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Affective Response as a Mediator of the Association between the Physical and Social Environment and Physical Activity Behavior

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Abstract

Perceptions of the physical and social environment have been shown to be predictive of physical activity (PA) behavior. However, the mechanisms of this association have not been examined.

Objective: Affective response to PA was examined as a putative mediator of the association between perceptions of the PA environment and subsequent PA behavior.

Methods: As part of a PA promotion pilot study, 59 low-active overweight or obese but otherwise healthy adults completed real-time assessments of the perceived physical and social PA environment, affective response to PA, and PA behavior over a 6-month period.

Results: As hypothesized, decreased latency to and greater duration of subsequent PA was predicted by engaging in PA with a partner (b=17.24, SE=.45, p<.01), engaging in PA outdoors versus indoors (b=3.70, SE=0.67, p<.01), and perceived pleasantness of the physical (b=0.59, SE=.17, p<.01) and social settings (b=0.68, SE=.16, p<.01). Affective response to PA (a shift toward feeling good versus bad during PA) mediated the association between engaging in PA with a partner (*a* path: 0.53(.11), p<.01, *b* path: 0.42(.12), p<.01, *ab* path: 0.22(.08), 95% CI: .09-.41) and perceived pleasantness of the physical (*a* path: .38(.02), p<.01; *b* path: .65(.23), p=.01; *ab* path:.25(.09), 95% CI .08-.43) and social setting (*a* path: .35(.02), p<.01; *b* path: .57(.23), p=.01; *ab* path: .20(.08), 95% CI .03-.37) and PA behavior, but not the association between engaging in PA outdoors versus indoors and PA behavior.

Conclusions: These findings suggest that perceived environmental variables may have their effects on PA through the process of psychological hedonism.

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Keywords

Physical activity; walking; perceived environment; social context; affective response; psychological hedonism

Regular physical activity (PA) plays an important role in the prevention and treatment of many health problems (Lee et al., 2012), yet less than half of Americans meet the current PA guidelines (≥ 150 minutes of moderate intensity PA or 75 minutes of vigorous intensity PA or an equivalent combination each week) (USDHHS, 2018). To increase rates of regular PA, it is necessary to identify and understand determinants of PA behavior. Past research has predominately focused on individual level determinants (e.g. intentions, self-efficacy) which account for limited variance in PA behavior (Petosa, Hortz, Cardina, & Suminski, 2005; Owen, Leslie, Salmon, & Fotheringham, 2000; Trost et al., 2002). Likewise, modest performance of interventions focused solely on individual factors have led researchers to shift towards more expansive models, including ecological models which describe multiple levels of influence on behavior (Sallis et al., 2006), with an emphasis on the individual's physical and social environments (Stokols, 1992; Humpel, Owen, & Leslie, 2002).

The physical environment refers to physical aspects of the environment, such as whether the person is outside versus inside when engaging in PA. Studies exploring the physical PA environment suggest that engaging in PA outdoors may increase PA behavior (Kerr et al. 2012; Lacharite-Lemicux, Brunnell, & Dionne, 2014; Marsh et al., 2006; Thompson Coon et al., 2011). The social environment refers to social aspects of the environment, such as whether or not the person is engaging in PA with someone else. It has been shown that engaging in PA with a partner is positively associated with PA behavior (Dunton, Berrigan, Ballard-Barash, Graudbard, & Atienza, 2009; Gellert, Ziegel, Warner, & Schwarner, 2011; Giles-Corti & Donovan, 2002; Plante et al. 2010), intentions to engage in PA (Rackow, Scholz, & Hornug, 2014; Fox, Rejeski, & Gauvin, 2000), and motivation for PA (Granner et al. 2007; Burke, Carron, & Eys, 2008). In addition to the nature of the physical and social environment, one may perceive physical and social aspects of the environment to be more or less positive versus negative. Positive perceptions of the PA environment have been shown to result in greater PA engagement (Humpel, Owen, & Leslie, 2002; Carnegie et al. 2002). For example, Ball, Bauman, Leslie, & Owen (2001) found perceived environmental aesthetics including increased friendliness, attractiveness, and pleasantness of the PA environment were associated with increased walking for exercise.

Despite mounting evidence supporting the influence of the physical and social environment on PA behavior, the mechanisms underlying this relationship are yet to be determined. One possible explanatory variable for the environment-PA relationship is affective response to PA. That is, the physical and social PA environment may impact affective response to PA, which in turn influences PA behavior (Figure 1).

This affect-behavior relationship is based on the principle of psychological hedonism (Cabanac, 1992; Kahneman, Wakker, & Sarin, 1997; Williams, 2018, 2019)—the idea that people act in ways that maximize pleasure and minimize displeasure. Consistent with this principle, research shows positive shifts in affect during PA are associated with increased PA

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behavior (Figure 1, Path B; Bryan, Hutchison, Seals, & Allen, 2007; Ekkekakis, Hall, & Petruzzello, 2005; Schwerdffeger et al. 2010; Magnan, Kwan, & Bryan, 2013; Williams et al. 2008; Williams, Dusinger, Ciccolo, Lewis, Albrecht, & Marcus, 2008; Williams, Dunsinger, Jennings & Marcus, 2012; for reviews see Liao et al. 2015 and Rhodes and Kates, 2015).

Theory and research also suggests affective response to PA may be influenced by both the physical and social environment (Figure 1, Path A). According to stress reduction theory (Ulrich et al., 1991) and attention restoration theory (Kaplan, 1995), engaging with natural stimuli found in an outdoor setting provides psychological restoration from stress and cognitive fatigue, leading to increases in positive affect (Hartig et al., 2003; Ulrich et al., 1991; Berman, Jonides, & Kaplan, 2008; Kaplan & Berman, 2010). Consistent with these ideas, in previous research outdoor PA was linked to more positive affect, increased energy, higher satisfaction, and greater enjoyment (Berman et al., 2008; Focht, 2009; Kerr et al. 2006, LaCille, Masks, & Heath, 2004; Plante et al., 2011; for a review see Thompson Coon et al., 2011). Likewise, engaging in PA with others also increases positive affective response (Dunton, Liao, Intille, Huh, & Leventhal, 2015), enjoyment (Fox, Rejeski, & Gauvin, 2000), and a sense of calmness during PA (Plante, Coscarelli, & Ford, 2011).

Taken together, the existing evidence supports separate associations between (1) PA environments and affective response to PA (Figure 1, Path A); and (2) affective response and PA behavior (Figure 1, Path B). However, there are limitations in prior research relevant to this proposed causal pathway. Studies (cited above) exploring the relationship between the PA environment and PA behavior have not assessed ratings of the PA environment in real time for each session of PA. Likewise, with two exceptions (Dunton et al., 2015; Focht, 2009) previous research (cited above) examining the effects of the PA environment on affective response to PA has used retrospective recalls of affect. Retrospective assessments of affect and other psychological factors may be inaccurate, prone to recall bias and cannot account for the dynamic relationship between the PA environment, affective response, and PA behavior (Ekkekakis et al., 2008; Stone et al., 1996, Sato & Kawahara, 2011). Moreover, no prior study has examined the full mediational pathway linking PA environment to affective response to PA to future PA behavior.

Ecological momentary assessment (EMA) captures data about an individual's current state or behavior in real time in an individual's natural environment, and has been used extensively to examine the interplay between affect and PA behavior (for a review see Liao et al., 2015). However, only one prior study that we are aware of has used EMA to examine the temporal relationships among PA environment, affective response to PA, and PA behavior. Specifically, Dunton and colleagues (2015) used EMA to examine the influence of the physical and social environment on affective response to PA and found participants reported higher positive affective response when engaging in PA with other people versus alone, and lower negative affect during outdoor PA versus indoor PA. However, in the latter study, affective response was assessed before and after PA, which better reflects affective response to completing PA rather than affective response to PA per se (Ekkekakis & Petruzzello, 1999), and is thus less likely to be predictive of future PA behavior (Williams et al., 2016).

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The Present Study

The present study improves on prior work in this area through an examination of the full mediational pathway from PA environment to affective response to PA to PA behavior (Figure 1) using EMA to assess all variables in real time and in participants' natural environments. Data for this study were drawn from a sample of low-active overweight or obese (BMI 25.0 – 39.9) adults enrolled in a randomized study (Williams et al., 2015) evaluating differential adherence to two six-month PA promotion programs designed to increase planned and purposeful walking-for-exercise using a previously tested individually tailored print-based intervention (Marcus et al., 2007). The two PA programs differed only with respect to the prescribed PA intensity: self-paced vs. moderate intensity thus allowing for an experimental test of the effects of self-paced versus moderate intensity PA prescriptions on PA behavior (Williams et al., 2015). As hypothesized, the self-paced condition reported more min/week of walking, corresponding to approximately 26 additional min/week over six months (Williams et al., 2015).

The present study is a secondary analysis of data from all participants, with experimental condition controlled in the analysis. We hypothesized that more positive perceptions of the (1) physical and (2) social PA environment (i.e. perceived pleasantness), as well as, (3) outdoor PA, and (4) PA with a partner would be associated with increased PA behavior. We further hypothesized that these effects, if present, would be mediated by affective response during PA, such that the PA environment would have a positive effect on affective response during PA, which would, in turn, positively influence PA behavior.

Methods

Participants

Recruitment occurred throughout the greater Providence, Rhode Island area via radio and newspaper ads. Participants (n=59) included adults (18-65) who were low active (<60 min/wk of structured exercise) and were overweight or obese (BMI 25.0 – 39.9) but otherwise healthy and able to walk for exercise. Participants were predominantly female (88%), and self-identified as non-Hispanic White (76%). Mean age was 47.7 years (SD=11.1) and mean BMI was 31.93 kg/m^2 (SD=3.99). The majority of participants were employed (85%) and reported household income ≥ US $50,000/year (54%).

Study Design

All participants received six-months of print-based PA promotion material focused on overcoming barriers to PA. Participants were instructed to target 30-60 min/day for at least 5 days/week as a walking goal to achieve 150-300 min/week of walking, consistent with national guidelines (USDHHS, 2018). Participants were randomly assigned to either walk for exercise at a moderate intensity (range between 64-76% of their predicted maximal heart rate) or at a self-selected intensity (additional information about study procedures are reported elsewhere; William et al., 2015). Using handheld electronic diaries (HP IPAQ v.111), participants were asked to initiate an EMA report on each day that they walked for exercise. These reports included duration of the exercise session, affective response to PA,

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and perceptions of the physical and social PA environment (among other psychosocial measures) over the span of six months. Additionally, each morning participants were asked to indicate whether they had exercised the previous day and, if so, whether they had reported the exercise in real time in their e-diary. The latter, retrospective reports did not include real-time ratings of PA setting, and thus were not used in the present analysis. However, the retrospective reports suggest that approximately 81% of exercise sessions over the course of the 6-month study were reported in real time, with 19% of exercise sessions reported only retrospectively (i.e., the following day).

The research was reviewed and approved by the Institutional Review Board at Brown University.

Measures

PA behavior.—Walking for PA was assessed via EMA—a method that has previously demonstrated validity in predicting accelerometer-based PA (Dunton et al., 2012; Knell et al., 2017; Maher, Rebar, & Dunton, 2018). Specifically, participants were instructed to indicate, in real time, each time they began and ended a walking session. At the beginning of each walking session, participants pushed the *Begin Exercise* button on their handheld electronic dairy. After initiating a walking session, the e-dairy displayed an *End Exercise* button that participants pressed at the end of their walking session.

Physical and social environment.—At the beginning of each walking session participants were asked to provide information about their PA environment, including characteristics of the environment and perceived pleasantness of the environment. In terms of the physical environment, participants were asked “Are you walking indoors?” and “How pleasant is the physical setting?” using a 10-point response scale, 0 (not at all) to 10 (extremely). In terms of social environment, participants were asked “Who are you with?” with possible answer choices including relative(s), friend(s), significant other, co-worker(s), trainer, other acquaintance(s), other non-acquaintance(s), no one. Due to lack of variability in the answer choices, answers were collapsed into two categories: walking with a partner and walking alone. Participants were also asked “How pleasant is the social setting?” using a 10-point response scale, 0 (not at all) to 10 (extremely).

Affect.—Consistent with our hypotheses based on psychological hedonism, we used the Feeling Scale (Hardy & Rejeski, 1989) to assess the global domain of core affective valence (i.e., good/pleasure versus bad/displeasure) (Russell, 1980) in response to PA rather than assessing more specific affective states (e.g., depressed, anxious, excited, energized) (see Ekkekakis & Petruzzello, 2002). The Feeling Scale consists of a single item measure “How are you feeling right now?” with response options ranging from −5 (very bad) to 0 (neutral) to +5 (very good). It has been used in numerous PA studies (for a review see Ekkekakis, 2003) and is known to be sensitive to change in affective response during PA. The Feeing Scale has been shown to be distinct from ratings of perceived exertion and predictive of future PA behavior (Hardy & Rejeski, 1989; Parfitt et al., 2006; Williams et al., 2008; Williams et al., 2012).

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EMA Procedures

Participants received in-person training and three days of practice with the handheld electronic diaries prior to the six-month data collection period. Participants were instructed to indicate in real time, the beginning and end of a walking-for-exercise session, during which time they were asked to complete affective, and environmental ratings of their PA experience. Affective response to PA (i.e. good versus bad) was assessed prior to each walking session, every 5 minutes during the walking session (after the first 30 minutes, the interval increased to every 10 minutes), immediately following each walking session, and 15 minutes after each session. Affect ratings during and after PA were prompted by an alarm. In addition, the Feeling Scale was administered at random once within each 3-hr block throughout the day. This allowed us to control for baseline affective valence and thus assess affective response to PA. Participants were compensated for their time based on compliance with the EMA procedures and protocol.

Data Reduction

PA behavior.—For the purpose of this analysis, and consistent with our previous work (Williams et al., 2016), PA behavior was operationalized as duration of each walking session over the course of the 6-month program (in min, must be ≥ 10 min to count as a walking session) divided by the latency (in days) from the previous walking session. For example, suppose a participant walked for 90 min and had last walked for exercise 3 days prior. In this case, duration/latency score would be 30 for that walking session. If we compare this to a participant who walked for 90 min but had walked for exercise on the previous day, she would get a duration/latency score of 90 for that walking session. Use of the duration/latency score controls for potential variability in PA scheduling.

Affective response to PA.—Affective response to PA was operationalized as the mean rating on the Feeling Scale *during* each individual walking session over the 6-month period, controlling for the most recent randomly sampled Feeling Scale rating obtained before the corresponding walking session.

Data Analysis

As a preliminary step, demographic data were summarized and presented for the aggregate sample. Unadjusted PA setting variables were summarized over time (average of the person-level data).

PA setting as a predicator of PA behavior.—Using a series of longitudinal mixed effects models, we tested the association between the time-varying indicators of PA setting (e.g., indicator of walking with a partner) and duration/latency of next PA session. Models included a random intercept and adjusted for person-level effects and clustering of PA setting and PA behavior within participant, within day, within week and additionally controlled for condition. Models use a likelihood based approach to estimation, making use of all available data without directly imputing missing outcomes.

Affective response to PA as a mediator of the setting-behavior association.—Following Preacher and Hayes (2008, 2018), we used a product of coefficients approach

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with bootstrapped standard errors, to test the hypothesis that affective response to PA mediated the association between PA setting and PA outcome (duration/latency of next walking session). Models allow for estimation of *a* path (association between setting and affective response to PA), *b* path (affective response to PA as a predictor of PA outcome) and *ab* path (indirect effect of setting on PA outcome that occurs through affective response). PA setting was considered a time-varying predictor of both affective response to PA and PA behavior. Models adjusted for person-level effects and for the clustering of PA setting and PA behavior within participant (and time) and adjusted standard errors accordingly. Each PA setting variable was explored separately as an independent variable and all models controlled for condition.

Analysis was conducted in SAS 9.3 and alpha level set at .05 a priori.

Results

Participants were 47.71 years on average (SD=11.07), predominately female (88%) and mean BMI of 31.93 (SD=3.99) at baseline (Table 1). Table 2 shows data summaries for PA behavior, affective response to PA, and physical and social environment variables.

PA Setting as a Predictor of PA Behavior

Results suggest significant within-subjects effects of walking with another person on duration/latency of next walking session (b=17.24, SE=.45, t=37.86, p<.01), reflecting an increase of 17 in duration/latency scores (i.e., 17 more minutes of PA the next day or 34 minutes two days later, etc.) when walking with any type of partner compared to walking alone . Likewise, participants reported a higher mean number of minutes of walking (b=3.70, SE=0.67, t=5.53, p<.01) when walking outdoors compared to walking indoors, corresponding to an increase of 4 in duration/latency scores (i.e., 4 more minutes of PA the next day or 8 minutes two days later, etc.) on average. There was a significant positive within-subjects effect of perceived pleasantness of the physical (b=0.59, SE=.17, t=3.41, p<.01) and social settings (b=0.68, SE=.16, t= 4.11, p<.01) on walking behavior corresponding to an increase of one unit in duration/latency scores for each unit higher on the perceived pleasantness scale (0-10) for physical and social settings.

Affective Response to PA as a Mediator of the Setting-PA Behavior Association

Results suggest affective response to PA was a significant mediator of the effects of walking with a partner on PA behavior: *a* path: 0.53(.11), p<.01, *b* path: 0.42(.12), p<.01, *ab* path: 0.22(.08), 95% CI: .09-.41, *c* path: 1.53(.68), p=.02, *c'* path: 1.30(.68), p=.05, suggesting that having a partner increased duration/latency of next walking session by producing a positive shift in affective response to PA. Affective response to PA did not mediate the association between walking location (indoors vs outdoors) on walking behavior. However, a positive shift in affective response mediated the effects of greater perceived pleasantness of the physical (*a* path: .38(.02), p<.01; *b* path: .65(.23), p=.01; *ab* path:.25(.09), 95% CI .08-.43); *c* path: .19(.18), p=.32; *c'* path: .43(.21), p=.03) and social setting (*a* path: .35(.02), p<.01; *b* path: .57(.23), p>=.01; *ab* path: .20(.08), 95% CI .03-.37; *c* path: .04(.18), p=.80 ; *c'* path: .24(.18), p=.10) on PA behavior.

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Discussion

The present study is the first to examine whether associations between the physical and social PA environment and PA behavior may be mediated through affective responses to PA. Walking was the prescribed mode of PA and was assessed in real time on a daily basis via EMA. EMA was also used to assess perceptions of the PA environment as well as affective response to PA.

As hypothesized, walking with a partner, compared to walking alone, was associated with decreased latency and greater duration of subsequent PA. Likewise, greater perceived pleasantness of the social environment was associated with decreased latency and greater duration of subsequent PA. These findings are consistent with results from previous research showing that positive social aspects of the PA environment are associated with PA initiation and maintenance (Fisher, Aggarwal, Liao, & Mosca, 2008, Kouvonen et al., 2011; Fox, Rejeski, & Gauvin, 2000; Rackow, Scholz, & Hornug, 2014), as well as increased feelings of social connectedness, calmness and enjoyment during PA (Raedeke, Focht, & Scales, 2007; Turner, Rejeski, & Brawley, 1997, Vranceanu, Gallo, & Bogart, 2009, Plante, Coscarelli, & Ford, 2001; Wankel, 1984). These prior research findings were extended in the present study, in that the effects of both having a PA partner and perceived pleasantness of the social environment on future PA behavior were mediated by affective response to PA.

Regarding the physical environment, engaging in PA outdoors, versus indoors, was positively associated with decreased latency and greater duration of subsequent PA. This finding is consistent with prior research showing that engaging in PA outdoors may increase PA behavior (Kerr et al. 2012; Lacharite-Lemicux, Brunnell, & Dionne, 2014; Marsh et al., 2006; Thompson Coon et al., 2011). However, in the present study, the association between engaging in PA outdoors and PA behavior was not mediated by affective response to PA. This is contrary to a prior systematic review which showed that exercising outdoor consistently led to increases in reported positively valenced emotions and decreases in negatively valenced emotions (Thompson Coon et al., 2011). It is possible that in the present study engaging in PA outdoors only led to a positively valenced affective response when the physical environment was rated as pleasant. Indeed, as hypothesized, results indicated that greater positive perceptions (i.e. perceived pleasantness) of the physical environment were associated with decreased latency and greater duration of subsequent PA and that this relationship was is in part mediated by affective response to PA. These findings are supported by previous research linking positive ratings of the aesthetics of the PA environment to increased PA behavior (Boehmer, Lovegreen, Haire-Joshu, & Brownson, 2006, Deshpande, Baker, Lovegreen, & Brownson, 2005; Kirby, Levesque, Wabano, & Robertson-Wilson, 2007).

Overall the present findings suggest that engaging PA with a partner and positively perceived environments (physical and social) are associated with increased PA behavior through their effects on more positive affective response to PA. These findings provide additional support for the operation of psychological hedonism in the context of PA behavior—that is, a more positive affective response during PA (shifts toward feeling good versus bad) leads to greater likelihood of future PA (Williams, 2008, Williams & Connell, 2019). Moreover, the present

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findings suggest that perceived environmental variables may have their effects on PA through the process of psychological hedonism. This is important because, as yet, affective response to PA has not been emphasized as a mechanism through which environmental variables influence PA behavior.

Additionally, the present findings suggest an individualized approach to intervening on physical and social PA environments to increase PA behavior. Prior research has shown that physical and social settings may influence PA behavior on a group level (e.g., Gellert et al., 2011; Lacharite-Lemicux et al., 2014). However, given that, in the present study, individual participants' affective responses mediated the effects of PA environment on behavior, it may be most helpful for participants to actively seek out the specific social and physical settings that lead them to feel better during PA, thereby making it more likely that they engage in future PA.

There are some limitations that should be acknowledged when interpreting these results. While a strength of the study is the use of collecting information about PA behavior in real-time, PA behavior was nonetheless assessed via self-report and limited to walking behavior. It may be useful in future studies to include an objective measure of PA, such as accelerometery, in conjunction with EMA of hypothesized independent variables. Additionally, the sample for this study was mostly female and mostly white non-Hispanic, and all participants were low-active and overweight or obese. Future research is needed to examine the associations between PA environment, affective response to PA, and PA behavior among different populations of participants. For example, more research is needed to determine whether the potential benefits of walking with a partner and pleasant social environments may be more prominent for women than men.

Additionally, while all of our hypotheses were supported regarding the direct effects of environmental factors on PA behavior, some of the effect sizes were small. Specifically, the difference between walking outdoors versus indoors resulted in a 4-unit increase in duration/latency scores, while effects of perceived pleasantness of the physical and social environment on PA behavior amounted to one additional unit in duration/latency scores for each additional point on the 11-point rating scale. These effects, while relatively small, were also consistent in the present sample of participants and thus are likely to accumulate over time in a way that is clinically meaningful. For example, the difference of 4 minutes per PA session amounts to an additional 28 minutes of PA per week. While the sample size allowed us to detect relatively small main effects, the study lacked power to detect potential interactions among the predictor variables.

Finally, further research is needed to examine additional information about the physical and social environment, such as whether "built" environments (i.e. outdoor track or walking path) versus naturalistic environments are more conducive to PA behavior, as suggested by Attention Restoration Theory (Kaplan, 1995) and Stress Reduction Theory (Ulrich et al., 1991). Likewise, future research is needed to examine more specific social experiences during PA to understand further which social environments are more successful at increasing positive affective response during PA and thus promoting PA behavior.

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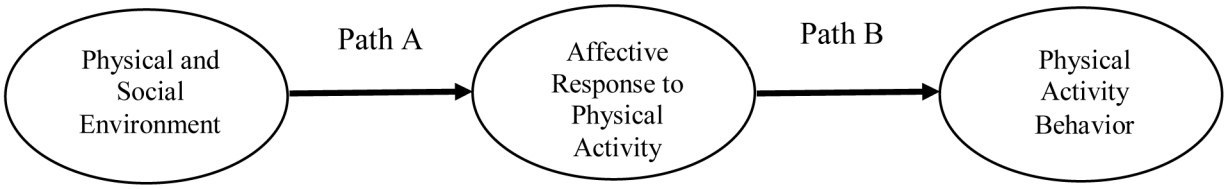

Figure 1.

The conceptual model tested in this study. Path A and Path B represent the hypothesized mediational pathways through which the physical and social environments influence physical activity behavior.

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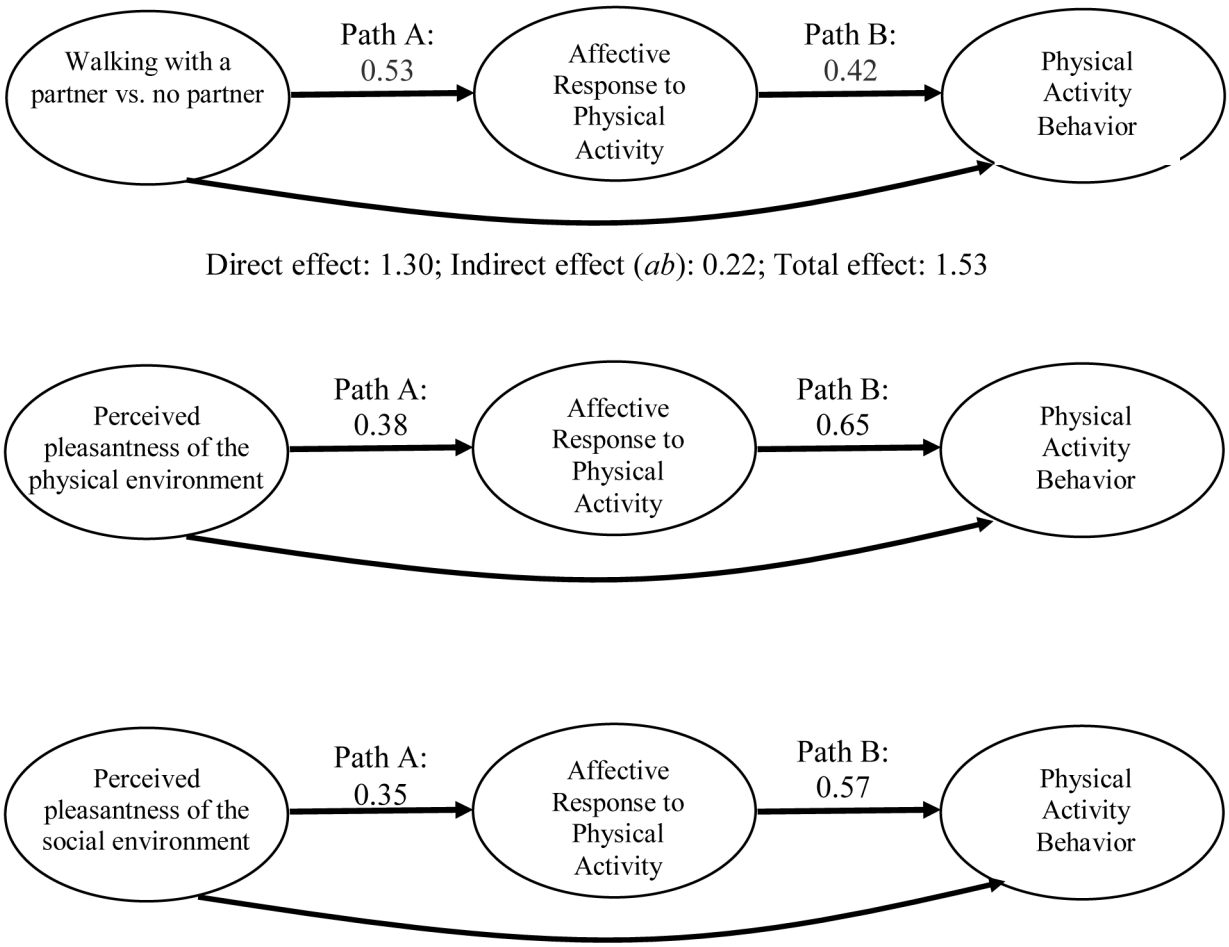

Figure 2.

Direct, indirect, and total effects of walking with a partner, perceived pleasantness of the physical environment, and perceived pleasantness of the social environment on physical activity behavior as mediated through affective response to physical activity. See text for more detail. Mediation effects for walking outdoor were not significant and thus are not depicted here.

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Table 1.

Characteristics of the study population (*N*=59).

Variable	
Age – mean (SD)	47.71 (11.06)
Gender (% Female)	88%
BMI – mean (SD)	31.93 (3.99)
Race/Ethnicity (% Non-Hispanic White)	88%
Household Income (% Over 50k)	54%
Employment (% Employed)	85%

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Table 2.

Data summaries for physical activity behavior, affective response to physical activity, and physical activity setting during the 6-month study period (*N*=59).

Variable	Grand Mean/Frequency	Variability		
		Moment-to-Moment	Day-to Day	Across Study
PA: duration-by-latency	10.97		12.24	9.92
Walking with Others	17.39			
Walking Alone	4.57			
Walking Outside	18.67			
Walking Inside	5.74			
During-PA FS score	+2.66	3.31	4.19	2.67
Walking with Others	+2.52			
Walking Alone	+1.94			
Walking Outside	+2.38			
Walking Inside	+2.58			
Perceived pleasantness of the social setting	7.59		3.89	3.99
Perceived pleasantness of the physical setting	7.89		3.44	3.50
Proportion of sessions outdoor	73%		.22	.19
Proportion of sessions with a partner	13%		.11	.12

Note. PA = physical activity. FS = Feeling Scale, range is −5 (very bad) to +5 (very good); perceived pleasantness of the physical/social setting, range is 0 (not at all pleasant) to 10 (extremely pleasant). Values are unadjusted. See text for analysis.