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The Influence of Chronically Accessible Autonomous and Controlling Motives on Physical Activity Within an Extended Theory of Planned Behavior

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An extended theory of planned behavior (Ajzen, 1991), incorporating the post-decisional phase of behavior and constructs from self-determination theory (Deci & Ryan, 1985), was tested for physical activity using a prospective survey design. Participants ($N = 172$) completed measures of intentions, attitudes, subjective norms, perceived behavioral control (PBC), self-determined motivation, continuation intentions, and chronically accessible physical activity motives. Participants completed a self-report measure of physical activity 3 weeks later. Path analysis supported the predictive utility of the proposed model. Importantly, the effect of continuation intentions of success on physical activity behavior was moderated by chronically accessible physical activity motives. Findings underscore the importance of taking into account continuation intentions, self-determined motivation, and individuals' chronically accessible motives when developing physical-activity-promoting interventions.

Increasing rates of obesity in America and Europe are incurring severe health-related consequences and necessitate large-scale behavioral dietary and physical activity interventions to decrease the prevalence of obesity and associated chronic diseases. Mokdad et al. (2003) reported that being overweight and obesity are significantly associated with a variety of chronic diseases, illustrating the potential impact of escalating obesity rates on health and quality of life. Low participation in physical activity has emerged as a significant independent predictor of obesity within the European Union (Martínez, Kearney, Kafatos, Paquet, & Martínez-Gonazalez, 1999). Research has shown that physical activity is an essential component in reducing and preventing obesity (Ross, Freeman, & Janssen, 2000) and has concluded that interventions aimed at preventing the escalation of obesity prevalence should target physical inactivity as a priority. It is, therefore, important to examine psychological determinants of leisure-time physical

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activity to identify potentially modifiable variables that can be targeted in interventions.

Self-Determination Theory

Self-determination theory (SDT) is an organismic theory of human motivation that has been extensively employed in the health domain and has been successful in explaining behavior in both sport and physical-activity contexts (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Hagger & Chatzisarantis, 2007). SDT views behavior as driven by fundamental needs for competence, autonomy, and relatedness. Humans are portrayed as active agents in the pursuit of fulfillment of these needs (Deci & Ryan, 2000). This theory also broadly distinguishes between two types of behavioral regulation: *Intrinsic motivation* refers to participating in a behavior for interest, enjoyment, or satisfaction inherent in that behavior; while *extrinsic motivation* describes participation in a behavior for reasons separable from the behavior itself, such as to obtain social approval.

Intrinsic motivation represents the prototypical instance of self-determined or autonomous motivation (Ryan & Deci, 2000) and is associated with behavioral quality and persistence, whereas extrinsic forms of regulation are associated with a lack of sustained behavior over time (Ryan & Deci, 2000). SDT also identifies four types of extrinsic motivation, placed at various points along a motivational continuum ranging from intrinsic to extrinsic motivation. The continuum is known as the *perceived locus of causality* (PLOC). These types of extrinsic motivation differ according to the degree to which they are self-determined or autonomous.

Integrated regulation falls closest to intrinsic motivation on the continuum and describes the most complete form of the internalization of extrinsic motivation (Deci & Ryan, 2000), when behavior is consistent with the self and is congruent with one's identity and values (Ryan, 1995). *Identified regulation* lies adjacent to integrated regulation and represents behavioral participation for reasons based on salient goals or values, although driven by factors external to the self. The least internalized form of extrinsic motivation is *introjected regulation*, which falls adjacent to external regulation and represents engagement in behavior to experience feelings of pride or worth or to avoid feelings of shame or guilt. As such reasons originate within the self, introjected regulation is considered more autonomous than external regulation. *External regulation* represents performing a behavior in order to satisfy a demand or to gain an external reward, and individuals experiencing external regulation are likely to feel alienated or controlled (Ryan & Deci, 2000).

SDT possesses considerable pragmatic value, as promoting an autonomous motivational orientation has been shown to increase behavioral

persistence (e.g., Edmunds, Ntoumanis, & Duda, 2007). However, although SDT predicts that individuals displaying extrinsic or controlling motivational orientations are unlikely to show behavioral persistence, research using an SDT framework in the health behavior domain has not yet identified strategies that can be used to facilitate behavioral persistence in such individuals beyond the development of interventions that aim to promote internalization, i.e., the process of changing behavioral regulations toward greater autonomy. Given that the process of internalization may take a considerable period of time, additional strategies may be required to facilitate behavioral persistence in controlled individuals.

Recent research has suggested that autonomous and controlled motivational orientations or reasons for engaging in behaviors should be distinct from the goals that a person pursues (Vansteenkiste, Soenens, & Lens, 2007). The self-concordance model (Sheldon & Elliot, 1999) predicts that individuals can pursue goals that are self-concordant or autonomous, or self-discordant or non-autonomous. The pursuit of self-discordant goals is likely to result in a person exerting less effort in striving to attain those goals than the pursuit of self-concordant or autonomous goals. Sheldon and Elliot showed that individuals make greater progress toward autonomous or self-concordant behavioral goals because they exert greater effort in their pursuit. Thus, it is imperative that interventions target both reasons and goals that people pursue in order to foster persistence in behaviors such as physical activity, and that particular effort is devoted to assisting individuals with self-discordant goals to learn strategies that will aid the enactment of behavior.

Chronically Accessible Motives in SDT

Virtually all previous research examining links between behavioral regulation and behavioral persistence in health behavior domains has employed traditional direct scaled measures of autonomous motivation (e.g., Mullan, Markland, & Ingledew, 1997). Although these are important, Levesque and Pelletier (2003) suggested that such measures do not capture automatic, nonconscious aspects of motivation and proposed that an indirect measure of chronically accessible motivational orientations—generated through open-ended, free-response paradigms derived from the construct and attitude accessibility literature (Higgins, King, & Mavin, 1982; Krosnick, 1989)—may be useful. These paradigms indicate that overarching attitudes, motives, and goals may be activated outside conscious control or awareness.

Accessibility is defined as the activation potential of available knowledge, thus chronically accessible motives are those located at the most readily accessible storage level (Higgins, 1996). Primacy of output has been used as

an indicator of chronic accessibility; individuals' first spontaneously generated responses are believed to best represent their chronically accessible constructs, attitudes, or motivations (Higgins, 1996). This indirect means of assessing chronic accessibility confers the advantage that participants are unaware of what is being measured, thereby minimizing self-report bias. In contrast, scaled instruments tend to be more direct informational measures, and participants are likely to be aware of what is being assessed.

Levesque and Pelletier (2003) suggested that measures of chronically accessible motivation are more likely to tap different motivational forces underlying behavior than are conventional scaled measures. These authors showed that a substantial discrepancy exists between regulatory styles elicited by chronic motivational measures and traditional scaled motivational measures, and suggested that individuals may access different motivational orientations for each measure. The authors' postulation that measures of chronically accessible motivation are more likely to represent those regulatory styles determining behavior was supported by their finding that chronic autonomous motivation predicted long-term academic behavior beyond scaled measures. It is interesting to note that while the measure of chronically accessible motivation was superior at predicting behavior, the scaled measure was more predictive of intention. A possible explanation for this is that the chronically accessible measure of motivation bypasses the deliberative route of intention formation, as it may reflect automatic and spontaneous motivations. In contrast, the scaled measure may assess deliberative and reflective aspects of motivational orientations and is, therefore, likely to be more strongly associated with behavioral intentions. This is consistent with Strack and Deutsch's (2004) dual-systems model, which explains social behavior as a function of both reflective (i.e., deliberative) and impulsive (i.e., spontaneous) processes and emphasizes the independence of the impulsive system from intentions. The measures also reflect Fazio and Olson's (2003) distinction between direct and indirect measures in social cognition research. The use of a measure of chronically accessible motivation, therefore, may complement direct scaled measures and provide a more complete assessment of motivational forces underlying behavior.

Theory of Planned Behavior

Social cognitive theories, such as the theory of planned behavior (TPB; Ajzen, 1991), can serve as frameworks in the development of physical-activity behavior-change interventions by identifying predictors of physical activity and providing targets for change. Such theories can aid the development of persuasive communications and experimental manipulations to promote

physical activity if they are successful in accounting for significant variance in physical-activity behavior, as this indicates that important behavioral predictors are captured.

The TPB is a parsimonious model of behavior-specific, social-cognitive determinants of behavior (Ajzen, 1988, 1991). The theory proposes that behavioral intention is the proximal predictor of behavior and that intention is predicted by attitudes, subjective norms, and perceived behavioral control (PBC). PBC also directly predicts behavior when perceptions of control are realistic.

The TPB has demonstrated efficacy in explaining variance in intentions and behavior in a number of behavioral contexts (Armitage & Conner, 2001), including physical activity (Hagger, Chatzisarantis, & Biddle, 2002b). However, a substantial amount of variance remains unaccounted for by the TPB variables (Hagger et al., 2002b). Furthermore, research has revealed large discrepancies between health-related intentions and behavior, a phenomenon that has become known as the *intention–behavior gap* (Godin, Conner, & Sheeran, 2005; Orbell & Sheeran, 1998; Sniehotta, Scholz, & Schwarzer, 2005). Conner and Norman's (2005) meta-analysis reported that intentions and PBC explained just 25.6% of the variance in behavior. Therefore, it appears to be necessary to extend the TPB to achieve a more comprehensive account of the determinants of adults' leisure-time physical activity, and to invoke constructs and principles from other theories that may enhance the model's predictive utility.

Limitations of the TPB and the Role of Continuation Intentions

When the TPB is used to predict behavior that does not closely follow the measurement of intentions, its exclusive focus on the pre-decisional or motivational phase of behavior and its neglect of the post-decisional phase (Gollwitzer & Sheeran, 2006; Schwarzer, 2001; Sniehotta et al., 2005) pose substantial limitations. This may underlie the unexplained variance in behavior after consideration of TPB constructs and could be linked to the intention–behavior discrepancy. During the motivational phase of behavior, individuals consider whether a behavior will lead to desired outcomes, while the post-action phase refers to the subsequent process of assessing whether the behavior has aided the attainment of those outcomes. Ajzen (1991) argued that such post-decisional evaluations can effect changes in intentions, causing a discrepancy between original intentions and subsequent behavior. For example, attainment of desired behavioral outcomes may further motivate some individuals into continuation of a behavior, but could prompt others to terminate the behavior (Gollwitzer & Sheeran, 2006; Sheeran, Webb, & Gollwitzer, 2005; Sniehotta et al., 2005).

In response to this limitation, Chatzisarantis, Hagger, Smith, and Phoenix (2004) developed the construct of continuation intentions to explore the role of post-decisional evaluations in explaining the intention–behavior discrepancy within a TPB framework and in a health domain. This construct is used to measure or induce deliberation of post-decisional considerations in advance, through the use of conditional statements of intentions. This is important because promoting people to form a response in advance of a given contingency or situation arising will facilitate the response being activated when the situation arises. Continuation intentions are usually measured in response to hypothetical scenarios, which prompt individuals to consider situations in which health behavior either has or has not been successful in bringing about desired outcomes.

Two types of continuation intentions are proposed. *Continuation intentions of success* represent individuals' intentions to continue performance of a health behavior under post-decisional conditions in which the behavior has been perceived to lead to desired behavioral outcomes, while *continuation intentions of failure* signify individuals' intentions to maintain performance of the health behavior under post-decisional conditions in which the behavior has been perceived as unsuccessful in bringing about desired behavioral outcomes (Chatzisarantis et al., 2004). Chatzisarantis et al. argued that continuation intentions are close approximations of actual intentions in the post-decisional phase because statements of continuation intentions lead individuals to use hypothetical reasoning and to construct mental models of possible post-decisional situations in order to infer their intentions. Studies have shown that including continuation intentions alongside conventional intentions partially accounts for the discrepancy between intentions and behavior, and that continuation intentions have utility in informing interventions to reduce the discrepancy (Chatzisarantis et al., 2004; Chatzisarantis & Hagger, 2008).

Integrating the Theories: TPB and SDT

The TPB identifies the proximal factors that guide behavior, but does not address why individuals form attitudes, subjective norms, PBC, or intentions. Self-determination theory, in contrast, aims to explain such general motives and could potentially contextualize the social cognitive constructs proposed by the TPB (Hagger, Chatzisarantis, & Biddle, 2002a). The integration of social cognitive models (e.g., TPB) with SDT, therefore, may provide a more comprehensive account of the determinants of intentional behavior. In this sense, *theoretical integration* in the current study refers to amalgamating the two theories in order to achieve complementa-

rity and a more complete account of physical-activity behavior (Hagger, 2009), rather than to reduce redundancy or to attain axiomatization. Research integrating these theories has demonstrated that people form behavioral beliefs and perceptions of control that are autonomous in nature, and these perceptions mediate the impact of autonomous motives on intentions and behavior. A recent meta-analysis of studies integrating these theories provided support for the complementary nature of the theories (Hagger & Chatzisarantis, 2009).

However, research to date has integrated concepts from SDT with only the original, pre-decisional-focused form of the TPB and not with an extended TPB framework that addresses the post-decisional phase of behavior. Measures of autonomous and controlled motivation within a TPB framework have also been limited to scaled measures; measures of chronically accessible motivation have not been included. Given the substantial differences between these two measures, as described by Levesque and Pelletier (2003), it is important to test the value of incorporating measures of chronically accessible motivational orientations in the TPB, as these may account for spontaneous and nonconscious influences on behavior and produce a more comprehensive model of health behavior.

The Present Study

Based on previous research integrating the TPB and SDT (Hagger & Chatzisarantis, 2009), we hypothesize that attitudes, PBC, and a scaled measure of self-determined motivation for physical activity will significantly predict behavioral intentions to participate in leisure-time physical activity and that intentions and self-determined motivation will significantly predict leisure-time physical-activity behavior. It is also hypothesized that the inclusion of continuation intentions will predict a significant proportion of variance in physical-activity behavior, after accounting for the effects of the original TPB variables and self-determined motivation (Chatzisarantis & Hagger, 2008). In addition, it is hypothesized that a chronically accessible measure of autonomous motivation will moderate the relationship between continuation intentions and physical-activity behavior (see Figure 1 for the hypothesized model).

As individuals with a controlled motivational orientation toward physical activity are more likely to experience failure in their goal striving, based on Sheldon and Elliot's (1999) finding that individuals make more progress toward autonomous goals because greater effort is expended, continuation intentions of failure are more likely to be useful for controlled individuals. Planning for a situation in which goals have not been attained may help to

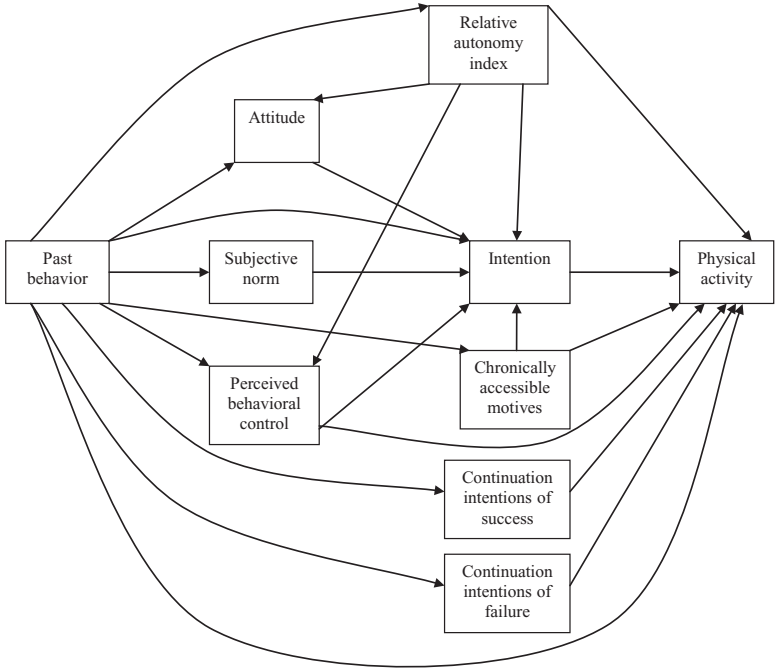

Figure 1. Hypothesized relationships between variables in the extended TPB model.

facilitate maintenance of physical-activity behavior if the situation then arises. In contrast, continuation intentions of success are less likely to be useful to controlled individuals and may be of more use to autonomous individuals, as those with an autonomous motivational style are more likely to encounter success in goal pursuit, meaning that planning for such a situation would help automate behavioral decisions upon encountering it.

The key hypothesis for this study is that the chronically accessible motivation measure will moderate the relationships of continuation intentions of success and failure with physical-activity behavior. The relationship between continuation intentions of success and physical-activity behavior is predicted to be positive and significant in individuals whose chronically accessible outcomes reflect autonomously oriented motivation and nonsignificant in those whose chronically accessible outcomes reflect controlled motivation for their physical-activity behavior. In contrast, a positive and significant relationship is expected between continuation intentions of failure and physical-activity behavior among individuals whose chronically accessible outcomes reflect control-oriented motivation, because they are more likely to experience failure in goal striving and less naturally inclined to persist. On the

basis of prior research (McLachlan & Hagger, 2010), chronically accessible primary outcomes in physical activity are used to represent chronic motivational orientation.

Method

Participants and Design

Participants ($N = 259$) were staff and students recruited from a university in the UK (the university was masked for blind review) and staff from several private companies in South East UK. A prospective correlational design was employed with the first and second waves of data collection separated by a 3-week interval. Each participant received two questionnaires. The first questionnaire contained measures of the psychological constructs, while the second contained a self-report measure of physical-activity behavior.[2]

Measures

Demographic variables. Participants were asked to report their age in years, gender, and date of birth. In addition, they were asked to provide the first three letters of their mother's maiden name in order to match first-wave and follow-up data while preserving anonymity.

Past physical-activity behavior. We used a two-item measure of past physical-activity behavior. Participants were asked to provide the frequency with which they had participated in active sports/vigorous physical activities of at least 40-min duration over the previous 6 months and over the past 2 weeks. Responses were rated on a 6-point Likert-type scale ranging from 1 (*not at all*) to 6 (*most of the days per week*; Bagozzi & Kimmel, 1995). This measure has demonstrated acceptable construct and validity statistics in previous research (Hagger & Chatzisarantis, 2005; Hagger, Chatzisarantis, & Harris, 2006).

Attitudes towards physical activity.[3] We used three items to measure attitudes toward physical activity. The statement "For me, doing active sports and/or vigorous physical activities for at least 40 minutes, 4 days per week during my leisure time, over the next 3 weeks is . . ." preceded the items. Responses were rated on 7-point semantic-differential scales with the follow-

[2]Further details of questionnaire items are available from the first author upon request.
[3]Theory of planned behavior variables were based on guidelines produced by Ajzen (2006).

ing bipolar adjectives as endpoints: *of no use–useful*, *unsatisfying–satisfying*, and *unimportant–important*.

Subjective norms. We measured subjective norms using four items (e.g., "Most people who are important to me would *want* me to do active sports and/or vigorous physical activities, for at least 40 minutes, 4 days per week during my leisure time, over the next 3 weeks"). Responses were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Perceived behavioral control. We assessed PBC using three items (e.g., "I am confident I can do active sports and/or vigorous physical activities, for at least 40 minutes, 4 days per week during my leisure time, over the next 3 weeks") to assess both the self-efficacy and controllability facets of PBC (Ajzen, 2002). Responses were rated on a 7-point scale ranging from 1 (*very unlikely*) to 7 (*very likely*).

Intentions. We assessed intentions with three items (e.g., "I intend to do active sports and/or vigorous physical activities for at least 40 minutes, 4 days per week during my leisure time, over the next 3 weeks"). Responses were rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Continuation intentions of success. Initially, participants were asked to consider general behavioral goals that they may wish to achieve through leisure-time physical activity, as in Chatzisarantis et al.'s (2004) study. Participants were then asked to consider a hypothetical scenario in which they had achieved all of their behavioral goals and reported their intentions to continue leisure-time physical activity in this situation. Three items measured continuation intentions of success (e.g., "If I achieve all of my exercise goals, I will still intend to continue doing active sports and/or vigorous physical activities, for at least 40 minutes, 4 days per week during my leisure time"). Responses were rated on a 7-point scale ranging from 1 (*strongly agree*) to 7 (*strongly disagree*). Items were based on Chatzisarantis and Hagger (2008).

Continuation intentions of failure. Participants were also asked to report their intentions to continue with leisure-time physical activity in a hypothetical scenario in which they had failed to attain salient goals through physical activity. Three items measured intentions to continue physical activity in this situation, which were virtually identical to the items used to assess continuation intentions of success, except that each statement began with "If I fail to achieve my exercise goals . . .". Response scales were identical to those used to measure continuation intentions of success.

Self-determined motivation. We used the Behavioral Regulation in Exercise Questionnaire (BREQ; Mullan et al., Markland, & Ingledew, 1997) to measure perceived locus of causality for leisure-time physical activity. The BREQ is based on Ryan and Connell's (1989) measure of PLOC and comprises multiple-item measures of each regulation type: intrinsic motivation

(e.g., "I enjoy exercise"), identified regulation (e.g., "I participate in exercise because I gain a lot of benefits that are important to me"), introjected regulation (e.g., "I will feel bad with myself if I do not exercise"), and external regulation (e.g., "I do it because significant others want me to exercise").

We used four items each for intrinsic motivation, identified regulation, and external regulation, while we assessed introjected regulation with three items. Responses were rated on a 4-point scale ranging from 1 (*not true at all*) to 4 (*very true*). To reduce the number of variables, a Relative Autonomy Index (RAI) was calculated using a weighted summation of the averaged BREQ scales, as recommended by Pelletier and Sarrazin (2007). The RAI was calculated according to the following formula:

$$\text{External Regulation} \times (-2) + \text{Introjection} \times (-1) + \text{Identification} + \text{Intrinsic Motivation} \times (2)$$

This provided a single score reflecting relative self-determination (autonomy) for physical activity. Positive scores on this index reflect more self-determined behavioral regulation (Goudas, Biddle, & Fox, 1994; Goudas, Biddle, & Underwood, 1995).

Chronically accessible autonomous and heteronomous outcomes. Participants were asked to list up to three main outcomes they hoped to attain through leisure-time physical activity. Participants were told that these outcomes could be anything that they hoped to achieve through participation in leisure-time active sports or vigorous physical activities over the next 3 weeks. They were asked to write down the first three outcomes that came to mind. This free-response measure was intended to tap chronically accessible motivation, based on Levesque and Pelletier's (2003) methodology.

Consistent with Higgins et al. (1982), primacy of output was used to indicate chronic accessibility. The technique originates in the attitude accessibility literature, in which attitudes expressed most readily have been those most strongly associated with behavior (Fazio, Chen, McDonel, & Sherman, 1982; Kokkinaki & Lunt, 1997). Outcomes were coded dichotomously: Participants reporting an autonomously oriented primary outcome (e.g., "to have fun," "to feel healthy") were coded as 1, while those reporting a controlled primary outcome (e.g., "to lose weight," "to tone body") were coded as 2. Coding was based on empirical evidence (McLachlan & Hagger, 2010) showing that appearance-related outcomes were significantly associated with extrinsic motivation and that individuals reporting a controlling regulatory style were almost twice as likely to report striving for an appearance-related outcome in their physical activity. Further evidence to support this coding system comes from Ingledew and Markland (2008), who reported that appearance- and weight-related motives were a signifi-

cant predictor of external regulation, which is the prototypical form of extrinsic motivation.

Physical-activity behavior. We measured physical-activity behavior using two items (e.g., "In the last 3 weeks, I participated in active sports and/or vigorous physical activities for at least 40 minutes during my leisure time . . ."). Responses were rated on a 7-point scale ranging from 1 (*not at all* or *never*) to 7 (*most days of the week* or *very often*). This measure was based on Godin and Shephard's (1985) single-item, self-report behavioral measure, which has demonstrated adequate validity and reliability relative to objective measures of physical activity. A period of 40 min was chosen, as this more than satisfies the minimum physical activity recommendations for healthy adults (Haskell et al., 2007).

Procedure

Participants were informed that they were participating in a survey on physical activity. The first questionnaire provided a definition of leisure-time active sports or vigorous physical activities prior to the psychological measures. Participants were asked to consider the active sports or vigorous physical activities of at least 40-min duration, 4 days per week, which they might do over the following 3 weeks during their leisure time. They were informed that this definition includes anything that is "really active" and were provided with the examples of jogging, swimming, and sports training. Participants were provided with this description at both waves of data collection. The follow-up questionnaire was distributed 3 weeks after administration of the initial questionnaire and measured prospective physical-activity behavior.

Data Analysis

Research hypotheses were tested by path analyses via simultaneous process using EQS v.6.1 computer software (Bentler, 2004). We employed a robust maximum likelihood estimation method to protect against violations of the assumption of normality of distribution in the data. Errors were correlated between attitude, subjective norm, and PBC; and between continuation intentions of success and failure, as these constructs were expected to show intercorrelation.

Indexes of fit used to assess the adequacy of the models in accounting for the data were the comparative fit index (CFI), non-normed fit index (NNFI), standardized root mean square residual (SRMR), and root mean square

error of approximation (RMSEA). Values of .90 or above are deemed acceptable for model fit for CFI and NNFI, although values of .95 are preferred; and a cut-off value of .08 or less for SRMSR and RMSEA indicates satisfactory model fit (Hu & Bentler, 1999). The parsimony-adjusted comparative fit index (PCFI; Mulaik et al., 1989) and the parsimony-adjusted non normed fit index (PNNFI; Kline, 2004) were used to assess the goodness-of-fit accounting for the parsimony of the model. The Lagrange multiplier (LM) test indicated fixed parameters within the model that would result in significant improvement in the goodness-of-fit chi-square value if released. Moderation effects were tested using multi-sample path-analytic models with invariance tests to evaluate significant differences between the two groups in the hypothesized moderated relationships.

Results

Preliminary Analyses

Participants. The attrition rate between the first and second waves of data collection was 33%, resulting in a final sample of 172 adults (53 males, 119 females; *M* age = 30.8 years, *SD* = 13.2). There were no significant differences in age, gender distribution, or distribution of autonomous and heteronomous outcomes by those who provided follow-up behavioral data and those who did not.

Descriptive statistics, intercorrelations, and reliability statistics. We computed mean-average composites of each of the psychological and behavioral variables. The only exception was the dichotomous, chronically accessible outcome measure. Descriptive statistics, correlations, and reliability statistics for the variables are presented in Table 1. Cronbach's alpha values and inter-item correlations indicate that the measures demonstrated adequate internal reliability, with the exception of the continuation intentions measures.

Path Analysis

We tested the extended TPB model in the entire sample with path analysis using the composite variables. Potential effects of past behavior on all other constructs were controlled through inclusion of this variable as an independent predictor of all other variables in the model. Intentions, PBC, RAI, and the chronically accessible outcomes measure were set to predict physical-activity behavior. Attitude, subjective norm, PBC, RAI, and the chronically

Table 1

Descriptive Statistics, Intercorrelations, and Reliability Statistics for Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. PB	2.88	1.48	**.79**								
2. Attitude	5.23	1.48	.52**	**.89**							
3. SubN	4.84	1.31	.19**	.53**	—						
4. PBC	4.92	1.42	.49**	.47**	.32**	**.75**					
5. RAI	3.67	2.33	.36**	.35**	−.08	.25**	—				
6. Intention	3.97	1.99	.69**	.76**	.45**	.59**	.30**	**.94**			
7. CIS	4.94	1.20	.33**	.45**	.28**	.23**	.23**	.42**	**.57**		
8. CIF	4.36	1.38	.43**	.50**	.26**	.32**	.30**	.55**	.53**	**.67**	
9. PA	3.55	1.78	.74**	.51**	.17*	.42**	.40**	.67**	.35**	.54**	**.94**
10. CAM	1.23	0.42	−.09	−.10	.16*	−.05	.25**	−.09	−.06	−.13*	−.14

Note. Cronbach's alpha reliability coefficients appear in boldface on the diagonal. PB = past behavior; SubN = subjective norm; PBC = perceived behavioral control; RAI = relative autonomy index; CIS = continuation intentions of success; CIF = continuation intentions of failure; PA = physical-activity behavior; CAM = chronically accessible motives.
*$p < .05$. **$p < .01$.

accessible outcomes measure were specified as predictors of intention. RAI was also set to predict intentions indirectly through attitude and PBC. Covariances were specified between the predictors of intention and between continuation intentions of success and failure. Goodness-of-fit indexes show that the model demonstrated good fit to the data, Satorra-Bentler (SB) Scaled $\chi^2(12) = 20.97$, $df = 12$, $p = .05$; CFI = .99; NNFI = .95; SRMSR = .08; RMSEA = .07; 90% confidence intervals (CIs) of RMSEA = .00 (lower bound), .11 (upper bound). The parsimony fit indexes of PCFI (Mulaik et al., 1989) and PNNFI (Kline, 2004) emerged as .26 and .25, respectively.

Standardized path coefficients for the free parameters in the path analysis are presented in Figure 2. We used the model to test hypothesized relationships among the psychological and behavioral constructs. The hypothesized significant and direct effects of attitude ($\beta = .37$, $p < .05$) and PBC on intentions were supported ($\beta = .25$, $p < .05$). As hypothesized, attitude ($\beta = .09$, $p < .05$) and PBC ($\beta = .07$, $p < .05$) exhibited significant indirect positive effects on physical-activity behavior, mediated by intentions. PBC did not exert a significant direct effect on behavior; therefore, this hypothesis was rejected. Scaled autonomous motivation exhibited a significant and direct positive relationship with behavior ($\beta = .11$, $p < .05$), but no significant direct effect on intentions. Therefore, this hypothesis was partially supported. Scaled autonomous motivation shows a significant indirect effect on intentions, mediated by attitudes and PBC ($\beta = -.27$. $p < .05$).[4] As hypothesized, intentions showed a significant and direct positive relationship with behavior ($\beta = .21$, $p < .05$). There was no significant direct effect of chronically accessible autonomous and heteronomous outcomes on physical activity; therefore, this hypothesis was rejected.

Moderation Analysis

In order to test the hypothesized moderation of the effects of continuation intentions of success and failure by the chronically accessible motivational measure, we segregated the sample into two samples. One sample comprised participants who reported a primary autonomous outcome on the chronically accessible measure (hereafter known as the *autonomous outcomes group*,

[4]In all analyses testing for significant indirect effects, the following criteria proposed by Baron and Kenny (1986) were met: (a) significant correlations between the dependent variable and the independent (predictor) variable(s); (b) significant correlations between the mediator and the independent variable(s); (c) a significant unique effect of the mediator on the dependent variable when it is included alongside the independent variable(s) in a multivariate test of these relationships; and (d) the significant effect of independent variable on the dependent is attenuated or extinguished when the mediator is included as an independent predictor of the dependent variable. The significant indirect effect test is equivalent to a Sobel (1982) test.

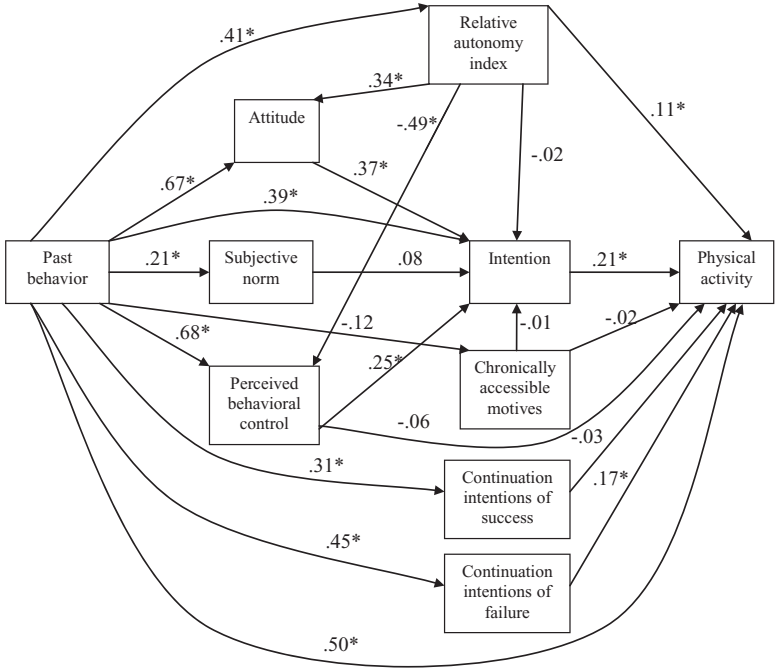

Figure 2. The extended TPB model showing the results of the single-sample path analysis. *Note.* Error covariances (ϕ) not included in the path diagram for clarity: Chronically Accessible Motives ↔ Relative Autonomy Index, $\phi = -.21$, $p < .05$; Attitude ↔ Relative Autonomy Index, $\phi = .51$, $p < .05$; Subjective Norm ↔ Relative Autonomy Index, $\phi = -.19$, $p < .05$; Perceived Behavioral Control ↔ Relative Autonomy Index, $\phi = .54$, $p < .05$; Attitude ↔ Chronically Accessible Motives, $\phi = -.06$, $p > .05$; Subjective Norm ↔ Chronically Accessible Motives, $\phi = .22$, $p < .05$; Perceived Behavioral Control ↔ Chronically Accessible Motives, $\phi = -.01$, $p > .05$; Subjective Norm ↔ Attitude, $\phi = .39$, $p < .05$; Perceived Behavioral Control ↔ Attitude, $\phi = .49$, $p < .05$; Perceived Behavioral Control ↔ Subjective Norm, $\phi = .14$, $p > .05$; Continuation Intentions of Failure ↔ Continuation Intentions of Success, $\phi = .49$, $p < .05$.

$N = 133$), while the other comprised participants who cited a primary controlling outcome (the *controlled outcomes group*, $N = 39$). The path-analysis model was re-estimated in each sample, and the invariance of the parameter estimates was tested using multi-sample analysis, constraining the parameter estimates to be invariant across the groups.

Initially, a baseline model was determined, based on the criteria of parsimony and substantive meaning. This model exhibited adequate fit with the data, SB $\chi^2(20) = 37.30$, $p = .01$ (CFI = .97; NNFI = .91; SRMR = .10; RMSEA = .10; 90% CIs = .05–.15). Following the estimation of this model, we conducted tests for the equivalence of parameters (path coefficients)

across groups. All parameters within the original model were constrained equal. The invariance analysis produced a model that showed adequate fit to the data, SB $\chi^2 = 56.18$, df = 39, p = .04; CFI = .97, NNFI = .95; SRMR = .11; RMSEA = .06; 90% CIs = .02 (lower bound), .11 (upper bound). One of the constrained paths was flagged as non-invariant, based on the LM test for releasing constraints. The LM test indicated that the path between continuation intentions of success and physical-activity behavior differed significantly ($p < .01$) between the two groups, providing partial support for the hypothesis that the relationships between continuation intentions and physical-activity behavior would be moderated by the chronically accessible outcomes measure.[5]

A significant negative path was determined between continuation intentions of success and physical-activity behavior in the controlled group ($\beta = -.30$, $p < .05$), but there was no significant path between these variables in the autonomous group. Freeing this parameter resulted in improved model fit, SB $\chi^2 = 50.02$, df = 38, p = .09; CFI = .98; NNFI = .97; SRMSR = .11; RMSEA = .06; 90% CIs = .00 (lower bound), .10 (upper bound). For completion, the model resulting from the release of this constraint was re-examined for further non-invariant parameters across the groups. The LM test for this model indicated that no other parameters were non-invariant across the groups, thus there was no significant moderating effect of chronically accessible motivation on the relationship between continuation intentions of failure and physical-activity behavior.[6]

Discussion

The present research tested an extended theory of planned behavior model that incorporated a traditional scaled measure of autonomous motivation and

[5]We also conducted our analysis of interactions using moderated hierarchical regression analysis to ensure that the main and interaction effects in the path analyses were robust. In accordance with the recommendation of Aiken and West (1991), all independent variables were standardized in order to avoid the problem of multicollinearity linked with the use of interaction terms. Results supported the main and interaction effects determined in the path analyses. Importantly, chronically accessible motivation significantly moderated the association between continuation intentions of success and physical-activity behavior. This finding strengthened the inference that continuation intentions are differentially effective in predicting physical-activity behavior, dependent on chronic motivational orientation.

[6]Although there was no significant moderating effect of chronically accessible motivation on the relationship between continuation intentions of failure and physical-activity behavior because the path representing this relationship was statistically invariant across the groups, the multi-sample analysis revealed a significant direct effect of continuation intentions of failure on physical activity in controlled individuals ($\beta = .36$, $p < .05$), but no such significant effect in autonomous individuals.

a measure of chronically accessible autonomous and heteronomous outcomes according to self-determination theory. It was hypothesized that the TPB variables of attitudes, subjective norms, and PBC would have direct positive effects on intentions and indirect positive effects on physical activity through the mediation of intentions, and that PBC and intentions would exert significant direct effects on physical activity. It was also hypothesized that autonomous motivation, as assessed by the traditional scaled measure, would exert a significant direct effect on behavior, and a significant indirect effect on intentions through mediation by attitudes and PBC. Finally, the chronically accessible outcomes measure was expected to exert a significant direct and negative effect on behavior and to moderate the effects of continuation intentions of success and failure on physical-activity behavior.

We used the chronically accessible outcomes measure to divide the sample into two groups. The autonomous group consisted of individuals who freely reported that they primarily participated in leisure-time physical activity for reasons unrelated to weight loss or physical appearance, while the controlled group was composed of individuals who reported engaging in leisure-time physical activity primarily for reasons relating to weight loss and physical appearance.

The results partially supported the hypothesis that the chronically accessible autonomous outcome measure would moderate the effects of continuation intentions on physical-activity behavior. Direct paths for continuation intentions of success and failure on physical activity were significant only in the controlled group. In this group, a positive path was found between continuation intentions of failure and physical activity, while a negative path was found between continuation intentions of success and physical activity. The LM test confirmed that the parameter estimates for continuation intentions of success on behavior were not invariant across the two groups.

The discovery that chronically accessible autonomous and controlled outcomes moderated the effect of continuation intentions of success on physical activity and the trend toward moderation of the effect of continuation intentions of failure on physical activity carry substantial implications for theory on psychological antecedents of physical-activity behavior and also for interventions to increase physical activity. The absence of significant paths from continuation intentions of success and failure to physical-activity behavior in the autonomous group suggests that planning continuation of behavior for situations of success and failure in goal attainment in advance of such decisions is not of use to such individuals. This could be because autonomous motivation is conducive to behavioral persistence, and this motivational orientation alone provides sufficient impetus to maintain behavior upon encountering either success of failure in goal striving, meaning that continuation intentions may be superfluous.

In contrast, continuation intentions of failure showed a significant and positive path with behavior in the controlled group, presumably because planning to continue behavioral engagement in situations of failure in goal attainment is useful in assisting these individuals to maintain efforts to achieve their goals after perceived failure. However, continuation intentions of success showed a significant negative association with physical-activity behavior in the controlled group, suggesting that planning to continue engagement in physical-activity behavior in situations of successful goal attainment was not useful in ensuring maintenance of physical activity. Possible explanations for this negative relationship are that the multicollinearity between continuation intentions of success and failure within controlled individuals has caused a suppressor effect, or current measures of continuation intentions of success do not assess the true nature of the construct. However, the correlation between the continuation intention statistics, while significant ($r = .53$, $p < .01$), was not particularly high, and tolerance statistics were acceptable. Furthermore, we also performed the correlation analysis for the high and low chronically accessible motives groups and found that the correlations were comparable. This evidence seems to rule out the premise that multicollinearity and suppressor effects were responsible for the negative relation between continuation intentions of success and behavior. Perhaps a more likely explanation is that high continuation intentions of success, as tapped by the current measure, may reflect a likelihood of terminating physical activity if success is not encountered, thus responding to these items could function counterproductively and represent intention to maintain physical activity only if success is experienced. This may be an issue for future measurement. It would be important to highlight in hypothetical scenarios that it is important to develop personally relevant criteria for success.

The present findings are consistent with key tenets of SDT (Deci & Ryan, 1985, 2000), which suggests that behavioral persistence is greater when individuals are autonomously motivated. This assumption has been supported by research in the physical-activity domain (e.g., Wankel, 1993). It could be inferred, therefore, that for individuals who participate in leisure-time physical activity for interest, enjoyment, satisfaction, and well-being, the planning of post-decisional intentions in advance achieved through formation of continuation intentions is unnecessary for behavioral maintenance.

In contrast, for individuals citing controlled primary outcomes in physical activity, planning to continue participation in physical activity in situations in which goals have not yet been achieved may be conducive to behavioral persistence, because such individuals may require additional assistance in goal attainment. The formation of continuation intentions of success, however, does not appear to incur beneficial effects for individuals citing controlled outcomes as their most accessible, as such individuals are not

interested in maintaining physical activity after obtaining desired outcomes and are highly likely to terminate behavior after these outcomes have been obtained, regardless of planning for situations of successful goal attainment. The results are consistent with previous findings suggesting that continuation intentions of failure have greater predictive utility for physical-activity behavior than do continuation intentions of success (Chatzisarantis & Hagger, 2008). Importantly, the chronically accessible outcomes measure is independent of the traditional conceptualization of intentions and represents nonconscious and spontaneous influences on behavior, in contrast to the deliberative nature of intentions.

Unexpectedly, a negative path, albeit virtually nil and nonsignificant, emerged between the scaled measure of autonomous motivation and intentions. Further analyses revealed that the exclusion of past behavior from the model restored the indirect effect of autonomous motivation on intention, mediated by attitude and PBC. This suggests that despite grounding decisions to exercise in autonomous motivation, the influence of autonomous motivation is not independent of past behavior. Continuation intentions, in contrast, are unlikely to be tied inextricably to past behavior and may exert a greater bearing on future physical activity.

The findings of this study underscore the importance of considering individuals' chronically accessible motivational orientations when developing techniques to enhance levels of physical activity. This study used a novel approach to explore differences in social cognitive determinants of physical-activity behavior between individuals with different motivational orientations for physical activity by using a free-response measure of chronically accessible outcomes or motives for physical activity to differentiate between individuals who tend to pursue autonomous and controlled accessible outcomes. This measure was an indirect method of accessing motivational orientations and, therefore, conferred the advantage that participants were unaware of exactly what the measure was tapping, thereby minimizing self-report bias.

Importantly, the model compensates for a shortcoming of the TPB by incorporating a direct measure of behavioral regulation in the form of the RAI. Further, the extended TPB model encompasses the post-decisional phase of behavior, which is neglected by the original TPB, thereby providing a more complete account of the social-cognitive determinants of physical activity. The model accounted for more variance in both intentions and behavior than have applications of the original TPB model in the physical-activity domain (see Hagger, Chatzisarantis, & Biddle, 2002a, 2002b). A further strength of the present study is the use of path analysis, which is a flexible, powerful technique that allows error in prediction to be modelled explicitly and tests the mediation and moderation effects within the proposed network of relationships.

However, the present study is limited in several ways. First, the interval between the two waves of data collection may have been insufficient for continuation intentions to affect behavior. A period of 3 weeks may have been too short to expect participants to have succeeded or failed in their goal pursuit, so the measure of physical activity may not have accurately reflected the effects of participants' continuation intentions. A greater time interval that enables realization of longer term goals would be desirable in future research.

The measure of physical activity was also limited, as the two-item measure employed is unlikely to have reflected the complexity of physical-activity behavior and could have suffered from self-report bias. Other limitations are the discrepancy in sample size between the two groups and the unsatisfactory internal reliability of the continuation intentions items. However, previous research (Chatzisarantis et al., 2004; Chatzisarantis & Hagger, 2008) has reported adequate internal reliability for the same continuation intentions items. Future research could usefully determine the reliability of the present findings by recruiting a larger sample of controlled individuals and by assessing whether findings can be replicated for other health behaviors. It may also be valuable to employ an implicit measure of chronically accessible motivation in the future, as this could more accurately assess nonconscious motivational forces acting on physical activity. Items for the measurement of continuation intentions could be revised in order to avoid any potentially counterproductive effects that may arise with the use of current measures of continuation intentions of success, and an objective measure of physical activity should be used to substantiate self-report measures in future work.

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