Journal of Behavioral Health
www.scopemed.org
DOI: 10.5455/jbh.20150213090349

Original Research

ScopeMed

Planfulness moderates intentions to plan and planning behavior for physical activity

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ABSTRACT

Background: Conscientiousness can predict participation in physical activity. A facet of conscientiousness that may contribute to the organization for physical activity is planfulness. Planfulness may be a determinant of planning behavior for physical activity. The relationship between dispositional needs to plan (planfulness), intentions to plan, perceived control over planning, planning behavior and physical activity have yet to be investigated. The purpose of the present study was to determine if planfulness moderated the relationship between intentions to plan and planning behavior for physical activity. The secondary objective was to test if planfulness moderated the relationship between planning behavior and physical activity. **Methods:** Participants were adults ($n = 337$, $M_{age} = 31.0 \pm 5.2$ years) with intentions to be active. Participants reported planfulness, perceived behavioral control over planning, intentions to plan, planning behavior, physical activity intentions and physical activity behavior at baseline (T1) and after 1 month (T2). Moderation analyses were conducted using hierarchical regressions. **Results:** After controlling for trait planfulness, cognitions toward planning and previous planning behavior, the interaction between planfulness and intentions to plan was significant ($R^2\Delta = 0.02$, $P < 0.05$). Intentions to plan were more strongly related to planning behavior for individuals of high planfulness than of moderate or low planfulness, ps$<$0.01. Planfulness did not moderate the relationship between planning behavior and physical activity, $P>0.05$. **Conclusion:** Findings suggest that a disposition toward planning may affect the motivation to plan but not necessarily the implementation of a plan for physical activity.

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Received: August 28, 2014
Accepted: February 13, 2015
Published: February 23, 2015

KEY WORDS: Conscientiousness, personality, physical activity, plan, planfulness

INTRODUTION

Engaging in regular physical activity can reduce the risk of developing chronic disease and all-cause mortality [1]. Unfortunately, more than 80% of Canadian adults are not meeting national recommendations for moderate to vigorous intensity physical activity [2]. Understanding the reasons the population continues to fall short of meeting physical activity recommendations is important in order to design effective interventions.

In contemporary behavioral theory, intention is considered the most proximal predictor of participation [3]. Intention represents the overall motivation to perform a behavior. While intention to perform physical activity is strongly related to activity behavior, almost half of those with the initial intention to act, subsequently fail to follow through [4]. Thus, intentions are necessary, but often insufficient for behavioral performance. In turn, researchers have begun to investigate behavioral regulatory strategies that individuals can use to translate their physical activity intentions into behavior.

Planning is a self-regulatory behavior that has received attention as a mediator of the intention-behavior relationship. Planning for physical activity involves identifying when, where and what an individual will do [5]. Meta-analytic findings suggest planning interventions can increase physical activity and can strengthen the intention-behavior relationship at post-intervention [6]. Planning is a central component to the mediation of physical activity interventions and contemporary behavioral theory.

Subsequently, researchers have begun to impart planning skills for intervention, as a means to increasing perceived behavioral

control (PBC) over planning behavior. In addition to PBC over planning, motivation to plan may be an important antecedent of planning behavior. Intentions to plan may be a prerequisite for planning behavior the same way intentions to be active are necessary to physical activity behavior. Similar to physical activity behavior, individuals may need to be motivated to plan before they engage in planning behavior. Furthermore, like the physical activity intention-behavior relationship, the planning intention-behavior relationship may be impacted by other factors. One such factor may be personality.

Dispositional traits can vary between people, are stable over time and can be inherited [7]. While personality can be difficult to modify based on their enduring and stable properties, participants come to interventions with predispositions, and they should be considered in order to increase the dose of an intervention. A personality trait that is associated with participation in physical activity is conscientiousness [8]; and most notable, conscientiousness consistently moderates the physical activity intention-behavior relationship [9]. Higher levels of conscientiousness can result in stronger physical activity intention-behavior relationships.

Conscientiousness can be characterized by industriousness, self-discipline, orderliness and control [10]. Conscientiousness may moderate the relationship between activity intentions and behavior because highly conscientious individuals are naturally inclined to be organized. Evidence partially supports the organizational component of conscientiousness moderating intentions and behavior for physical activity [8].

Planning is ultimately about organization. A personality sub-facet that has not received attention within the context of physical activity is planfulness. The planfulness scale is derived from the International Personality Item Pool and is based on the theoretical model of conscientiousness [10,11]. The planfulness scale measures an individuals' dispositional need to plan. Given that planning can be important for physical activity participation, it stands to reason that planfulness could influence planning for physical activity.

The purpose of the present study was to determine if planfulness interacts with intentions to plan and planning behavior. We theorize that planfulness will influence whether or not an individual *is* motivated to plan. Thus, we hypothesize that individuals scoring higher on planfulness will be more likely to follow through on their intentions to plan than those lower on this trait. We subsequently determined if planfulness moderated the planning and physical activity relationship. We did not necessarily expect planfulness to moderate the planning and physical activity relationship.

METHODS

Participants

Participants were recruited online through social networking sites. Advertisements targeted adults living in Canada who wanted to be more active. Participants were eligible for the present study if they were between the ages of 25 and 45 years, were residents of Canada, had access to email and text messaging, self-reported medical clearance to perform physical activity and had been inactive according to the Canadian Physical Activity Guidelines over the prior month, but had intentions to become more active.

Design

The study employed a between-participants, repeated measures design. The purpose of the primary study was to determine if text messages about planning enhanced planning more than text messages about physical activity. Participants were assigned to receive text messages about physical activity or planning behavior. Data were collected at baseline (T1) and after 4 weeks of receiving text messages (T2). At T1 and T2, participants completed measures of the planfulness, intentions to plan, PBC over planning behavior, self-reported planning behavior, intentions to be active and self-reported physical activity. Results of the trial showed null group differences, thus participants were aggregated for the present analysis. For a complete description of the trial, please refer to Mistry, Sweet, Rhodes, and Latimer-Cheung [12]. The institution's Research Ethics Board approved the study in December 2012 (REF#: GPHE-053-08).

Measures

Planfulness

Planfulness was assessed using 10 items on a scale of strongly disagree (1) to strongly agree (7) on the following statements; (1) I like to plan ahead, (2) I do things by the book, (3) I am exacting in my work, (4) I pay attention to details, (5) I make plans and stick to them, (6) I jump into things without thinking, (7) I like to act on a whim, (8) I often make last-minute plans, (9) I make rash decisions, (10) I make a mess of things. The reliability of the scale was tested upon developed ($\alpha = 0.78$) (11). Planfulness is associated with deliberate behavior and is inversely related to impulsiveness and spontaneity.

Planning intentions

Three items from Ajzen [13] were modified to assess intentions to plan for physical activity. Participants responded to items on a scale ranging from strongly disagree (1) to agree strongly (7). The items included: "I intend to plan for physical activity over the next 4 weeks"; "I will try to plan my physical activity for the next 4 weeks; and "I will plan for physical activity over the next 4 weeks." All items were internally reliable ($\alpha = 0.84$).

Planning PBC

Four items from Ajzen [13] were modified to assess perceived control over planning. Participants rated on a scale of 1 (strongly disagree) to 7 (strongly agree) if over the next 4 weeks they were, "…capable of planning for physical activity"; "…confident

they would be able to plan for your physical activity"; "had the ability to plan physical activity"; and "have complete control over planning for physical activity" [13]. The items showed internal reliability ($\alpha = 0.89$).

Planning behavior

Planning behavior was assessed using a validated self-report scale that has been tested in previous research [5]. Participants responded on a 7-point scale from strongly disagree (1) to strongly agree (7) if, over the past week, they had made a detailed plan regarding; 'when to exercise', 'where to exercise', 'how to exercise', 'how often to exercise' and 'with whom to exercise'. The measure was internally consistency ($\alpha = 0.93$).

Physical activity intentions

Three items were used to assess participants' physical activity intentions [13]. Participants rated the following items on a 7-point scale from strongly disagree (1) to agree strongly (7): "I intend to do physical activity over the next 4 weeks,"; "I will do physical activity over the next 4 weeks,"; "I will try to do physical activity over the next 4 weeks." The items were internally consistent ($\alpha = 0.88$).

Physical activity

The modified Godin Leisure-Time Exercise Questionnaire (GLTEQ) was used to measure the days (frequency) and minutes (duration) of moderate and vigorous physical activity over the previous 7 days. The frequency and duration of activity were multiplied and summed to determine moderate and vigorous minutes per week. The GLTEQ has shown validity and reliability for assessments of physical activity in previous research [14].

Analyses

About 70% of participants had complete data at T2. Multiple imputation was applied to address missing data for planning and physical activity variables at T2. Multiple imputation is a respectable procedure for dealing with missing data [15]. Five datasets were created through multiple imputation, and the moderation analyses were tested on each dataset. The pooled results are reported.

The procedures for testing moderation were guided by previously applied methods in personality research [16]. All variables were mean-centered to reduce multicollinearity. Given that past behavior can be the strongest predictor of future behavior, past planning behavior, and physical activity were controlled for to avoid misleading tests and to add adding rigor to our analyses [17]. Two, separate moderation analyses were conducted, first with planning behavior as the dependent variable, and then with physical activity as the dependent variable. Small, medium and large effect sizes were interpreted using f^2 values (0.02, 0.15, 0.35) identified by Cohen [18].

Planning behavior

Controlling for T1 planning, we tested if planfulness affected the relationship between intentions to plan and planning at T2. In the first step of the regression, planfulness at T1, intentions to plan at T2, PBC over planning at T2 and planning at T1 were entered. In the second step, the interaction term between planfulness and intentions to plan was entered. If the interaction term explained a significant increase in variance in the relationship between intentions to plan and planning behavior, planfulness would be deemed a moderator.

Simple slopes were used to determine the association between intentions to plan and planning behavior [19]. For significant interaction effects, moderation of the intention to plan and planning behavior relationship were compared at high ($\bar{X}+1$ standard deviation [SD]), medium ($\bar{X}$) and low ($\bar{X}$-1SD) levels of planfulness.

Physical activity

Next, we tested if planfulness affected the relationship between planning and physical activity at T2 after controlling for physical activity at T1. Planfulness at T1, planning at T2, intentions to active at T2 and physical activity at T1 were entered in the first step of the regression. The interaction term between planfulness and planning was entered into the second step. If the interaction term explained a significant increase in variance in the relationship between planning and physical activity, planfulness would be deemed a moderator.

RESULTS

Sample

Totally, 337 participants (M_{age} = 31 ± 5 years) were enrolled in the study. The majority of the sample were female (77%), Caucasian (82%), university educated (78%), single (53%) or married (27%) and had an income lower than $65,000 per year (53%). Complete demographic information is published elsewhere [12].

Descriptive statistics and correlations for all measures are provided in Table 1. Of note, planfulness was significantly related to planning at T1 ($r = 0.14$, $P < 0.05$), planning intentions at T2 ($r = 0.17$, $P < 0.05$), PBC over planning at T2 ($r = 0.14$, $P < 0.05$), and physical activity intentions at T2 ($r = 0.16$, $P < 0.05$).

Test for the Moderating Effect of Planfulness on Planning Behavior

In the first step, planfulness, $\beta = -0.12$, $P < 0.05$, intentions to plan, $\beta = 0.48$, $P < 0.05$, PBC over planning, $\beta = 0.33$, $P < 0.05$, and previous planning behavior, $\beta = 0.28$, $P < 0.05$, were significant predictors of planning behavior, $R^2 = 0.40$, $P < 0.05$. The negative relationship observed between planfulness and planning behavior warranted tests for suppression effects [16].

After entering past planning and planfulness into our analyses, we systematically entered intentions to plan and perceived control over planning into our regression. As a result, the relationship between planfulness and planning behavior reversed and increased in magnitude. Since the beta values in the regression changed direction and were stronger than the bivariate correlation [Table 1], we must caution the interpretation of the relationship between planfulness and planning behavior, as it is likely a result of suppression.

In the second step, the interaction term between intentions to plan and planfulness explained additional variance in planning behavior, $R^2\Delta = 0.02$, $\beta = 0.16$, $P < 0.05$; $f^2 = 0.02$. Planfulness was a significant moderator of the relationship between intentions to plan and planning behavior [Table 2]. Intentions to plan were more strongly related to planning behavior for individuals of high planfulness, $\beta = 0.93$, $t(334) = 13.2$, $P < 0.001$, than moderate, $\beta = 0.76$, $t(334) = 12.0$, $P < 0.001$, or low planfulness, $\beta = 0.59$, $t(334) = 6.2$, $P < 0.001$. For a visual representation of the moderation [Figure 1].

Test for the moderating effect of the planfulness on physical activity

In the first step, planning behavior, $\beta = 0.19$, $P < 0.05$ and prior physical activity, $\beta = 0.34$, $P < 0.05$, were the only predictors of physical activity. In the second step, the interaction term between planfulness and planning behavior did not explain increased variance in the relationship between planning behavior and physical activity. Planfulness was not a moderator of planning behavior and physical activity [Table 2].

DISCUSSION

We theorized that to examine the planning-physical activity relationship, an individual must already have created a plan. We hypothesized that individuals scoring higher on planfulness would be more likely follow through on their intentions to plan than those lower on this trait. Consistent with our hypothesis, planfulness was a statistically significant moderator of the relationship between intentions to plan and planning behavior. Although the effect of planfulness on the relationship between intentions to planning and planning was small, findings identify personality facets that may affect planning behavior for physical activity.

Those who scored higher in planfulness were more likely to follow through on their intentions to plan and actually plan than those of medium or low planfulness. Planfulness may tell you whether or not someone will create a plan. Planful individuals may be inherently more organized and thus more likely to follow through on their motivations to plan. Contrastingly, less planful individuals may be less organized and less likely to follow through on their planning motivations. Planfulness may explain which individuals adhere to planning interventions and those who fail to comply.

Theoretically, planfulness is about plan creation, not necessarily plan the enactment. Consistent with our hypothesis, planfulness did not moderate the relationship between planning behavior and physical activity. Planfulness did not relate to intentions to be active and activity, yet planfulness affected the intentions to plan and planning relationship. Our results show that the disposition can affect planning behavior the same way disposition can affect activity behavior. Our findings are similar to those of Rhodes and Dickau [9], if the intention to plan and planning behavior relationship is treated as the focal intention-behavior relationship.

Though the relationships maybe similar, the dispositions affecting planning motivations and planning behavior are different from those that affect physical activity motivations and activity behavior. Results support the notion that intentions to plan and intentions to be active are different motivations. Whereas planfulness affected plan creation, self-discipline is likely to indicate whether or not plans are enacted. Self-discipline and other lower order facets of conscientiousness may be important for the plan enactment [20]. Future studies should examine if physical activity plan fulfillment is a product of self-discipline and plan creation. Closer examinations of lower-order facets of conscientiousness suggest industriousness-ambition and self-discipline are the key moderators of intentions and behavior [20]. Further research is needed to dissect this relationship and to examine how lower-order facets may interact with planning, to result in physical activity.

Results from the present study imply that motivations in the form of intentions are necessary to planning behavior. Low motivation to plan is unlikely to lead to planning behavior the same way low motivation to be active rarely leads to activity behavior. Thus far, physical activity planning interventions have considered motivation to be active as the only predictor of planning behavior. Future planning interventions may consider motivations to plan in addition to dispositional planfulness to increase planning and indirectly, increase physical activity.

Table 1: Descriptive statistics and correlations (n=337)

	2	3	4	5	6	7	8	Mean	SE
T1									
Planfulness	0.14*	0.09	0.14*	0.17*	0.04	0.16*	−0.03	4.89	0.05
Planning		0.19*	0.09	0.11	0.27*	0.16*	0.11	4.96	0.08
Physical activity			0.02	−0.10	−0.13	0.11	0.32*	151	8
T2									
Planning PBC				0.57*	0.49*	0.51*	0.13	5.68	0.06
Planning intentions					0.54*	0.38*	0.11	5.42	0.11
Planning						0.38*	0.21*	4.98	0.12
Physical activity intentions							0.28*	6.04	0.05
Physical activity								170	10

*$P<0.05$, **$P<0.01$, SE: Standard error, PBC: Perceived behavioral control

Table 2: Testing the moderating effects of planfulness on planning and physical activity

	F_{change}	df	r^2_{change}	β
Predicting planning				
Block 1	54.3*	332	0.40	
Planfulness				−0.12*
Planning intentions				0.48*
Planning PBC				0.33*
Past planning				0.28*
Block 2	9.66*	331	0.02	
Planfulness				−0.11
Planning intentions				0.50*
Planning PBC				0.33*
Past planning				0.27*
Planfulness×Planning intentions				0.16*
Predicting physical activity				
Block 1	11.8*	332	0.20	
Planfulness				−0.09
Planning				0.19*
Physical activity intentions				0.18*
Past physical activity				0.34*
Block 2	1.53	331	0.00	
Planfulness				−0.09
Planning				0.19*
Physical activity intentions				0.18*
Past physical activity				0.30*
Planfulness×Planning				−0.01

PBC: Perceived behavioral control

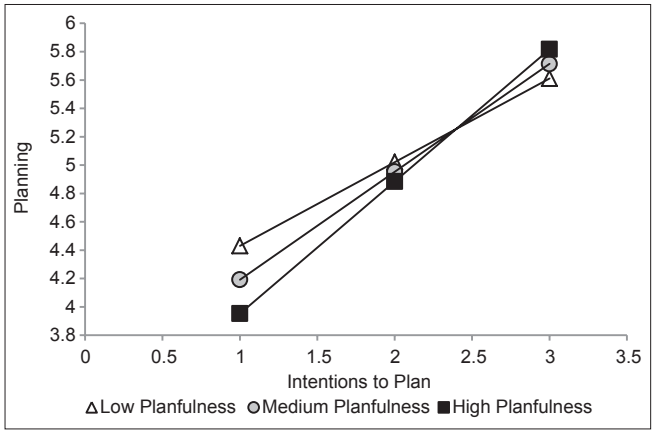

Figure 1: Moderation effect of planfulness on intentions to plan and planning behavior

Limitations

Limitations of our study may, however, confine generalizability. First, we used self-reported measures of action planning and physical activity. Even though both have shown validity and reliability in past research, future studies should use objective measures of physical activity. Furthermore, the majority of the sample were female, Caucasian and university-educated. Though this is not different from many physical activity studies, future research with more diverse samples is needed to examine if demographics interacts with disposition and planning.

CONCLUSION

The current evidence sheds light on the antecedents of planning. Dispositional planfulness affected intentions to plan and planning behavior. It appears that motivations for planning are distinct from those of physical activity. Planning and physical activity motivation must be considered independently to improve adherence to planning interventions. Targeting motivations to plan could increase planning behavior and indirectly lead to changes in physical activity, corroborating the benefits of planning for physical activity.

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Source of Support: Nil, Conflict of Interest: None declared.