudes and knowledge are negatively related to constraints while constraints in turn have a negative effect on motivation. The model also predicts direct positive effects of attitudes and knowledge on motivation. 180 undergraduate students served as subjects. The data lent strong support for the model and suggested that the model is a parsimonious way of explaining exercise motivation. To further examine constraints' motivational consequences, three exerciser groups' (sedentary, occasional, frequent) perceived constraints were compared statistically. As hypothesised, frequent exercisers were significantly lower on the combined score of constraints and different types (internal and external) of constraints than occasional exercisers who in turn perceived significantly fewer constraints than sedentary persons. This linear trend, however, was more evident among female than male subjects. Additionally, sedentary females also perceived more internal-permanent and internal-temporary constraints than the other female or male exerciser groups. Taken together, the results suggest that constraints have strong (negative) motivational consequences but these effects are tempered by positive attitudes toward and better knowledge about exercise.

Keywords: *exercise, motivation, attitude, constraints*

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Introduction

It is firmly established that exercise has beneficial effects on human health. For example, the premature mortality rate is about 50% lower among exercisers than nonexercisers (Blair, Kohl, Barlow, Paffenbarger, Gibbons and Marcera, 1995; Lee, Hsieh, and Paffenbarger, 1995; Myers, Prakash, Froelicher, Partington, and Atwood, 2002). When compared to the least fit individuals, the most fit persons' likelihood of having a heart disease is 7-8 times lower (Blair, 1993). In a similar vein, incidence of stroke declines linearly with intensity of regular exercise. Exercisers are much less likely to have diabetes, osteoporosis, and obesity. These and other effects are well documented in the famous Surgeon General's Report in 1996 and in numerous studies since then. Scientific evidence is so compelling that one may ask: why continue to do research to demonstrate the physiological effects of exercise?

It is time to move from physiology to psychology. Psychologists are called upon to provide a clear understanding and explanation for why the U.S. population still continues not to exercise. One would think that people would have taken notice of such strong physiological effects of exercise and would have started exercise programmes, especially because these positive effects have been continuously trumpeted in the public media during the last 10 years or so. However, the fact remains that 78% of the U.S. population is classified sedentary, with only 22% exercising regularly (Blair, 1993). Why this colossal failure? Notwithstanding disabled individuals, everybody has the means to exercise as it only takes a pair of sneakers and go out the door for a brisk walk. Certainly, money cannot be an obstacle for anybody, nor can lack of time as the average American spends about three hours a day watching television. So, why don't people exercise?

Needless to say, the issue is purely psychological, and more specifically, motivational. In their theoretical analysis and model, Iso-Ahola and St. Clair (2000) outlined the motivational foundations of exercise and nonexercise. According to this theory of intrinsic-extrinsic motivation, exercise behaviour can be sustained only if one is intrinsically motivated. This means that a person engages in physical activity for its own sake, for love and enjoyment of the activity. Participation provides the key intrinsic rewards, sense of autonomy (freedom and control) and competence. As a result, in laypersons' terms, exercise comes to be seen as "fun" and is therefore continued day after day. To be sure, people can initiate and maintain exercise behaviour for a while by such extrinsic contingencies as expected loss of weight, nagging spouse, and thoughts like, "I should exercise because Surgeon General says so". However, the motivational power of such extrinsic factors is transient. That is why about 50% of people drop out of their exercise programmes six months after starting them (Carmody, Senner, Malinow, and Matarazzo, 1980; Dishman, 1988).

To become motivated for exercise, psychological conditions have to be favourable. That is, people have to be able to perceive that this activity gives them a sense of autonomy, competence and enjoyment. If they perceive exercise as a leisure activity (or leisure-like activity), then they expect to receive these psychological rewards from their engagement (Iso-Ahola, 1980, 1989, 1999). Thus, it is not surprising that an increased sense of freedom leads to greater adherence to exercise programmes (Thompson and Wankel, 1980). Conversely, if exercise is perceived as a work-like activity, then motivation for it becomes difficult. As a result, barriers are more readily accepted as reasons not to exercise. Barriers, therefore, have negative motivational consequences. While the link between perceived barriers and exercise behavior has been established (Booth, Owen, Bauman, Clavisi, and Leslie, 2000; Brownson, Eyler, King, Brown, Shyu and Sallis, 2000; King, Castro, Wilcox, Eyler, Sallis and Brownson, 2000; Lian, Gan, Pin, Wee, and Ye, 1999; Mitchell and Olds, 1999; Steinhardt and Dishman, 1989; Trost, Owen, Bauman, Sallis & Brown, 2002) no studies have attempted to examine the relationship between barriers and exercise motivation.

Iso-Ahola and St. Clair (2000, p. 136) proposed "that to those for whom exercise has not become routine (i.e., occasional exercisers and nonexercisers), perceived constraints are greater underminers of their goal-setting for exercise than to those for whom exercise has become routine" (i.e., regular exercisers). The present study was planned to test this proposition and thus *predicted that regular exercisers would be lower on all perceived constraints than occasional exercisers and nonexercisers.* Constraints, however, can be divided into internal vs. external and temporary vs. permanent. The resultant 2x2 model presents four major types of constraints: internal – permanent (e.g., perceived competence), internal-temporary (e.g., lack of energy), external-permanent

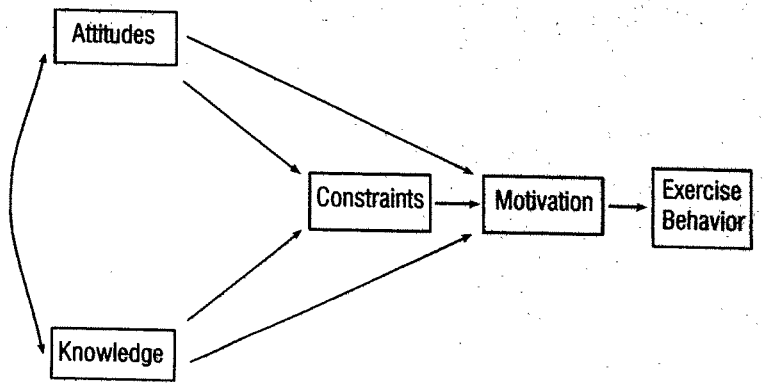

Figure 1. A path analytic model of motivational determinants of exercise behaviour (Iso-Ahola & St. Clair, 2000).

(e.g., no time in daily schedule), and external-temporary (e.g., hanging out with friends). Although we expected regular exercisers to be lower on all of these constraints, it was important to examine possible differences between the three exerciser groups on these various types of constraints. Recent empirical research has shown that "intrapersonal constraints interact with motivational dimensions and act as psychological mediators of amotivation and intrinsic motivation" (Alexandris, Tsorbatzoudis and Grouios, 2002, p. 249).

A more direct way of testing constraints' motivational consequences is through path analysis. Iso-Ahola and St. Clair (2000) presented a path analysis model that can be tested empirically (see Figure 1). Accordingly, constraints have a direct (negative) effect on exercise motivation and also serve as the mediator of the influence of attitudes and knowledge on motivation. The present study was designed to test these effects and predicted that the more constraints one has, the lower is his/her intrinsic motivation for exercise. It was also predicted that constraints have less effect on people's exercise motivation whose attitudes toward exercise are positive and who have better knowledge about exercise (p. 134). Thus, in path analysis terms, attitudes and knowledge should have direct negative effects on constraints but direct positive effects on motivation itself. This model was tested using all the constraints together as the mediator and separately when using the internal constraints score as the mediator in one analysis and the external constraints score in another.

Method

Subjects

The questionnaires were distributed to undergraduate students enrolled in at least one course offered by the Department of Kinesiology at a large research university on the east coast of the U.S. The courses used for his sample represented both "activity" (weight training and basketball) and lecture (sport psychology) classes. Since the questionnaires were administered during the first class of the semester, subjects had not been exposed to any material taught in those classes. Altogether, 180 undergraduate students filled out the questionnaire; 105 were males and 75 females. No student refused to participate in the study, although 5-7 subjects' responses could not be included in all the analyses as they failed to fill out all sections of the questionnaire.

Variables

In the first set of analyses, the two independent variables were type of exerciser (sedentary, occasional, frequent) and gender. The dependent variables were perceived constraints: (1) internal/permanent, (2) internal/temporary, (3) external/permanent, and (4) external/temporary. In the second set of analyses, attitudes and knowledge were predictors while perceived constraints was the criterion variable. When motivation was the dependent variable, attitudes, knowledge and constraints were predictors.

Measurements

Exercise participation. The variable "type of exerciser" was created based upon subjects' responses to the question: "Considering a 7-day period (a week), how many times on the average do you do the following kind of exercise for more than 15 minutes during your free time"? Subjects indicated the number of times per week they engaged in "strenuous exercise (heart beats rapidly)" (e.g., running, jogging, swimming, basketball, biking), "moderate exercise (not exhausting)" (e.g., tennis, walking, badminton), and "mild exercise (minimal effort)". This measure was taken from Godin and Shephard's (1985) "simple method" to assess exercise behaviour and represents a slight modification of the widely used 7-day recall questionnaire to assess leisure time exercise behaviour (Blair et al, 1985, Sallis et al, 1985). Godin, Jobin and Bouillon (1986) have reported satisfactory reliability and validity data for this measure. Those subjects who indicated zero times of strenuous exercise were classified as "sedentary" (31 subjects); those who indicated 1-2 times per week were designated as "occasional" (67 subjects), and those who answered 3 times or more per week were categorised as "frequent" (82 subjects).

Based upon the formula provided by Godin and Shepard (1985), MET values were calculated for each subject. The three groups differed significantly from one another in the total MET values [$F(2,175) = 91.3$, $P<.0001$, $\eta^2=.51$]: frequent ($M = 61.2$), occasional ($M = 36.3$), and sedentary ($M = 19.4$). Subjects were also asked: "Considering a 7-day period (a week), during your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?" Answers were given on a 1-3 scale from "never" to "sometimes" to "often". The three groups differed significantly [$F(2,174) = 43.4$, $P<.0001$, $\eta^2=.33$]: frequent ($M = 2.8$), occasional ($M = 2.2$), and sedentary ($M = 1.9$). These data validate the division of subjects into the three groups and show that they differed significantly from one another in terms of their actual participation in exercise activities, their total MET values, and their subjective perceptions of how much they exercised.

Constraints. To measure these variables, the same format was used for all items: "On the days you don't exercise (or would not decide to exercise), how important is each of the following in your decision *not* to exercise?" Subjects responded on a 1-5 scale from "not important" to "very important". The following two items made up (1) internal-permanent constraints: "I decide not to exercise (or would decide not to exercise) because I am not physically capable". "I decide not to exercise because I don't have the mental will power or self-discipline". (2) Internal-temporary: "I decide not to exercise because I don't have energy ... because I feel lazy". (3) External-permanent: "I decide not to exercise because I don't have time ... because I can't fit it into my daily schedule/plans". (4) External-temporary: "I decide not to exercise because the weather interferes with my plans to exercise ... because I'd rather hang out with my friends". The total constraints measure consisted of six items measured slightly differently from the above. "How frequently does ... prevent you from exercising"? The six constraints included were: the feeling of being too tired, regular plans (daily schedule), your lack of skills, an unexpected event (like bad weather), the feeling of being too lazy, and the inconvenience of exercise locations/facilities. Subjects responded to these items on a 1-5 scale from "very infrequently" to "very frequently". The coefficient alpha for the six items measure was .77. Skills, tiredness and laziness were internal constraints while plans, inconvenience, and unexpected events were external constraints.

Motivation. Intrinsic motivation was measured by four items: ... because I love exercise, ... because I enjoy exercise, ... because it makes me feel good/relaxed, ... because it makes me feel less tense and less stressed. Responses were recorded on a 1-5 scale from "not important" to "very important". These items reflect both intrinsic-permanent and intrinsic-temporary attributions for exercise. The coefficient alpha for this 4-item measure was .81. In addition, extrinsic motivation was measured by three items ... because it is important to me to be fit and healthy in general, ... because it is my goal to exercise at least 3 times per week ... because I want to lose weight. The first two are extrinsic-permanent attributions for exercise and the last is extrinsic-temporary. The coefficient alpha for this 3-item measure was .63.

Attitudes and knowledge. Attitudes were assessed by responses to the stem: "For me to exercise regularly 2-3 times or more per week is (would be) ..." on six bipolar scales (pleasant to unpleasant, fun to boring, good to bad, important to nonimportant, enjoyable to not enjoyable, worthwhile to not worthwhile). The coefficient alpha for this measure was .90. Knowledge was assessed by responses to three items: (1) "I am knowledgeable about the physical/mental health benefits of exercise." (2) "I am knowledgeable about the amount of exercise that is needed to obtain physical/mental health benefits of exercise", and (3) "I am aware of the different locations/facilities that are available for getting some form of exercise". Responses were recorded on a 1-5 scale from "strongly disagree" to strongly agree". The coefficient alpha for this measure was .77.

Data collection

The questionnaires were distributed to undergraduate students enrolled in one lecture (sport psychology) or in one of the five activity classes (weight training and basketball). This was done at the beginning of the first class of the semester. Students were informed that their participation was voluntary, that there were no right or wrong answers, and that there was no time limit on filling out the questionnaire. They were also reminded to take their time and to read each individual set of instructions. Students returned their completed questionnaires to the same researcher that distributed them.

Results

Exercisers' perceptions of constraints

A combined score of perceived lack of physical competence and will power constituted *internal-permanent constraints.* As expected, the main effect of type of exerciser was significant [$F(2,175)=12.74$, $P<.001$, $\eta^2=.13$]. In addition, the gender effect [$F(1,175)=5.9$, $P<.02$, $\eta^2=.03$] and the interaction effect [$F(2,175)=4.7$, $P<.01$, $\eta^2=.05$) were significant. The main effect of type of exerciser is depicted in Figure 2 and shows a linear decrease in these constraints from sedentary to frequent exercisers. Post hoc tests indicated that each group differed significantly ($P<.05$) from one another. The gender effect indicated that females were higher on these constraints. The interaction effect revealed that there were no sex differences among occasional exercisers nor among frequent exercisers. However, sedentary females perceived more internal-permanent constraints than sedentary males ($P<.05$); they were also higher on these constraints than both male and female occasional and frequent exercisers ($P<.01$).

A combined score of having no energy and feeling lazy comprised *internal-temporary* constraints. As predicted, the main effect of type of exerciser [$F(2,175)=7.1$, $P<.001$, $\eta^2=.07$] was significant. In addition, the gender effect [$F(1,175)=5.7$, $P<.02$, $\eta^2=.03$] and the interaction effect [$F(2,175=4.0$, $P<.02$, $\eta^2=.04$] were significant. Figure 2 illustrates the main effect of type of exerciser and shows a linear decrease in these attributions from sedentary to frequent exercisers, with each group differing significantly from one another ($P<.05$). The gender effect indicated that female subjects were higher on these attributions. The interaction effect revealed that sedentary females were higher on these constraints than sedentary males ($P<.05$). Sedentary females also perceived more internal-temporary constraints than both male and female occasional and frequent exercisers ($P<.05$), while occasional and frequent male and female exercisers did not differ on these constraints.

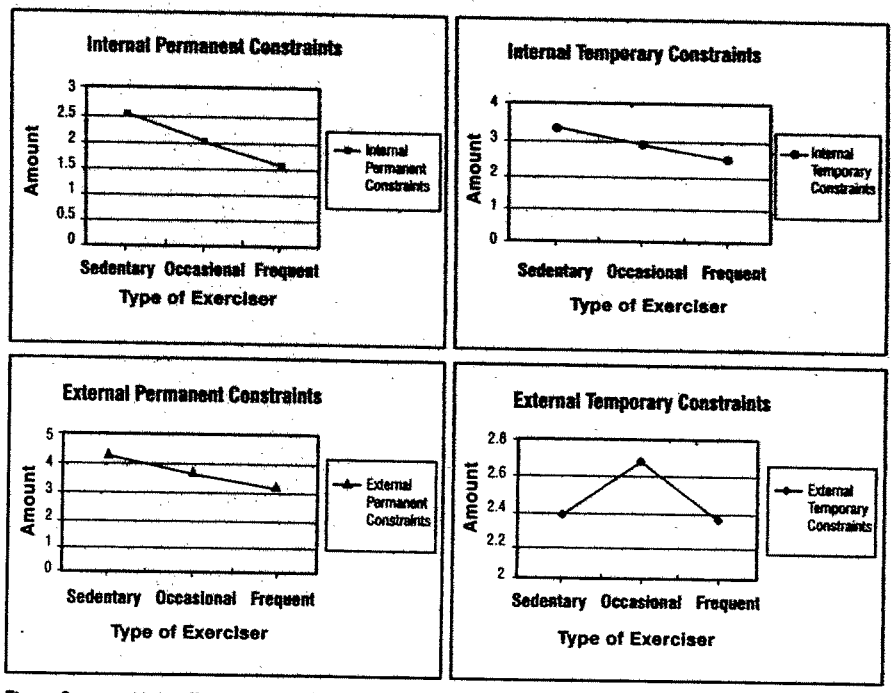

Figure 2. Main effects of type of exerciser on various types of constraints

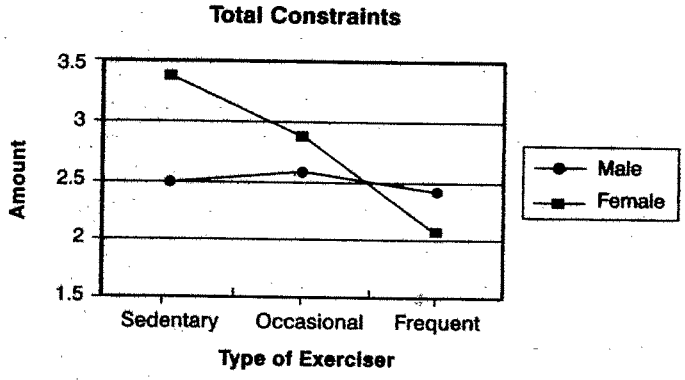

Figure 3. Interaction effect of gender and type of exerciser on total constraints

A composite score of not having time and not being able to fit exercise into daily schedule constituted *external-permanent* constraints. In support of our expectations, the main effect of type of exerciser was significant [F (2, 173)=8.0, P<.001, η^2=.08]. As Figure 2 shows, perception of these constraints decreased linearly from sedentary to frequent exercisers, with the groups differing significantly from each other (P<.05). The gender effect was marginally significant [F (1,173)=3.6, P<.06, η^2=.02] and indicated that females perceived more external-permanent constraints. The interaction effect was nonsignificant.

A combined score of weather and hanging out with friends comprised *external-temporary* constraints. As expected, the main effect of type of exerciser [F (2,175)=4.5, P<.01, η^2=.05] was significant. Figure 2 shows that frequent exercisers were lower (P<.06) on these constraints than occasional exercisers. Sedentary subjects, however, did not differ from either occasional or frequent exercisers. The gender effect was nonsignificant, but the interaction effect [F (2,175)=4.1, P<.02, η^2=.04] reached significance. Post hoc tests showed that the only reliable difference (P<.05) occurred between occasional and frequent female exercisers, with the former perceiving more external-temporary constraints.

The *total constraints* score was a sum of six items indicated earlier. The main effect of type of exerciser was significant [F (2,174)=15.8, p<.001, η^2=.15] and indicated that perception of constraints decreased linearly from sedentary (M=3.00) to occasional (M=2.7) to frequent exercisers (M=2.2). These groups differed significantly from one another (P<.05). The significant main effect of gender [F (1,174)=6.3, P<.01, η^2=.03] showed that female subjects (M=2.7) perceived more constraints than males (M=2.4). Figure 3 presents the significant interaction effect [F (2,174)=10.1, P<.001, η^2=.10]. As can be seen, males' perception of constraints stayed relatively steady among the three exerciser groups, whereas females' perceptions dropped dramatically from sedentary to frequent exercisers.

Table 1. Path coefficients (standardised beta-coefficient) showing the effects of predictors on criterion-variables

	CRITERION-VARIABLES					
Predictors	**Total Constraints**	**Internal Constraints**	**External Constraints**	**Intrinsic Motivation**	**Extrinsic Motivation**	**Exercise[a] Behavior**
Attitudes	-.46**(-.56)	-.45**(-.53)	-.38**(-.47)	.41**(.60)	.23**(.37)	.03(.32)
Knowledge	-.21**(-.42)	-.16*(-.37)	-.21**(-.38)	.11(.41)	20**(.34)	-.08(.17)
Explained Variance (R^2)	35%	30%	26%			
Total Constraints				-.26**(-.53)	-.07(-.29)	-.39**(-.47)
Explained Variance (R^2)				43%	17%	
Intrinsic Motivation						.19*(.37)
Variance (R^2) Explained						24%

* p<.05
** p<.01
[a] frequency of strenuous exercise per week
values in parenthesis are zero-order correlations, all significant (P<.01)

Predicting constraints, motivation and behaviour

To test the path analysis model presented in Figure 1, standardised beta coefficients were calculated using linear regression analyses. The first analyses determined the extent to which attitudes and knowledge predict constraints, while the second analyses assessed the contribution of constraints, attitudes and knowledge to motivation. Finally, exercise behaviour was regressed on constraints, attitudes, knowledge and intrinsic motivation. The results of these analyses are summarised in Table 1. Multicollinearity was not a problem in any of the analyses as none of the variable tolerances approached values to warrant caution (Norusis, 1990).

When the total constraints was the criterion variable, the model explained 35% of the variance and indicated that both attitudes (-.46) and knowledge (-.21) were inversely related to constraints. Similar results were obtained when internal and external constraints were the criterion variables. In all cases, attitudes predicted constraints better than knowledge. When intrinsic motivation was the criterion, attitudes (.41) and constraints (-.26) were significant predictors but knowledge was not. On the other hand, when extrinsic motivation was the criterion variable, attitudes (.23) and knowledge (.20) were significant predictors while constraints (-.07) was not. The three predictors explained 43% of the variance on intrinsic motivation and 17% on extrinsic motivation. Finally, exercise behaviour (strenuous exercise per week) was regressed on attitudes, knowledge, total constraints and intrinsic motivation. The model explained 24% of the variance and showed that constraints (-.39) and intrinsic motivation (.19) were significant predictors of exercise behavior.

Discussion

The purpose of this study was to examine the role constraints play in exercise behaviour. This was accomplished in two ways. In the first set of analyses, three exerciser groups' (frequent, occasional and sedentary) perceptions of constraints were compared statistically. In these analyses, constraints were divided into four different types depending on whether they were internal or external and permanent or temporary. The second set of analyses examined attitudinal determinants and motivational consequences of constraints. This was done on the basis of a path analysis model (Iso-Ahola and St. Clair, 2000), according to which attitudes and knowledge are major determinants of constraints, while constraints in turn have a direct negative effect on motivation for exercise.

Based upon the reported data, it is clear that the three groups of exercisers differ substantially in their perceptions of constraints. As expected, frequent exercisers were significantly lower on all types of constraints than occasional exercisers and sedentary individuals; occasional exercisers in turn perceived fewer constraints than the sedentary persons. A fairly linear decrease of constraints from sedentary to frequent exercisers suggests that constraints have motivational consequences. Other studies also support this idea (Alexandris et al, 2002; Carroll and Alexandris, 1997). Frequent exercisers have reached their status in part because they have been able to eliminate most of the constraints. On the other hand, nonexercisers and occasional exercisers still perceive both internal and external constraints and are therefore motivationally challenged in their attempts to exercise regularly and vigorously enough. The fact that nonexercisers and occasional exercisers suffer from both internal and external constraints is important for understanding the behavioural differences between them and frequent exercisers. On the one hand, nonexercisers think that they do not have physical and mental skills needed for exercise and on the other, they are faced with difficult external problems, such as scheduling conflicts due to family and work obligations. This combination of constraints becomes a powerful force that undermines their motivation for exercise.

The data also revealed considerable gender differences. In general, female subjects

perceived more constraints, both internal and external, than did males. In addition to this overall "main effect", the interaction effects indicated that the decline in the perceptions of constraints from nonexercisers to frequent exercisers was mainly attributable to females (see Figure 3). While males' perceptions of constraints did not change much, females' perceptions declined markedly from nonexercisers to occasional and frequent exercisers. Other interaction effects showed that sedentary females perceived more internal-permanent and internal-temporary constraints than sedentary males and both male and female occasional and frequent exercisers. Thus, it appears that constraints prevent females from becoming exercisers. Sedentary females not only perceive more constraints in general, but especially internal constraints. In other words, they think they do not have physical competence nor mental will power to engage in exercise activities. In addition, they are more apt to feel lazy and having little energy. Perceived physical competence and lack of mental discipline seem especially serious constraints to starting up or maintaining exercise routines. On the other hand, this is not entirely surprising given that many studies (e.g., Marcus, Eaton, Ross, and Harlow, 1994; Garcia and King, 1991; Rogers and Gauvin, 1998; Litt, Kleppinger, and Judge, 2002; Cox, Gorely, Puddey, Burke, and Beilin, 2003) have found lack of self-efficacy to be a significant barrier to exercise. Self-efficacy is a general construct but contains the idea of perceived lack of physical and mental skills included here in the internal-permanent constraints. Studies have also shown that a related construct, perceived behavioural control, is a significant predictor of intentions to exercise (e.g., Hausenblass, Carron and Mack, 1997) and of changes in physical activity (Motl et al., 2005).

The above gender difference is noteworthy considering that subjects were college students. Because college females do not have family and motherhood obligations, there should have been few, if any, differences between men and women. It, then, should not be surprising to find in future studies that such differences between males and females also exist among regular 9-5 workers, perhaps even to a larger extent. On the other hand, the above gender differences raise a possibility that subjects' responses may reflect more of their excuses than actual constraints to exercise. For example, why should today's college females perceive less physical competence and will power than males given that girls have participated in organised sports during the last 20 years as much as boys? Today's 18-22 year old girls are used to participating in various sports and physical activities and should therefore perceive adequate physical and mental skills to participate in general exercise. If so, female and male college students should not differ in their perceptions of internal-permanent constraints. However, whether the observed gender differences were based upon excuses or actual constraints does not matter from a motivational standpoint. Both excuses and actual constraints are perceptions and it is the perceptions that form the basis of human motivation and behaviour.

Regression analyses supported the path analysis model (Figure 1) and showed that constraints indeed have negative motivational consequences. As expected, constraints were negatively related to intrinsic motivation for exercise. Constraints also had a negative effect on actual exercise behaviour, which is consistent with previous studies (e.g., Booth et al, 2000; Brownson et al, 2000; King et al, 2000). Therefore, it appears that constraints have both direct and indirect (through motivation) effects on exercise behaviour. It is also worth noting that constraints had a negative effect on intrinsic motivation but not on extrinsic motivation. This further underscores the negative impact of constraints because it is intrinsic motivation, not extrinsic motivation, that sustains exercise behaviour in the long term.

As for the determinants of constraints, as expected, both attitudes and knowledge were negatively related to constraints. Additionally, attitudes had a direct positive effect on intrinsic motivation. This finding is consistent with other studies reviewed in a meta-analysis of the attitude-intention relationship (Hausenblass et al., 1997). Thus, more positive attitudes toward, and better knowledge about, exercise reduce perceived constraints and thereby promote intrinsic motivation for exercise. If one is affectively (attitude) and cognitively (knowledge) predisposed toward exercise, it makes sense that positive attitudes and better knowledge undermine perceived constraints. Such a favourable predisposition makes it easier to either work around constraints or dismiss them altogether. The importance of these effects of attitudes and knowledge is further underscored by the finding that they were true for both internal and external constraints.

Our data may help clarify previous findings regarding the effects of perceived benefits of exercise. Tai-Seale (2003) found recognised knowledge to be a significant factor in moving rural midwesterners from "precontemplation" all the way to "action". On the other hand, other studies (e.g., Litt et al, 2002) have found no such effects for pros and cons of exercise. Our results showed that knowledge of benefits has only indirect effects on intrinsic motivation (through constraints) but does have direct effects on extrinsic motivation. This is consistent with a theory of intrinsic-extrinsic motivation (Ryan and Deci, 2000), in that benefits of exercise are typically seen as extrinsic rewards (e.g., better health, losing weight). Perceived benefits should, therefore, affect the extrinsic, but not intrinsic, side of motivation, as was found here. Since the motivational effects of extrinsic contingencies are temporary in general, knowledge of benefits may mainly affect exercise motivation only in the short run, and such effects are likely to be variable, as previous studies have shown. The long-term motivational effects appear to materialise to the extent that knowledge of benefits reduces constraints to exercise.

The results lend strong support for Iso-Ahola and St. Clair's (2000) theoretical model of exercise motivation. As the model predicts, constraints play an important mediating role and clearly undermine motivation for exercise and exercise itself. This negative effect, however, is tempered by positive attitudes and better knowledge about exercise. The model provides a parsimonious way of explaining exercise motivation and behaviour. What is needed now is tests of the model in populations other than college students.

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