Social-Cognitive Determinants of Physical Activity Attendance in Older Adults

Fabio Lucidi, Caterina Grano, Claudio Barbaranelli, and Cristiano Violani

The present study evaluated whether, and to what extent, the constructs implicated in the theory of planned behavior could predict behavioral intention to exercise and exercise-class attendance of older adults (age 65–90 years) already enrolled in a physical activity program. The study also evaluated whether including self-efficacy judgments might improve the predictive capacity of the model. Participants (N = 1,095) were randomly sampled Italian volunteers from exercise classes for older adults. First, they completed questionnaires assessing the above-mentioned constructs. Then, class attendance was recorded during the following 3 months. Results indicated a substantial correspondence between the model and the data. Perceived behavioral control and self-efficacy were the strongest predictors of behavioral intention, whereas attitudes and subjective norms only partially contributed to its prediction. The inclusion of self-efficacy improved the predictive capacity of the overall model. Finally, results showed a weak relation between behavioral intention and attendance rate in physical activity sessions.

Key Words: theory of planned behavior, self-efficacy, regular physical activity

Exercise has consistently been shown to provide significant physical and psychological benefits when it is performed on a regular basis. These benefits have been consistently reported in studies considering different age groups, including older adults (Colcombe et al., 2003; Karlsson, 2002). Despite this evidence, the number of adults over age 65 who take part in regular exercise programs is very limited (Centers for Disease Control and Prevention, 2004). Furthermore, even when measures of physical activity including health-related lifestyle activities such as household chores, transportation, or leisure-time physical activities are used, most individuals over 65 years are not physically active (Centers for Disease Control and Prevention). In Italy, only 3.5% of adults over age 65 report doing physical activity regularly, and 2.2% of them say they only do it occasionally (Istituto Nazionale di Statistica, 2002).

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Considering the growing proportion of this segment of the population in industrialized countries and the burden of a sedentary lifestyle for public health systems, the need to develop effective active lifestyle interventions becomes urgent. Because the benefits of physical exercise partly derive from the maintenance of physical activity levels over time (Nied & Franklin, 2002; Vuori, 2001), appropriate measures should be taken not only to increase involvement in physical activity programs but also to improve maintenance and long-term compliance with such programs (Mazzeo & Tanaka, 2001). This is especially relevant if we consider that individuals who start structured programs often fail to stick with them after the first few months (Dishman, 1988).

Identifying the social-cognitive determinants of people’s intention to do physical exercise regularly and their adherence to a regular physical exercise schedule is one way to approach these interventions (Motl et al., 2002). Social-cognitive determinants, which reflect reinforcement history, past behavior, and social influence, have been shown to strongly influence volitional behavior (e.g., Conner & Norman, 1996). The value of studying social-cognitive factors also stems from the fact that these influences are potentially modifiable.

In the last decade, researchers have applied several theoretical models to the prediction and understanding of physical activity participation. The theory of planned behavior has received great attention, and its predictive validity has been consistently demonstrated in various populations of adults (Blue, 1995; Motl et al., 2002). The theory of planned behavior is a general parsimonious model of the specific cognitive determinants of behavior (Ajzen, 1991). It posits that the intention of performing a given behavior is the most proximal antecedent of such a behavior. Intentions, in turn, are determined by three predictors: people’s attitudes, subjective norms, and perceived behavioral control. Attitudes toward behavior refer to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question. Subjective norms refer to one’s perceived social pressure to perform the behavior. Finally, perceived behavioral control represents how much control individuals believe they have over the performance of the target behavior. Attitudes, subjective norms, and perceived behavioral control have been demonstrated to be reliable predictors of intentions to perform health behaviors and generally account for 40–50% of the variance in meta-analytic reviews (Armitage & Conner, 2001; Hausenblas, Carron, & Mack, 1997). Likewise, intentions and perceived behavioral control typically explain 20–40% of the variance in health behaviors in prospective studies (Armitage & Conner; Hausenblas et al.; Sheeran & Orbell, 1998). Evidence also suggests that perceived behavioral control contributes to a significant increment in explained behavioral variance after controlling statistically for the contribution accrued by intention (Armitage & Conner; Hausenblas et al.).

Some researchers have further articulated the models deriving from the theory of planned behavior by including self-efficacy and suggesting that this construct might be useful in the explanation of physical activity behavior (Yordy & Lent, 1993). Efficacy beliefs are concerned with personal judgments of one’s ability to successfully perform a behavior in order to produce a specific outcome (Bandura, 1977, 1997). A vast array of studies demonstrate that self-efficacy beliefs predict adherence to intervention programs targeting the prevention of unhealthy habits or
the promotion of healthy behaviors such as physical activity (Conn, 1997, 1998; Hellman, 1997; Mazzeo et al., 1998; McAuley, 1991, 1993).

These notions were systematically reviewed in a recent meta-analysis that examined the relations among behavior, intentions, attitudes, subjective norms, perceived behavioral control, and self-efficacy in the domain of physical activity (Hagger, Chatzisarantis, & Biddle, 2002). Medium to large effect sizes were found for the relations linking intention to attitudes, perceived behavioral control, and behavior, and a smaller effect size was found for the relation between subjective norms and intention. Finally, with respect to the role of self-efficacy, the meta-analytic study by Hagger and colleagues indicated that the inclusion of self-efficacy also improved the predictive capacity of the model, although it had the effect of attenuating the influence of perceived behavioral control (PBC) on intentions. This might be a result of the similarity of the two constructs. Ajzen stated that the concept of PBC is similar to Bandura’s self-efficacy construct (Ajzen & Madden, 1986), but he also has pointed out that although self-efficacy focuses on internal aspects of control, PBC also reflects external aspects of control (Ajzen & Timko, 1986). Some authors (Hagger et al.; Mummery, Spence, & Hundec, 2000) suggest that the confusion between internal and external aspects of PBC might explain why, in some studies, the effect of PBC on intention is attenuated by self-efficacy. With regard to older adults, only a limited number of studies have used the theory of planned behavior to predict exercise behavior (e.g., Brenes, Strube, & Storandt, 1998; Courneya, Nigg, & Estabrooks, 1998; Estabrooks & Carron, 1998; Godin & Shepard, 1986), and they rarely extended this analysis to self-efficacy (Estabrooks & Carron).

On the basis of these considerations, the present study aimed to evaluate whether, and to what extent, the constructs implicated in the theory of planned behavior could predict intention to exercise and actual participation in exercise classes by older adults already enrolled in a physical activity program for at least 6 months. Furthermore, the study aimed to evaluate whether the inclusion of self-efficacy would improve the model’s predictive contribution. Participants first completed questionnaires assessing the constructs of the theory of planned behavior and self-efficacy. Then, exercise-class attendance was measured weekly by trainers over the following 3 months.

**Method**

**Participants**

A national sample of 1,095 65- to 90-year-old Italian men and women (mean age = 69 years and 10 months) participated in the study. Participants were enrolled in a sport activity program run by the “Lega Anziani in Movimento” as part of the activities promoted by the Italian Union for Sport for All—a nonprofit organization that mainly aims to promote physical activity and socialization. The program, which is run throughout the country, is specifically designed for older adults and consists of two physical activity sessions per week that include components of aerobic exercise, strength training, balance, and flexibility.

Participants in the study were randomly selected from the entire population of 70,000 older adults who were enrolled in the physical activity program at the
time the study began. In particular, 100 trainers were first randomly selected from the rosters of the organizing agency and then asked to indicate who, among their trainees, had been in their exercise class for at least the preceding 6 months. All the trainees who met this condition and also were at least 65 years old were contacted for participation in the present study. This sampling procedure led to an initial recruitment of 1,200 people. Of those, 1,095 (91%) agreed to participate in the study. Consistent with the gender distribution in the population of reference, 917 participants in the present study were women (nearly 84%).

Data analyses did not include 86 participants (69 women and 17 men) who, during the 3 months of the study, dropped out of the program for reasons beyond their personal control, such as injury or illness. The final sample, therefore, included 1,009 participants, including 848 women (mean age = 69.73 years, $SD = 4.36$) and 161 men (mean age = 70.06 years, $SD = 4.37$).

**Measures**

Each participant completed a questionnaire including the sociopsychological variables of the TPB and a self-efficacy scale. With respect to the wording and scaling of the TPB variables, we followed the recommendations set forward by Ajzen and Fishbein (1980).

In a previous pilot study, 30 older adults involved in physical activity programs completed an open-ended questionnaire. The wording of the measures of interest relied on the indications that emerged from this pilot study. Then, a second pilot study addressed the data distribution of attitudes, subjective norms, and perceived behavioral items. In particular, 50 older adults involved in physical activity programs completed this preliminary version of the questionnaire. All responses were on a 7-point scale. The analysis of the distribution revealed that responses to all items were concentrated at the middle and extreme points of the scales. For this reason, the original 7-point scales were modified to include 5-point responses. The final version of the questionnaire evaluated the following items.

**Attitudes.** Nine items assessed the favorability of participants’ attitudes toward physical activity behavior. Respondents rated the target behavior on a series of 5-point semantic-differential items tapping both the evaluative and affective aspects of attitudes (advantageous/disadvantageous, unpleasant/pleasant, useful/useless, undesirable/desirable, positive/negative, agreeable/disagreeable, beneficial/harmful, bad/good, wise/foolish). The statement that preceded the list of adjectives was “For me, participating in regular physical activity, at least two times a week, for at least 45 minutes each time, during the next 3 months, will be. . .”

**Subjective Norms.** Two items measured participants’ subjective norms ($\alpha = .67$) on a 5-point scale ranging from 1 (not at all) to 5 (completely). In particular, respondents rated to what extent meaningful others would have approved of the target behavior and to what extent they were convinced of meaningful others’ approval or disapproval.

**Perceived Behavioral Control.** Two separate items originally measured participants’ perceived control over the target behavior. Respondents rated the extent to which their decision to regularly attend physical activity sessions was up to them.
on a 5-point scale ranging from it is not up to me at all (1) to it is completely up to me (5); they also rated how easy it would be for them to attend classes (“For me, to attend this exercise class on a regular basis in the next 3 months will be. . .”) on a 5-point scale ranging from extremely easy (1) to extremely difficult (5).

A preliminary analysis of the data showed that the second item was collinear with the intention item targeting the probability of performing the behavior (see below). Thus, the PBC score was based only on the first item, despite the awareness of reducing the reliability of the PBC measure. This decision seemed nonetheless preferable to alternative solutions in order to preserve the reliability of the intention measure, which represented one of the two criteria considered for analysis.1

Self-Efficacy. The final questionnaire also included a 17-item self-efficacy scale (Bandura, 2001) related to physical activity program attendance, which had previously been tested on a different pilot sample of 100 older adults involved in physical activity programs.

Behavioral Intention. Two questions assessed participants’ intention to exercise (α = .65). On the first item, participants rated the strength of their intention to regularly attend the two weekly exercise sessions scheduled for the program in which they were enrolled during the ensuing 3 months. On the second item, participants rated the probability of performing the target behavior. For each item, a 5-point scale anchored by not at all (1) and completely (5) represented the response scale.

Procedures

The questionnaires were administered individually by trained interviewers. This procedure permitted more control over the administration and data-collection phases of the study and on possible problems with missing data. The questionnaire took approximately 40 min to complete.

Physical trainers recorded their trainees’ attendance in the two weekly sessions over the 3 months of physical exercise classes. The behavioral outcome of the study was the percentage ratio obtained by dividing the number of attended sessions by the number of possible sessions over the 3-month period. Both trainers and participants were unaware that attendance in the physical activity program sessions was an object of measurement in the study, because recording attendance is a standard practice in Italian Union for Sport for All courses.

Results

We carried out a preliminary series of principal-component analyses to analyze the items measuring attitudes and self-efficacy toward physical activity. With respect to

1. The decision to eliminate the PBC item was further influenced by the strong likelihood that a relevant number of respondents probably misconstrued the Italian semantics of the easy/difficult item of PBC, thus interpreting “ease” in terms of probability (“It is easy for me to . . .” interpreted as “It could easily happen”). The elimination of this item changed the characteristics of our PBC measure, which at this point only referred to aspects of perceived controllability of behavior without taking into consideration the perceived ease or difficulty of performing that behavior.
attitudes, two factors emerged. Items relating to the evaluative aspects of attitude (e.g., advantageous/disadvantageous, beneficial/harmful) loaded on a first factor, whereas items relating to affective aspects (e.g., undesirable/desirable, unpleasant/pleasant) loaded on a second factor. With respect to self-efficacy, two factors also emerged. The first referred to feelings (e.g., when I feel tired), mood states (e.g., when I feel depressed), or conditions that hinder the desire to do physical exercise regularly (e.g., during bad weather; $\alpha = .8$) and explained 27.3% of the variance. The second factor referred to concurrent events (e.g., when visitors are present) or other personal demands (e.g., when I have too much work to do at home; $\alpha = .65$) and explained 9.2% of the variance. Table 1 reports the factor loadings for the two sets of items obtained after oblimin rotation. These two principal-component analyses generated factor scores measuring attitudes and self-efficacy that were used in all the following analyses.

Before testing the hypothesized model by structural-equation modeling, we analyzed the univariate distribution of each variable. Table 2 reports the descriptive statistics for all variables considered ($M$, $SD$, correlations). Moderate to large

Table 1 Factor Loadings (After Oblimin Rotation) for the Items on the Physical Exercise Self-Efficacy Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
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<tbody>
<tr>
<td>When I am feeling anxious</td>
<td>.751</td>
<td></td>
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<tr>
<td>When I am feeling depressed</td>
<td>.720</td>
<td></td>
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<tr>
<td>If I don’t reach my exercise goals</td>
<td>.614</td>
<td></td>
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<tr>
<td>When I am feeling tired</td>
<td>.582</td>
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<tr>
<td>After a vacation</td>
<td>.539</td>
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<tr>
<td>After recovering from an illness that caused me to stop exercising</td>
<td>.524</td>
<td></td>
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<tr>
<td>When I feel physical discomfort when I exercise</td>
<td>.515</td>
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<tr>
<td>Without support from my family or friends</td>
<td>.508</td>
<td></td>
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<tr>
<td>After recovering from an injury that caused me to stop exercising</td>
<td>.464</td>
<td></td>
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<tr>
<td>During bad weather</td>
<td>.462</td>
<td></td>
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<tr>
<td>When I have other time commitments</td>
<td>.743</td>
<td></td>
</tr>
<tr>
<td>After experiencing family problems</td>
<td>.705</td>
<td></td>
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<tr>
<td>When visitors are present</td>
<td>.658</td>
<td></td>
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<tr>
<td>When there are other interesting things to do</td>
<td>.603</td>
<td></td>
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<tr>
<td>When I have too much work to do at home</td>
<td>.555</td>
<td></td>
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<tr>
<td>During or after experiencing personal problems</td>
<td>.425</td>
<td></td>
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<tr>
<td>During a vacation</td>
<td>.301</td>
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Table 2  Observed Correlations and Other Characteristics of the Variables in the Model

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>M</th>
<th>SD</th>
<th>Kurtosis</th>
<th>Skewness</th>
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<tbody>
<tr>
<td>1. Attitude 1</td>
<td>— .50</td>
<td>.18</td>
<td>.17</td>
<td>.06</td>
<td>.15</td>
<td>.10**</td>
<td>.13</td>
<td>.19</td>
<td>.04</td>
<td>4.64</td>
<td>0.39</td>
<td>−0.51</td>
<td>0.85</td>
<td></td>
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<tr>
<td>2. Attitude 2</td>
<td>— .24</td>
<td>.13</td>
<td>.07*</td>
<td>.18</td>
<td>.12</td>
<td>.16</td>
<td>.15</td>
<td>.05</td>
<td>4.69</td>
<td>0.32</td>
<td>1.78</td>
<td>1.38</td>
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<tr>
<td>3. Subjective Norms 1</td>
<td>— .48</td>
<td>.06</td>
<td>.20</td>
<td>.06</td>
<td>.09**</td>
<td>.19</td>
<td>.03</td>
<td>4.69</td>
<td>0.55</td>
<td>5.72</td>
<td>2.07</td>
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<tr>
<td>4. Subjective Norms 2</td>
<td>— .07*</td>
<td>.15</td>
<td>.07*</td>
<td>.11</td>
<td>.22</td>
<td>.09**</td>
<td>4.64</td>
<td>0.64</td>
<td>5.80</td>
<td>2.18</td>
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<tr>
<td>5. Perceived behavior control</td>
<td>— .11</td>
<td>.09**</td>
<td>.17</td>
<td>.25</td>
<td>.07*</td>
<td>4.79</td>
<td>0.56</td>
<td>16.32</td>
<td>3.60</td>
<td></td>
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<tr>
<td>6. Self-efficacy 1</td>
<td>— .37</td>
<td>.25</td>
<td>.24</td>
<td>.09**</td>
<td>4.46</td>
<td>0.49</td>
<td>0.64</td>
<td>0.96</td>
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<tr>
<td>7. Self-efficacy 2</td>
<td>— .16</td>
<td>.12</td>
<td>.08*</td>
<td>3.19</td>
<td>0.83</td>
<td>−0.20</td>
<td>0.47</td>
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<tr>
<td>8. Intention 1</td>
<td>— .20</td>
<td>.07*</td>
<td>4.81</td>
<td>0.42</td>
<td>4.13</td>
<td>2.07</td>
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<tr>
<td>9. Intention 2</td>
<td>— .27</td>
<td>4.70</td>
<td>0.58</td>
<td>6.88</td>
<td>2.32</td>
<td></td>
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<tr>
<td>10. Behavior</td>
<td>— 79.93</td>
<td>19.68</td>
<td>1.66</td>
<td>1.34</td>
<td></td>
<td></td>
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Note. Correlations in italics are not significant. All other correlations are significant with a p value ≤.001. All scales ranged from 1 to 5. The behavior measure is expressed as a percentage.

*p < .05. **p < .01.
shifts from the normal distribution can affect parameter estimates, which can be too low, or $\chi^2$ can be too high. Possible solutions are transforming the variables and considering them as continuous and considering the variables as continuous without transforming them, by using appropriate ways to estimate the parameters (the so-called robust methods, e.g., Satorra & Bentler, 1994). Two of the variables considered in the model (factor scores for attitudes and self-efficacy) shifted moderately from the normal distribution; they were then normalized through a log transformation. This was not possible for the other variables included in the model (subjective norms, perceived behavioral control, and intention) because their shift from the normal distribution was consistent and the conditions to apply any of the possible transformations were not met (Tabachnick & Fidell, 1989). These variables were then treated as categorical (see Flora & Curran, 2004). Data analyses were run through the Mplus software (Muthén & Muthén, 1998).

This program allows the analysis of categorical variables (binary or ordered polytomous ones) or a combination of continuous and categorical variables. Mplus represents an extension and refinement of the previous LISCOMP (Muthén, 1987). According to the authors, the procedures and statistical indices used by the software prevent errors in parameter estimates, standard errors, and fit measures of the model. These errors occur when methods developed for use with continuous and normal variables are applied to nonnormal or noncontinuous data. In line with what has been suggested by Flora and Curran (2004), a robust weighted-least-squares method was used (namely, the WLS-MV options of parameters-estimation method in Mplus). This method “performs exceptionally well across a variety of commonly encountered conditions in applied research . . . . These methods are well-behaved for a variety of non-normal distributions that might be expected in practice” (Flora & Curran, p. 488). Instead, maximum-likelihood-based methods, which are commonly used with variables with zero skewness and kurtosis, do not perform well when the number of categories is small (five or fewer) and when univariate distributions are censored as were indicators of subjective norms, perceived behavioral control, and intention in this study (see Muthén & Kaplan, 1985).

The results showed a substantial correspondence between the theoretical model and the data, with the following fit indices: $\chi^2(21) = 58.20$, $p = .00003$, CFI = .96, NNFI = .96, RMSEA = .044. Each of the four observed variables measured its respective predictor correctly and adequately. The four predictors were moderately correlated (with correlations ranging from .14 to .39). The variables with the strongest weights in the model were perceived behavioral control (beta = 0.37) and self-efficacy (beta = 0.38). In contrast, attitudes (beta = 0.18) and subjective norms (beta = 0.18) only partially contributed to the prediction of participants’ intentions, although they were statistically significant. The model is represented in Figure 1.

The hypothesized model accounted for a substantial portion of the explained variance in participants’ intentions (55%). In contrast, the amount of variance in attendance behavior that the model accounted for was very small ($R^2 = .09$). The separate direct paths of perceived behavioral control and self-efficacy on behavior were not statistically significant. Although only intention exerted a significant direct influence on behavior, all the other predictors included in the model showed a statistically significant indirect effect on behavior, through the mediation of intention. In particular, the standardized indirect effects of perceived behavioral control and
Figure 1 – Path model showing relationships among planned behavior constructs, self-efficacy, and exercise attendance.
self-efficacy were equal to .11, and the standardized indirect effects of attitude and subjective norms were equal to .05.

In order to evaluate whether including self-efficacy had the effect of attenuating the influence of perceived behavioral control on intention or behavior, an alternative model that did not include self-efficacy was also tested. The model's fit indices substantially confirmed the adequacy of the original model. Furthermore, the beta coefficient associated with the path from perceived behavioral control to intention was nearly identical to the coefficient estimated in the original model (.40), although the alternative model's resulting percentage of explained variance in participants' intention decreased from .55 to .40. Thus, one can conclude that although self-efficacy and perceived behavioral control were correlated they were not redundant.

Discussion

The present study aimed to evaluate whether the variables considered in the theory of planned behavior, together with self-efficacy, could predict intention to exercise regularly and actual exercise-class attendance of older adults who were already enrolled in a physical activity program. Our findings indicate that the hypothesized model explained a substantial portion of the variance in the participants' intention (55%) and a small portion of the variance in the participants' actual attendance (9%).

The findings were evaluated by comparing them with the results of a review by Hagger et al. (2002), who employed meta-analytic-derived correlations to provide an overview of the average relations linking the three TPB variables and self-efficacy to people's intentions and behaviors concerning physical activity. The present findings will be discussed with respect to intentions and behaviors separately.

Behavioral Intentions

The impact of attitudes (β = 0.18) in explaining older people's intention did not turn out to be as relevant as it was in Hagger and colleagues' (2002) meta-analytic review (β = 0.30). In contrast, our finding that subjective norms only weakly contributed to the prediction of intention was consistent with Hagger and colleagues' findings, thus supporting the claim that subjective norms represent the weakest predictor of people's intentions. Finally, as to the hypothesized effects of control dimensions on intentions, our findings yielded paths of influence that were higher than those reported by Hagger and colleagues both for self-efficacy (β = 0.37 vs. β = 0.28) and for PBC (β = 0.38 vs. β = 0.27). In sum, the findings mainly differ from earlier studies in two respects, that is, a lower impact of attitudes and a higher impact of self-efficacy and PBC on participants' intentions.

With respect to the attitudes–intention relationship, our findings are aligned with several other studies indicating that in people who already are enrolled in physical activity programs, attitudes only moderately contribute to the prediction of intentions. This has been documented both in older (Estabrooks & Carron, 1998) and in younger exercisers (Armitage, 2005; Smith & Biddle, 1999). A plausible explanation for the relatively low attitudes–intention relation might be embedded in the fact that, among the population of exercisers, attitudes toward physical activity are
generally high and positive, and their limited variability is only slightly associated with the intention to regularly exercise. Recent studies show that older exercisers experience a multitude of acute negative and positive thoughts when making daily exercise decisions. The positive thoughts are quite prevalent and tend to primarily revolve around positive health-related outcome expectations or benefits of exercise (Gyurcsik & Estabrooks, 2004). It is plausible to hypothesize that similar acute thoughts might contribute to the formation of positive attitudes that homogenized the sample, thus reducing variability in participants’ attitudes and, consequently, the strength of the relation between their attitudes and intentions. Consistent with this hypothesis, one can note that the mean attitude scores reported in Table 2 are highly positive and vary little—findings that are in line with the results of previous studies of older exercisers (Estabrooks & Carron). On the other hand, studies of older people not yet enrolled in physical activity programs report higher variability in attitudes (Courneya et al., 1998) and emphasize stronger attitudes–intention relationships (Lucidi, Lauriola, Leone, & Grano, 2004).

With respect to the role of control dimensions (i.e., perceived control and self-efficacy), the existing literature highlights different patterns. Previous research has indicated that, in people already enrolled in physical activities programs, the dimensions of control are the most important predictors of one’s intention to maintain exercise (e.g., Armitage, 2005). Unlike in the case of attitudes, this influence emerges despite the evidence that data on control dimensions tend to show high and positive values across studies (Courneya, 1995; Courneya et al., 1998). Moreover, their impact is particularly strong in studies focusing on exercise attendance in older exercisers (Brenes et al., 1998; Estabrooks & Carron, 1998) as compared with studies considering younger people (Dzewaltowski, Noble, & Shaw 1990; Yordy & Lent, 1993).

Some authors point out that older people have great difficulty in initiating an exercise program given the evidence of structural, physical, health-related, and attitudinal barriers to physical activity (Godin, 1994; O’Brien Cousins, 1997). Nevertheless, some studies indicate that once they begin an exercise program, older adults are able to maintain it. For example, Brenes et al. (1998) followed a sample of older adults enrolled in a physical activity class and found that 89% of the participants were still exercising 9 months later. In line with this result, the mean attendance rate we found over a period of 3 months was high (79.93%), suggesting that our participants were able to overcome possible barriers and obstacles to their regular participation in the program. Older adults who have already initiated a program might nonetheless continue to experience negative thoughts about the barriers they face (e.g., Gyurcsik & Estabrooks, 2004). On the basis of our findings on the predictive relations linking control dimensions to intention, it is plausible to hypothesize that perceived behavioral control and self-efficacy represent critical self-regulatory capacities to which older exercisers turn in order to overcome anticipated impediments and negative thoughts that otherwise would lower their intention to participate in the exercise program.

There are other important issues that need to be considered when discussing control dimensions. Our findings indicate that self-efficacy provides added value to the prediction of intention, above and beyond the prediction accrued by perceived behavioral control. This improvement is consistent with the results of several studies that have included self-efficacy in the TPB variables (e.g., Courneya &
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McAuley, 1994; Dzewaltowsky et al., 1990; Estabrooks & Carron, 1998; Terry & O’Leary, 1995) and was also stressed in the meta-analytical review by Hagger et al. (2002). As to the issue of the redundancy between self-efficacy and PBC, there was little evidence of it in the present findings. It is quite possible that the lack of redundancy shown in our results is partly a result of our choice to exclusively measure perceived control over the behavior and to remove any aspect related to the ease or difficulty one might perceive in enacting that behavior. In line with this possibility, Ajzen (2002) suggested that PBC should be conceived of as consisting of two interrelated components related to perceived difficulty and perceived control. This suggestion has found empirical support in several studies that have emphasized that self-efficacy is more closely related to perceived difficulty than to perceived control (Kraft, Rise, Sutton, & Røysamb, 2005; Traftimow, Sheeran, Conner, & Finlay, 2002).

Attendance Rate

The guiding model predicted a small amount of variance in participants’ class attendance during the 3 months (9%). Behavioral intention had a significant direct effect on attendance behavior, whereas perceived behavioral control and self-efficacy did not. Furthermore, the intentions–behavior relation estimated in the present study was weaker ($\beta = 0.29$) than the one reported by the authors of the meta-analysis ($\beta = 0.36$). This finding is certainly disappointing, because it is known that the benefits from exercising primarily derive from maintaining the behavior over time.

Several considerations might bear on the interpretation of these findings. First, the study adopted methodological choices that, despite their ecological value, represent a stricter standard for empirical scrutiny. That is, the study considered an objective measure of exercise-class attendance rather than relying on self-report data, a design choice that rarely has characterized the existing physical activity literature examining the predictive role of variables concerning the theory of planned behavior (but for notable exceptions, see Armitage, 2005; Estabrooks & Carron, 1998), and that might have attenuated the relation between intention and behavior, as other scholars have also pointed out (Armitage & Conner, 2001). Second, attendance in the physical activity program was assessed over a period of 3 months, a time lag that is relatively long and that therefore might have reduced the chances of detecting a relation between the variables considered in the present model and behavior. These same methodological choices, on the other hand, stand as important and necessary steps to carefully ascertain the value of the theory of planned behavior in explaining physical activity, as Armitage very recently also stressed. The “small” effects on behavior reported here suggest that older exercisers’ attendance might be influenced by variables that are extraneous to the model we tested. Thus, they might highlight the need to articulate further the hypotheses about the psychological processes and variables affecting the maintenance of physical activity, as Sheeran, Conner, and Norman (2001) also seem to suggest in their analysis of the value of the TPB in accounting for people’s participation in annual health screenings and maintaining health behaviors over time.
Limitations

Some caveats call for caution in interpreting the findings of this study. First of all, female participants disproportionately contributed to the sample. This disproportion surely does not correspond to the gender ratio in the population of older adults in Italy, in which men represent just over 41% of people over 65 years of age (Istituto Nazionale di Statistica, 2004). Nevertheless, data from the Italian Institute of Statistics (Istituto Nazionale di Statistica, 2002) indicate that male Italian exercisers (especially older exercisers) practice “unsupervised” physical activity (such as jogging, cycling, walking) more frequently than women, whereas women are involved in supervised exercise programs more often than men. Thus, although our findings might not generalize to the entire population of older adults, they might generalize to older individuals who are involved in supervised and structured physical activity programs.

Second, the present study relied on a structural model in which PBC was gauged by a measure focusing only on perceived controllability. We partly explained the reasons for this choice in the Methods section and discussed the implications of this choice for understanding the relation between PCB and self-efficacy. We think it is also important to reiterate that single-item measures are less reliable than multiple-item measures; the effect of this relative unreliability generally results in an attenuation of the structural coefficients that are related to the single-item measure. Despite the possibility that this might have affected the structural coefficients linking PBC to intention, we nonetheless found coefficient paths that were generally higher than those reported in the existing literature.

In spite of these limitations, we believe that the present study contributes to the understanding of the processes underlying regular physical exercise in an important yet relatively understudied population. We also believe that future research should address these processes further.

References

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**Erratum**

In *JAPA* 13(3), the July 2005 issue, an author’s name was mishyphenated. For the article titled “No Sustained Effect of Aerobic or Resistance Training on Insulin Sensitivity in Nonobese, Healthy Older Women,” the last author’s name appeared as Mylène Aubertin Leheudre (Leheudre, M.A.). It should have been Mylène Aubertin-Leheudre (Aubertin-Leheudre, M.).