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Psychological Correlates of Physical Activity and Exercise Preferences in Metropolitan and Non-Metropolitan Cancer Survivors

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Abstract

Objective: Interventions to increase physical activity (PA) in cancer survivors have often adopted a 'one-size-fits-all' approach, and may benefit from being tailored to psychological constructs associated with behavior. The study objective was to investigate the exercise preferences and psychological constructs related to PA among cancer survivors.

Methods: Post-treatment colorectal, endometrial, and breast cancer survivors (*n*=183) living in metropolitan and non-metropolitan areas completed survey measures of PA, exercise preferences, attitudes, self-efficacy, perceived behavioral control (PBC), and intention toward PA.

Results: A structural equation model with adequate fit and quality indices revealed that instrumental attitude and self-efficacy were related to PA intention. Intention was related to behavior and mediated the relationship between self-efficacy and behavior. Preferred exercise intensity was related to self-efficacy, PBC, attitudes, and intention, while preferred exercise company was related to self-efficacy and PBC. Participants preferred moderate-intensity PA (71%), specifically self-paced (52%) walking (65%) in an outdoor environment (58%).

Conclusions: Since instrumental attitude and self-efficacy were associated with PA, incorporating persuasive communications targeting attitudes in PA interventions may promote PA participation. As cancer survivors who prefer low-intensity exercise and exercising with others report lower self-efficacy and PBC, interventions targeting confidence and successful experience in this group may also be warranted.

Keywords: attitudes, behavioral medicine, cancer, cancer survivors, health behavior, oncology, physical activity, psychological theory, psycho-oncology, self-efficacy

Background

Colorectal, breast, and endometrial cancers are amongst the most frequently diagnosed cancer types in Australia,[1] and have been linked to heightened morbidity.[2,3] Despite promising survival rates, survivors remain at risk of cardiovascular disease due to insufficient physical activity (PA), obesity, and an unhealthy diet.[3] Efforts to promote PA in cancer survivors appear to be most effective when adopting techniques derived from theories of behavior,[4] and, specifically, theory-based constructs that have shown promise for predicting PA.[5]

Several theories seek to explain the predictors of health behavior including the Theory of Planned Behavior (TPB),[6] Social Cognitive Theory (SCT),[7] and the Transtheoretical Model of Change (TTM).[8] The TPB stipulates that attitudes towards a given target behavior, social norms, and perceived behavioral control (PBC) predict an individual's intention to engage in behavior.[6] The TPB has shown promise for predicting PA in rural breast cancer survivors.[9] Furthermore, research has shown that affective attitudes, notably enjoyment and positive anticipated affect, and PBC, consistently predict PA intention and behavior.[10,11,12]

According to SCT, behavior is determined by social-cognitive factors that regulate and reinforce goal-oriented behaviors over time. Self-efficacy is a core construct of SCT and reflects individuals' subjective evaluation of their ability to perform a behavior.[7] Self-efficacy is a key determinant of behavior within the theory and has similar content to PBC within the TPB,[6] indicating overlap between these theoretical approaches.**[14]** Perceived competence, a proxy for self-efficacy, has been shown to predict PA in Australian cancer survivors[13] and interventions targeting change in self-efficacy have been effective in promoting PA in cancer survivors.[5] Finally, the TTM proposes that motivational readiness predicts behavior,[8] and is closely aligned with behavioral intention from the TPB.[14]

Taken together, constructs from these theories have consistently predicted PA in chronic illness contexts including cancer.[5,9,10,13] Numerous researchers have recognized substantive redundancy in constructs across social cognition theories applied to health behavior, suggesting that constructs from many social cognition theories can be synthesized into core determinants.[14,15] Recognizing this overlap,[14,15] researchers have adopted integrated approaches to identify correlates of PA, which have informed interventions targeting these core constructs to promote PA in cancer survivors.[16,17]

Self-efficacy and affective attitudes towards exercise have been identified as correlates of PA.[5,11] Further, practicing preferred exercise type has been linked to improved PA attitudes, PBC, and intention in breast cancer survivors.[18] As exercise that is consistent with individuals' preferences yields greater enjoyment, perceived control, motivation, and instrumental and affective attitudes, preferences may be a correlate of PA, mediated by behavioral intention. However, preferences other than exercise type and their relationship with theoretical constructs have received little attention.[19]

There is also limited research examining whether PA correlates are consistent across cancer survivors living in non-metropolitan and metropolitan areas in Australia, with previous research limited to a handful of studies with small samples.[20,21,22] Such comparisons are important given a third of Australians reside in non-metropolitan regions,[23] and non-metropolitan survivors experience unique PA barriers.[20,21] Cancer survivors living in regional and remote areas have worse health outcomes and greater survivorship-related burden than their metropolitan counterparts.[23,24] Given that psychosocial factors and needs appear to differ by region,[22,25] ascertaining whether exercise preferences and resulting attitudes and confidence differ by geographical classification may inform the design and potential tailoring of future interventions.[22]

This study aimed to identify relations between a core set of social cognition factors derived from multiple theories, exercise preferences, and PA participation in Australian cancer survivors across non-metropolitan and metropolitan areas. Exercise preferences are hypothesized to correlate with attitudes, PBC, and self-efficacy, which are in turn hypothesized to be associated with greater intention, as measured by motivational readiness. Intention is hypothesized to be associated with PA.

Methods

Participants

Endometrial, colorectal, and breast cancer survivors who had completed cancer treatment including surgery, adjuvant chemotherapy, and/or radiation therapy within the five years prior, were in remission and without recurrence, were eligible for inclusion. Survivors were identified via medical records at participating sites: St John of God Subiaco and Murdoch Hospitals, Women Centre in West Leederville, Hollywood Private Hospital, Western Australia and Tamara Private Hospital in Tamworth, New South Wales, Cancer Specialists, Victoria, and breast cancer nurses in South Australia and Western Australia.

Participants were classified into metropolitan and non-metropolitan groups[23,24] according to the Accessibility and Remoteness Index of Australia (ARIA+) based on road distance (km) to service centers. ARIA+ classifications are determined by index scores per 1km area which constitute major cities, inner regional, outer regional, remote, and very remote regions. Residential postcodes were input into the ARIA online tool to discern participants' classifications.[26]

Procedure

This study was approved by the St John of God Human Research Ethics Committee (#937, #1102, #1201). Eligible English-speaking cancer survivors were identified from

oncologists' medical records and offered a survey and return envelope during a follow-up appointment or were posted a survey after expressing interest in the WATAAP[27] or PPARCS trials.[28] Participants gave written informed consent with an opportunity to ask any questions before completing the survey. Data were collected between April 2016 and November 2019.

Psychological and Demographic Predictors

Variables. Participants self-reported their age, gender, cancer type, smoking, and alcohol consumption levels. Smoking and alcohol consumption items were adapted from those administered in the National Health Interview Survey.[29]

Exercise Preferences. Preferred exercise company, type, location, intensity, and structure were assessed, based on the five-factor model.[30] For example, participants indicated their preferred exercise intensity by selecting either low, moderate or high intensity.

Psychological Constructs. Items assessing PBC and self-efficacy were adapted from previous research[31] and measured on 6-point scales (1= *no control* and 6= *complete control*). Three items (e.g., 'Whether or not I am physically active is entirely up to me') were averaged to produce the PBC score. The single item: 'I am confident that I would be able to be physically active' assessed self-efficacy. Intention was measured on a single item tapping motivational readiness ('How ready are you to implement physical activity changes?'), which has been used as a measure of intention in previous research.[14,18] Responses were provided on a 10-point scale (1= *not ready at all* and 10= *extremely ready*).[32] Attitudes were measured on three items in responses to the common stem ('For me, being physically active at a moderate intensity in the next two weeks is…'). Responses were provided on 6-point semantic differential scales. Instrumental attitudes were measured using the *extremely important*-to-*unimportant* bipolar adjectives and affective attitudes using the *extremely enjoyable*-to-*unenjoyable* and *extremely pleasant*-to-*unpleasant* bipolar adjectives.

Outcome Measures

Physical Activity. PA was measured using the 7-item International Physical Activity Questionnaire, Short-Form (IPAQ).[33] Participants self-reported amount and intensity of walking, and moderate- and vigorous-intensity PA exercise performed per week, with scores converted to Metabolic Equivalents (METs) using standardized formulae. Total PA is the weighted sum of the scores for each intensity. The IPAQ is reliable[33] and valid[34] for an older adult population against pedometers and 7-day activity logs.

Data Analysis

Hypothesized relations among the integrated model constructs, shown in Figure 1, were tested with variance-based structural equation modeling using the WARP v.7.0 analysis package.[35] Model parameters and standard errors were computed using the 'Stable3' estimation method. Model constructs were represented by single-item latent variables, which enabled the modeling of measurement error. Construct validity of the single-item latent variables was established using the normalized factor pattern loadings which should approach or exceed .700. Predictions of the proposed model were estimated by specifying hypothesized relations among the latent variables and testing the fit of the model with the data. Effects of the binary exercise preference variables on model constructs were also included. Binary demographic variables were included as covariates. There were few instances of missing data with missing data ranging from 0.55% to 7.55%. Missing data were imputed using hierarchical linear regression. This is a common imputation method used in conjunction with variance-based structural equation modeling, which has been shown in simulation studies to produce estimates closely aligned with data sets with no missing data.[35]

Adequacy of the proposed model was established using an overall goodness-of-fit (GoF) index, with values of .100, .250, and .360 corresponding to small, medium, and large effect sizes. Further information on the quality of the model was provided by the average

path coefficient (APC) and average R^2 (ARS) coefficients, both of which should be statistically significant. In addition, an overall GoF index is provided by the average block variance inflation factor for model parameters (AVIF) and the average full collinearity variance inflation factor (AFVIF), which should be equal to or lower than 3.3 for well-fitting models. Four further indices were used to evaluate model quality: the Simpson's paradox ratio (SPR), R^2 contribution ratio (R^2CR), the statistical suppression ratio (SSR), and the nonlinear bivariate causality direction ratio (NLBCDR). The SPR should exceed .700 and ideally approach 1.000, the R^2CR and SSR should exceed 0.900 and 0.700, respectively, and the NLBCDR should exceed .700 for high quality models.[35]

Model effects were estimated using standardized path coefficients with confidence intervals and test statistics. Effect sizes were estimated using an equivalent of Cohen's *f*-square coefficient, with values of .02, .15, and .35 representing small, medium, and large effect sizes, respectively.

We tested whether effects in the models differed in participants living in non-metropolitan locations relative to participants in metropolitan areas using multi-sample analyses. We re-estimated the model separately in each group and compared parameter estimates in these models using the Satterthwaite method with two-tailed significance tests.[35] Data files, analysis scripts, and output files are available online: https://osf.io/26t3w/

Results

Of survivors who were offered a survey, an estimated 86% returned a survey. Participants (*n*=183) were mostly female (*n*=124, 68%), a mean of 65 years old (*SD*=9.90), and 2.39 years post-treatment completion (*SD*=1.49). Survivors were recruited from sites in Western Australia (*n*=117, 64%), New South Wales (*n*=46, 25%), Victoria (*n*=18, 10%), and South Australia (*n*=2, 1%). Respondents were classified as metropolitan (*n*=103, 56%) and non-

metropolitan (*n*=80, 44%), whereby the non-metropolitan classification included those in inner regional (*n*=28, 15%), outer regional (*n*=49, 27%), remote (*n*=2, 1%), and very remote (n=1, 1%) areas. Full demographic characteristics of the sample are reported in Table 1.

Intention differed by age (r=-.268, p<.001), recruitment method (r=.154, p=.043), and cancer type ($F(2,174)=6.53$, p=.002, η^2=.070), such that younger patients, breast cancer patients, and patients recruited via their expression of interest in research participation reported greater intentions concerning PA change. Age was associated with instrumental attitude (r=-.171, p=.024), such that younger survivors perceived PA to be more important. Survivors recruited via an expression of interest in research participation reported greater MET minutes of weekly PA (r=.170, p=.026).

Descriptive statistics of measures by location are reported in Supplementary File A. Non-metropolitan participants' scores on intention, self-efficacy, and instrumental attitudes were significantly higher than those in metropolitan regions, and PA was also higher with a difference that approached conventional levels of statistical significance. Internal consistency of the PBC (α=.65) and affective attitude (α=.95) scales were acceptable.

Participants' exercise preferences are reported in Table 2. Most participants preferred unsupervised/self-paced exercise (51.9%), specifically walking (64.5%), alone (43.7%), outdoors (57.9%) at a moderate intensity (71.0%). Exercise intensity preferences differed across participants' age, such that those with preference for high-intensity PA were younger ($F(2,179)=5.62$, p=.004, η^2=.059).

Factor loadings for the single-item latent variables approached or exceeded the recommended 0.700 cut-off values in all cases (factor loading range =.643 to .971). Correlations among the majority of constructs were small-to-medium in size (r range =.235 to .638), with the exception of the relationship between PBC and behavior, which was not statistically significant (r=.138, p=.063).

Structural Equation Models

The proposed model exhibited adequate fit and quality indices (APC=.117, p<.027; ARS=.231, p<.231; AVIF=1.232; AFVIF=1.584; GoF=.481; SPR=.815; R^2CR=.960; SSR=.889; NLBCDR=.778). Standardized parameter estimates and effect sizes for all direct and indirect effects are summarized in Table 3. Standard errors and effects of control variables (age and gender) are included in Supplementary File B.

Direct Effects. Intention (β=.234, p<.001), but not PBC (β=.074, p=.155), significantly predicted behavior. Self-efficacy (β=.371, p<.001) and instrumental attitude (β=.151, p=.018) significantly predicted intention, with non-significant effects for PBC (β=.078, p=.142) and affective attitudes (β=.061, p=.201). Preferring to exercise with others significantly predicted PBC (β=-.187, p=.005) and self-efficacy (β=-.171, p=.009), and preference of higher exercise intensity significantly predicted intention (β=.130, p=.036), PBC (β=.303, p<.001), self-efficacy (β=.405, p<.001), and instrumental (β=.356, p<.001) and affective (β=.209, p=.002) attitudes, but not behavior. The effect fell only marginally short of significance (β=.095, p=.097). Overall, the model accounted for significant variance in PA (R^2=.155) and intention (R^2=.488).

Indirect and Total Effects. There was a significant indirect effect of self-efficacy on behavior mediated by intention (β=.087, p=.046), but no effects for PBC, and instrumental and affective attitudes (βs<.035, ps>.248). The sum of indirect effects of intensity preference on behavior through all the variables fell short of statistical significance by a trivial margin (β=.109, p<.066). Together with the non-significant direct effect, this resulted in a significant total effect for intensity preference on behavior (β=.204, p=.002). Multi-sample analyses indicated no significant differences in model effects across participants living in non-metropolitan and metropolitan areas. Full results of the multi-sample analyses are presented in Supplementary File C.

Discussion

The study revealed novel findings supporting an association between exercise intensity preference with self-efficacy, affective and instrumental attitudes, PBC, and intention, and a total effect between intensity preference and behavior. Self-efficacy and instrumental attitude were significantly associated with intention, and in turn, intention significantly correlated with behavior.

The significant associations between exercise intensity preference and PA intention and behavior are important findings, suggesting that survivors who prefer lower-intensity exercise report lower levels of confidence and motivation. These survivors may be less likely to engage in moderate-to-vigorous PA. Accordingly, proposed PA interventions for survivors should aim to increase activity by bolstering self-efficacy and intentions, especially for disengaged and unmotivated individuals.[36] Identification of a low-intensity preference may be a useful screening tool to identify survivors who could benefit from counseling interventions targeting perceived importance and confidence for PA engagement or a matched lower intensity intervention that focuses on participation in light-moderate intensity PA. Further, preference for exercising with others was associated with lower self-efficacy and PBC, pointing to the importance of promoting successful PA experiences by a gradual approach to increasing exercise intensity. Such intervention may necessitate counseling and motivational interviewing interventions which aim to foster self-determined motivation for behavior change self-efficacy.[37,38]

Participants favored moderate-intensity PA, specifically walking, that is self-paced, outdoors and alone or with a partner. Exercise preferences did not differ by geographical classification. While our findings regarding the preference for moderate-intensity activities and walking are consistent with previous research,[25,39] they differ to those of a Canadian study in which rural survivors preferred supervised, indoor exercise.[25] Many existing

programs are facility-based, supervised, and often involve group activities.[4,21] Uptake and effectiveness of future interventions may be improved interventions better match the exercise preferences of survivors for moderate-intensity walking programs. Future research to explore changes in exercise preference across age and survivorship phase may be worthwhile.

The association between instrumental attitude and intention among cancer survivors is a novel finding. Previous research supports affective, rather than instrumental, attitudes as the predominant correlate of PA intention[11] and behavior.[19] A possible interpretation is that instrumental attitude may be more critical to the uptake of PA, consistent with current findings, while affective attitude may be more relevant to behavioral maintenance.[11] This seems to be consistent with previous research. A previous study[40] found that instrumental attitude, but not affective attitude, predicted PA intention in cancer survivors, while other research supports relations between perceived importance, affective response, and PA participation.[18,19,21]

Future research might consider the consistency of preferences and correlates among Australian metropolitan and non-metropolitan survivors when designing and testing PA interventions. As non-metropolitan survivors are disadvantaged, and have greater comorbidities and support needs than their urban counterparts,[23] tailoring interventions to suit rural survivors may involve similar intervention materials, exercise type, structure, and setting, but with more contact or supportive components.[22]

Study Limitations

The cross-sectional design of the current study precludes the inference of causal effects among model constructs. The proposed direction of effects is therefore inferred from theory alone, not the data. Further, we did not include normative or self-perception measures, which should be considered in future studies. The study included only three participants in remote areas and self-selection bias for participating survivors is likely. Cancer type varied at sites

depending on participating oncologists' specialties and may be overcome by future recruitment via cancer registries.

Clinical Implications

As instrumental attitude and self-efficacy appear to be closely related to PA behavior, future interventions should promote the importance of PA and foster confidence to engage in PA. Exercise preferences for unsupervised, moderate-intensity activities such as walking, and psychological constructs did not vary by location. Exercise intensity and company preferences were associated with psychological constructs, such that survivors who prefer to exercise with others and at a low intensity may benefit from specific initiatives to strengthen intentions and confidence.

Conclusion

Current findings revealed that instrumental attitudes and self-efficacy correlated with PA intention, and intentions were closely linked to behavior. Preferred exercise intensity and company also correlated with psychological constructs underpinning PA. Preferences and correlates did not vary by geographical classification, although those who preferred lower-intensity activities may have less confidence and intentions for PA engagement. Interventions that target improved self-confidence and affective attitudes, and are tailored according to preferred exercise intensity, may be a useful approach to improve uptake and adherence in cancer survivors.

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Conflict of Interest

None.

Data Availability Statement

The data that support the findings of this study are openly available on the Open Science Framework at http://doi.org/10.17605/osf.io/26t3w, reference number 26t3w.

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Table 1
Sample Demographics for All Survivors and by Geographical Classification

		Total (*n*=183)	**Metropolitan (*n*=103)**	**Non-Metropolitan (*n*=80)**
Age (years)	Mean (*SD*)	65.05(9.90)	65.98(8.48)	63.86(11.41)
	Range	35-88	39-82	35-88
Years since diagnosis†	Mean (*SD*)	3.04(1.54)	3.83(1.13)	2.47(1.54)
Years since treatment completion	Mean (*SD*)	2.39(1.49)	3.23(1.24)	1.82(1.38)
		***n*(%)**	***n*(%)**	***n*(%)**
Gender	Female	124(67.8%)	59(57.3%)	65(81.3%)
	Male	59(32.2%)	44(42.7%)	15(18.8%)
Cancer type	Colorectal	89(48.6%)	67(65.0%)	22(27.5%)
	Breast	58(31.7%)	-	58(72.5%)
	Endometrial	35(19.1%)	35(34.0%)	-
	Missing	1(0.5%)	1(1.0%)	-
Treatments administered†	Surgery	117(100%)	49(100%)	68(100%)
	Chemotherapy	63(53.8%)	24(49.0%)	39(57.4%)
	Radiation therapy	49(41.9%)	10(20.4%)	39(57.4%)
	Hormone therapy	25(21.4%)	-	25(36.8%)
	Brachytherapy	3(2.6%)	2(4.1%)	1(1.5%)
	Immunotherapy	2(1.7%)	-	2(2.9%)
Lifestyle	Non-smoker	169(92.3%)	97(94.2%)	72(90.0%)
	Smoker	14(7.7%)	6(5.8%)	8(10.0%)
Alcoholic drinks per day	0	58(31.7%)	27(26.2%)	31(38.8%)
	1-2	99(54.1%)	61(59.2%)	38(47.5%)
	3-4	16(8.7%)	13(12.6%)	3(3.8%)
	5+	3(1.6%)	2(1.9%)	1(1.3%)
	Missing	7(3.8%)	-	7(8.8%)

Note. †Data available for 117 participants.

Table 2
Exercise Preferences Across Survivors and by Geographical Location

		Total (183)	Metropolitan (103)	Non-Metropolitan (80)	$p^{\dagger}$
		***n*(%)**	***n*(%)**	***n*(%)**	
Exercise company	Alone	80(43.7%)	44(42.7%)	36(45.0%)	.468
	With a partner	53(29.0%)	34(33.0%)	19(23.8%)	
	With a few people	32(17.5%)	17(16.5%)	15(18.8%)	
	In a group	14(7.7%)	6(5.8%)	8(10.0%)	
	Missing	4(2.2%)	2(1.9%)	2(2.5%)	
Exercise location	Outdoors	106(57.9%)	61(59.2%)	45(56.3%)	.906
	At home	41(22.4%)	23(22.3%)	18(22.5%)	
	Fitness centre	32(17.5%)	17(16.5%)	15(18.8%)	
	Missing	4(2.2%)	2(1.9%)	2(2.5%)	
Exercise type	Walking	118(64.5%)	66(64.1%)	52(65.0%)	.190
	Cycling	18(9.8%)	12(11.7%)	6(7.5%)	
	Weight training	12(6.6%)	6(5.8%)	6(7.5%)	
	Aerobics	11(6.0%)	4(3.9%)	7(8.8%)	
	Swimming	6(3.3%)	6(5.8%)	0	
	Jogging	5(2.7%)	3(2.9%)	2(2.5%)	
	Missing	13(7.1%)	6(5.8%)	7(8.8%)	
Exercise intensity	Moderate	130(71.0%)	71(68.9%)	59(73.8%)	.593
	Low	45(24.6%)	27(26.2%)	18(22.5%)	
	High	7(3.8%)	5(4.9%)	2(2.5%)	
	Missing	1(0.5%)	0	1(1.3%)	
Exercise structure	Unsupervised/self-paced	95(51.9%)	52(50.5%)	43(53.8%)	.618
	Supervised/instructed	27(14.8%)	14(13.6%)	13(16.3%)	
	Recreational	23(12.6%)	17(16.5%)	6(7.5%)	
	Spontaneous/flexible	16(8.7%)	8(7.8%)	8(10.0%)	
	Scheduled	9(4.9%)	5(4.9%)	4(5.0%)	
	Competitive	4(2.2%)	2(1.9%)	2(2.5%)	
	Missing	9(4.9%)	5(4.9%)	4(5.0%)	

Note. Items derived from model by Courneya and Hellsten.[32] $^{\dagger}p$-values for chi-square difference tests.

Table 3

Standardized Parameter Estimates for Direct and Indirect Effects for the Structural Equation Model

Effect	β	*p*	ES	Effect	β	*p*	ES
Direct effects				Direct effects (cont'd)			
Int.→Beh.	**.234**	**<.001**	**.064**	**Type→Iatt.**	**.165**	**.011**	**.038**
PBC→Beh.	.074	.155	.015	Struc.→Iatt.	.097	.091	.018
Alc.→Beh.	**.151**	**.018**	**.026**	**Intens.→Iatt.**	**.356**	**<.001**	**.145**
Com.→Beh.	.093	.100	.006	Alc.→Aatt.	.110	.064	.012
Loc.→Beh.	-.007	.465	.000	Com.→Aatt.	.111	.063	.018
Type→Beh.	.067	.179	.009	Loc.→Aatt.	-.018	.405	.001
Struc.→Beh.	.03	.344	.001	Type→Aatt.	-.109	.067	.013
Intens.→Beh.	.095	.097	.023	Struc.→Aatt.	.025	.365	.002
PBC→Int.	.078	.142	.031	**Intens.→Aatt.**	**.209**	**.002**	**.050**
SE→Int.	**.371**	**<.001**	**.220**				
Iatt.→Int.	**.151**	**.018**	**.079**	Indirect effects			
Aatt.→Int.	.061	.201	.026	PBC→Int.→Beh.	.018	.363	.004
Alc.→Int.	-.079	.138	.006	**SE→Int.→Beh.**	**.087**	**.046**	**.021**
Com.→Int.	-.082	.132	.008	Iatt.→Int.→Beh.	.035	.248	.011
Loc.→Int.	-.044	.273	.005	Aatt.→Int.→Beh.	.014	.391	.003
Type→Int.	-.010	.444	.002				
Struc.→Int.	.056	.224	.009	Sum of indir. effects			
Intens.→Int.	**.130**	**.036**	**.049**	Alc.→Beh.	-.033	.324	.006
Alc.→PBC	**-.182**	**.006**	**.032**	Com.→Beh.	-.048	.258	.003
Com.→PBC	**-.187**	**.005**	**.029**	Loc.→Beh.	-.018	.402	<.001
Loc.→PBC	-.039	.298	.001	Type→Beh.	-.010	.448	.001
Type→PBC	-.015	.421	.001	Struc.→Beh.	.020	.393	.001
Struc.→PBC	.032	.330	.003	Intens.→Beh.	.109	.066	.026
Intens.→PBC	**.303**	**<.001**	**.084**				
Alc.→SE	-.053	.237	.002	Total effects[b]			
Com.→SE	**-.171**	**.009**	**.026**	PBC→Beh.	.092	.102	.018
Loc.→SE	-.079	.139	.004	Alc.→Beh.	.118	.052	.020
Type→SE	-.116	.055	.027	Com.→Beh.	.046	.267	.003
Struc.→SE	.003	.485	.000	Loc.→Beh.	-.025	.368	.001
Intens.→SE	**.405**	**<.001**	**.159**	Type→Beh.	.058	.216	.008
Alc.→Iatt.	**.139**	**.027**	**.015**	Struc.→Beh.	.050	.249	.002
Com.→Iatt.	.058	.213	.005	Intens.→Beh.	.204	**.002**	.049
Loc.→Iatt.	.080	.138	.005				

Note. [a]Sum of indirect effects of past behavior on behavior through all model constructs; [a]Total effect comprising sums of all indirect effects through model constructs plus the direct effect; β=Standardized parameter estimate; Int.=Intention; Beh.=Behavior; PBC=Perceived behavioral control; Iatt.=instrumental attitude; Aatt.=affective attitude; Alc.=Alcohol consumption; Com.=Preferred company when exercising (with company vs. alone); Loc.=Preferred exercise location (outdoors/home vs. facility); Type=Preferred exercise type (walking vs. non-walking); Struc.=Preferred exercise structure (supervised vs. unsupervised); Intens.=Preferred exercise intensity (low vs. moderate/high).

Figure 1. Proposed model illustrating effects among constructs. Effects of control variables (gender, age, alcohol consumption) omitted for clarity.

(Figure provided in separate file)