The effects of basic psychological need satisfaction from the self-determination theory on relationships within the theory of planned behavior (TPB) were examined in a prospective study. It was hypothesized that need satisfaction would moderate the relationship between intention and behavior and between intention and its proximal determinants. Participants \((n = 250)\) completed measures of the TPB and psychological need satisfaction with respect to restrictive dietary behaviors. Moderated multiple regression analyses indicated that each psychological need moderated the effects of subjective norms on intention. Results suggest that individuals with high psychological need satisfaction tend to base their intentions on subjective norms to a greater extent compared with individuals with lower psychological need satisfaction.

Epidemiological research suggests that rates of cardiovascular disease and obesity in industrialized nations are rising sharply and reaching epidemic proportions (World Health Organization, 1999). As a consequence, there is greater impetus to further understand the psychological antecedents and mechanisms underpinning the self-regulation of dieting behavior. Policymakers and health strategists have turned to theoretical models developed by social psychologists in search of models to understand these influential factors and processes (Hagger & Chatzisarantis, 2005b).

Recently, social psychologists have examined the viability of multitheory models to explain the influences on health behavior. For example, researchers have sought to integrate social cognitive approaches such as the theory of planned behavior (TPB; Ajzen, 1985, 1991), and organismic theories of motivation such as the self-determination theory (SDT; Deci & Ryan, 1985, 2002), in order to develop a deeper understanding of the motivational processes involved in volitional behavior (e.g., Hagger & Chatzisarantis, in press; Hagger, Chatzisarantis, & Harris, 2006a). Much of the research integrating these...
approaches has offered mediational models of health behavior in which psychological needs act as distal predictors of the more proximal social cognitive influences on intentional action (Hagger, Chatzisarantis, & Biddle, 2002a; Standage, Duda, & Ntoumanis, 2003). However, few studies have examined whether the distal predictors in such mediational models also affect the strength of the relationships between the proximal predictors of behavior. The present study aims to extend the integration of the TPB with SDT by examining whether psychological needs may affect the relationships in the TPB.

**TPB**

The TPB is a social cognitive theory that proposes that behavior is influenced by intentions, a motivational construct representing planning to engage in a certain social behavior (Ajzen, 1985; Conner, Sheeran, Norman, & Armitage, 2000). Intentions are proposed to mediate the effects of three belief-based social cognitive constructs on social behavior: attitudes, subjective norms, and perceived behavioral control (PBC). Attitudes reflect positive or negative evaluations or appraisals of the target behavior, subjective norms refer to the degree of perceived social pressure from significant others to perform the behavior, and PBC represents an individual’s feelings of control over performing the behavior (Ajzen, 1991). PBC can also exert a direct influence on behavior unmediated by intentions when it is closely matched with actual control. Recent meta-analytic reviews have shown that the theory accounts for an average of 39% of the variance in intention and 27% of the variance in behavior across a number of contexts (Armitage & Conner, 2001).

**Moderators of Relationships Among TPB Constructs**

Research has suggested that the intention-behavior relationship, although consistent, is only moderate in strength (Armitage & Conner, 2001; Hagger, Chatzisarantis, & Biddle, 2002b). This suggests that individuals may have strong intentions, but they often fail to convert them into behavior. Researchers have therefore sought to establish the conditions under which these relationships are strengthened or weakened via moderator variables. If such moderators can be identified, researchers and practitioners interested in changing intentions would be able to target the variables most likely to change behavior (Sheeran & Abraham, 2003). Numerous moderators have been examined in relation to the intention–behavior relationship in the TPB (Conner et al., 2000), including PBC (Armitage & Conner), implementation intentions (Orbell, Hodgkins, & Sheeran, 1997), intention stability (Sheeran, Orbell, & Trafimow, 1999), anticipated regret and descriptive norms (Sheeran & Orbell, 1999), and personality (Rhodes, Courneya, & Hayduk, 2002).
In addition to the moderators of the intention–behavior relationship, a number of moderators have been investigated with respect to the efficacy of the predictors of intention. The temporal stability of TPB variables (Sheeran, Norman, & Orbell, 1999) and self-regulatory volitional components (Orbell, 2003) have also been shown to act as moderators of the relationships between the proximal predictors of intentions within the TPB. These are important because they demonstrate the mechanisms that give rise to intentions. In particular, there are a number of proposed moderators of the subjective norm–intention relationship. Ajzen (1991) noted inconsistencies in the contribution of subjective norms to intention across studies. He suggested that for some behaviors, the effect of personal considerations such as attitude and PBC overshadow the effect of subjective norms on intention. Armitage and Conner (2001) also noted that meta-analyses of the theory have typically found subjective norm to be the weakest predictor of intentions (e.g., Hagger et al., 2002b; Shepperd, Hartwick, & Warshaw, 1988; Van den Putte, 1991).

It has been suggested that the small but significant effect of subjective norms may reflect individual differences in the importance of subjective norms within the decision-making process (Trafimow & Finlay, 1996). Therefore, in addition to the context and type of behavior, it seems that individual differences may also affect the strength of the subjective norm–intention relationship. For example, Trafimow and Finlay found that individual differences in the importance of subjective norms moderated the impact of subjective norms on intentions.

In summary, it seems that much attention is now being focused on identifying possible moderators of TPB relationships, particularly the subjective norms–intention relationship. This may result in the identification of situations in which the model is most effective at predicting behavior and also the mechanisms underlying people’s formation of intentions. Research has suggested that individual difference variables may affect the formation of intentions and moderate relationships in the TPB (e.g., Rhodes, Courneya, & Hayduk, 2002; Trafimow & Finlay, 1996).

**SDT**

SDT (Deci & Ryan, 1985, 2002) proposed that there are basic psychological needs that need to be fulfilled in order for individuals to attain optimal psychological functioning and motivation in life contexts. Basic psychological needs are proposed to exist at the global level and are traitlike, generalized, and universal (Ryan & Deci, 2000; Vallerand, 1997). Basic psychological needs include the needs for autonomy, competence, and relatedness, and are defined as the need to perceive oneself as the origin of one’s behavior, to feel effective and capable, and to feel connected to others, respectively. Satisfaction of the basic psychological
needs is required for optimal functioning, social development, and well-being (Ryan & Deci). Basic psychological needs are generally considered to be traitlike individual-difference constructs. However, recent research suggests that individuals can experience daily fluctuations in need satisfaction (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). Reis et al. surmised that individuals do show trait levels of need satisfaction, resulting in between-person variance, but that individuals also show daily variation from their trait/baseline level, resulting in within-person variance. They noted that such investigations complement rather than conflict with the trait approach. Reis et al. also found clear evidence for the importance of all three basic psychological needs for emotional well-being. This is in line with the complementarity hypothesis, which states that all three needs are required to be fulfilled in order for autonomously motivated behavior to occur (Deci & Ryan, 2002) and has been supported empirically (Hagger et al., 2006a).

Although mediational models integrating the SDT and TPB have been supported empirically (Hagger et al., 2006a; Hagger, Chatzisarantis, & Harris, 2006b), including corroboration in recent meta-analyses (Hagger & Chatzisarantis, 2007, in press), it is proposed that basic psychological needs may moderate relationships within the TPB. Moderation effects have been examined by others (e.g., Rhodes, Courneya, & Hayduk, 2002) with regard to the influence of dispositional variables on TPB relationships, but moderation effects have not yet been examined from the SDT perspective. Therefore, we propose that an examination of moderation effects is warranted. This endeavor should not detract from previous work but rather add to the development of a fuller understanding of decision-making processes from both SDT and TPB perspectives. It is further proposed that these moderation effects may be especially evident for the relationship between subjective norms and intentions. It is thought that basic psychological needs may affect the extent to which subjective norms are translated into intentions. For example, individuals whose needs are not being met by their general social environment may not give much weight to social norms in the decision-making process, whereas individuals whose needs are being met by their social environment may give more weight to social norms when making judgments regarding their intentions to act.

**Integrating the TPB and SDT**

The hierarchy of motivation proposed by Vallerand (1997) can be used as a framework in which to integrate the TPB and basic psychological needs from SDT (Hagger et al., 2006a). In the hierarchical model of motivation, intrinsic and extrinsic types of motivation operate and interact at different levels of generality.
and stability. Motivation is proposed to exist at three levels: the situational, contextual, and global levels. The model includes both top-down and bottom-up effects between levels of the hierarchy. Therefore, in addition to psychological needs affecting motives and situational constructs, situational constructs can also affect motives and psychological needs. The focus of the current study is on the further examination of these top-down effects of basic psychological needs on intentional behavior.

There is general agreement in the literature that basic psychological needs and contextual motives exist at global and contextual levels, respectively. However, Hagger et al. (2006a) have noted that although TPB constructs are not seen as situational motives and beliefs per se, they are reflective of motivation and beliefs at this level. Whereas TPB items may make reference to a relatively long time frame (e.g., 2 weeks), perceptions such as attitudes, subjective norms, and intentions are still specific judgments or expectations toward engaging in the specific type of action at that point in time. In other words, according to all the information available to the actor at the time, the person has made a specific judgment regarding future behavioral engagement and, assuming no changes, this reflects his or her situational motivation to engage in that behavior. Furthermore, in terms of content, these judgments make clear reference to a specific time frame, a specific behavior, and a specific context and are not generalized with regard to context or even lifespan. The results of the Hagger et al. (2006a) study corroborated this view; TPB constructs were found to mediate the effect of global need and contextual motive constructs on behavior.

Three premises have previously been proposed for the theoretical integration of the TPB and SDT (Hagger et al., 2006a). The first is that mediational studies have shown that basic psychological needs are related to autonomous motives and are a source of information when people make judgments about future behavioral engagement, such as those posited in the TPB (Hagger et al., 2002a; Hagger, Chatzisarantis, Barkoukis, Wang, & Baranowski, 2005; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003). The second premise suggests that psychological needs are informative as to the origins of motivational orientations and intentions (Hagger et al., 2006a). The third premise is based on Vallerand’s (1997) framework and suggests that the effects of psychological needs on contextual motivation and intention are top down.

The purpose of the present study was to examine whether individual differences in global constructs from the SDT not only affect situational judgments regarding future behavioral engagement, as shown in previous studies of mediational effects, but whether these global-level individual differences also influence people’s tendencies to act in accordance with certain beliefs at the situational level in a dieting context.
Psychological Needs Act as Moderators

Research into the effects of psychological needs on intentions and behavior have generally been studied in mediational models such as that proposed by Vallerand (1997) as a basis for such an integration. However, mediational models may only provide a partial explanation of the processes involved in the effects of psychological needs on motivation and behavior. Research has suggested that global or general motivational orientations—considered to be at the same level of generality as basic psychological needs—moderate the effects of contextual motivational orientations on behavior. For example, recent research has suggested that generalized orientations, such as chronic autonomous motivational orientations, moderate the effects of proximal motivational variables on intentions and behavior. Levesque and Pelletier (2003) demonstrated that the strength of a proximal prime for autonomous motivation was moderated by chronic, generalized autonomous motives. In addition, research has suggested that intentions based on attitudes predict behavior more strongly than intentions based on subjective norms (Sheeran et al., 1999). The authors stated that attitudes were indicative of autonomous motivation from the SDT and was the process responsible for the moderation effect. However, no study to date has examined the moderation effects of psychological needs on the proximal predictors of intentional action.

The Present Study and Hypotheses

Mediational models provide evidence for but one of the mechanisms important in examining the processes by which distal constructs such as basic psychological needs influence more situated motivational variables such as intention and, also behavior. Mediation analyses demonstrate how a mediator variable can translate or explain the relationship between two others (e.g., Hagger et al., 2006a; Pelletier, Dion, Slovinec-D’Angelo, & Reid, 2004). However, research examining the effects of generalized or dispositional constructs on the predictors of intention and behavior has not been confined to the mediation models offered, for example, by Rhodes et al. (Courneya, Friedenreich, Sela, Quinney, & Rhodes, 2002; Rhodes & Courneya, 2003; Rhodes, Courneya, and Jones, 2002, 2003, 2004). Rhodes, Courneya, and Jones found that the conscientiousness facet of personality moderated the attitude–intention and the intention–behavior relationship, in addition to the mediation models that they reported previously. This indicates that dispositional variables may play a role in changing the nature of relationships in the TPB, in addition to the influences of these constructs on the proximal predictors of intention and behavior. Importantly, models that test moderation hypotheses do not make models
that include other processes such as mediation invalid, rather, they provide additional information about the effects of dispositional constructs on relationships within the TPB. Therefore, tests of mediation and moderation effects should contribute to the converging evidence for the potential effects the constructs have within the theory.

The purpose of the present study, therefore, was to establish whether such moderation relationships existed within the TPB. Based on the SDT, people whose basic psychological needs are satisfied are more likely to form intentions to engage in actions that are likely to fulfill and perpetuate the sense of autonomy, competence, and relatedness at the global level. It is therefore expected that individuals who rate their psychological need satisfaction highly are more likely to form intentions that are consistent with these needs.

Given the complementarity hypothesis of psychological need satisfaction, it may be that all psychological needs have moderating effects within the TPB rather than just one or two of the needs. For example, although relatedness may seem most likely to have any effect on the translation of subjective norms into intentions because both seem to be relatively more socially influenced, it may be that people with high satisfaction of the need for autonomy may be more likely to interpret social pressures as supporting their intrinsic motivation and therefore may be more likely to form intentions to act that are consistent with these needs. Therefore, a full complement of moderation effects will be tested in the present study, such that perceived satisfaction of the needs for autonomy, competence, and relatedness are expected to have moderating effects within the model. This will extend the literature by indicating that the effects of complementarity of psychological needs change the effects of situated cognition on intentions.

We also expected the satisfaction of basic psychological needs to moderate the effects of intentions on behavior. It was expected that basic need satisfaction would result in an individual being more likely to enact his or her intentions. This is based on the premise from the SDT that people whose psychological needs are satisfied tend to be more likely to form specific plans to engage in need-satisfying behaviors in the future. In addition to these hypothesized moderation effects, we also expected the hypotheses of the TPB to be supported and to replicate the significant main effects of the SDT constructs on intentions and behavior found in other studies integrating the TPB and SDT. We expected intention to predict behavior and mediate the effects of attitudes, subjective norm, and PBC on behavior. In addition, we expected the psychological needs of autonomy, competence, and relatedness to have significant main effects on intentions and behavior. This meant that there would be both direct and indirect effects of basic psychological need satisfaction on intentions and behavior, as shown previously (Hagger et al., 2006a).
Method

Participants and Design

Two hundred and fifty university students and staff living in Essex, United Kingdom, volunteered to participate in the study (142 women, 108 men; mean age = 24.64, standard deviation [SD] = 6.39). A prospective, correlational design was employed. Self-report data were collected via two questionnaires distributed with a time lag of 2 weeks. Intention, attitude, subjective norms, PBC, and basic psychological need measures were obtained at Time 1, and behavior measures were obtained at Time 2.

Measures

Basic psychological need satisfaction. Global measures of basic psychological need satisfaction were adapted from the situational measure put forward by Sheldon, Elliot, Kim, and Kasser (2001). Satisfaction of the psychological needs for autonomy (e.g., “I feel that my choices are based on my true interests and values”), competence (e.g., “I feel that I am successful in completing difficult tasks and projects”), and relatedness (e.g., “I feel a sense of contact with people who care for me, and whom I care for”) were measured using three items each, rated on 7-point scales ranging from 1 (not true at all) to 7 (very true).

TPB. Measures of the TPB constructs were developed according to recommended guidelines (Ajzen, 1991). Behavioral intention was measured using five items measured on 6-point scales (e.g., “I will watch my diet in the next two weeks”) ranging from 1 (very unlikely) to 6 (very likely). Attitude was measured using five items on 6-point semantic differential scales following the statement, “For me, watching my diet in the next two weeks is . . .” The semantic differential scales included both affective (pleasant–unpleasant) and instrumental (valuable–worthless) components of attitudes (Hagger & Chatzisarantis, 2005a). Subjective norm was measured using four items measured along a 6-point scale with endpoints of 1 (agree very strongly) and 6 (disagree very strongly) (e.g., “Most people who are important to me would want me to watch my diet in the next two weeks”). PBC was measured using five items (e.g., “Overall, how much control do you have in watching your diet in the next two weeks?”) developed from Armitage and Conner (1999a, 1999b), Manstead and van Eekelen (1998), and Terry and O’Leary (1995). Items were measured on 6-point scales with endpoints labeled 1 (low control) and 6 (low control).

Self-reported behavior. Self-reported behavior was measured using two items: “In the course of the past two weeks, how often have you watched your diet?” and “I watched my diet the following number of times per week in the past two weeks,”
with responses made on 6-point scales ranging from 1 (almost never) to 6 (every day). The concurrent and criterion validity of self-report dietary measures used have been confirmed against diary methods (Conner & Armitage, 2002). In addition, factor analytic studies have provided support for the construct, predictive, and nomological validity of these behavioral measures using structural equation modeling. For example, confirmatory factor analytic studies (e.g., Hagger et al., 2006a, 2006b) found the factor loadings for these self-report dieting behavior measures to be positive and to exceed the recommended minimum of .40 suggested by Ford, MacCallum, and Tait (1986). In addition, Hagger et al. (2006b) found all factors in a model (encompassing the TPB and behavioral measures used in the current study) to be adequately represented in both diet and exercise contexts and to exhibit a predictable pattern of relationships with psychological constructs. Hagger et al. (2006b) noted that this supports the use of these measures in producing valid models of the same constructs within future studies in the area.

Procedure

Participants were informed that they were completing a survey on dieting habits and were presented with the questionnaire. At the beginning of each questionnaire, participants were reminded that for the purpose of the study, the target behavior of “watching your diet” included any of the following activities: cutting down on sugary foods (e.g., sweets, soft drinks, chocolate); cutting down on fatty foods (e.g., butter, bacon, chips); forbidding snacks between meals; decreasing food intake in general by eating lighter meals, not having seconds, and not overeating; taking diet pills, liquid diet formula, or medications to control weight; eating lots of diet foods (e.g., reduced-calorie salad dressing, diet soft drinks, and so on); and fasting (i.e., purposefully skipping one or more meals). This list of behaviors was compiled from Krowchuk, Kreiter, Woods, Sinal, and DuRant (1998). It was emphasized to participants that “watching your diet” did not necessarily imply being on a specific diet or dietary program. Participants were informed that there would be a further questionnaire distributed 2 weeks later. Participants were informed that all answers were anonymous, that the collected data would be used for research purposes only, and that they had the right to withdraw at any time.

Results

Preliminary Analyses

Internal consistency values for all scales ranged from .76 to .93. None of the correlation coefficients between variables exceeded .70, indicating that multicollinearity was not likely to be a problem. Furthermore, collinearity diagnostics
also revealed that all tolerance values were above .20, the value below which multicollinearity may be deemed to be problematic (Cohen, Cohen, & West, 2003; Tabachnick & Fidell, 2001). Bivariate correlations among the study constructs can be found in Table 1, along with the Cronbach’s alpha values, means, and SDs. Subgroup analyses were conducted to establish whether there were any differences that needed to be considered before proceeding with the analyses. To examine whether any gender differences existed within the variables over the 2-week time frame, t tests were conducted. Gender differences were found on only three of the psychological variables: need for competence, attitude, and intention. However, it must be noted that the effect sizes were very small and accounted for a maximum of 9% of the explained variance, suggesting that these differences were largely unsubstantial and an insufficient basis to segregate the sample by gender.  

Regression Analyses: Prediction of Intention

Three separate moderated regression analyses were conducted to examine the effect of the TPB constructs, each of the three basic psychological needs, and the interaction of these needs with the TPB constructs on the intention to watch diet. Variables were centered prior to examining interaction effects in accordance with the recommendations of Cohen et al. (2003). Results of the regression analyses are shown in Table 2. In each analysis, attitude, subjective norms, and PBC were entered in the first step, the main effect of the basic psychological need (moderator) in the second step, and the interaction terms between the psychological need and the TPB constructs in the third step.

The first step was therefore the same in all three regression analyses. It revealed that attitude ($\beta = .44, p < .01$), subjective norms ($\beta = .19, p < .01$), and PBC ($\beta = .33, p < .01$) were all significant predictors of intention. Collectively, these variables accounted for 55.2% of the variance in intention, $F(3, 249) = 100.85, p < .01$.

The addition of the need for autonomy in the second step of the regression resulted in a significant change in variance accounted for ($R^2_{\text{change}} = .02, F_{\text{change}} = 12.961, p < .01$). Attitude ($\beta = .45, p < .01$), subjective norms ($\beta = .17, p < .01$), and PBC ($\beta = .35, p < .01$) all remained significant predictors of intention, whereas autonomy also had a significant main effect ($\beta = -.15, p < .01$). The addition of the three interaction terms comprising the need for autonomy with

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2Independent samples t tests revealed gender differences for three of the psychological variables: need for competence, attitude, and intention. Need for competence was significantly higher in men ($M = 4.88, SD = 1.03$) relative to women ($M = 4.58, SD = 1.16$), $t(247) = 2.165, p < .05$, partial $\eta^2 = .02$. Attitude was found to be significantly higher in women ($M = 4.12, SD = 0.94$) relative to men ($M = 3.47, SD = 1.11$), $t(247) = 4.974, p < .001$, partial $\eta^2 = .09$. Intention to watch diet was found to be significantly higher among women ($M = 3.75, SD = 1.13$) compared with men ($M = 3.15, SD = 1.29$), $t(247) = 3.890, p < .001$, partial $\eta^2 = .06$. 

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<td>3. Attitude</td>
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<td>4. Subjective norm</td>
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<td>5. Perceived behavioral control</td>
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<td>6. Autonomy</td>
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<td>7. Competence</td>
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<td>4.70</td>
<td>1.12</td>
<td>-.21**</td>
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<td>8. Relatedness</td>
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<td>5.14</td>
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<td>.17**</td>
<td>-.03</td>
<td>.16*</td>
<td>.70**</td>
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TPB variables were measured on a 5-point scale, behavior on a 6-point scale, and basic psychological needs on a 7-point scale. *p < .05. **p < .01.
Table 2

Summary of the Hierarchical Regression of Intention on TPB Variables, Basic Psychological Needs, and TPB Variable by Basic Psychological Need Interaction Terms

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*Spurious correlation.

TPB = theory of planned behavior; SN = subjective norm; PBC = perceived behavioral control; BPN = basic psychological need.

* $p < .05$. ** $p < .01$. 
each of the TPB constructs in the third step resulted in a significant change in variance accounted for ($R^2_{\text{change}} = .02$, $F_{\text{change}} = 3.42$, $p < .05$). Attitude ($\beta = .44$, $p < .01$), subjective norms ($\beta = .15$, $p < .05$), PBC ($\beta = .36$, $p < .01$), and the need for autonomy ($\beta = -.140$, $p < .01$) all remained significant predictors of intention, and the interaction of autonomy with subjective norms was significant ($\beta = .13$, $p < .05$). Neither of the other interaction terms was significant.

The addition of competence in the second step of the regression did not result in a significant change in variance accounted for ($R^2_{\text{change}} = .01$, $F_{\text{change}} = 3.25$, $p = \text{ns}$). The addition of the trio of interaction terms comprising the need for competence with each TPB variable in the third step resulted in a significant change in variance accounted for ($R^2_{\text{change}} = .02$, $F_{\text{change}} = 3.33$, $p < .05$). Attitude ($\beta = .47$, $p < .01$), subjective norms ($\beta = .13$, $p < .05$), and PBC ($\beta = .32$, $p < .01$) all remained significant predictors of intention, and the interaction of competence with subjective norms was also a significant predictor ($\beta = .12$, $p < .05$). The interaction of competence with attitude was also significant ($\beta = -.10$, $p < .05$). However, this beta represented a small effect and only just surpassed the marginal level of significance at the $p < .05$ level. It was surmised that this may be a spurious relationship, perhaps resulting from suppressor effects among attitude, intention, and need for competence. It should be noted that interaction effects of attitude with the autonomy and relatedness psychological needs were not found to be significant, adding further support to the likely spurious nature of this interaction effect.

Finally, the addition of relatedness in the second step of the regression resulted in a significant change in variance accounted for ($R^2_{\text{change}} = .02$, $F_{\text{change}} = 10.72$, $p < .01$). Attitude ($\beta = .47$, $p < .01$), subjective norms ($\beta = .17$, $p < .05$), and PBC ($\beta = .35$, $p < .01$) remained significant predictors of intention. Relatedness was also a significant predictor ($\beta = -.14$, $p < .01$). The introduction of the interaction terms for relatedness with the TPB variables in the third step resulted in a significant change in variance accounted for ($R^2_{\text{change}} = .05$, $F_{\text{change}} = 11.13$, $p < .01$). Attitude ($\beta = .43$, $p < .01$), PBC ($\beta = .38$, $p < .01$), and relatedness ($\beta = -.13$, $p < .01$) all remained significant predictors of intention, and interaction of relatedness with subjective norms was also a significant predictor ($\beta = .26$, $p < .01$).

**Simple Slopes Analyses**

The significant interactions found in the regression analyses were decomposed using simple slopes analysis. Regression slopes were computed for the regression of intention on subjective norms at three levels of the moderator variable: the mean $-1$ SD (low), the mean (moderate), and the mean $+1$ SD (high).

Simple slopes analyses revealed subjective norm to impact upon intention to a greater degree at higher levels of satisfaction of each basic psychological need. For example, unstandardised beta-weights for the effect of subjective norms on intention was higher for high autonomy ($B = .31$, $t = 4.76$, $p < .01$) compared to
moderate autonomy ($B = .16, t = 2.91, p < .01$) and low autonomy ($B = .01, t = .14, p = ns$). The same was found for high competence ($B = .27, t = 4.33, p < .01$) compared with moderate competence ($B = .15, t = 2.58, p < .05$) and low competence ($B = .04, t = .40, p = ns$). Similar results were also found for high relatedness ($B = .38, t = 6.30, p < .01$) compared with moderate relatedness ($B = .09, t = 1.55, p = ns$) and low relatedness ($B = -.21, t = 2.44, p < .05$). These results reveal that the predictive validity of subjective norm is greater at high levels of each basic psychological need construct and, in the case of low relatedness, is negative rather than positive. This indicates that individuals with higher levels of satisfaction of the needs for autonomy, competence, or relatedness are more likely to base their intentions to watch their diet on subjective norms to a greater degree than those individuals with lower levels of need satisfaction.

Regression Analyses: Prediction of Behavior

Three separate moderated regression analyses were conducted to examine the effect of the TPB constructs (attitudes, subjective norms, and PBC), intentions, each of the three basic psychological needs, and the interaction of these needs with intention on self-reported diet behavior. Results of these analyses are given in Table 3. In each analysis, attitude, subjective norms, and PBC were entered in the first step, intention in the second step, the main effect of the basic psychological need (moderator) in the third step, and the interaction terms comprising the psychological need with intention in the fourth step.

The initial two steps were identical in each analysis and tested the hypothesis from the TPB that intention mediated the effects of attitudes, subjective norms, and PBC on behavior. In the first step, attitude ($B = .20, p < .01$) significantly predicted dieting behavior, but PBC and subjective norms did not. This analysis accounted for 11.5% of the variance in behavior, $F(3, 246) = 10.62, p < .01$. However, the inclusion of intentions significantly increased the explained variance ($R^2_{change} = .09, F_{change} = 30.76, p < .01$), accounting for 21.3% of the variance in behavior. Importantly, the effect of attitude on behavior was extinguished with the inclusion of intentions. Given that these TPB constructs were all intercorrelated, the mediation hypothesis of the TPB was supported (Baron & Kenny, 1986). However, the inclusion of the main and interaction effects of the basic psychological needs constructs did not result in any significant increases in explained variance (Table 3). The hypothesized moderation of the effect of intention on behavior by the psychological needs variables was therefore not supported in the current study.

Discussion

The present study investigated whether satisfaction of the basic psychological needs for autonomy, competence, and relatedness would moderate the
Table 3

Summary of Hierarchical Regression of Dieting Behavior on Theory of Planned Behavior Variables, Intention, Basic Psychological Needs, and Intention by Basic Psychological Need Interaction Terms

<table>
<thead>
<tr>
<th>Variables entered</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>Autonomy</td>
<td>Competence</td>
<td>Relatedness</td>
</tr>
<tr>
<td>Attitude</td>
<td>.20**</td>
<td>.03</td>
<td>.03</td>
<td>.03</td>
</tr>
<tr>
<td>SN</td>
<td>.13</td>
<td>.04</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>PBC</td>
<td>.11</td>
<td>-.04</td>
<td>.00</td>
<td>-.02</td>
</tr>
<tr>
<td>Intention</td>
<td>—</td>
<td>.47**</td>
<td>.41**</td>
<td>.44**</td>
</tr>
<tr>
<td>BPN</td>
<td>—</td>
<td>—</td>
<td>-.17**</td>
<td>-.18**</td>
</tr>
<tr>
<td>Intention × BPN</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.12</td>
<td>.21</td>
<td>.24</td>
<td>.24</td>
</tr>
<tr>
<td>Model $F$</td>
<td>10.62**</td>
<td>16.62**</td>
<td>15.33**</td>
<td>15.65**</td>
</tr>
<tr>
<td>$df$</td>
<td>(3, 246)</td>
<td>(4, 245)</td>
<td>(5, 244)</td>
<td>(5, 244)</td>
</tr>
<tr>
<td>$F_{\text{change}}$</td>
<td>—</td>
<td>30.76**</td>
<td>8.20**</td>
<td>9.46**</td>
</tr>
</tbody>
</table>

SN = subjective norm; PBC = perceived behavioral control; BPN = basic psychological need.

* $p < .05$. ** $p < .01$. 
relationship between intention to restrict one’s diet and the proximal predictors of intention from the TPB (attitude, subjective norm, and PBC), and the relationship between intention to restrict one’s diet and dieting behavior. As a subaim, we also expected attitude, subjective norm, and PBC to influence dieting intention and for intention to mediate the effects of these predictors on dieting behavior as stipulated by the TPB. Results indicated that all three basic psychological needs moderated the relationship between subjective norms and intention. This indicates that subjective norms have a greater effect on intentions for individuals with higher levels of basic psychological need satisfaction than individuals with lower levels of basic psychological need satisfaction. However, there was no evidence for the moderation of the effect of any of the other proximal predictors of intention or any support for the moderation of the intention–behavior relationship.

The finding that the subjective norm–intention relationship is moderated by all three psychological needs is in line with the suggestions of Deci and Ryan (1985) regarding the impact of individual differences within the individual on motivation and behavior. It is also congruent with Deci and Flaste’s (1995) premise that the satisfaction of basic psychological needs, and, in particular, relatedness, leads people to be motivated to become part of a group and to accept the group’s values. It is possible that individuals with higher need satisfaction are more likely to internalize the views of others and thus give them more weight when making decisions to act. Individuals with lower need satisfaction may be less likely to internalize the views of others, especially if their basic psychological needs are being thwarted and they have resulting feelings of alienation. It seems that if the views of others have been deemed as important and have been internalized as one’s own, they will therefore play a stronger role in the decision-making process; if an individual’s basic psychological needs are not being met, he or she may perceive the views of others as controlling and external to the self, and they may not bare as much weight in the decision-making process. Together, these findings indicate that dieting is a typically social behavior, with individuals considering the opinions of others and their own psychological needs when making decisions to engage in dieting behavior.

The lack of moderation of the effects of attitudes and PBC on intention and of the intention–behavior relationship by the psychological needs constructs seems to indicate that the roles of these constructs may be additive rather than interactive for this particular behavior. Recent evidence suggests that psychological needs are influential in the development of the proximal predictors of situational-level motivation (such as intention) within the TPB (Hagger et al., 2006a). In such cases, psychological needs serve as an impetus or source of information when individuals form perceptions relating to their behavioral engagement in exercise and dieting contexts. Indeed, several studies have adopted mediational models that suggest that this may be the case, indicating that the direct effects of motivational orientations or global psychological need factors from the SDT affect behavior.
through their effects on the proximal, situational-level motivational constructs that are the immediate antecedents of behavior. Such models corroborate the top-down effects suggested by Vallerand’s (1997) hierarchical model.

The results indicate that basic psychological needs exert a significant negative effect on dieting behavior even when accounting for intentions (see Table 3). This supports the findings of Hagger et al. (2006a), suggesting that global basic psychological need satisfaction can have direct effects on situational constructs specified within the TPB. Specifically, they found direct and unmediated negative effects of a higher order psychological need satisfaction factor on behavior in a dieting context. The results of the present study also support the hypothesis of Elliot, McGregor, and Thrash (2002) that global-level constructs can directly affect situational constructs without these effects being mediated by constructs at the contextual level. In conclusion, it is evident that global-level, generalized motivational constructs can influence social cognitions at the situational level and should be considered within any full decision-making analyses.

One possible reason why the moderation effects in the present study were evident for the social factor, subjective norms, and intentions, but not for the more personal factors such as attitudes or PBC, may be the nature of the behavior. Hagger et al. (2006a) suggested that there is perhaps a general tendency for dietary behavior to be engaged in for external reasons for some individuals. People may generally tend to engage in dieting because of some form of external contingency, such as looking good for others or improving contingent self-esteem, although some people may engage in dieting for some internally valued goal, such as for health reasons. Hagger et al. suggested that individuals with high need satisfaction may either avoid dieting behavior via a direct, nondeliberative process, hence their finding a direct negative effect of needs on dieting behavior, or that such individuals may engage in dieting behaviors via a deliberative route, mediated by TPB variables, if they are to engage in the behavior autonomously. It may be that for some people, the needs for autonomy, competence, and relatedness may drive them to take on board the perceptions of others and form intentions on this basis more so than when psychological needs are not satisfied. Indeed, research has shown that people are motivated to internalize the perceived needs of others in their decision making when they view the desires of others as coming from a knowledgeable, trustworthy source and having the interest of the person at heart (Iyengar & Lepper, 1999). People are therefore more likely to form intentions on the basis of the perceived beliefs of significant others because they see such pressures as being supportive of their needs.

Future investigations should attempt to replicate this study in various other contexts, for example, the academic and physical activity domains, and should also attempt to use a nonstudent population to generalize the findings. Vallerand (1997) stated that motivational research has generally involved student popula-
tions, and there has been little attention given to age, gender, race, or culture. These factors may have implications for basic psychological needs and their roles as moderators within the TPB. Future research might also assess the impact of basic psychological needs assessed at contextual and situational levels. It is plausible that these effects may have more of an impact at increasingly specific levels and thus may provide more effective avenues for interventions to increase diet behavior. It may also be informative to know whether different processes are at work for different types of dieting behavior, for example, cutting out fatty foods versus taking diet pills, and further research in this area may also be advantageous in developing interventions.

A further limitation of this study is that, although it is a prospective study, it is correlational in nature. Future studies may do well to replicate these findings experimentally to provide further support for these findings. For example, it may be possible to manipulate need satisfaction and examine the effect on the subjective norms–intention relationship. As in many areas, converging evidence from correlational and experimentation research strengthens support for the hypothesis under scrutiny. In addition, the prediction of behavior in the present study was over a relatively short period. Although this 2-week period is acknowledged as having value in terms of promoting health outcomes (Hagger et al., 2002a), future studies should focus on longer-range prediction (see Pelletier et al., 2004). Another potential line of investigation for future research is to investigate not only the indirect and reflective influence of global-level motivational constructs but also the process by which such constructs influence behavior spontaneously and automatically (Levesque & Pelletier, 2003; Strack & Deutsch, 2004).

In summary, the results of this study reveal that the basic psychological needs for autonomy, competence, and relatedness have moderating effects on the relationship between subjective norms and intentions within the TPB. This is the first study to our knowledge to provide empirical evidence that the satisfaction of basic psychological needs influences the strength of relationships within the TPB. In conclusion, the theoretical implications of these findings indicate that global-level, generalized constructs such as basic psychological needs can have a significant impact upon decision-making processes. Results highlight the need to consider the different processes when mapping human decision making and the need to consider such generalized variables in decision-making models in future research.

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References


