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Running Head: Beliefs about Physical Activity

Motivational Antecedent Beliefs of Endurance, Strength, and Flexibility Activities

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Abstract

Research into the correlates of physical activity has focused almost exclusively on physical activity as an omnibus construct. Health Canada and the American College of Sports Medicine, however, advocate physical activity in terms of performing regular endurance, strength, and flexibility activities. The purpose of this study was to investigate the absolute and relative contributions of behavioral, normative, and control beliefs associated with endurance, strength, and flexibility activities within a theory of planned behavior (TPB) structure. Participants were 185 undergraduates who completed measures of the TPB and a two-week follow-up of endurance, strength, and flexibility behavior. Results using structural equation modeling and Hotelling's *t* tests for dependent correlations identified different motivational antecedents for each type of physical activity ($p < .05$). Endurance behavior was influenced exclusively by behavioral beliefs, flexibility behavior was influenced by normative and control beliefs, and strength behavior was influenced by key behavioral, normative, and control beliefs. The different motivational profiles for each physical activity allude to the importance of tailoring interventions by physical activity type.

Key Words: theory of planned behavior, belief analysis, physical activity mode

There is substantial evidence that physical activity (PA) is an effective preventive strategy against numerous chronic diseases, but most developed countries do not meet the minimal PA requirements to accrue benefits (Canadian Fitness and Lifestyle Research Institute, 2001; U.S. Department of Health and Human Services, 1996). Interventions to promote PA are likely to be facilitated by a sound understanding of PA correlates. To date, the theory of planned behavior (TPB; Ajzen, 1991, 2002a) has successfully explained PA in numerous populations (Hagger, Chatzisarantis, & Biddle, 2002). The TPB suggests that the proximal determinants of behavior are one's intention to engage in that behavior and his/her perceived behavioral control (PBC: perception of the ease or difficulty of performing the behavior, Ajzen, 1991). PBC is also hypothesized to influence behavior through intention along with attitude (i.e., overall evaluations of performing the behavior) and subjective norm (i.e., perceived social pressures to perform the behavior). Furthermore, it is assumed that an attitude is formulated via a cost / benefit evaluation (i.e., behavioral beliefs) about PA, subjective norm is formulated by evaluating the perceived pressure to perform PA from social referents (i.e., normative beliefs), and PBC is formulated by evaluating the barriers or facilitators (i.e., control beliefs) of PA. When attempting to understand the antecedents of motivation for the development of interventions, Ajzen (2002b) outlines the importance of evaluating these more specific beliefs rather than the global TPB constructs (i.e., attitude, subjective norm, PBC).

Although over 50 studies have utilized the TPB for understanding PA, few have implemented the belief-level analysis required for direct application to interventions (Hagger et al., 2002). Further, research into the correlates of PA has focused almost exclusively on PA as an omnibus construct (Bryan & Rocheleau, 2002; Eves, Hoppe & McLauren, 2003). Physical activity, however, is advocated for health benefits by Health Canada (2002) and the American College of Sports Medicine (2000) in terms of performing regular endurance, strength, and flexibility activities. Given that these behaviors are discrete, the motives for these behaviors may differ.

Only one study has focused on differences between motivational antecedents of these discrete PA behaviors. Bryan and Rocheleau (2002) showed that strength activities were influenced by PBC more than

endurance behaviors. The study, however, had limitations that warrant replication and extension. First, aggregated beliefs were used to form the omnibus constructs of attitude, subjective norm, and PBC when Ajzen (2002b) identifies that intervention efforts should be tailored to belief-level targets. Creating scales based on aggregating potentially disparate beliefs may obscure these particular belief targets and violate classical test score theory (Rhodes, Plotnikoff, & Spence, 2004). Thus, an examination of disaggregated beliefs about discrete PA behaviors is warranted. Second, the coefficients between models were not compared statistically making it difficult to interpret potential differences. Finally, the study only included a comparison between strength and endurance activities. Given that regular flexibility activities are also advocated, an extension to include flexibility activities is warranted (Health Canada, 2002; ACSM, 2000).

The purpose of this study was to investigate the behavioral, normative, and control beliefs associated with endurance, strength, and flexibility activities. Both the absolute (within activity comparison) and relative (between activity comparison) contributions of various TPB beliefs across three discrete PA behaviors within the TPB model were assessed. We hypothesized that strength activities would be associated with control beliefs based on the results and theorizing of Bryan and Rocheleau (2002). We considered the differences between motives for flexibility activities and the other physical activities more exploratory.

Method

Participants and Procedure

Two hundred undergraduate students received extra credit for completing a TPB survey during large group sessions in February and March 2003. In a two-week follow-up, 185 of the original participants returned to complete measures of endurance, strength and flexibility behavior. No difference ($p > .05$) was found between the 185 participants who returned and the 15 participants who did not. The mean age of participants was 21.07 (SD = 6.42 yrs), 83% were female, and the mean year in university for the sample was 2.89 (SD = 1.76).

Instruments

Prior to completing the survey, participants read Health Canada's definitions regarding the mode, frequency, duration and intensity of the three activities (see Health Canada, 2002). Physical activity was measured using an adapted version of the Godin Leisure Time Exercise Questionnaire (Godin, Jobin, & Bouillon, 1986; Godin & Shephard, 1985) to assess the frequency for endurance, strength, and flexibility activities. The belief-based measures were developed using the belief elicitation procedures of Ajzen (2002a) on an independent sample of 30 undergraduate students. Elicited beliefs and their comparative rank ordering by activity can be found in Table 1. A total of 46 items (see Table 2), were generated to measure these beliefs. These items were pilot tested among 10 undergraduate students to establish face validity. Global (i.e., direct) measures of attitude (4 items), subjective norm (3 items), PBC (3 items), and intention (2 items) were also assessed in the form recommended by Ajzen (2002a) (see Table 3).

Analysis

Structural equation models were estimated with maximum likelihood procedures using LISREL 8.20 (Jöreskog & Sörbom, 1997). For specification of the latent concepts, the loading for each concept's first indicator was pre-set to 1.0 in the model to create a metric scale. Exogenous constructs of attitude, subjective norm, and PBC were freed to correlate.

The global TPB model for each activity was first estimated. The second set of analyses then fixed the effects of the global TPB models and interchanged the beliefs within these fixed frameworks (see Figure 1). This approach improves upon a simple univariate analysis because the beliefs are estimated within the hypothesized causal structure of the TPB. As well, the fixed TPB model reduces the test-wise experimental error because only the beliefs are newly estimated in each successive model.

Our critical result of interest was the total effect of a belief upon behavior while controlling for the TPB. Total effects include the indirect effect of a construct on a dependent variable (i.e., the effect of a belief on behavior through its general construct and intention) and the direct effect of a construct on that dependent

variable (i.e., the direct path of a belief on behavior), if any. The total effect of a belief on intention was also considered.

Our analysis of indirect and direct effects of beliefs on intention and behavior also allows for an evaluation of mediation. For each belief, we examined the mediation of the belief–intention relationship by the belief’s respective global construct. This was achieved by comparing a model where a) a TPB belief has an indirect effect on intention through its general construct with b) a model freeing the path from belief to intention. The two models were then compared using the χ^2 change statistic. Complete mediation is established if the χ^2 change statistic is non-significant and the t-statistic for the total effect of the belief on intention is significant (Hayduk, 1996). Finally, we examined the mediation of the belief–behavior relationship by the belief’s respective global construct and intention using the same procedure.

Results

Results of the global TPB models by endurance [$\chi^2=89.14$ (N=185, 55) $p <.01$, RMSEA = .06, CFI = .97], strength [$\chi^2=112.92$ (N=185, 55) $p <.01$, RMSEA = .08, CFI = .96], and flexibility [$\chi^2=100.13$ (N=185, 55) $p <.01$, RMSEA = .07, CFI = .96] suggested some misfit. Most of the suggested changes through observing the standardized residuals and modification indices were of a multiple nonsignificant ($p >.05$) nature. Still, a significant structural effect from attitude directly on endurance behavior was identified. This improved model fit (χ^2 change = 11.40, $p <.01$) and was included as part of the model used in the belief analyses. The final measurement models are displayed in Table 3 and the structural models are presented in Figure 1. These models were fixed for the belief-level analysis.

Belief-level analyses are presented in Tables 4-6 for the behavioral, normative, and control beliefs respectively¹. Descriptives and factor loadings for these beliefs are presented in Table 2. All loadings were significant ($p <.01$) suggesting acceptable measurement for each individual belief model. For the behavioral beliefs, attitude and intention acted as mediators of the belief – behavior relationship ($\Delta \chi^2 p >.05$) with only minor exceptions. In these cases, the t-statistic was still significant ($p <.05$) for the indirect effect, suggesting partial mediation. All behavioral beliefs had significant ($p <.05$) total effects on at least one PA

behavior with the exceptions of muscle soreness and fatigue. Differences in the statistical significance ($p < .05$) of beliefs on behavior differed by PA. Specifically, flexibility behavior was not influenced by any of the behavioral beliefs, while strength and endurance behavior was influenced by certain behavioral beliefs (see Table 4).

For the normative beliefs (Table 5), subjective norm and intention acted as mediators of the belief–behavior relationship ($\Delta \chi^2 p > .05$) with two notable exceptions. The normative belief about health professionals had a direct effect on flexibility behavior ($p < .05$) and the belief about gym patrons had a direct effect on strength behavior ($p < .05$). Still, the t-statistic was significant ($p < .05$) for the indirect effect, suggesting partial mediation. Endurance behavior was not influenced by any of the normative beliefs ($p > .05$). In contrast, select normative beliefs had significant ($p < .05$) associations with strength and flexibility behavior (see Table 5).

Finally, for the control beliefs (Table 6), PBC and intention acted as mediators of the belief–behavior relationship ($\Delta \chi^2 p > .05$). PBC, however, did not act as a complete mediator of control belief–intention relations ($\Delta \chi^2 p < .05$). Control belief-behavior relations differed by activity. Specifically, endurance behavior was not influenced ($p > .05$) by any of the control beliefs, while strength and flexibility behaviors were influenced ($p < .05$) by various control beliefs (see Table 6).

The previous analysis contained tests of statistical significance for a series of within-model coefficients. We also conducted tests of the relative differences between belief-behavior relations by activity. This analysis used Hotelling's t test for dependent correlations at a criterion of $p < .05$. Overall, 18 of 23 beliefs showed significant differences in belief-behavior relations across the three activities (see Table 7).

Discussion

The purpose of this study was to investigate the behavioral, normative, and control beliefs associated with endurance, strength, and flexibility activities. Study results will be interpreted using Cohen's (1992) effect sizes for standardized correlation coefficients of small (.10), medium (.30), and large (.50). Using these effect sizes as a guideline, we consider large effect sizes as priority targets for intervention followed by

medium effects and, finally, small effects as secondary intervention targets. Our key coefficients of discussion interest are the total effects of beliefs upon behavior. Sutton (2002) points out that belief-behavior relations are the critical coefficients for illuminating how belief-based interventions may translate into behavior change.

Endurance Behavior

The overall TPB model explained 23% of the variance in two-week endurance behavior and 35% of the variance in endurance behavior intention. Additionally, three medium belief-behavior total effects were identified (i.e., improved affect, a sense of accomplishment, and improved physical health). The findings regarding affect and accomplishment mimic most previous research showing the critical importance of affective evaluations on PA (e.g., Lowe, Eves & Carroll, 2002; Rhodes & Courneya, 2003). The importance of physical health on endurance behavior also supports the health-oriented approach taken in many existing intervention campaigns (e.g., Health Canada, 2002).

Six additional behavioral beliefs had small effects upon endurance behavior (see Table 4). On the other hand, endurance behavior was not influenced by any normative or control beliefs. Interestingly, control beliefs are typically as important as behavioral beliefs (Hagger et al., 2002). However, the discrepancy between a general PA measure typically used in TPB research (see Hagger et al. for a review) and our more specific endurance activity measure may be responsible for this difference. Specifically, an omnibus PA measure may capture the control aspects of strength and flexibility as well as endurance activities suggesting that the distinctness of PAs is important when attempting to understand PA motivation. Whatever the case may be, the current data suggest that intervention programs for endurance behaviors should focus on behavioral beliefs as the key targets of change among college students.

Strength Behavior

The overall TPB model for strength behavior performed better than the endurance behavior model by explaining 33% of the variance in two-week behavior and 46% of the variance in intention. Only two medium belief-behavior total effects were identified in the univariate analyses (i.e., strength activities

provide a sense of accomplishment and take too much of an individual's free time). Intervention approaches focusing on these beliefs seem warranted. However, time construed as a key behavioral belief, differs from the control belief regarding lack of time. Instead, this belief may represent people's preferences for other free-time behaviors over strength activities. The concept of behavioral preference is a key aspect of behavioral economic theory (see Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Future research on this topic is needed to understand behavioral decisions for leisure-time behaviors. Finally, some additional behavioral (see Table 4), normative (see Table 5), and control (see Table 6) beliefs also had small effects upon strength behavior. Although they will likely have little impact on a PA intervention, their potential influence may still need attention.

Flexibility Behavior

For flexibility behavior, the overall TPB model performed reasonably well by explaining 32% of the variance in two-week behavior and 34% of the variance in intention. One medium belief-behavior total effect was identified (i.e., the normative belief about health professionals). This is an interesting finding that needs more inductive research to examine why the impact of health professionals on flexibility behavior is so important. Perhaps individuals who have undergone or are undergoing some form of rehabilitation may be engaging in regular flexibility as a result of medical advice. Nevertheless, this is mere speculation. Future research on this topic is needed.

All other normative beliefs had small effects upon flexibility behavior. Various control beliefs (see Table 6) had small effects on flexibility behavior, however, not one behavioral belief had an effect. In fact, subjective norm and its respective normative beliefs were the key antecedents of flexibility motivation and behavior. This is opposite to the TPB and PA literature where subjective norm is often of trivial importance when predicting intention and behavior (Hagger et al., 2002). TPB researchers have sometimes critiqued the measurement of subjective norm because of its poor performance (e.g., Armitage & Conner, 2001). Our results support the validity of subjective norm as an antecedent of intention and behavior and suggest that

subjective norm is simply not as important to endurance behavior and strength behavior as it is to flexibility behavior.

Relative Contributions of Beliefs on Endurance, Strength, and Flexibility Behaviors

Direct comparison analysis of the belief-behavior relationship by activity type identified that 18 of 23 beliefs showed significant differences across the three activities. When comparing endurance and strength behavior, endurance activities were influenced more from beliefs about improved affect, while strength activities were influenced more from the belief that the activity takes too much time, and particular normative and control beliefs. When comparing endurance and flexibility activities, endurance activities were influenced more by behavioral beliefs, while flexibility activities were influenced more by select control and normative beliefs. Finally, when comparing strength and flexibility behavior, strength activities were influenced more by the behavioral beliefs, while flexibility activities were influenced more from health professionals, and coaches/instructors. The different motivational profiles for each PA behavior allude to the importance of tailoring interventions by PA type. Currently, for example, Health Canada's PA Guide (2002) includes strategies for all three types of activities in a "one intervention fits all" approach. It may be more beneficial to tailor the motivational information to suit the specific activities being promoted.

Although the primary focus in this paper was on the motivational antecedents of endurance, strength, and flexibility behavior, another focus was on the theoretical issue of whether the global TPB constructs (e.g., attitude, subjective norm, PBC) and intention mediate the relationship between belief and behavior. We evaluated the TPB model as a defined linear causal structure from belief to behavior based on Sutton (2002), but Ajzen (2002a) does not theorize this belief – global construct causal structure. Our results generally supported the causal TPB structure. This suggests that beliefs are indirectly associated with behavior through their general TPB construct and intention. Only PBC failed to mediate the control beliefs with relative consistency, a finding reported elsewhere (Godin, Gagne, & Sheeran, 2004). Nevertheless, although the failed mediation effect was statistically significant ($p < .05$), the contribution of additional variance by the control beliefs above PBC was minimal (0-1% explained variance).

Some limitations of the study and future research opportunities warrant mention. First, our hypothesized causal effects in these structural equation models represent one conceptualization of the relationships between the measured indicators. The models were found to have some misfit from their observed variance/covariance matrix. Alternative models may represent the data equally or better.

Second, the study used a convenience sample of predominantly female university undergraduates and self-reported PA behavior. If gender differences in activities are present among belief-behavior relations, our results will be biased towards females. No research on this topic is available at present, but our mean levels of endurance, strength, and flexibility do match population level age-matched statistics (CFLRI, 2001). The veracity of this line of research would benefit by using more objective measures of PA (e.g., attendance to a fitness facility) and diverse samples to strengthen the cross validation of the findings. Third, the measures utilized in this study were self-report and of similar Likert-type scaling. Though structural equation modeling was utilized to estimate the TPB concepts free of measurement error, some system variance error associated with a singular form of scaling may have thwarted error free estimation. Fourth, though we have demonstrated that motivational antecedent beliefs vary by endurance, strength, and flexibility activities, the TPB is concerned with single behaviors and not categories of behaviors. The present research narrowed the categories of PA from an omnibus collection of activities, but singular PA behaviors may be a prudent approach for future research (see also Eves et al., 2003). Finally, we measured only the expectancy component of beliefs when Ajzen (1991, 2002a) hypothesizes an expectancy x value interaction for belief structure. We based our expectancy only assessment on the results of Gagne and Godin (2000) and Baker et al. (2003) who found the value component and the expectancy x value interaction to contribute no additional explained variance over expectancy measures. Still, research using both expectancy and value measures may improve our understanding of physical activity motivation in the future, even if it proves to be a direct replication of previous findings.

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Figure Captions

Figure 1. A path model example of the analysis strategy for examining belief relationships in the theory of planned behavior.

Figure 2. Theory of planned behavior models for endurance, strength, and flexibility behaviors. Note: * $p < .05$, ** $p < .01$.

Footnotes

1. A total of 69 univariate belief effects were estimated within the fixed TPB models. Fit statistics ranged from $\Delta \chi^2$ 1.28 – 18.66 but each individual model fit has not been included for the sake of parsimony.

Table 1

Belief Elicitation by Endurance, Strength, and Flexibility Activities (N = 30)

	Endurance % Endorsed	Strength % Endorsed	Flexibility % Endorsed	Q	P-Level	Post Hoc
<u>Behavioral Beliefs</u>						
Physical health	90	40	43	19.18	.00	S,F<E
Takes too much time	80	43	37	15.47	.00	F,S<E
Self-esteem	77	43	23	17.04	.00	F,S<E
Physical appearance	57	73	27	15.10	.00	F<E,S
Improved Affect	57	27	23	9.58	.01	F,S<E
Social interactions	30	0	10	11.46	.00	S,F<E
Muscle soreness	27	40	27	2.29	.32	-
Cause fatigue	23	30	3	8.67	.01	F<E,S
Cause injury	13	33	20	4.67	.10	-
Accomplishment	13	20	0	6.22	.05	F<E,S
<u>Normative Beliefs</u>						
Family	73	57	53	5.17	.08	-
Friends	70	57	50	4.67	.10	-
Health professionals	33	43	20	5.69	.06	-
Workout partner	27	20	17	1.40	.50	-
Gym patrons	20	33	23	1.86	.40	-
Instructors	20	43	23	6.62	.04	E<S
Media	7	27	17	6.75	.03	E<S
Future partners	13	10	20	2.00	.37	-
<u>Control Beliefs</u>						
Lack of time	83	70	70	3.56	.17	-
Fatigue	20	13	13	0.80	.67	-
Equipment	20	20	17	0.18	.91	-
Social support	20	13	7	3.00	.22	-
Technique	0	17	20	6.89	.03	E<S,F

Note. E = endurance activities, S = strength training activities, and F = stretching activities. Q = Cochran's Q statistic for k dependent proportions. Post-hoc (Q) tests for dependent observations were set at $p < .05$.

Table 2

Means, Standard Deviations, and Factor Loadings for Behavioral, Normative, and Control Beliefs by Physical Activity Type

		Endurance			Strength			Flexibility		
		M	SD	FL	M	SD	FL	M	SD	FL
<u>Behavioral Beliefs</u>										
Health	Improve my physical health	6.45	1.06	.65	5.74	1.29	.81	5.86	1.31	.67
	Keep my body healthy	6.57	0.79	.61	6.09	1.23	.81	6.23	1.07	.71
Self-Esteem	Increase my self-esteem	6.10	1.21	.84	5.70	1.43	.79	5.46	1.47	.84
	Make me more self-confident	5.99	1.14	.81	5.55	1.42	.82	5.24	1.50	.84
Physical	Improve my PA	5.81	1.83	.86	5.57	1.70	.79	4.84	1.75	.72
Appearance	Help me look good	5.89	1.35	.93	5.73	1.37	.91	5.11	1.58	.91
Improved Affect	Cheer me up	5.96	1.26	.84	5.25	1.58	.87	5.51	1.47	.92
	Improve my overall happiness	5.68	1.34	.86	5.08	1.56	.86	5.30	1.48	.87
Social	Maintain my SR	4.69	1.58	.82	4.15	1.60	.88	4.36	1.68	.77
Relationships	Maintain my connections with friends/family	4.10	1.75	.69	3.66	1.60	.70	3.77	1.67	.82
Sense of	Provide a SoA	6.37	1.04	.85	5.90	1.37	.78	5.48	1.60	.79
Accomplishment	Give me a sense of personal Achievement	6.28	1.15	.80	5.87	1.38	.87	5.70	1.45	.90
Time	Take too much of my time	3.18	1.73	.77	3.44	1.76	.79	3.47	1.70	.72
	Consume too much time	3.37	1.84	.93	3.58	1.80	.89	3.46	1.76	.90
Soreness	Cause muscle soreness	4.90	1.60	.51	5.76	1.41	.55	4.01	1.81	.59
	Be physically painful	3.41	1.79	.79	4.09	1.90	.83	3.05	1.75	.74
Fatigue	Make me tired	4.23	1.90	.79	4.40	1.84	.81	3.10	1.71	.73
	Make me fatigued	4.11	4.81	.85	4.22	1.80	.83	3.16	1.65	.78
Injury	Cause me injury	2.63	1.59	.75	3.37	1.89	.83	2.26	1.43	.62
	Cause me physical harm	2.30	1.56	.92	2.81	1.79	.83	2.09	1.33	.78
<u>Normative Beliefs</u>										
Friends	Want me to	5.59	1.27	.79	4.99	1.43	.79	5.10	1.56	.79
	Will themselves	5.21	1.55	.66	4.58	1.62	.52	4.51	1.66	.70
Family	Want me to	5.99	1.11	.74	5.22	1.43	.79	5.33	1.42	.82
	Will themselves	4.86	1.82	.47	4.06	1.82	.37	3.84	1.85	.39
Health	Want me to	6.23	1.07	.48	5.84	1.21	.71	6.08	1.06	.30
Professionals	Will themselves	5.28	1.38	.41	4.96	1.41	.32	4.97	1.30	.48
Workout Partner(s)	Want me to	6.21	1.18	.76	5.71	1.50	.81	5.56	1.49	.76
Sport Teammate(s)	Will themselves	5.85	1.35	.83	5.52	1.51	.73	4.98	1.69	.75
Media	Want me to	5.91	1.26	.91	5.04	1.63	.81	5.16	1.60	.86
	Will themselves	5.41	1.29	.55	5.16	1.38	.55	5.33	1.41	.67
Gym Patrons	Want me to	5.32	1.58	.76	5.51	1.56	.80	5.22	1.48	.70
	Will themselves	5.90	1.18	.71	5.90	1.25	.72	5.05	1.42	.65
Romantic Partner	Want me to	6.22	1.16	.68	5.29	1.52	.87	5.57	1.42	.62
	Will themselves	5.59	1.54	.60	5.31	1.69	.68	4.32	1.90	.55
Instructors	Want me to	5.61	1.49	.81	5.86	1.32	.90	5.96	1.13	.57
	Will themselves	5.87	1.20	.66	5.60	1.25	.54	5.30	1.35	.56
<u>Control Beliefs</u>										
Lack of Time	Lack the time	4.62	1.99	.79	4.52	1.92	.82	4.59	2.00	.81
	Other time commitments	4.63	1.88	.76	4.36	1.90	.80	4.47	1.91	.81
Fatigue	Too tired	4.92	1.88	.89	4.81	1.90	.88	5.12	1.82	.88
	Too fatigued	5.32	1.69	.82	5.17	1.81	.89	5.58	1.54	.83
Access	Necessary equipment	5.92	1.65	.85	5.33	1.99	.92	5.74	1.75	.88
	Place to do it at	6.19	1.38	.84	5.71	1.81	.88	6.02	1.58	.90
Social Support	Person to do the activity with	5.80	1.72	.77	5.59	1.78	.87	5.66	1.82	.83
	Social support	6.12	1.33	.63	6.03	1.40	.65	5.98	1.47	.64
Technique	how to properly do the activity	6.10	1.44	.91	5.13	1.96	.94	5.26	2.00	.91
	know the proper technique	6.14	1.44	.89	5.20	2.00	.94	5.29	1.90	.91

Note. All factor loadings significant ($p < .01$). Please note that each belief was estimated in a separate structural equation model.

Table 3

Factor Loadings and Descriptive Statistics for the Theory of Planned Behavior Global Constructs on Endurance, Strength and Flexibility Behavior Models

	Endurance			Strength			Flexibility		
	M	SD	FL	M	SD	FL	M	SD	FL
<u>Attitude</u>									
Unenjoyable-enjoyable	5.83	1.38	.62	5.01	1.73	.82	5.73	1.45	.74
Unpleasant-pleasant	5.51	1.46	.60	4.78	1.69	.69	5.57	1.51	.69
Harmful-beneficial	6.53	0.99	.73	6.19	1.23	.69	6.34	1.05	.70
Useless-useful	6.17	1.13	.88	5.82	1.43	.82	6.01	1.24	.76
<u>Subjective Norm</u>									
“want me to”	5.70	1.28	.76	4.87	1.51	.83	5.08	1.48	.72
“would approve of me”	6.49	0.99	.64	6.14	1.30	.83	6.32	1.05	.52
“will be engaging in”	4.92	1.64	.60	4.47	1.62	.39	4.03	1.68	.51
<u>PBC</u>									
“control”	6.48	0.99	.98	6.11	1.42	.99	6.40	1.04	.85
“control (reversed)”	6.04	1.45	.41	5.77	1.64	.65	5.93	1.62	.63
“completely up to me”	6.36	1.11	.63	6.23	1.30	.62	6.34	1.09	.66
<u>Intention</u>									
Plan	5.68	1.59	.97	4.61	2.11	.96	4.52	2.01	.96
Intend	5.74	1.59	.96	4.65	2.09	.99	4.53	2.05	.97
Behavior	3.28	1.24	1.00	1.18	0.87	1.00	1.94	1.53	1.00

Note. All factor loadings significant ($p < .01$). Endurance, strength, and flexibility were estimated in three separate structural equation models.

Table 4

Effects of Behavioral Beliefs on the General Attitude Construct, Intention, and Two Week Behavior for Endurance, Strength, and Flexibility Activities

Belief		Test for direct effect on...		Direct effect on	Total effect on...	
		Intention	Behavior	Attitude	Intention	Behavior
1. Improve my physical health	(Endurance)	1.12	1.53	.80**	.10**	.31**
	(Strength)	1.99	1.59	.91**	.40**	.20*
	(Flexibility)	0.15	1.91	.81**	.08	.04
2. Increase my self-esteem	(Endurance)	0.65	0.58	.65**	.09	.26**
	(Strength)	1.28	0.30	.80**	.37**	.19*
	(Flexibility)	0.72	0.22	.65**	.05	.03
3. Improve my physical appearance	(Endurance)	1.40	1.21	.43**	.07	.17*
	(Strength)	0.20	0.32	.49**	.26**	.13*
	(Flexibility)	0.01	0.03	.51**	.04	.02
4. Improve affect	(Endurance)	0.06	0.02	.89**	.19*	.40**
	(Strength)	0.39	0.73	.91**	.49**	.25**
	(Flexibility)	0.00	1.96	.84**	.12	.06
5. Maintain/improve social relationships	(Endurance)	0.04	0.51	.42**	.10	.20*
	(Strength)	0.03	2.59	.56**	.31**	.16*
	(Flexibility)	0.30	2.57	.51**	.04**	.02
6. Provide a sense of accomplishment	(Endurance)	0.12	0.05	.72**	.12	.30**
	(Strength)	1.53	3.92*	.80**	.34**	.33**
	(Flexibility)	0.69	0.92	.80**	.11	.06
7. Take too much of my free time	(Endurance)	11.26**	2.45	-.41**	-.31**	-.24**
	(Strength)	2.92	5.90**	-.49**	-.29**	-.37**
	(Flexibility)	7.57**	2.59	-.48**	-.24**	-.12
8. Cause muscle soreness	(Endurance)	7.66**	0.00	-.02	-.28**	-.07
	(Strength)	0.29	0.05	-.25**	-.14**	-.07
	(Flexibility)	3.51	0.39	-.23**	-.03	-.01
9. Make me tired	(Endurance)	3.09	0.02	-.22*	-.05	-.10
	(Strength)	0.46	0.08	-.36**	-.19**	-.10
	(Flexibility)	0.34	0.00	-.19*	-.01	.00
10. Cause me injury	(Endurance)	3.55	0.45	-.25**	-.05	-.11
	(Strength)	0.09	0.04	-.45**	-.29**	-.17*
	(Flexibility)	0.16	0.54	-.17*	-.01	.00

Note. Tests for direct effects are in χ^2 values. * $p < .05$, ** $p < .01$.

Table 5

Effects of Normative Beliefs on the General Subjective Norm Construct, Intention, and Two Week Behavior for Endurance, Strength, and Flexibility Activities

Belief		Test for direct effect on...		Direct effect on Subjective Norm	Total effect on...	
		Intention	Behavior		Intention	Behavior
1. Friends	(Endurance)	0.36	1.82	.89**	.32**	.07
	(Strength)	0.10	0.69	.93**	.24**	.12
	(Flexibility)	1.48	0.68	.85**	.39**	.20*
2. Family	(Endurance)	0.05	1.78	.92**	.24**	.05
	(Strength)	0.00	0.94	.99**	.26**	.13*
	(Flexibility)	2.72	0.37	.99**	.43**	.23**
3. Health Professionals	(Endurance)	0.82	0.91	.68**	.16*	.04
	(Strength)	0.06	1.65	.63**	.10	.05
	(Flexibility)	1.49	5.43*	.28**	.15*	.35**
4. Workout partner/ sport teammates	(Endurance)	6.88**	2.91	.54**	.38**	.08
	(Strength)	3.39	0.06	.75**	.38**	.19*
	(Flexibility)	1.18	0.15	.84**	.56**	.29**
5. Media	(Endurance)	0.57	1.63	.49**	.13*	.03
	(Strength)	0.74	0.34	.40**	.06	.03
	(Flexibility)	1.77	0.12	.53**	.26**	.14*
6. Gym patrons	(Endurance)	4.02*	0.28	.55**	.30**	.07
	(Strength)	0.04	4.62*	.42**	.08**	.21*
	(Flexibility)	0.11	0.02	.61**	.36**	.19*
7. Romantic Partner (IN)	(Endurance)	0.53	0.32	.96**	.31**	.07
	(Strength)	0.08	0.00	.74**	.15**	.08
	(Flexibility)	0.45	0.27	.61**	.31**	.16*
8. Instructors / Coaches	(Endurance)	6.55**	0.67	.63**	.35**	.08
	(Strength)	0.00	0.60	.69**	.11	.06
	(Flexibility)	1.11	1.11	.60**	.35**	.18*

Note. Tests for direct effects are in χ^2 values. * $p < .05$, ** $p < .01$.

Table 6

Effects of Control Beliefs on the General TPB Construct, Intention, and Two Week Behavior for Endurance, Strength, and Flexibility Activities

Belief		Test for direct effect on...		Direct effect on PBC	Total effect on...	
		Intention	Behavior		Intention	Behavior
1. Lack of Time	(Endurance)	23.27**	0.83	.39**	.47**	.07
	(Strength)	5.61**	0.80	.30**	.18*	.13*
	(Flexibility)	3.89*	1.35	.44**	.21**	.18*
2. Too tired	(Endurance)	9.97**	1.98	.31**	.35**	.04
	(Strength)	0.71	2.40	.32**	.01	.05
	(Flexibility)	0.08	0.17	.59**	.08	.13*
3. Access	(Endurance)	11.43**	1.35	.38**	.34**	.03
	(Strength)	9.42**	1.88	.39**	.20**	.15*
	(Flexibility)	1.47	0.15	.56**	.09	.12
4. Social Support	(Endurance)	5.05*	3.19	.31**	.27**	.03
	(Strength)	6.53**	1.08	.38**	.16*	.13*
	(Flexibility)	0.92	0.19	.62**	.11	.15*
5. Technique	(Endurance)	12.58**	2.06	.27**	.33**	.04
	(Strength)	16.56**	1.26	.31**	.28**	.18*
	(Flexibility)	0.08	0.01	.40**	.09	.11

Note. Tests for direct effects are in χ^2 values. * $p < .05$, ** $p < .01$.

Table 7

Differences Between Effects of Physical Activity Beliefs on Two Week Behavior for Endurance, Strength, and Flexibility Activities (N = 185)

Belief	Difference
<u>Behavioral Beliefs</u>	
Improve my physical health	Flexibility < Strength, Endurance
Increase my self-esteem	Flexibility < Strength, Endurance
Improve my physical appearance	Flexibility < Endurance
Improved affect	Flexibility < Strength < Endurance
Maintain/improve social relations	Flexibility < Strength, Endurance
Provide a sense of accomplishment	Flexibility < Endurance, Strength
Take too much of my free time	Flexibility < Endurance < Strength
Cause muscle soreness	-
Make me tired	-
Cause me injury	Flexibility < Endurance, Strength
<u>Normative Beliefs</u>	
Friends	-
Family	Endurance < Flexibility
Health Professionals	Endurance, Strength < Flexibility
Workout partner/ Sport teammates	Endurance < Strength, Flexibility
Media	-
Gym patrons	Endurance < Strength
Romantic partner	Endurance < Flexibility
Coaches / Instructors	Strength, Endurance < Flexibility
<u>Control Beliefs</u>	
Lack of time	Endurance < Flexibility
Too tired	-
Lack of Facilities	Endurance < Strength
Lack of Social Support	Endurance < Strength, Flexibility
Do not know how to do it	Endurance < Strength

Note. Tests performed using Hotelling's t for dependent correlations ($p < .05$).





