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Extending the Theory of Planned Behavior: The Role of Self and Social Influences in Predicting Adolescent Regular Moderate-to-Vigorous Physical Activity

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The current study aimed to test the validity of an extended theory of planned behavior model (TPB; Ajzen, 1991), incorporating additional self and social influences, for predicting adolescent moderate-to-vigorous physical activity. Participants ($N = 423$) completed an initial questionnaire that assessed the standard TPB constructs of attitude, subjective norm, and perceived behavioral control, as well as past behavior, self-identity, and the additional social influence variables of group norms, family social support, friends' social support, and social provisions. One week after completion of the main questionnaire, participants completed a follow-up questionnaire that assessed self-reported physical activity during the previous week. The standard TPB variables—past behavior, self-identity, and group norms, but not social support influences—predicted intentions, with intention, past behavior, and self-identity predicting behavior. Overall, the results provide support for an extended version of the TPB incorporating self-identity and those social influences linked explicitly to membership of a behaviorally relevant reference group.

Keywords: exercise, self-identity, social support, group norms, teenagers, attitude-behavior relations

Participation in physical activity is a key component of a healthy lifestyle in young people, and it is recommended that youth should accumulate at least 60 min of moderate-to-vigorous physical activity on most (National Association for Sport and Physical Education, 2004), if not all (Australian Government; Department of Health and Ageing, 2004), days of the week. Engaging in regular physical activity may help to control body weight, develop a healthy cardiovascular system, and improve psychological well-being (Biddle, Gorely, & Stensel, 2004; Harsha, 1995). However, despite the benefits of physical activity, many adolescents lead sedentary lifestyles. In particular, at approximately 14 years of age, engaging in

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physical activity has been shown to substantially decline for both males and females (Pate et al., 2002).

Several models have been used over the past decades to gain a better understanding of the antecedents of engaging in physical activity behavior. The theory of planned behavior (TPB; Ajzen, 1991) is one of the major predictive models used in research on exercise behavior (see e.g., Biddle & Nigg, 2000). The TPB suggests that the proximal determinant of behavior is one's intention to engage in that behavior, with intentions being determined by three constructs: attitudes, subjective norms, and perceived behavioral control. Attitudes are the overall evaluations, either positive or negative, toward performing the behavior, whereas subjective norms refer to the perceived social pressure from important referents to perform or not to perform the behavior. Perceived behavioral control (PBC) refers to the amount of control individuals believe they have over performing a behavior, and is similar to the concept of self-efficacy. In addition, PBC can also predict behavior when an individual is accurate in assessing their skills, resources, and other prerequisites needed to perform the given behavior (Ajzen, 1991). Attitude, subjective norm, and PBC are informed by underlying behavioral, normative, and control beliefs, respectively.

The TPB has been successful in predicting a wide range of health-related behaviors (for reviews, see Conner & Sparks, 2005; Godin & Kok, 1996), including adolescent physical activity (Hagger, Chatzisarantis, Biddle, & Orbell, 2001; Mummery, Spence, & Hudec, 2000). In a recent meta-analysis of 72 TPB-exercise studies, Hagger, Chatzisarantis, and Biddle (2002) found that attitude, subjective norm, and PBC together explained 45% of the variance in exercise intention whereas intention and PBC together explained 27% of the variance in exercise behavior. It should also be noted that past behavior is often included as an additional predictor of exercise intentions and behavior within the TPB. From a practical perspective, including past behavior in the TPB may improve prediction of later action; however, from a theoretical perspective, past behavior frequency is suggested to be of little value when trying to understand behavioral determinants (Ajzen, 2002). Nevertheless, by accounting for past behavior it is possible to test the sufficiency of the TPB predictors (Ajzen, 1991).

Overall, there is strong support demonstrated for the TPB in predicting exercise intentions and behavior; however, a large proportion of the variance remains unexplained, thus leading researchers to propose the addition of other variables to improve the predictive ability of the TPB. The TPB is, in principle, open to the inclusion of additional predictors as long as there is a strong theoretical justification for their inclusion and they capture a significant portion of unique variance in intentions or behavior (Ajzen, 1991).

Social Influences

One aspect of the TPB model that has been questioned in the literature is the role of subjective norm in explaining social and health behaviors, including physical activity. Across many different health behaviors, Armitage and Conner (2001) found that, although attitude, subjective norm, and PBC revealed significant average correlations with intention, attitude and PBC averaged higher correlations than subjective norm. Similar results in other meta-analyses examining exercise behavior have found support for the relationship between subjective norm and

intention to be substantially smaller than the attitude–intention and PBC–intention relationships (Hagger et al., 2002; Hausenblas, Carron, & Mack, 1997), and this pattern of results is also demonstrated in adolescent physical activity behaviors (Hagger et al., 2001).

Ajzen (1991) argued that the consistent poor influence of subjective norms on intention supports the position that behavioral intentions are influenced more by one's attitudes and perceptions of control than perceptions of pressure from others. Alternatively, it has been argued that the conceptualization of the subjective norm construct is inadequate, where the narrow focus on perceived social pressure ineffectively captures the impact of social influences on behavior (White, Terry, & Hogg, 1994). Researchers have advocated that there may be other types of social influences, such as the effects of group membership on behavior as outlined by social identity/self-categorization theories, and the effects of social support that may provide a better explanation of the social influences determining behavioral intentions.

Group Norms and Social Identity Influence. The subjective norm construct within the TPB reflects injunctive norms as the focus is on perceived social pressure from significant others to perform the behavior (Ajzen, 1991). Group norms, on the other hand, refer to the explicit or implicit prescriptions regarding one's appropriate attitudes and behaviors as a member of a specific reference group in a specific context (White, Hogg & Terry, 2002). Accordingly, subjective norms assert general normative pressure to be most influential on the intention–behavior relationship, whereas social identity theorists (e.g., Hogg & Abrams, 1988; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) argue that the normative influence from an in-group member with whom one identifies, to be most influential.

The influence of social identity on the intention–behavior relationship can be explained through a social identity (Hogg & Abrams, 1988) and self-categorization theory (Turner et al., 1987) perspective. According to the theories, when social identity is salient, the individual constructs context-specific group norms based on shared intragroup information and assimilate themselves to these group norms (Turner, 1982). Behavioral performance, therefore, is more likely to occur when there is normative support from a relevant group for performing the behavior and for attitudes toward the given behavior than without in-group support (e.g., Terry & Hogg, 1996). Accordingly, group norms influence behavioral performance as the individual, based on their observations of group members, seeks to act in a manner similar to that of their in-group, therefore achieving categorization as a group member (Hogg & Abrams, 1988; Turner et al., 1987).

Terry and Hogg (1996) found that group norms of friends and peers improved the prediction of university students' intentions to engage in regular exercise, but only for individuals who identified strongly with the group. More-recent evidence suggests that the influences of group norms on behavior are not necessarily dependent on the strength of identification; it has been found that group norms predict behavioral intentions irrespective of level of identification (e.g., Johnston & White, 2003). Affiliation with a group of physically active friends (Smith, 2003) and having more physically active friends (Voorhees et al., 2005) have been reported as factors that are important to adolescent participation in physical activity. In the current study, then, the perceived actions of an important referent group for adolescents (i.e., school friends) were examined to determine their influence on physical activity intentions.

Social Support. Adolescents who engage in physical activity also report assistance from friends and family to perform the behavior as important (Sallis, Prochaska, & Taylor, 2000). Although the importance of social support to physical activity behavior has been widely accepted (Sallis, 1999), the relationship of social support in helping to predict engagement in health behavior, within the TPB framework, has only recently been investigated. Studies examining exercise (e.g., Courneya, Plonikoff, Hotz, & Birkett, 2000) have found support for the construct of social support adding predictive value to both intentions and behavior. Furthermore, research indicates that social support has a stronger influence than subjective norms in predicting physical activity intentions (Courneya et al., 2000; Rhodes, Jones, & Courneya, 2002). These findings have led some researchers to suggest that social support should be a permanent construct within the TPB, or even replace subjective norms in the TPB in the context of exercise prediction (Rhodes et al., 2002).

Although the conceptualization of social support varies, a number of researchers (e.g., Courneya & McAuley, 1995; Povey, Conner, Sparks, James, & Shepherd, 2000) have adopted a definition of social support that refers to the comfort, assistance, and information one receives through formal and informal social interactions (Wallston, Alagna, DeVellis, & DeVellis, 1983). Thus, whereas subjective norms within the TPB refer to perceived social pressure from important others to perform or not to perform the behavior (Ajzen, 1991), social support implies perception of assistance in performing the behavior. Expanding on the social support definition, Weiss (1974) advocated that social support consists of six social provisions that reflect what an individual receives from relationships with others. These provisions include guidance (advice or information), reliable alliance (others are counted on for tangible assistance), reassurance of worth (recognition of one's competence), opportunity for nurturance (providing assistance to others), attachment (emotional closeness), and social integration (sense of belonging to a group). The social provisions model (Weiss, 1974) has been argued to contain all of the major dimensions of social support proposed by other theorists plus one additional component, opportunity for nurturance, which reflects the reciprocal nature of support (Cutrona & Russell, 1987).

Several studies within the exercise domain have examined the relationship between social provisions and subjective norms, and evidence was found for the conceptual distinctiveness of each component and the greater influence of social provisions, rather than subjective norms, in predicting behavioral intentions (Courneya & McAuley, 1995; Rhodes et al., 2002). It has been argued, however, that social provisions are more of a global measure of social support and, as such, may only measure a diffuse perception of assistance from others in undertaking a given behavior (Saunders, Motl, Dowda, Dishman, & Pate, 2004).

A more specific measure of perceived assistance from family and friends, in particular, has been argued to help in the prediction of social support influences on physical activity behavior (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Many studies in the exercise domain have reported on the importance of both family and friends as sources of social support for adolescents (Anderssen & Wold, 1992; Sallis et al., 2000). Considering the different conceptualizations of social support, both a global social provisions measure (i.e., an overall perceived level of assistance exchanged through general social relationships in performing a given behavior) and specific social support measures (i.e., perceived assistance in performing a given

behavior from family members and friends) may be useful to capture the social support influences on adolescent physical activity.

Two recent studies have included both a global measure and specific measures of social support in examining physical activity within the TPB. Rhodes et al.'s (2002) study of 192 undergraduate students found that attitude, PBC, and social support had significant effects on intention, whereas subjective norms remained nonsignificant, and intention, PBC, and social support had significant effects on exercise behavior. Similarly, Saunders et al.'s (2004) study of adolescent girls found that attitude, subjective norm, PBC, and social provisions provided significant effects on intentions, whereas social provisions, family support, and intention had significant effects on physical activity. The results of these studies suggest that social support influences have both a direct and indirect effect (via intentions) on behavior, provide stronger predictive power than subjective norms, and, within adolescent populations, extinguish the effect of PBC on behavior. However, neither of these studies made a direct comparison between the various social influences of both family and friend support and the overall assessment of social provisions. Considering that research supports the inclusion of both family and friend support, and support from social provisions within the TPB, the current study sought to examine this range of influences in determining adolescents' physical activity intentions.

Self-Identity

It has been argued that social factors have a lesser influence on performing a given behavior when one has a greater self-identification with that behavior. The argument is based on the notion that, in spite of social influences (Biddle, Bank, & Slavings, 1987), individuals seek to act in accordance with their self-identity to validate their status as a role member (Callero, 1985). Research has shown that individuals who identify themselves as exercisers have more favorable exercise intentions than those who do not (Kendzierski, 1988). Furthermore, it has been shown that individuals engage in significantly more exercise when they identify as a type of person who exercises (Rivis & Sheeran, 2003a). Thus, self-identity factors may play an important role in predicting physical activity.

Self-identity originated with identity theory (Stryker, 1968, 1986) and is conceptualized as the salient part of an individual's self that relates to a particular behavior (Conner & Armitage, 1998). Self-identity is argued to be inextricably linked to the wider social structure (Terry, Hogg, & White, 1999).

Accordingly, the self is composed of a collection of identities that reflect the roles the individual may fulfill in a social context (Stryker, 1968, 1986). A key proposition to this view of identity theory is that the multiple identities that make up an individual's self-concept are organized into a hierarchy according to the most valued self-identities, and the more salient the self-identity, the more likely the individual will behave in accordance with the identity (Stryker, 1968, 1986). Thus, when an individual identifies strongly as a person who performs a particular behavior, the behavior becomes an important part of their self-concept, in turn, influencing their motivation to perform the behavior.

Support for the inclusion of self-identity within the TPB was demonstrated in a meta-analysis that found self-identity to account for an additional 1% of the variance in behavioral intentions over and above the TPB constructs (Conner &

Armitage, 1998), with a significant effect for self-identity found in the context of physical activity (Jackson, Smith, & Conner, 2003; Theodorakis, 1994). There were, however, initial concerns with the emerging support for the inclusion of self-identity measures within the TPB, mainly that self-identities were measures of past behavior, in which identification with a role is inferred from previous experience with the behavior (see Sparks & Guthrie, 1998). Research, however, has shown that the effect of self-identity on intentions remains after accounting for past behavior (e.g., Terry et al., 1999). Despite the research supporting the influence of self-identity on behavioral intentions, there is a paucity of research examining the role of self-identity within the TPB in relation to adolescent behavioral intentions, more specifically adolescent physical activity intentions. Research has shown that, when an adolescent self-identifies as being a sporty person, this presence of a salient sport identity strengthens sport behavior (Lau, Fox, & Cheung, 2005). The current study, therefore, sought to examine the influence of self-identity on adolescent physical activity intentions.

Overall, the current study aimed to test the validity of an extended TPB model, incorporating additional self and social influences, for predicting and understanding adolescent physical activity. Additionally, by including both group norms and social support measures in the current study, the relative importance that various social influences have on adolescent physical activity can be examined. More specifically, the current study assessed the impact of these influences as they relate to physical activity that is of a moderate-to-vigorous intensity performed on a regular basis. The target behavior was chosen based on the empirical literature providing clear evidence that health benefits for children and adolescents occur with regular amounts of physical activity and at levels of moderate-to-vigorous intensity (U.S. Department of Health and Human Services, 1996; Australian Government Department of Health and Aging, 2004).

The current study had a number of hypotheses. From a TPB perspective, it was expected that attitude, subjective norm, and PBC would predict adolescents' intention to engage in regular physical activity, and intention and PBC would predict performance of the behavior. In relation to the additional predictors, it was expected that self-identity, group norms, and social support influences (family support, friends' support, and social provisions) would be identified as additional predictors of adolescents' intentions to engage in regular physical activity and, in addition, may predict behavioral performance.

Method

Participants

Participants were 423 ninth-grade students, 251 (59%) female and 172 (41%) male, ranging in age from 12 to 16 years ($M = 13.47$, $SD = 0.56$), with 97.4% aged between 13 and 14 years. A majority of the participants reported coming from an English-speaking background (87%) and not having a disability that interfered with them doing physical activity (91%). Participants were recruited from 10 schools across South East Queensland, Australia. Seven of the participating schools allowed the entire Year-9 cohort to be involved while senior members of staff at three schools selected specific groups of students to take part in the study, with selection based on the ease of access to students owing to timetabling constraints. School participation

was determined by convenience and availability although attempts were made to provide a representation of students from a range of sociodemographic backgrounds. Of the participants who completed the main questionnaire, 395 (93%) completed the follow-up questionnaire 1 week later.

Design and Procedure

The university ethics committee and relevant school educational authorities approved the study. The study used a prospective design with two waves of data collection 1 week apart. The main questionnaire assessed the standard TPB predictors (i.e., attitude, subjective norm, PBC, and intentions), along with past behavior and the additional measures of self-identity, group norm, and social support influences, in relation to performing physical activity. The second wave of data collection assessed participants' self-reported physical activity during the previous week.

Based on availability and convenience, selected schools were approached to gain approval from the principal for student participation in the study. Each school was given an information package and, on request, the questionnaires. Out of 18 schools contacted, 10 participated in the project with time constraints reported as the main reason for nonparticipation. Both parental and child written consent were required for participation. A 42% consent response rate was obtained across all the schools; however, owing to the active consent ethical requirement, it was not possible to explore whether participants differed from nonparticipants. Following the return of signed consent forms, questionnaire distribution commenced. In all cases, participants completed the questionnaires at their own pace and in selected class times. A code identifier was used to enable matching of the questionnaires, and to maintain confidentiality and anonymity of participants. Verbal and written instructions were given to participants for both waves of data collection. All participants received a water bottle or pen as a thank-you gift for participating.

Measures

Target Behavior. The target behavior was moderate-to-vigorous physical activity on a regular basis. Moderate-to-vigorous physical activity was operationalized as, "any activity that is energetic but not exhausting to any activity at a higher intensity that causes your heart to beat rapidly, and make you huff and puff." A regular basis was operationalized as, "at least 60 minutes per day on at least 5 days of the week" and described as either being built up during the day with a variety of activities or done in one session.

Intention. Three items assessed the strength of intention to perform the target behavior (e.g., "I do not intend [1]/ intend [7] to do moderate-to-vigorous physical activity on a regular basis in the next week").

Attitude. Attitude toward doing moderate-to-vigorous physical activity on a regular basis in the next week was assessed by five 7-point semantic differential scales, including three reversed items (e.g., *unpleasant* [1] to *pleasant* [7]).

Subjective Norm. Subjective norm was assessed by two items (e.g., "Those people who are important to me would want me to do moderate-to-vigorous

physical activity on a regular basis in the next week,” scored *strongly disagree* [1] to *strongly agree* [7]).

Perceived Behavioral Control. PBC was measured by three items reflecting the participant’s sense of control about performing the target behavior (e.g., “I am confident that I could do moderate-to-vigorous physical activity on a regular basis in the next week,” scored *strongly disagree* [1] to *strongly agree* [7]).

Past Behavior. Past behavior, was measured with a single item, “In the course of the past week, how often have you done moderate-to-vigorous physical activity for at least 60 minutes,” scored *not at all* (0) to *on 5 days or more* (5).

Self-Identity. Self-identity was measured by three items adopted from Terry et al. (1999) (e.g., “To do physical activity is an important part of who I am,” scored as *no, definitely not* [1] to *yes, definitely* [7]).

Group Norm. Group norm was measured by two items developed by Terry and Hogg (1996), (e.g., “How many of your friends at school would do moderate-to-vigorous physical activity on a regular basis in the next week”, scored *none* [1] to *all* [7]). An elicitation study of a smaller number of the target population revealed that an appropriate reference group for the behavior was school friends.

Family Social Support. Family social support was measured by five items adopted from Prochaska, Rodgers, and Sallis (2002) assessing how often, during a typical week, a member of the family has done physical activities with them; watched them participate in physical activities; and provided them with encouragement, praise, and transportation in connection with their physical activities. An example item is, “During a typical week, how often has a member of your family encouraged you to do physical activity or sports,” scored *never* (0) to *daily* (4).

Friends’ Social Support. Friends’ social support was measured by four items adopted from Prochaska et al. (2002), assessing the weekly frequency with which their friends provide encouragement, praise, and participation concerning their physical activities and the adolescent’s encouragement of their friends to be physically active (e.g., “During a typical week, how often do your friends encourage you to do physical activity or sports,” scored *never* [0] to *daily* [4]).

Social Provisions. Social provisions were measured using 24 items, including 11 reversed items, from the modified social provisions scale (Motl, Dishman, Saunders, Dowda, & Pate, 2004). An example item is, “There are people I can count on to be physically active with me,” scored *disagree a lot* (1) to *agree a lot* (5). The modified social provisions scale has been found to possess factorial and cross-validity, and construct validity, and have a direct relationship between social provisions and exercise behavior in adolescent Caucasian girls (Motl et al., 2004).

Reported Behavior. One week after completion of the main questionnaire, participants were asked to indicate the number of days they had performed physical activity in the intervening week (i.e., “In the course of the past week, how often have you done moderate-to-vigorous physical activity for at least 60 minutes,” scored *not at all* [0] to *on 5 days or more* [5]).

Results

A regression analysis was conducted to test the proposed predictors of intention to perform regular moderate-to-vigorous physical activity. In addition, a regression analysis was conducted to explore the effect of self and social influences on a single-item, self-report measure of moderate-to-vigorous physical activity behavior at a 1-week follow-up.¹

To assess the discriminant and convergent validity of the social influence measures, an initial principal components analysis with varimax rotation was performed on the subjective norm, group norm, family social support, and friends' social support items. Based on eigenvalues greater than 1 and a scree test, four factors were rotated. The analysis (accounting for 66% of the variance) revealed that the items for each variable loaded onto the relevant component, supporting the empirical distinction among the variables.

Descriptive Statistics

The means, standard deviations, correlations, and reliabilities of the variables are reported in Table 1. As demonstrated in Table 1, significant moderate correlations were found among the TPB predictors. As expected, all TPB predictors were significantly correlated with intention and behavior, with intention and past behavior emerging as the strongest behavioral correlates. Inspection of the correlation matrix also revealed low-to-moderate correlations between the self and social influence variables. Similarly, low-to-moderate correlations were found between the TPB variables and the additional self and social influence predictors, with all correlations reported as significant. Significant low-to-moderate correlations between the additional self and social influence variables and the TPB criterion variables of intention and behavior were also revealed.

The average level of physical activity for participants was 3.85 ($SD = 1.28$), reflecting a moderate level of physical activity during the previous 1-week period (Table 1). Analysis of the distribution of physical activity indicated that 176 (41.6%) participants self-reported engaging in 5 days or more of moderate-to-vigorous physical activity in the previous week, with 77 (18.2%) engaging in 4 days, 74 (17.5%) engaging in 3 days, 49 (11.6%) engaging in 2 days, 14 (3.3%) engaging in 1 day, and 5 (1.2%) participants self-reporting that no moderate-to-vigorous physical activity was performed in the previous week.

Regression Analysis Predicting Intentions

A hierarchical multiple regression analysis was conducted to examine the proposed predictors of intention to engage in moderate-to-vigorous physical activity on a regular basis. The standard TPB variables were entered at Step 1; with self-identity, group norm, family social support, friends' social support, and social provisions entered at Step 2; and past behavior at Step 3. The Step 1 variables accounted for 58% of the variance in intentions, $F(3, 416) = 188.82, p < .001$, with all three TPB predictors (attitude, subjective norm, and PBC) reported as significant. The Step 2 variables significantly accounted for an additional 7% of the variance in intentions, $F(8, 411) = 93.87, p < .001$. The three TPB variables, along with self-identity and

Table 1 Means, Standard Deviations, and Bivariate Correlations for Attitude, Subjective Norm, PBC, Self-identity, Group Norm, Family Social Support, Friends' Social Support, Social Provisions, Past Behavior, Intention, and Reported Behavior

| Variable | <i>M</i> | <i>SD</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|----------------------------|----------|-----------|-------|----------|--------|--------|----------|--------|--------|--------|--------|--------|--------|
| 1. Attitude | 5.85 | 1.16 | (.86) | .45*** | .47*** | .53*** | .29*** | .29*** | .27*** | .37*** | .41*** | .61*** | .36*** |
| 2. Subjective norm | 5.43 | 1.22 | | (.56***) | .48*** | .50*** | .31*** | .39*** | .32*** | .42*** | .44*** | .57*** | .41*** |
| 3. PBC | 5.73 | 1.04 | | | (.78) | .59*** | .35*** | .34*** | .28*** | .47*** | .46*** | .66*** | .46*** |
| 4. Self-identity | 5.55 | 1.49 | | | | (.87) | .44*** | .46*** | .46*** | .60*** | .57*** | .69*** | .57*** |
| 5. Group norm | 5.03 | 1.36 | | | | | (.67***) | .26*** | .41*** | .39*** | .37*** | .46*** | .34*** |
| 6. Family social support | 2.53 | .91 | | | | | | (.78) | .48*** | .51*** | .39*** | .42*** | .37*** |
| 7. Friends' social support | 2.19 | .99 | | | | | | | (.80) | .51*** | .31*** | .41*** | .33*** |
| 8. Social provisions | 3.75 | .56 | | | | | | | | (.88) | .42*** | .52*** | .43*** |
| 9. Past behavior | 3.68 | 1.34 | | | | | | | | | — | .65*** | .71*** |
| 10. Intention | 5.71 | 1.28 | | | | | | | | | | (.87) | .61*** |
| 11. Reported behavior | 3.85 | 1.28 | | | | | | | | | | | — |

Note. Mean scores in the current study are based on 7-point scales (1–7), except for family social support (0–4), friends' social support (0–4), social provisions (1–5), reported and past behavior (0–5). The figures in parentheses on the diagonal are alpha coefficients. If a construct was measured with two items, Pearson's *r* (and significance) is reported.
****p* < .001.

group norms, were found to be positively and significantly related to intentions. Past behavior entered at Step 3 accounted for a further 4.5% of the variance in intentions, $F(9, 410) = 101.79, p < .001$. When all the variables were entered into the equation at Step 3, the significant predictors of intentions were past behavior, PBC, attitude, self-identity, subjective norm, and group norms (see Table 2).

Table 2 Hierarchical Multiple Regression Analysis Predicting Intention

| Step and variable | <i>B</i> | <i>SE</i> | β |
|-------------------------|----------|-----------|---------|
| Step 1 | | | |
| Attitude | .35 | .04 | .32*** |
| Subjective norm | .24 | .04 | .23*** |
| PBC | .48 | .05 | .39*** |
| Step 2 | | | |
| Attitude | .25 | .04 | .23*** |
| Subjective norm | .15 | .04 | .15*** |
| PBC | .33 | .05 | .27*** |
| Self-identity | .20 | .04 | .24*** |
| Group norm | .10 | .03 | .11** |
| Family social support | .05 | .05 | .03 |
| Friends' social support | .06 | .05 | .04 |
| Social provisions | .05 | .09 | .02 |
| Step 3 | | | |
| Attitude | .23 | .04 | .21*** |
| Subjective norm | .12 | .04 | .11** |
| PBC | .29 | .05 | .24*** |
| Self-identity | .13 | .04 | .16*** |
| Group norm | .07 | .03 | .08* |
| Family social support | .00 | .05 | .00 |
| Friends' social support | .07 | .05 | .05 |
| Social provisions | .04 | .09 | .02 |
| Past behavior | .26 | .03 | .27*** |

Note. $R^2 = .58$ for step 1; $R^2 = .65$ for step 2; $R^2 = .69$ for Step 3 ($p < .001$).

* $p < .05$, ** $p < .01$, *** $p < .001$.

Regression Analysis Predicting Behavior

An additional regression analysis was conducted to explore the effect of self and social influences on a single item, self-report measure of moderate-to-vigorous physical activity behavior at a 1-week follow-up. Intention and PBC were entered

at Step 1; with attitude, subjective norm, self-identity, group norm, family social support, friends' social support and social provisions entered at Step 2; and past behavior entered at Step 3. As shown in Table 3, Step 1 explained a significant proportion of variance (37%), $F(2, 389) = 113.47, p < .001$, with intention reported as significant. The addition of Step 2 accounted for a further 5% of the variance in behavior, $F(9, 382) = 30.42, p < .001$. Intention remained a significant predictor of behavior, although self-identity was also found to be significantly related to behavior. Past behavior entered at Step 3 significantly accounted for an additional 14% of the variance in behavior, $F(10, 381) = 48.03, p < .001$. In the overall model, past behavior, intentions, and self-identity were the significant predictors of physical activity behavior.

Table 3 Hierarchical Multiple Regression Analysis Predicting Behavior

| Step and variable | <i>B</i> | <i>SE</i> | β |
|-------------------------|----------|-----------|---------|
| Step 1 | | | |
| Intention | .55 | .06 | .54*** |
| PBC | .12 | .07 | .10 |
| Step 2 | | | |
| Intention | .40 | .07 | .40*** |
| PBC | .05 | .07 | .04 |
| Attitude | -.11 | .06 | -.10 |
| Subjective norm | .02 | .05 | .02 |
| Self-identity | .22 | .06 | .26*** |
| Group norm | .04 | .04 | .04 |
| Family social support | .09 | .07 | .07 |
| Friends' social support | .01 | .06 | .01 |
| Social provisions | .02 | .13 | .01 |
| Step 3 | | | |
| Intention | .18 | .06 | .18** |
| PBC | .04 | .06 | .03 |
| Attitude | -.09 | .05 | -.09 |
| Subjective norm | -.02 | .05 | -.02 |
| Self-identity | .13 | .05 | .15** |
| Group norm | -.00 | .04 | -.00 |
| Family social support | .01 | .06 | .01 |
| Friends' social support | .04 | .06 | .03 |
| Social provisions | .06 | .11 | .03 |
| Past behavior | .50 | .05 | .52*** |

Note. $R^2 = .37$ for Step 1; $R^2 = .42$ for Step 2; $R^2 = .56$ for Step 3 ($p < .001$).

** $p < .01$, *** $p < .001$.

Discussion

The current study aimed to test the validity of an extended TPB model, incorporating additional self and social influences, for predicting and understanding adolescent physical activity. The results of the study provide support for the TPB in that attitude, subjective norms, and PBC predicted intentions to engage in regular physical activity, and that intention, but not PBC, emerged as a significant predictor of reported physical activity at a 1-week follow-up. For the additional self and social influence variables, the results of the study support the inclusion of self-identity and group norms, but not social support influences, as significant predictors of intention, and self-identity as a significant predictor of behavior. These results were evident even after controlling for the effects of past behavior.

The results of the current study provide considerable support for the efficacy of the TPB model in predicting adolescent physical activity. Attitude, subjective norm, and PBC significantly predicted adolescent intentions to engage in regular physical activity. These findings suggest that adolescents who have more favorable attitudes toward performing physical activity perceive pressure from important referents to perform physical activity, and who believe they have more confidence in their ability to perform physical activity, will have stronger intentions to engage in moderate-to-vigorous physical activity on a regular basis. Strong intentions to perform physical activity, in turn, predicted self-reported behavioral performance at a 1-week follow-up. Support for the TPB model is consistent with previous meta-analytic findings in the exercise domain (Hagger et al., 2002). It should be noted, however, that PBC did not emerge as a significant predictor of behavior, a finding that is inconsistent with previous adolescent physical activity research (e.g., Trost, Saunders, & Ward, 2002). 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). In addition, the use of PBC items primarily reflecting self-efficacy may have contributed to this finding given that previous research has demonstrated that the self-efficacy component is not as optimal a predictor for behavior as a measure reflecting perceived controllability (Terry & O'Leary, 1995).

The results of the current study also revealed that self-identity and group norms were significant predictors of intentions to perform regular physical activity, whereas the social support variables of family support, friends' support, and social provisions were not found to be significant predictors of behavioral intentions. Self-identity also emerged as a significant predictor of self-reported behavior even when controlling for the effects of past behavior. The finding that self-identity emerged as a predictor of behavioral intentions and behavioral performance suggests that those adolescents who identify with the concept of being a person who is physically active are more likely to perform regular physical activity than those who do not have a physical activity self-identity. These results are consistent with research in the adult physical activity domain (Jackson et al., 2003; Theodorakis, 1994).

For the additional social influence measures included in the current study, group norm (along with subjective norm) emerged as a significant predictor of adolescent intentions to engage in physical activity. The finding that group norm and subjective norm significantly predicted behavioral intentions suggests that

adolescent intentions to engage in regular physical activity are more likely if they perceive that important referents think they should perform the behavior (subjective norm) and perceive their friends at school perform the behavior (group norm). The findings are consistent with previous research in which the subjective norm and the group norm independently predicted behavioral intentions (Johnston & White, 2003). These results highlight the impact of the relationship between normative influences and behavioral intentions and emphasize the importance of groups and friends, as well as direct social pressures from important referents, in providing normative information that adolescents draw upon when making decisions. These findings concur with other TPB-based research that suggests a range of social influences serve as important determinants of adolescent behavioral intentions (Rivis & Sheeran, 2003b).

In the current study, however, not any of the range of the social support influences significantly predicted behavioral intentions. The finding that the social support influences, which included separate measures of support from family and friends as well as a social provisions measure, did not significantly predict adolescent intentions to engage in regular physical activity is inconsistent with previous research in which social support influences have predicted physical activity intentions in adolescent populations (Saunders et al., 2004). Within the TPB literature, the inclusion of social support is relatively new. Additionally, there have been several different conceptualizations of the construct in the literature.

The current study aimed to assess the effect of social support influences within the TPB by utilizing three social support measures that tapped two specific sources of support (i.e., perceived support from family members and friends) and one global social provisions measure that incorporates many types of support. However, the lack of efficacy for the social support measures in predicting behavioral intentions warrants discussion. Specifically, there are some issues with the measurement of social support in the current study that should be noted.

First, although the current study used measures that have previously predicted behavioral intentions (Rhodes et al., 2002; Saunders et al., 2004), the social support measures used in the current study did not follow the measurement characteristics of action, target, context, and time outlined by the TPB (Ajzen, 1991). Thus, predictive power may not have been maximized owing to measurements not complying with TPB specifications. Second, although the social provisions measure in the current study was included to capture the many types of support available, thus giving an overall perceived level of assistance for performing physical activity, the study did not examine the impact of the separate support factors (e.g., reassurance of worth) that are theorized to be contained within the social provisions measure (Motl et al., 2004; Weiss, 1974). Research has found that, along with different sources of support, different types of support (e.g., emotional support) influence adolescent physical activity (Duncan, Duncan, & Strycker, 2005). Third, including only items that reflect what the recipient perceives as the support they receive from different sources, the current study ignored the perceptions of the providers of support and the recipients' appraisal of the support provided, areas that are rarely included in social support research but are nevertheless deemed important when considering the influence of social support (Hupcey, 1998).

The impact of social support may have also been affected by the choice of the target behavior in the current study, which was moderate-to-vigorous physical

activity. Previous research has shown that social support variables have a lesser influence on adolescent engagement in general moderate-to-vigorous physical activity than in reference to specific involvement in team sports (Saunders et al., 2004). Moderate-to-vigorous physical activity may or may not be social in nature, whereas team sports, by definition, are socially orientated and often require assistance from others to perform the behavior (Saunders et al., 2004). Accordingly, if the target behavior had referred to moderate-to-vigorous physical activity specifically within a team sport context, then social support variables may have emerged as more influential.

Overall, the current research highlights the need for a multifaceted approach incorporating attitudinal, normative, control, and self and social influences when designing programs to strengthen physical activity intentions and, therefore, improve physical activity behavior among adolescents. First, in addition to increasing positive attitudes through persuasive campaigns, the results of the current study suggest that increasing the confidence in one's ability to perform the target behavior would be an effective strategy to use in trying to promote favorable intentions toward physical activity participation for adolescents. Family and community/school leaders should provide appropriate environments that foster the competence and ease in performing regular physical activity. In addition, when trying to increase an individual's confidence for performing physical activity, strategies that use Bandura's principles of personal mastery experience, vicarious experience, persuasion, and physiological state may be useful (see Bandura, 1991). Second, the results of the study found that subjective norm and group norms were influential predictors of regular physical activity intentions. Thus, an effective strategy to strengthen physical activity intentions in young people would be for school leaders to encourage performance of physical activity within friendship groups. Additionally, campaigns and community leaders could focus on openly showing important referents approving of the behavior. Third, given the finding that self-identity predicted both intentions and behavior, encouraging adolescents to embrace an identity of being a physically active person would prove beneficial in promoting adolescent physical activity.

The current study has a number of strengths, including a sample that was representative of individuals from both genders and from diverse sociodemographic areas. In addition, there is a large body of evidence supporting the TPB model in predicting adult intentions and behavior but only a small body of research examining adolescent intentions and behavior. Although previous research has investigated the role of self-identity within the physical activity domain (Jackson et al., 2003; Theodorakis, 1994), there is a paucity of research examining the construct within an adolescent population. Furthermore, previous research sampling adolescents in relation to physical activity intentions and behavior have measured only one specific source of support (e.g., family) along with a global social provisions measure (Saunders et al., 2004), or have combined several measures of social support into the one construct (Rhodes et al., 2002).

The current study has a number of limitations that should also be noted. The sample in the current study was predominately Caucasian; thus, the findings may not generalize to other ethnic communities in Australia. Furthermore, the study population consisted of only one grade level (ninth). Given that previous research has found grade-level differences among the TPB components (Mummery et al., 2000), future research should investigate the efficacy of the extended TPB model

applied to a broad range of school grade groups. Finally, conclusions about the results for behavior should be interpreted with caution. The assessment of behavior in the current study used a one-item self-report measure. Although self-report methods among young people are reported to be reliable and valid ways of assessing physical activity as long as the participants are over 10 years of age (Kohl, Fulton, & Caspersen, 2000), the one-item scale used in the current study is not a comprehensive measure of previous physical activity as are other self-report instruments, for example, a 7-day physical activity recall (Sallis, Buono, Roby, Micale, & Nelson, 1993). In addition, there was only a 1-week follow-up between data collection points, and, as such, the likelihood of intention predicting behavior may be governed by the individual's cognitive decision-making processes that strive for equilibrium in their beliefs.

Overall, the current study provided strong support for the efficacy of the TPB model in understanding adolescent regular physical activity intentions and behavior. Additionally, the current study found support for the inclusion of self and social influences, within the TPB model, as additional predictors of adolescent physical activity intentions. In the current study, self-identity and group norms were influential in predicting adolescent intentions to perform regular physical activity. There was, however, no evidence for the role of social support, challenging the notion that social support is important to consider when examining adolescent physical activity intentions.

Further investigation of social support, in conjunction with other sources of social influence, such as group norms, is warranted in this context. In addition, previous research has demonstrated gender differences in relation to social support, in particular that social support may be more influential for females', rather than for males', physical activity behaviors. Future research, then, should confirm the gender-based similarities within the extended TPB model applied to adolescent physical activity that were found in the current study. Furthermore, the focus in the current study was on comparing the direct impact of a range of sources of norms. According to social identity theory (Hogg & Abrams, 1988), group norms should interact with the level of identification one feels in relation to a behaviorally relevant reference group. Future research, then, should also examine the relationship between group norms and in-group identification within the context of predicting adolescent physical activity intentions. Given the decline in adolescent physical activity and the current crisis of both national and international childhood obesity, determining the important factors in predicting physical activity is essential to enable the development of effective strategies to combat adolescent inactivity.

Note

1. To ensure that the results of the study were not influenced by a subsample of participants who had a physical disability that interferes with them engaging in physical activity, analyses were run with and without this subsample. The findings from these analyses revealed the same pattern of results so that students with a physical disability were included in the final data set. Furthermore, preliminary analyses revealed that the bivariate correlations between the predictor and criterion variables (intention and behavior) were similar for males and females. To ensure that the impact of gender did not affect the results of the study, regression analyses were conducted separately on the samples of male and female participants and found that a similar pattern of results was obtained within each subsample. Therefore, data were analyzed on the full sample of males and females.

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