Running head: testing a model of parental physical activity

Testing a model of physical activity among mothers and fathers of young children: Integrating
self-determined motivation, planning, and theory of planned behavior

Abstract

Parents' are at risk for inactivity; however, research into understanding parental physical activity (PA) is scarce. We integrated self-determined motivation, planning, and theory of planned behavior (TPB) to understand better parental PA. Parents (252 mothers, 206 fathers) completed a main questionnaire assessing measures underpinning these constructs and a 1-week follow-up of PA behavior to examine whether self-determined motivation indirectly influenced intention via the TPB variables (i.e., attitude, subjective norm, and perceived behavioral control) and intention indirectly influenced behavior via planning. We found self-determined motivation on intention was fully mediated by the TPB variables and intention on behavior was partially mediated by the planning variables. In addition, slight differences in the model's paths between the sexes were revealed. The results illustrate the range of important determinants of parental PA and provide support for the integrated model in explaining PA decision making as well as the importance of examining sex differences.

Key words: exercise, parenthood, integrative model, motivation, action plans, coping plans

Participation in regular physical activity (PA) of at least a moderate intensity is a key component to a healthy lifestyle where it is shown to have positive benefits on people's physiological and psychological health with the effects lasting both short and long-term (Bauman, Bellew, Vita, Brown, & Owen, 2002; Warburton, Nicol, & Bredin, 2006). The positive effects of regular PA on people's health and well-being are substantial and, in Australia, engaging in this health behavior is considered beneficial in the prevention of seven of the eight national health priorities (e.g., obesity, cardiovascular health; see Australian Institute of Health and Welfare, 2010). Accordingly, the Australian Government Department of Health and Ageing (2005) recommend at least 30 minutes of moderate-intensity PA be performed on most, preferably all, days of the week. In spite of the numerous benefits of regular PA, many individuals lead sedentary lifestyles. According to the National Health Survey 2004-05 (Australian Bureau of Statistics, 2006), 70% of Australians aged over 15 years were classified as sedentary or having low activity levels.

Although physical inactivity is of concern for the entire Australian population, research indicates that certain population groups are less likely to be active. Parents with dependent children are a group identified as being at risk for physical inactivity (Armstrong, Bauman, & Davies, 2000; Bellows-Riecken & Rhodes, 2008; Hamilton & White, 2010a). Specifically, it is suggested that parents with at least one child at home are 20% less likely to be sufficiently active than those without children in the home (Armstrong et al., 2000) and that the presence of a young child in the household (i.e., a child younger than 5 years of age) has a greater negative influence on parental PA than having older children present (Bellows-Riecken & Rhodes, 2008).

As parents are key figures in the socialization process of their children's behavior, including PA behavior (Pugliese & Tinsley, 2007), it is especially important for them to be active as they may influence also the PA behaviors and, thus, the health of their children.

Furthermore, regular PA may have positive effects on parenting practices such as increasing energy levels to better perform the parenting role (Hamilton & White, 2011; Lewis & Ridge, 2005). Whereas estimates and descriptions of adults' PA are well-documented, there is little research examining factors that influence parental PA. Research applying theoretical models for understanding PA decision making among this at risk population is also limited (Bellows-Riecken & Rhodes, 2008). Identifying the influences of PA within defined at risk groups may ensure that more effective interventions are developed as the health promotion action is tailored to the specific target group (Bauman et al., 2002). Researchers (Bellows-Riecken & Rhodes, 2008) and government agencies (Bauman et al., 2002), therefore, advocate for timely attention into addressing this shortfall in the literature and determining those factors that guide parents' decisions to be active.

In reviewing the adult PA literature, a wide variety of factors such as internalized value systems, beliefs, cognitions, and volitional processes have been identified as underlying the decision-making of abandoning health compromising behaviors (e.g., sedentary lifestyles, smoking) and adopting health enhancing behaviors (e.g., regular PA, healthy diet). Many of these determinants of behavior operate through a mediational process. As such, researchers have aimed to identify the optimal set of predictive pathways that allow for the best, yet parsimonious, explanation of behavioral enactment. These models and theories of health behavior, however, are often only partially complete in their representation of belief initiation through to behavioral enactment. Current models, therefore, are often unable to explain all of the processes of people's decision making adequately. It is important to develop and test a model that provides a more complete explanation of people's PA intentions and behavior to identify at which stage of the decision-making process interventions might be most useful.

Additionally, given the sex differences that is currently present in the PA literature in that females are more inactive than males (Burton & Turrell, 2000), it is equally important to

understand the role of gender in the relationship between theoretical constructs and PA participation. Researchers that have examined sex differences in PA determinants have found that women may require different facilitators (e.g., availability of facilities) and face different constraints (e.g., lack of social support) than men (Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010; Phongsavan, McLean, & Bauman, 2007), which can affect their control over their PA participation. Additionally, it is suggested that social factors may be more influential for females' rather than for males' PA-related behavior (Leslie et al., 1999). Furthermore, ingrained socially constructed notions of motherhood where care-giving roles and demands make it difficult for women to prioritise their own health needs over the needs of their parenting responsibilities (Lewis & Ridge, 2005) may require women to plan more when they will incorporate PA into their schedules. Specifically, planning may be more important for women's PA than for men (Hankonen et al., 2010). Overall, it is important not only test a model which provides a comprehensive explanation of people's PA intentions and behavior but to examine also the role of gender in the model.

Integrative Model of Parental Physical Activity

Theory of Planned Behavior. In challenging and building on existing theories, researchers tend to adopt useful elements from one model and combine them with aspects of another model. This eclectic approach to understanding behavior can be seen as a means of theory evolution (Schwarzer, 2008). In reviewing the literature, the Theory of Planned Behavior (TPB; Ajzen, 1991) is a well validated predictive model used in the PA domain (see Symons Downs & Hausenblas, 2005) and, therefore, given the complexity of the model is a useful framework to adopt to explain parents' decisions to engage in regular PA. More specifically, the importance that parents place on their attitudes, social influences, and control factors toward PA suggests that adopting an attitude-behaviour approach may be useful to extend our understanding of parental PA decision making (Hamilton & White 2010b).

The TPB is based on the premise that intention is the most proximal predictor of behavior, with intention determined by three TPB social-cognitive variables: attitudes (i.e., an overall positive or negative evaluation of performing the behavior), subjective norms (i.e., the individual's perception of social approval from people important to them who would want them to perform the behavior), and perceived behavioral control (PBC; the extent to which an individual perceives the behavior to be under their volitional control) (Ajzen, 1991). PBC is also theorized to predict behavior directly (Ajzen, 1991). The TPB, however, is somewhat limited in its explanations of health-related decision making for two main reasons. First, the TPB is not explicit in its specifications of the reasons as to why certain beliefs are pursued (Hagger & Chatzisarantis, 2009) and, second, the discrepancy between intention and behavior (i.e., why good intentions do not always translate into behavior; Sheeran, 2002) are not explained via the TPB variables. As such, integrating other theoretical perspectives with the TPB may improve our understanding of parents' PA decision making.

Self-determined Motivation. Parenthood is a time of many external pressures (e.g., having to contend with childcare responsibilities in addition to household chores as well as spouse and work commitments). Thus, it would seem likely that non-pressuring forms of motivation (i.e., self-determined motivation where an individual experiences a sense of competence, relatedness, and autonomy; Deci & Ryan, 1985, 2008) may enhance parents' social cognitive decision-making processes toward engaging in regular PA (see Hamilton & White, 2010b). Investigating the role of autonomous or self-determined motivation from a self-determination theory (SDT; Deci & Ryan, 1985, 2008) perspective on parents' PA, therefore, seems warranted in this context.

According to SDT researchers, SDT represents a broad theoretical framework concerned with understanding the motivations (i.e., amotivation, extrinsic motivation, and intrinsic or self-determined motivation; see Ryan & Deci, 2002) that guide human

development. Researchers examining components of SDT have demonstrated that self-determined motivation directly predicts people's PA intentions (Wilson & Rodgers, 2004). Other researchers that have tested self-determined motivation with the TPB have found that self-determined motivation indirectly influences people's PA intentions via the TPB variables (Hagger & Chatzisarantis, 2009). Hagger and Chatzisarantis suggest that, as motivational orientations need to be translated into intentions to enact a need-satisfying behavior and that determining one's intentions is through underlying beliefs and personality dispositions that are the antecedents of the TPB variables (see Ajzen, 1991), self-determined motivation should be mediated through the TPB variables. Parents, then, who are motivated to perform PA via their inherent interest and enjoyment of the behavior itself may be more likely attend to the positive outcomes of the behavior (e.g., improving parenting practices; see Hamilton & White 2010b) and look for opportunities to give them greater control over performing the behavior (e.g., eliciting the support of others for childminding to help facilitate PA performance; see Hamilton & White 2010b).

In addition, subjective norms, although conceptualized more as an external regulated type of motivation in the form of social approval (Ajzen, 1991), may be internalized as a form of support. This reasoning may be because the demands to perform the behavior are coming from those people who are significant and important to the individual (see Hagger & Chatzisarantis, 2009). Given that the approval from others (i.e., subjective norms) may be considered as a form of support and that receiving support is shown to be important to parents' PA participation (Brown et al., 2001), it would seem reasonable that those who are self-determined may also want to do what significant others feel is appropriate.

Planning. However, parents raising young children may be faced with higher demands; as such, their good intentions to engage in regular PA might not always translate into behavioural performance. Researchers have referred to this discrepancy as the 'intention-

behavior gap' (Sheeran, 2002). Investigating constructs which strengthen the intention-behavior link is important given that, across a variety of health behaviors, 47% of individuals with positive intentions to perform a given behavior did not perform the behavior whereas only 7% of non-intenders performed the behavior (Sheeran, 2002). In examining the intention-behavior gap, researchers have differentiated between a motivational phase, where an intention is formed, and a volitional phase where a range of self-regulatory strategies are enacted to ensure an intention is realised (Gollwitzer, 1999; Schwarzer, 1992). Planning is a key self-regulatory activity in the volitional phase that impacts on the intention-behavior relationship (Gollwitzer, 1999; Schwarzer, 1992). Given the demands of parenthood, parents may need to plan when they schedule PA into their routines as well as plan for additional obstacles that arise (e.g., children getting sick) which may interrupt any schedules formed. Thus, investigating the role of planning from a Health Action Process Approach (HAPA; Schwarzer, 1992) perspective on parents' PA also seems warranted in this context.

Making detailed plans (i.e., when, where, and how an intended behavior is to be performed) connects the individual with good opportunities to act as the critical situation becomes highly accessible and, thus, easily identifiable when encountered later. This process enables the behavior to be performed automatically without requiring the effort and attention of the individual (Orbell, Hodgkins, & Sheeran, 1998). Action plans increases behavioral engagement through these enhanced cue accessibility and automaticity of action initiation mechanisms rather than through increases in people's motivation or intention (Orbell et al., 1998). Accordingly, making action plans is advocated to mediate the role of intention on behavior (Schwarzer, 1992). This proposition is a central tenet of the HAPA and prior research has found support for action plans mediating the intention-behavior relationship (Schwarzer, 1992; Sniehotta, Scholz, & Schwarzer, 2005). Furthermore, Norman and Connor

(2005), who integrated planning with the TPB, found partial support for the influence of intention on behavior via action planning.

Although action plans increase the chances that a behavioral intention will be implemented, other intentional behaviors and actual demands (e.g., work and childcare responsibilities) can interfere with the execution of these plans. Researchers have identified a different way of planning that focuses on anticipating and overcoming barriers. Coping planning is a barrier-focused self-regulation strategy where individuals mentally link anticipated situations that hinder performance of their intended behavior with appropriate coping responses to overcome such challenging situations (Sniehotta, Schwarzer, Scholz, & Schuz, 2005). Thus, unlike action plans that connect the individual with good opportunities to act through a task-facilitating strategy, coping plans protect good intentions from anticipated obstacles via a distraction-inhibiting strategy (Sniehotta, Schwarzer, et al., 2005). Research in the PA domain has found that having fewer coping plans increases the chance of relapsing to previously sedentary behavior (Simkin & Gross, 1994). More recent research that examined the effects of both action plans and coping plans found that individuals who formed action plans and coping plans were more likely to increase their level of exercise and leisure-time activities (Sniehotta, Scholz, & Schwarzer, 2006). Intervention work has also found that the combination of these two techniques is more effective in promoting exercise behavior than a motivational intervention alone (Prestwich, Lawton, & Conner, 2003).

The Current Study

Raising a family may present many challenges that can ultimately affect parents' PA participation. Thus, there may be specific drivers and inhibitors of PA for mothers and fathers of young children. It would be useful, then, to determine those processes that are important in guiding parents' PA decisions. This study aims to integrate self-determined motivation, planning, and TPB within a hypothesized sequence to provide an understanding and

representation of the determinants and their sequence in predicting regular parental PA as well as test for any differences of the model's relationships between the sexes. This is the first study to test such an integrative model to help explain PA engagement from belief initiation through to behavioral enactment in this specific at risk group and provides also an analysis of any sex differences. In testing this model, we expect self-determined motivation to indirectly influence behavioral intention via the TPB social-cognitive variables (namely attitudes, subjective norms, and PBC). We expect also that intention will indirectly influence behavior via an indirect path to planning (see Figure 1). Given that the impact of the TPB variables may vary in different target populations (Ajzen, 1991) and that gender differences in social cognitive determinants have been identified within the PA literature (e.g., Hankonen et al., 2010), we investigated, in an exploratory manner, whether these motivational paths differ between the sexes. In reviewing the limited literature (see Hankonen et al., 2010; Leslie et al., 1999), we expect to find some differences in the decision-making process between mothers and fathers on the social influence variable (i.e., subjective norm), PBC, and planning.

Method

Participants and Procedure

The research was carried out between September 2009 and January 2010 and ethical clearance by the University Human Research Ethics Committee was granted. Parents were recruited via various family and parenting networks including mothers' and fathers' groups, baby/toddler swim schools, and child play centres as well as through the local Playgroup Association, one prominent day care association, two online parenting forums in Australia, and the University Alumni association. Participants, those who completed Time 1 (main questionnaire, $N = 580$) and 2 (follow-up behavior questionnaire 1-week later) data points, were one parent from each of 458 families ($n = 252$ mothers, $n = 206$ fathers; 79% sample retention rate¹). Participants were included in the study if they were aged 18 years and over

and were the parent of at least one child younger than 5 years of age who usually resided in the same household as the parent. Individuals who were pregnant and/or had a medical condition that prevents performing PA at recommended levels (see Australian Government Department of Health and Ageing, 2005) were excluded from participation. The majority (96%) of the parents were in a partnered relationship with 76% of the participants indicating they were of an Australian background. There was a diverse range in the demographic factors of participants' age ($M_{age} = 35.54$, $SD = 5.40$; range = 21–53 years), education level (university education = 53%, non-university education = 47%), work status (full-time = 49%, part-time = 23%, not employed = 28%), and number of children (1 child = 25%, 2 children = 50%, 3 or more children = 25%). Parents completed the main questionnaire, either on-line or paper-based² and then 1 week later, via telephone follow-up, self-reported their PA behavior in the previous week. A prize draw of a chance to win one of five AUD\$150 sporting store gift vouchers was offered as an incentive for participation. The results reported are part of a larger study investigating mediators of parental PA intentions and behavior, key beliefs to target for resultant intervention programs, and measurement of parental PA. The results reported here focus solely on the integration of self-determined motivation, planning, and TPB in helping to understand the mediators of parental PA intentions and behavior.

Measures

To maximise congruence between the prediction and criterion variables, the standard TPB variables were measured at the same level of specificity in terms of action, target, and time, in line with TPB recommendations (Ajzen, 1991). Unweighted composites based on the mean of the items were computed for all variables (except behavior which was measured by a single item) and used in subsequent analyses. The target behavior was regular PA and was defined according to current guidelines (i.e., PA performed of at least a moderate-intensity on

5 days or more of the week for at least 30 minutes; see Australian Government Department of Health and Ageing, 2005; Haskell et al., 2007).

Intention. Three items assessed the strength of intention to perform PA (“I intend to do regular PA in the next week”, “I plan to do regular PA in the next week”, and “I expect that I will do regular PA in the next week”, scored *strongly disagree* [1] to *strongly agree* [7]). The scale scores were internally consistent ($\alpha = .94$).

Attitude. Attitude towards engaging in regular PA was assessed by three, 7-point semantic differential scales, all reversed scored (“For me to do regular PA in the next week would be ...”, *valuable* [1] to *worthless* [7], *pleasant* [1] to *unpleasant* [7], and *good* [1] to *bad* [7]). The scale scores were internally consistent ($\alpha = .74$).

Subjective norm. Subjective norm was assessed by two items assessing perceived social pressures toward performing the behavior (“Most people who are important to me would approve of my doing regular PA in the next week” and “Those people who are important to me think that I should do regular PA in the next week”, scored *strongly disagree* [1] to *strongly agree* [7]). The items were correlated significantly ($r = .54, p < .001$).

Perceived behavioral control. PBC was measured by two items assessing the participant’s sense of control about performing the target behavior (“I have complete control over whether I do regular PA in the next week” and “It is mostly up to me whether or not I do regular PA in the next week”, scored *strongly disagree* [1] to *strongly agree* [7]). The items were correlated significantly ($r = .66, p < .001$).

Self-determination. Self-determined motivation was measured by four items from the autonomous motivation subscale of the Treatment Self-Regulation Questionnaire (TSRQ) developed by Williams, Grow, Freedman, Ryan, and Deci (1996) and assessed the reasons why one would engage in regular PA (“Because I personally believe it is the best thing for my health”, “Because I have carefully thought about it and believe it is very important for many

aspects of my life”, “Because it is an important choice I really want to make”, and “Because it is very important for being as healthy as possible”, scored *not at all true* [1] to *very true* [7]). The scale scores were internally consistent ($\alpha = .89$).

Action and coping planning. The action planning and coping planning scales were each measured by four items based on Sniehotta, Schwarzer et al. (2005) and assessed the extent to which one has made a detailed plan in relation to doing regular PA in the next week. For action planning, these items included, “When to do regular PA over the next week”, “Where to do regular PA over the next week”, “How to do regular PA over the next week”, and “How often to do regular PA over the next week”. For coping planning, these items included, “What to do if something interferes with my plans”, “How to cope with possible setbacks”, “What to do in difficult situations in order to stick to my intentions”, and “When I have to pay extra attention to prevent lapses”. For both action and coping planning, parents were asked to circle one option regarding if they had made a detailed plan and the scales were scored *not at all true* [1] to *exactly true* [7]) and were reliable ($\alpha = .97$ and $\alpha = .96$, respectively).

Behavior. Self-reported PA behavior was measured on a single-item scale assessing the number of days parents had performed PA in the previous week, (i.e., “On how many days in the course of the past week [past 7 days] have you engaged in at least 30 minutes of at least a moderate-intensity PA”). The behavior item was measured at the same level of specificity as the TPB constructs of attitude, subjective norms, PBC, and intention (i.e., defining PA as those activities performed for at least 30 minutes of at least a moderate intensity). Single-item self report measures of PA have demonstrated reliability and validity and deemed appropriate tools in assessing respondents’ PA (Milton, Bull, & Bauman, 2010). We validated our single item behavior measure (Authors blinded for review, in press) against an objective measure of pedometer steps on a sub-sample of the target group ($n = 30$) and a modified 7-day PA recall (Craig et al., 2003; Fjeldsoe, Marshall, & Miller, 2009). The correlation between the number

of steps and the number of days self reported was very strong ($r = .81, p < .001$). The correlation between the total amount of time spent in moderate and vigorous PA and number of days self-reported was moderate ($r_s = .51, p < .001$) and within the range of previous studies assessing the validity of single-item PA measures (Milton et al., 2010).

Model Analysis

The data analysis was designed to test two meditational pathways. Based on prior literature, the first mediation pathway was that from self-determined motivation to intentions via the TPB social-cognitive variables (i.e., attitudes, subjective norm, PBC) (see Hagger & Chatzisarantis, 2009), and the second was from intention to behavior via the planning variables (i.e., action and coping planning) (see Sniehotta, Schwarzer, et al., 2005). Given that differences in social cognitive determinants have been identified within the PA literature (e.g., Hankonen et al., 2010), the data analysis was further designed to test for differences by sex in those meditational pathways. This process required that the data be analysed separately for men and women, and that tests of mediation be conducted separately and then statistically compared. Therefore, we used a multi-group analysis strategy to analyse the data, starting with separate groups, finding well fitting models for each group, and then statistically comparing the parameter estimates for men and women.

Meditation hypotheses are causal in nature (Mathieu, deShon, & Bergh, 2008). Of importance, then, is the degree to which causal inferences can be made based on the results presented. The current study does not meet the design requirements for ascribing causality to the indirect paths we test; therefore, only indirect associations, as opposed to causal effects, can be inferred from the results. To test the two meditational hypotheses, indirect paths were estimated in the presence of direct paths. The inclusion of the direct path conforms to what Gelfand, Mensinger, and Tenhave (2009) termed an exploratory approach to testing mediation. Kenny (2008), however, argued that the direct path should be included so as to

demonstrate it is zero when complete mediation is hypothesized and to guard against biased coefficients if complete mediation is not present. Thus, we included a direct path in the model in the two areas in which meditational hypotheses were made: from self-determined motivation to intention and from intention to behaviour.

The TPB variables were allowed to covary, as were the two planning variables. The model we tested is presented in Figure 1. We then requested the total and specific indirect paths (McKinnon, 2000) from self-determined motivation to intention via the TPB variables, and the total and specific indirect paths from intention to behavior via the two planning variables. Significant differences in the strengths of the specific indirect paths were tested for each sex separately using the method employed in Mplus and described by Cheung (2007) and Lau and Cheung (2010). The method required defining, estimating, then testing the difference in the specific indirect paths through the ‘Model Constraint’ command of Mplus. Indirect paths were defined as the multiplication of the coefficients associated with each path which together made up the indirect path. The difference in the strength of specific indirect paths required subtracting one specific indirect path from another. Statistical testing was then conducted by calculating the standard error of the difference using the delta method and using this to test whether the difference was statistically different from zero. Through the multi-group analysis, we then tested the significance of differences in the strength of the indirect paths for mothers compared to fathers also in the manner described above. As all paths compared in specific tests were calculated using variables measured on the same scale, the comparisons are meaningful.

Path modelling using Mplus V5.2 was used to test the model. Due to the presence of significant multivariate kurtosis (Mardia’s normalized multivariate kurtosis values: women: $z = 9.66, p < .001$; men: $z = 9.59, p < .001$), robust maximum likelihood estimation (i.e., MLM in Mplus) was employed. MLM corrects both the chi-square test, calculating the Satorra

Bentler chi square (Satorra & Bentler, 2001), and the parameter estimates for non-normality. Two multivariate outliers were detected. As analyses conducted both with and without these two outliers were not different in substance and with only very minimal changes in some significance levels, all data were retained. There was no evidence of heteroskedasticity present in either the men's or women's data. Composites formed by using the mean of the items were employed in modelling. Model fit was assessed using the chi-square statistic for exact fit, plus the CFI, the TLI, RMSEA and SRMR. Conventional standards of fit were employed: a non-significant chi-square, a CFI and TLI value above .9 and preferably above .95, a value of the RMSEA below .06, and the SRMR less than .05. (Hu & Bentler, 1999).

Results

Descriptive Statistics

The means, standard deviations, and correlations among all variables for both mothers and fathers are reported in Table 1. As demonstrated in Table 1, all variables were significantly correlated with intention and behavior, with intention emerging as the strongest behavioral correlate. The average number of days parents performed PA was 3.04 ($SD = 2.05$), reflecting a moderate level of PA during the previous 1 week time-period.

Single-group Path Models

The proposed model, shown in Figure 1, was initially tested for mothers and fathers separately. For mothers, model fit indices suggested that there was significant misfit, in particular the significant chi square and the excessive RMSEA ($\chi^2 (df = 11) = 44.28, p < .01$; CFI = .95; TLI = .86; RMSEA = .11; SRMR = .06). For fathers, the hypothesized model was an adequate fit to the data ($\chi^2 (df = 11) = 19.69, p = .05$; CFI = .98; TLI = .95; RMSEA = .06; SRMR = .04). Inspection of residuals and modification indices for women suggested that self-determined motivation was significantly related to the planning variables. These additional paths are not unexpected given that previous research on exercise has found that

identified regulation (a form of autonomous motivation in which the individual identifies with the value of exercise) has a direct influence on people's spontaneous implementation intentions, a term synonymous with planning (Brickell & Chatzisarantis, 2007). For both mothers and fathers, these two extra paths from self determined motivation to planning were added to the model, resulting in a significant improvement in model fit for both groups (Satorra-Bentler scaled chi-square difference: Mothers: 34.79, $df = 2$, $p < .001$; Fathers: 14.50, $df = 2$, $p < .001$. Model fit indices: Mothers: $\chi^2 (df = 9) = 17.04$, $p = .05$; CFI = .98; TLI = .96; RMSEA = .06; SRMR = .03; Fathers: $\chi^2 (df = 9) = 5.85$, $p < .83$; CFI = 1.00; TLI = 1.02; RMSEA = .00; SRMR = .02). Furthermore, the non-significant chi-square for the model for both mothers and fathers suggested that the addition of these two paths was sufficient to produce a model with exact fit to the data.

Self-determination via TPB variables to intentions. Inspection of the estimates indicated that, for mothers, self-determined motivation predicted attitudes and subjective norms, while, for fathers, self-determined motivation significantly predicted all three TPB variables. The three TPB variables were significant predictors of intention for mothers. For fathers, attitudes and PBC, but not subjective norms, were significant predictors of intention.

For both mothers and fathers, the path from self-determined motivation to intention was fully mediated by the three TPB variables as evidenced by a non-significant and almost zero direct path, and a large and significant total indirect path (see Figure 1 for direct paths and Table 2 for the total, indirect, and specific indirect paths). The statistical difference in the strength of specific paths was established by testing if the difference in the two unstandardized path coefficients of interest, differed significantly from zero, as outlined in Cheung (2007). The standard error of the difference is computed by Mplus using the delta method (Preacher & Hayes, 2008). All test results are reported in Table 2.

Testing of the relative strength of the three specific indirect paths from self-determined motivation to intention indicated some differences between mothers and fathers. For both sexes, the indirect path of self-determined motivation on intention via attitudes was significantly stronger than those through either subjective norms or PBC. For mothers only, subjective norms mediated the relationship between self-determined motivation and intention with the indirect path from self-determined motivation to intention through subjective norms being significantly stronger than the indirect path through PBC. For fathers only, PBC also significantly mediate the relationship between self-determined motivation and intention, although the two indirect paths did not significantly differ from each other. A further test was conducted to compare the strength of the specific indirect paths between the sexes. These tests were conducted in the same manner as the within group tests, except that the specific indirect paths compared were those of mothers and fathers. The results revealed that the indirect path from self-determined motivation to intention via subjective norms was significantly stronger for mothers than for fathers, while the indirect path via PBC was significantly stronger for fathers than mothers. No difference between the sexes was observed for the attitude path.

Intention via planning to behavior. For both mothers and fathers, the direct path from intention to behavior was strong and significant. Furthermore, for both the sexes, the total indirect path from intention to behavior via the two planning variables was significant, although much weaker than the direct path from intentions to behavior (see Table 2). Testing of the relative strength of the two specific indirect paths from intention to behavior via action planning and coping planning for mothers indicated that they did not differ significantly from each other, even though the significant indirect path through coping planning was significant and the indirect path via action planning was not significant. For fathers, the opposite pattern emerged with a significant path via action planning but not via coping planning although, once again, the strength of the two indirect paths did not differ. A further test was conducted

to compare the strength of the specific indirect paths between the sexes where no differences between mothers and fathers for either action planning or coping planning were observed.

Multi-group Path Model

To conduct the multi-group path model, we first tested a model with all paths between the two groups unconstrained (chi square = 22.57, $df = 18$, $p = .21$). Next, we released one across group constraint at a time and retested the model each time. Only three statistically different paths were found. When these three paths were allowed to be estimated freely across the two groups but with all other paths and the covariances among the mediators constrained to be the same (a total of 16 additional constraints), the model produced an adequate fit to the data (chi-square = 34.89, $df = 34$, $p = .42$). Of most importance, the fit between the unconstrained model and the model with the 16 additional cross-group constraints imposed was not significantly different from each other (Satorra-Bentler scaled chi-square difference test = 12.69, $df = 16$, $p = .70$).

This testing revealed that three paths differed between mothers and fathers. Mothers were found to have significantly stronger paths from self-determination to attitudes ($\text{diff}_b = .15$, $p = .05$) and from subjective norms to intentions ($\text{diff}_b = .27$, $p < .01$) than did fathers, and fathers had a significantly stronger path from self-determination to PBC than did mothers ($\text{diff}_b = .43$, $p < .01$). All other estimates were not significantly different between the sexes.

Discussion

We tested an integrated model including self-determined motivation, planning, and TPB in a population of parents of young children, who, to date, have received limited attention but are at risk for inactivity (Bellows-Riecken & Rhodes, 2008). The findings support self-determined motivation on intention being fully mediated by the TPB variables and partially support the impact of intention on behavior mediated by planning. Slight differences in the model's motivational paths between the sexes were found also.

Findings of the path model support previous research (Hagger & Chatzisarantis, 2009) and the hypothesis that self-determined motivation on intention will be mediated via the TPB variables. For mothers, attitudes and subjective norms, but not PBC, mediated the paths of self-determined motivation on intentions whereas, for fathers, attitudes and PBC, but not subjective norms, mediated this relationship. These findings suggest that the TPB social-cognitive variables are necessary for the translation of self-determined motivation into intentions and that parental PA decision making relies on motives, social-cognitive influences, and intentions. Thus, social cognitions that are consistent with personally relevant and valued goals in relation to performing PA will compel an individual to form intentions to engage in regular PA in the future.

The present model, and in line with Norman and Conner (2005), also provides some support for the integration of a volitional phase to socio-cognitive models of health behavior where we found partial support for planning mediating the intention-behavior relationship. In line with Ajzen (1991), however, the most pervasive effect on behavior was the direct path of intention on behavior. In this study, there was only a 1-week follow-up between data collection points. Thus, the likelihood of intention predicting behavior may be governed more by the individual's deliberate cognitive decision-making processes that strive for equilibrium in their beliefs rather than through a more automatic process that allows the individual to mentally link the intended behavior with a particular context for its enactment. Additionally, the lack of multiple time points to investigate the causal relationship between intention, planning, and behavior may have further limited the ability to detect planning as the proximal predictor of behavior where previous research has shown intentions to decrease and planning to increase over time (Sniehotta, Schwarzer, et al., 2005).

It should be noted also that PBC did not emerge as a significant predictor of behavior, which is inconsistent with the propositions of the TPB (Ajzen, 1991). According to Ajzen

(1991), the strength of PBC in determining behavior is dependent on perceptions of control being reflective of actual control. Research in the exercise domain has shown that individuals generally overestimate their control over the behavioral performance (Sheeran, Trafimow, & Armitage, 2003). TPB meta-analytic research has also found intentions, but not PBC, to provide unique contributions to exercise behavior (Symons Downs & Hausenblas, 2005). Additionally, the PBC measure in the current study reflected items assessing control rather than self-efficacy. Previous research has demonstrated that the control component alone may not be the optimal predictor for behavior as is a general factor of PBC that combines both self-efficacy and controllability (Rhodes & Courneya, 2003). These findings support our lack of evidence to suggest a significant link between PBC and behavior.

Overall, the integration of self-determined motivation, planning, and TPB provides a more complete understanding of parental PA, which is currently lacking in the empirical literature. This understanding can help to guide, more effectively, where in the PA decision-making process interventions might be most useful for parents of young children. Parents' are at risk for physical inactivity; however, research into understanding parental PA is scarce. Little research has also focused on testing specific model effects between the sexes, which our study has done to provide evidence of the relative equivalence in the pattern of results between mothers and fathers. In particular, the results show that the indirect path from self-determined motivation to intention mediated by attitudes and the indirect path from intention to behavior mediated by planning are consistent for both sexes, as are the paths of intentions on behavior. These findings suggest that self-determined parents are more likely to attend to the positive outcomes of regular PA (e.g., improving parenting practices) which influences their intentions to do so. Furthermore, for both sexes, intentions to be active are important for behavioral performance and making plans may help to ensure intentions are acted on.

There were, however, some paths that varied between the sexes. The most pervasive differences were the indirect and direct paths of subjective norm on intention which were significantly stronger for mothers compared to fathers. Given that previous researchers suggest that social influences are particularly salient for females' rather than for males' PA-related behavior (Leslie et al., 1999 Phongsavan et al., 2007), these findings are not surprising. In relation to intervention strategies, then, it may be beneficial for campaigns specific to mothers, rather than fathers, to focus on openly showing important referents (e.g., partners) approving of their engagement in regular PA. We expected also to find some differences in the decision-making process between mothers and fathers on PBC. Our findings revealed self-determined motivation on PBC was significant for fathers but not for mothers. It would appear, then, that fathers but not mothers form control-related perceptions regarding future participation in regular PA based on their beliefs that PA is performed for autonomous reasons. It is suggested that the prevailing ethic of care (Lewis & Ridge, 2005), in which it is difficult to priorities one's own needs over the needs of the family, may be more prevalent for mothers than fathers. Furthermore, previous research has shown that women may require different facilitators and face different constraints than men (Hankonen et al., Phongsavan et al., 2007), which can affect their control over their PA participation. Thus, it may be that mothers require more help to overcome the barriers to PA performance and, although, the behavior might align with their internal value system this motivation is not sufficient to increase their sense of control over behavioral performance. Overall, given the significant differences between the sexes in the paths from self-determined motivation to intention suggests that researchers should consider the theoretical ramifications of investigating these relationships may depend on the sex of the individual.

Sex differences in the decision-making process between mothers and fathers on planning were also expected. Supporting this suggestion is the finding that mothers may be

more influenced by coping plans and fathers by action plans. Thus, given that women may face additional constraints for their PA performance than men (Hankonen et al., Phongsavan et al., 2007), it may be important for them to plan more for when obstacles arise. To help parents to action their intentions, it may be important for intervention programs to consider concentrating their efforts on fathers, in particular, formulating when, where, and how they will be active and mothers, in particular, generating plans to overcome obstacles that may arise which interferes with their plans (e.g., child's ill health). In addition, researchers should consider also that the theoretical ramifications of investigating the effects of planning on behaviour via intentions may again depend on the sex of the individual. Caution, however, should be taken with this interpretation given the significant high inter-correlation between the planning measures. Furthermore, although previous research has shown planning to be more important for women than for men (Hankonen et al., 2010), no significant differences between the sexes were found for intention to behavior mediated via action planning and coping planning. The individuals in the current study were parents of young children. Younger children, given their lack of self-care abilities, require greater amounts of parental care and attention which, ultimately, may impact on a parent's ability to be regularly active (Hamilton & White, 2010a). It would seem likely, then, that both mothers and fathers might need to plan more when they will incorporate PA into their schedules.

Study Limitations and Future Directions

The current study has a number of limitations. The sample was not largely representative of parents of young children (i.e., predominately Caucasian and married participants) and, thus, limits the generalisability of the study's findings. The use of self-report data and self-selection methods might have also facilitated socially desirable responses and the recruitment of higher numbers of individuals who felt favourably about PA (e.g., the attitude scale evidencing a mean of 6.41 and 6.38 on a 7 point scale for mothers and fathers,

respectively). However, the study, via adopting multiple methods of data collection and the recruitment of parents with a wide range of activity levels, tried to combat against any self-selection bias. Furthermore, the item stems of the TPB measures were devised specifically for the target behavior (albeit adapted from established TPB guidelines and similar TPB studies). Ideally, some preliminary pilot testing of these measures would have ensured that the scales were valid and reliable prior to their use in the current investigation. Additionally, behavior was assessed on a one item self-report measure which may not be the most precise measure of PA as are objective tools. We did, however, conduct a validation analysis of our single item (see Authors blinded for review, in press). Given the correlational nature of the research, it might also be useful for future research to test the model longitudinally with multiple follow-up points to develop a latent growth curve analysis as well as help to unpack the intention-planning-behavior relationship. Furthermore, it would be useful to test the efficacy of the model experimentally to examine whether manipulating these constructs actually change parents' PA. Future research might benefit also from a continued examination of this integrative model to determine its utility to other health-related behaviors, such as other energy balancing behaviors (e.g., sedentary behaviors, healthy eating practices). Finally, the two additional paths added from self-determined motivation to the planning variables need to be treated tentatively as they were not hypothesized and were post-hoc modifications to the model. While model misfit was accounted for by the addition of these paths, until they can be replicated with other samples, they should be treated with some caution.

Conclusion

The current study supports the hypothesis that self-determined motivation affects parents' intentions to be regularly active via the proximal determinants of intentions, namely, attitudes. Furthermore, the path from self-determined motivation to intentions is mediated via perceptions of social approval and control for mothers and fathers, respectively. Thus, the

theoretical ramifications of integrating SDT with TPB may depend on the sex of the individual. The study also provides partial support for the further integration of a volitional phase (i.e., action and coping plans) in understanding parents' PA, although the impact of intention on behavior emerged as the strongest direct link. Overall, the integration of self-determined motivation, planning, and TPB into a single model adds to the health psychology literature by indicating the processes that guide parents' decisions to be regularly active.

Each of these constructs can be targeted in resultant intervention work aimed at increasing parental PA. For example, increasing positive attitudes through persuasive campaigns, such as highlighting PA as having the benefit of improving parenting practices, may be useful. Increasing parental control over behavioral may also be effective in promoting favorable intentions towards PA participation. Family and community leaders, then, should provide appropriate resources and environments that foster positive attitudes and ease in performing regular PA for parents with young children. These efforts should be conducted in an autonomy-supportive manner (e.g., acknowledging parents' perspectives and feelings about the behavior and providing parents with choices for PA performance) to enhance the internal motivation toward doing such behaviors (Chatzisartantis, Hagger, Smith, & Sage, 2007). Sex specific tailoring of messages should also be undertaken to ensure the maximum effectiveness of such a program. For example, messages that highlight the importance of social approval should be targeted at mothers rather than fathers. Furthermore, helping parents to generate action plans as well as coping plans may help fathers and mothers, respectively, to action their intentions.

Overall, there are some specific messages to consider when understanding parental PA. First, parents should be provided with choices for performing PA to instil a sense of internal value and interest toward PA, thus improving parents' ratings of their beliefs toward behavioral performance. This strategy is particularly important given that self-determined

motivation drives parents' intentions via their social-cognitions. Second, parents' attitudes and perceptions of control are important to consider in improving their PA intentions, which was the strongest determinant of behavior. Third, engaging parents in formulating plans for PA engagement may help parents to translate their good intentions into behavioral action. Finally, sex specific differences should be taken into consideration when understanding parental PA, in particular, considering the importance of social influences for mothers' PA.

Footnotes

1. Attrition bias was assessed by comparing those participants who did and did not provide follow-up data. Multivariate analysis of variance, $F(7, 561) = 0.96, p = .458$, and univariate F -tests revealed no significant differences on any of the study variables assessed in the Time 1 main questionnaire. We examined also for any differences in the correlations of the study's Time 1 constructs across those who did and did not complete both questionnaires. Using Fischer's Z test, evaluation of the correlations between intention and the predictor variables of attitude ($z = 0.73, p = .465$), subjective norm ($z = 1.67, p = .095$), PBC ($z = -0.34, p = .734$), self-determined motivation ($z = 0.11, p = .912$), action planning ($z = 0.82, p = .412$), and coping planning ($z = 1.23, p = .219$) by questionnaire responders revealed no significant differences.

2. We further examined for any differences in the correlations of the study's constructs across the methods of questionnaire delivery. Using Fischer's Z test, evaluation of the correlations between behaviour and the predictor variables of intention ($z = -0.16, p = .87$), attitude ($z = 0.69, p = .49$), subjective norm ($z = 0.22, p = .83$), PBC ($z = 1.42, p = .16$), self-determined motivation ($z = 0.88, p = .38$), action planning ($z = -0.82, p = .41$), and coping planning ($z = 0.54, p = .59$) by method of questionnaire delivery revealed no significant differences.

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Table 1. *Parents' Reports of Self-determined Motivation, Attitudes, Subjective Norms, Perceived Behavioral Control (PBC), Intention, Action Planning, Coping Planning, and PA Behavior: Observed Pearson Correlations and Descriptive Statistics*

Variable	1.	2.	3.	4.	5.	6.	7.	8.	M	SD	Skew	Kurtosis
1. Self motivation	-	0.48***	0.39***	0.30***	0.42***	0.40***	0.41***	0.22**	5.82	1.18	-1.16	4.01
2. Attitudes	0.59***	-	0.29***	0.09	0.52***	0.38***	0.37***	0.27***	6.38	0.74	-1.43	4.99
3. Subjective norms	0.33***	0.25***	-	0.39***	0.31***	0.14*	0.21***	0.15*	5.89	1.30	-1.38	4.67
4. PBC	-0.01	0.00	0.41***	-	0.32***	0.14*	0.16*	0.18*	5.34	1.64	-.74	2.45
5. Intention	0.31***	0.46***	0.51***	0.41***	-	0.57***	0.55***	0.58***	5.51	1.67	-.96	2.90
6. Action Planning	0.40***	0.44***	0.25***	0.23***	0.57***	-	0.72***	0.48***	3.92	2.20	-.07	1.52
7. Coping Planning	0.39***	0.38***	0.20**	0.24***	0.49***	0.68***	-	0.44***	3.29	1.62	.67	2.56
8. Behavior	0.21**	0.31***	0.24***	0.23***	0.59***	0.47***	0.44***	-	3.16	2.07	.16	2.19
M	5.13	6.41	5.80	4.86	5.34	4.07	3.14	2.94				
SD	1.15	0.87	1.40	1.85	1.81	2.31	1.61	2.04				
Skew	-1.74	-1.89	-1.51	-.55	-.95	-.13	.90	.26				

Kurtosis	5.96	6.78	5.14	2.14	2.73	1.47	2.88	2.12
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Note. Correlations for mothers ($n = 252$) presented below diagonal. Correlations for fathers ($n = 206$) presented above diagonal. Means and standard deviations for mothers are presented in the horizontal rows, and means and standard deviations for fathers are presented in the vertical columns. *Note.* Mean scores in the current study are based on 7-point scales (1 to 7) except for behavior which was scored on an 8-point scale (0 to 7 days). *Note.* Self motivation = self-determined motivation.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 2. *Unstandardized and Standardized Total, Total Indirect, and Specific Indirect Paths*

	Mothers				Fathers				Difference ^a
Path	Unstd	Sobel	Sobel p	Std	Unstd	Sobel	Sobel p	Std	
	Estimate	S.E.		Estimate	Estimate	S.E.		Estimate	
Self-determined motivation to intention									
total	0.49	0.10	0.00	0.30	0.59	0.11	0.00	0.42	
total indirect	0.53	0.10	0.00	0.34	0.41	0.08	0.00	0.29	
selfd - att - intention	0.37 ^a	0.08	0.00	0.24	0.29 ^a	0.07	0.00	0.21	.08 ^{ns}
selfd - sn - intention	0.16 ^b	0.05	0.00	0.10	0.02 ^{cd}	0.04	0.56	0.02	.14*
selfd - pbc - intention	0.00 ^c	0.03	0.88	0.00	0.09 ^d	0.04	0.01	0.07	.10*
Intention to behavior									
total	0.64	0.05	0.00	0.57	0.66	0.08	0.00	0.53	
total indirect	0.13	0.04	0.00	0.12	0.16	0.05	0.00	0.13	
intention – aplan - beh	0.06 ^e	0.05	0.19	0.06	0.11 ^e	0.06	0.04	0.09	.05 ^{ns}
intention - cplan - beh	0.07 ^e	0.04	0.05	0.06	0.05 ^e	0.04	0.26	0.04	.03 ^{ns}
TPB to planning^b									
att - aplan	0.52	0.11	0.00	0.20	0.61	0.14	0.00	0.20	
sn - aplan	0.26	0.06	0.00	0.16	0.04	0.06	0.53	0.02	
pbc - aplan	0.17	0.04	0.00	0.14	0.14	0.05	0.00	0.10	
att - cplan	0.30	0.07	0.00	0.16	0.43	0.10	0.00	0.19	
sn - cplan	0.14	0.03	0.00	0.12	0.27	0.04	0.54	0.02	
pbc - cplan	0.10	0.03	0.00	0.11	0.10	0.03	0.00	0.10	

Note. selfd = self-determined motivation, att = attitude, sn = subjective norms, pbc = perceived behavioral control, aplan = action planning, cplan = coping planning, beh = behavior. *Note.* ^aThe difference between mothers and fathers on their unstandardized indirect path. *Note.* ^bOnly indirect paths were tested in this part of the model therefore the total and indirect paths are identical. Coefficients within each section of the table with the same superscript were not significantly different from each other. * = $p < .05$; ns = not significant.

Figure 1. Path model to test the TPB augmented to include self-determined motivation and planning. *Note.* Proposed path model to test the TPB augmented to include self-determined motivation and planning indicated by formed black lines in figure; final path model to test the TPB augmented to include self-determined motivation and planning, and illustrating standardised path coefficients indicated by all represented lines in figure. *Note.* Standardised path coefficients for the mothers are shown outside parentheses and coefficients for fathers shown within parentheses. *Note.* Covariances among the TPB variables and between the planning variables are as indicated: attitude with subjective norm = $.06(.13)$; attitude with PBC = $.01(-.06)$; subjective norm with PBC = $.44^{**}(.31^{**})$; action planning with coping planning = $.52^{**}(.56^{**})$. *Note.* Results of the unstandardized coefficients from the tests of the direct estimates can be obtained from the first author. $* p < .05$. $**p < .001$.