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2007

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This article was originally published at:

<https://doi.org/10.1123/japa.15.1.1>

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Citation for this paper:

Dean, R. N., Farrell, J. M., Kelley, M. L., Taylor, M. J., & Rhodes, R. E. (2007). Testing the efficacy of the theory of planned behavior to explain strength training in older adults. *Journal of aging and physical activity*, 15(1), 1–12. <https://doi.org/10.1123/japa.15.1.1>.

Running Head: THEORY OF PLANNED BEHAVIOR AND STRENGTH TRAINING IN OLDER ADULTS

Testing the Efficacy of the Theory of Planned Behavior to Explain  
Strength Training in Older Adults

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Submitted: July 19, 2005

Resubmitted: February 3, 2006

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## Abstract

The benefits of strength training are important in preventing falls, prolonging independence, and improving the quality of life of older adults. Despite these benefits, only 10% of adults age 65 years and older take part in strength training activity. To date, little research has been conducted on the predictors of strength training participation in the older population. The Theory of Planned Behavior (TPB) has proven useful in the prediction of general exercise behavior in adults; however, no studies have applied the theory to older adult's strength training behavior. The purpose of this study was to use the constructs of the TPB to gain a better understanding of the factors that influence older adults' participation in strength training. Two hundred men and women aged 55 years and older were purposively sampled seniors centres in Ontario. Participants completed measures of select demographics, TPB constructs pertaining to strength training, and self-reported physical activity participation. It was hypothesized that perceived behavioral control, followed by attitude, would be the strongest determinants of strength training intentions and that intention would be the strongest determinant of strength training behavior. Results using ordinary least squares regression analyses revealed that subjective norm ( $\beta = .44$ ) and perceived behavioral control ( $\beta = .27$ ) but not attitude ( $\beta = .07$ ) were significant ( $p < .001$ ) predictors of intention, explaining 42% of its variance. Intention ( $\beta = .62$ ), but not perceived behavioral control ( $\beta = .02$ ), was a significant ( $p < .001$ ) predictor of behavior, explaining 40% of its variance. Gender and current strength training participation did not significantly moderate the relationship between the TPB variables. Overall, these results suggest that interventions targeting subjective norm and perceived control may be important for promoting strength training intentions and subsequent behavior among older adults.

## Testing the Efficacy of the Theory of Planned Behavior to Explain Strength Training in Older Adults

“If *exercise* could be packed into a pill, it would be the single most widely prescribed and beneficial medicine in the nation” (*National Institute on Aging*, 2001). Research has consistently demonstrated the beneficial effects that strength training can have on the quality of life and independence of the older population. Strength training is the single most effective way for older adults to increase and maintain their muscular strength and endurance in older age. As well, participation in strength training can increase bone density, energy metabolism, insulin action, and functional status (Fiatarone et al., 1990; Mazzeo et al., 1998; Tsutsumi, Don, Zaichkowsky, & Delizonna, 1997).

Despite the benefits, rates of strength training participation within the older population remain low. According to the United States National Health Interview Survey, only 10% of adults aged 65-74 years and 7% of adults aged 75 years and older, participate in exercise designed to increase muscular strength and endurance (*Healthy People 2010*, 1998). A better understanding of the factors that influence strength training in the older population is critical for developing interventions to promote higher levels of involvement.

(Ajzen, 1991) Theory of Planned Behavior (TPB) is an expectancy value model that was expanded from the Theory of Reasoned Action (Ajzen & Fishbein, 1980). The TPB provides a theoretical framework to describe the ways in which attitude (i.e., overall evaluation of the behaviour), subjective norm (i.e., perceived social pressures to engage in the behaviour), perceived behavioral control (i.e., ability to perform the behaviour), and intention (i.e., summary motivation to perform the behaviour) combine to predict behavior. According to the theory,

intention is the main determinant of behavior and intention is formed by attitude, subjective norm, and perceived behavioral control (PBC). The theory also states that perceived behavioral control can have a direct effect on behavior if the behavior is not under complete volitional control (Ajzen & Driver, 1992).

The TPB has been applied extensively to explain exercise behavior (Hagger, Chatzisarantis, & Biddle, 2002). Overall, attitude and PBC are the strongest predictors of general exercise intentions with medium-large effect sizes and subjective norms appear to play a smaller role in exercise intention with small to trivial effect (Godin & Kok, 1996; Hausenblas, Carron, & Mack, 1997). As well, intention tends to be the strongest predictor of general exercise behavior with a large effect while PBC often has a small-trivial direct effect after controlling for intention.

Ajzen (1991), however, proposed that the relative influence of each of the TPB constructs will change according to the behavior and the population under study. Accordingly, meta-analyses of the TPB have revealed that age moderates the intention-behavior relationship in exercise applications (Hagger et al., 2002). Therefore, studies of the TPB within different age groups are warranted.

Only a handful of studies have applied the TPB specifically to the exercise behavior of older adults (Benjamin, Edwards, & Bharti, 2005; Brenes, Strube, & Storandt, 1998; Conn, 1998; Conn, Libbus, Thompson, & Kelley, 1994; Conn, Tripp-Reimer, & Maas, 2003; Courneya, 1995; Michels & Kugler, 1998). The findings of these studies provide evidence to show that the TPB variables may play different roles in influencing the exercise behavior of older adults compared to younger adults. Compared to the meta-analyses of the TPB, these results suggest that the role

of subjective norms may be stronger in older adults than it is in younger adults, while attitude and PBC appear to have similar effects in both populations.

In addition to the influence of demographics on the relative contribution of the TPB variables, the relationship between the variables is also specific to the behavior under study (Ajzen, 1991). Bryan and Rocheleau (2002) noted that one of the limitations of TPB and exercise studies is that there has been no specification of the type of exercise under study. Instead, they suggest that the focus has concentrated on aerobic activity or “exercise” in general. Bryan and Rocheleau note that individuals who engage in aerobic activity versus strength training often have different goals and the difficulty of performing these two activities may be quite different. For example, a person may only have to own a pair of shoes in order to participate in aerobic activity; however, strength training requires access to training facilities and equipment. As a result, it is important to determine if and how the relationships between the TPB variables differ in different exercise applications.

Two studies to date have applied the TPB specifically to strength training. (Bryan & Rocheleau, 2002) and (Rhodes, Blanchard, & Matheson, in press) tested the TPB in aerobic versus strength training activities in prospective designs using samples of college students. The results of both studies revealed differences in the predictive validity of the model for aerobic versus strength training behavior. Interestingly, both studies revealed that the fit of the model for strength training was actually better than that of aerobic exercise with more variance explained in behaviour. The stronger fit of the models to strength training was attributed to the stronger role of perceived behavioral control. In other words, there appear to be more control factors at play influencing strength-training behaviour. Rhodes et al. (in press) also demonstrated that control

beliefs focused on access to facilities, knowledge of activity techniques, and social support were more predictive of strength training behaviors than aerobic/endurance behaviors. These findings demonstrate the need for different intervention foci to promote the two different types of physical activities.

Still, no studies to date have evaluated the TPB to explain strength training in an older population. Considering older adults' minimal involvement in strength training and the lack of information about the factors affecting participation, interventions to promote the activity are needed. The application of this well-established theory, to this behavior, in this population, may provide a better understanding of the factors that influence participation, and therefore, guide interventions to promote strength-training activity among older adults.

#### *Purpose and Hypothesis*

The purpose of the present study was to test the efficacy of the TPB to explain strength-training behavior in the older population, in order to gain a better understanding about the factors that influence participation. The role of gender and current strength training participation were also explored as moderating variables between the TPB constructs and intention and behavior. Based on the prior literature, it was hypothesized that PBC, followed by attitude, would be the strongest predictors of intention and intention would be the strongest predictor of behavior. It was tentatively hypothesized that subjective norm may also be an important predictor of intention in this population based on prior research. Since women have lower rates of participation in strength training activity, gender was expected to moderate the relationship between intention and behaviour and between PBC, attitude and intention (*Canadian Fitness and Lifestyle Research Institute*, 1995; Kruger, Brown, Galuska, & Buchner, 2004). Current strength

training participation was also expected to moderate the relationship between intention and the TPB variables as past participation/habit have previously been shown to add to model (Michels & Kugler, 1998).

## Method

### *Participants*

Men and women aged 55 years and older were recruited from locations hosting activities for older adults such as community recreation centers, senior exercise classes, bowling leagues, churches, and mall walking groups. Older adults were approached at a variety of locations in order to ensure participants with a range of physical activity levels and experiences. As a result, it can be stated that purposive sampling was used. Two hundred individuals participated in the study. Based on the guidelines of (Miles & Shevlin, 2001) our sample size was adequate to detect a medium effect size. The sample consisted of 52 males (26%), 147 females (73.5%) and one unidentified (0.05%). Fifty percent of the sample was 75 years of age and younger making this a young-old sample (Spirduso, Francis, & MacRae, 2005). Fifty-four percent of the sample was married or living common law and 71% had completed at least a high school education.

### *Procedure*

Letters were sent to a variety of seniors' organizations in Ontario, requesting permission to distribute a physical activity questionnaire at their location. After permission was granted, the primary researcher traveled to these locations and either approached participants as a group or individually. Participants were provided with a verbal description of the study and asked to spare a few minutes of their time. Volunteers were provided with a one-page cover letter describing the study information and a four-page questionnaire designed to measure the TPB constructs

pertaining to strength training, self-reported physical activity participation, and select demographics. Anyone over the age of 55 years, who was willing and able to complete the questionnaire, was included. Questionnaires were self-administered and took approximately ten minutes to complete. Questionnaires were immediately returned to the researcher upon completion.

### *Instrumentation*

Participants were provided with definitions of strength training and aerobic training and asked to refer to these definitions when responding to all questions on the questionnaire. *Strength training* was defined as: *repetitively working your muscles against moderate to heavy resistance (e.g., lifting a weight 8 to 15 times), done to improve or maintain muscular strength and/or muscular endurance, performed for all major muscle groups, and resistance is gradually increased over time as strength improves. Examples include lifting weights, using machines or resistance tubing, and doing calisthenics (e.g., sit-ups).* *Aerobic training* was defined as: *activity that increases breathing rate and heart rate, uses large muscle groups, may cause sweating or perspiration, and done for at least 30 minutes. Examples include brisk walking, swimming, cycling, dancing and tennis.* These definitions were designed based on the American College of Sports Medicine (ACSM) and the Canada's Physical Activity Guides (CPAG) definitions of strength training and endurance training. The CPAG and ACSM definitions were combined in order to make them more comprehensive and examples were added in order to add clarity.

The questions used to assess the TPB constructs were adapted from previous research using the Theory of Planned Behavior (Brenes et al., 1998; Bryan & Rocheleau, 2002; Courneya, 1995; Godin & Kok, 1996). *Behavior* was assessed by asking "How many days a week do you

participate in strength training?” Responses ranged from zero to seven days a week. This simple method of assessing behavior was adapted from Bryan and Rocheleau (2002).

Unless otherwise noted, all TPB constructs were measured on a seven point Likert scale from 1 (Strongly Disagree) to 7 (Strongly Agree). *Intention* was assessed using two items: “I plan to strength train on a regular basis within the next three months” and “I will try to strength train at least two to three times a week within the next three months”. An aggregated intention score was calculated with the mean of these two items. Internal consistency was acceptable at  $\alpha = .97$ .

Five items were used to assess *attitude* toward strength training. Participants rated strength training on a 1 to 7 scale as: “useless” to “useful”, “harmful” to “beneficial”, “foolish” to “wise”, “unenjoyable” to “enjoyable”, “unhealthy” to “healthy”. An aggregated attitude score was calculated using the mean of these five statements. Internal consistency was acceptable at  $\alpha = .93$ . Two items were used to assess *subjective norm* including: “Most people who are important to me think I should strength train”, “Most people who are important to me would/do support my participation in strength training”. An aggregated subjective norm score was calculated using the mean of these two statements. Internal consistency was acceptable at  $\alpha = .85$ .

To assess *perceived behavioral control*, both perceived control and perceived difficulty to do strength training were assessed using the following statements: “If I chose to, I could strength-train any time I wanted to” and “Overall, for me to engage in strength training would be....” (1 = extremely difficult, 7 = extremely easy). An aggregated perceived behavioral control score was calculated using the mean of these two statements. Internal consistency was acceptable at  $\alpha = .76$ . Demographic information such as age, gender, education, marital status, perceived

health, and perceived fitness was also collected on the questionnaire. The questionnaire was piloted on a convenient and representative sample of five individuals and assessed for clarity.

### *Data Analysis*

All statistical analyses were conducted using SPSS 10.0 for Windows. An alpha level of .05 was used to determine statistical significance for all procedures. Following basic descriptive and bivariate correlations of the demographic and TPB variables, hierarchical ordinary least squares regression analyses were conducted. The known predictors of behavior including intention and PBC were entered into the regression at block 1 using forced entry. Attitude and subjective norm were entered into the equation in block 2 using forced entry. A similar procedure was used to explain strength-training intention, however attitude, subjective norm and PBC were all entered together at step 1 using forced entry.

As a part of our exploratory analysis, we also investigated the role of gender and current participation as moderators of the relationship between the TPB variables. Intention, attitude, subjective norm and PBC were mean centered and an interaction variable was created for each variable with gender and current strength training participation. Forced, block wise entry was used to enter all mean centered TPB and interaction variables into the regression equation. To explain intention, the mean centered attitude, subjective norm and PBC variables were entered at step 1 followed by gender and mean centered strength training participation at step 2. The three TPB x gender interaction variables were entered at step 3 and the three TPB x strength training interaction variables were entered at step four.

The same procedure was used to explain strength-training behavior, however, only gender was investigated as a moderating variable. Mean centered intention and PBC were entered at block 1, followed by mean centered attitude and subjective norm in block 2. Gender was entered into block 3, followed by intention x gender and PBC x gender in block 4. Finally, attitude x gender and subjective norm x gender were entered in block 5.

### Results

Ninety-five percent of participants rated their health as “excellent” to “good” and 87% of participants rated their fitness as “excellent” to “good”. Participants were also asked how many friends they had who participated in strength training and aerobic training to help assess social factors that influence physical activity participation. Results showed that more individuals had friends who participated in aerobic training than strength training. For example, 24% of participants reported no friends who participated in strength training versus only 11% reporting no friends who participated in aerobic training. The mean days per week of aerobic exercise participation was  $2.6 \pm 1.9$  days. The mean days per week of strength training participation was  $1.6 \pm 1.7$  days.

Due to missing values and inconsistencies in self-reported physical activity participation, only 159 individuals were used in the final data analysis. T-test and Chi square analysis revealed that those who did not participate in strength training and those in the older age ranges were more likely to have missing values ( $p < .05$ ). In addition, the attitude variable was negatively skewed, with 48% scoring seven (i.e., strong attitudes toward strength training). The lack of variance and heavy negative skew in this variable creates a limitation in the analyses of this variable and may cause its effect to be underestimated.

As illustrated in Table 1, attitude, subjective norm and PBC were significantly correlated with intention at .35, .59 and .49 respectively ( $p < .001$ ). Intention was significantly correlated with behavior at .63 ( $p < .001$ ). Attitude, subjective norm and PBC were significantly correlated with behavior at .17 ( $p < .05$ ), .36 and .32 respectively ( $p < .001$ ).

Ordinary least squares regression analyses were conducted to determine if the TPB is a useful model for explaining strength-training *intention* and *behavior* in the older population (see Table 2). Gender and current strength training participation did not significantly moderate the relationship between the TPB variables and as a result, the results presented here are based on the non-mean centred analyses. Results revealed that subjective norm ( $\beta = .44, p < .001$ ) and PBC ( $\beta = .27, p < .001$ ), but not attitude ( $\beta = .07$ ), explained 42% of the variance in intention ( $F_{3,155} = 36.84, p < .001$ ). Further, intention ( $\beta = .62, p < .001$ ), but not perceived behavioural control ( $\beta = .02$ ) explained 40% of the variance in strength training behavior ( $F_{2,153} = 50.92, p < .001$ ).

Expand on non-significant findings.....

Where put ci's?

### Discussion

In order to promote strength training within the older population, we must first identify the factors that influence participation. Since the TPB has proven useful in explaining aerobic exercise in the younger population, the theory holds promise in explaining more specific forms of exercise such as strength training. Results of this study support the use of the TPB in explaining strength-training behavior in the older population since the constructs were able to explain 42% of the variance in strength training intention and 40% of the variance in strength training behavior.

The influence of each of the individual TPB constructs, however, differed from meta-analyses involving primarily young and middle aged adults and were also slightly different from our original hypotheses. In contrast to our hypothesis, attitude was not a significant correlate of strength training intention. Consistent with our hypotheses, PBC and subjective norm were significant determinants of strength training intention, however, the influence of subjective norms was larger than what was expected. Consistent with our hypothesis, intention was the only significant predictor of strength training behavior.

The most unique finding of this study was the significant role that subjective norm played as an independent correlate of strength-training intentions. Throughout the physical activity literature, subjective norm is generally the weakest predictor of intention compared to attitude and PBC (Armitage & Conner, 2002; Carron, Hausenblas, & Estabrooks, 2002). The stronger influence of subjective norm in this application may be related to the motives that influence older adult's participation in physical activity versus younger adults. For example, older adults report exercising more often for social reasons than younger subjects (Gill & Overdorf, 1994) and the social benefits tend to be the most commonly reported advantage of being physically active among older adults (Conn, 1998).

As noted earlier, more participants in this study reported friends who participated in aerobic training versus strength training. Since physical activity provides an opportunity for older adults to interact with others, they may be more likely to participate in activities that their friends are also involved with. This is consistent with (S O'Brien Cousins, 1996) who found that social reinforcement was one of the best predictors of late life exercise. Future research should continue to investigate the contribution that socialization plays in influencing older adult's

physical activity participation. In addition, direct comparisons between older adults and younger adults would provide more conclusive evidence about the different factors that influence strength training participation in the two populations.

Contrary to our hypothesis, attitude was not a significant predictor of strength training intention. The majority of the sample had positive attitudes toward strength training, suggesting that they already know that strength training is a beneficial activity. In other words, there appears to be a ceiling effect with regard to attitude. These findings are consistent with the findings of (S O'Brien Cousins, 2000; S. O'Brien Cousins & Gillis, 2005) who found that sedentary older adults knew keeping active was important, yet they still did not participate. These findings suggest that health promotion programs, which attempt to modify older adults' attitudes toward strength training, may not be enough to help facilitate participation in the activity. (Ajzen, 2002) notes that there must be room for change in the designated target in order for the intervention to be effective in influencing behavior. As a result, interventions would be better suited to target other TPB variables, such as subjective norms and PBC, in order to influence change.

The influence of PBC in this study was not a surprising finding and is consistent with the TPB and physical activity literature. As Bryan and Rocheleau (2002) and Rhodes et al. (in press) previously demonstrated, the influence of PBC in strength training applications might reflect control factors such as access to facilities, equipment, and knowledge about what exercises to perform. Also, consistent with our hypothesis, intention was the strongest predictor of strength training behavior. This finding is not consistent with the results of Bryan and Rocheleau (2002) and Rhodes et al. (in press) who found that PBC was also a predictor of strength training intention. Our result is, however, consistent with other meta-analyses of the TPB in the exercise

domain. It is also of note that this study is based on a cross sectional design and future research should attempt to confirm the results of the present study through a prospective design.

An exploratory purpose of this study was to investigate the role of gender and current strength training participation as moderators of the relationship between the TPB variables. Although females typically report lower rates of participation in strength training activity, this study revealed no gender influence on the relationship between the TPB variables. A smaller proportion of males in this sample may have limited the statistical power of this analysis. Current participation in strength training did not moderate the relationship between the TPB variables, suggesting that similar factors influence the intentions of current strength trainers versus those who do not participate. As a result, separate interventions are not required for those who do not participate versus those who do not.

#### *Study Limitations*

The questionnaire used in this study was adapted from a variety of previous TPB studies, however this tool had not been validated. As well, the measures of strength and aerobic training used in this study were brief and results may differ by using a validated physical activity measure such as the Physical Activity Scale for the Elderly (PASE) (Washburn, Smith, Jette, & Janney, 1993) or more objective measures. In the present study, we modified the CPAG and ACSM definitions to make them more applicable to older adults and although a short pilot study was performed to ensure clarity, more work needs to be done to validate and support these definitions. Purposeful sampling was used with the intent of obtaining an array of participants ranging from sedentary to active strength trainers. A random sample of older adults may achieve better generalizability. In addition, information about the recruitment to participant rate was not

tracked. Finally, the smaller number of males in this study and the lack of variability in the attitude variable, makes the results subject to type II error and underestimation respectively.

### *Implications for practice*

It appears that subjective norms and perceived behavioral control are the strongest factors influencing strength training intentions in older adults. As a result, interventions that target these constructs may be effective at increasing strength training intention and behavior in older adults. For example, PBC could be improved by providing access to facilities and equipment or providing knowledge about what exercises to do and how to do them. On the other hand, increasing the social aspects of the activity and promoting strength training as a necessary component of all physical activity regimes could improve subjective norms. Further research using a prospective design is needed in order to assess the effectiveness of interventions targeting these constructs.

### *Conclusion*

Overall, it appears that the constructs of the TPB are useful in explaining strength-training behavior in the older population. As a results, TPB based intervention may hold promise for helping more older adults become involved in strength training activity. The promotion of strength training is important in order to help older adults to remain strong, functional and independent in their later years.

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Table 1

## Correlations between TPB Constructs

	2	3	4	5	6	Mean	SD
1. Behavior	.63***	.17*	.36***	.32***	-.03	1.8	1.7
2. Intention		.35***	.59***	.49***	.09	4.6	2.4
3. Attitude			.44***	.32***	.17*	6.1	1.4
4. Subject. Norm				.44***	.21**	5.1	1.8
5. PBC						5.3	1.4
6. Gender						1.8	0.43

Note. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Table 2

Summary of strength training intention and behavior using hierarchical regression analysis

(N=159).

	R <sup>2</sup>	R <sup>2</sup> <sub>change</sub>	F <sub>change</sub>	df	β <sup>1</sup>	β <sup>2</sup>
<u>Exercise Intention</u>						
(Block #1)	.42	.42	36.84***	3,155		
1. attitude					.07	
2. subjective norm					.44***	
3. perceived control					.27***	
<u>Exercise Behavior</u>						
(Block #1)	.40	.40	50.92***	2,153		
1. intention					.62***	.64***
2. perceived control					.02	.03
(Block #2)	.40	<.01	.36	2,151		
1. attitude						-.05
2. subjective norm						-.01

Note. \*\* $p < .01$ ; \*\*\* $p < .001$ .  $\beta^{1-2}$  = standardized regression coefficients for equations #1 and #2.  
df = degrees of freedom.