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Questionnaires for Outcome Expectancy, Self-Regulation, and Behavioral Expectation for Resistance Training Among Young-Old Adults: Development and Preliminary Validity

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Abstract

The purpose of the present research was to develop questionnaires to assess outcome expectancy for resistance training (RT), behavioral expectation in the context of perceived barriers to RT, and self-regulation strategies for RT among young-old adults (50–69 years). Measurement development included (a) item generation through elicitation interviews (N = 14) and open-ended questionnaires (N = 56), (b) expert feedback on a preliminary draft of the questionnaires (N = 4), and (c) a quantitative longitudinal study for item-reduction and psychometric analyses (N = 94). Elicitation procedures, expert feedback, and item reduction yielded four questionnaires with a total of 33 items. Positive outcome expectancy (α = .809), negative outcome expectancy (α = .729), behavioral expectation (α = .925), and self-regulation (α = .761) had—with one exception—moderate bivariate associations with two different indicators of self-reported RT behavior at one-month follow-up (r = .298 to .506). The present research provides preliminary support for newly developed questionnaires to facilitate understanding of the psychosocial determinants of RT among young-old adults.

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Keywords

social cognitive framework; elicitation interviews; reliability; validity

Resistance training (RT) has many health benefits, particularly for middle-aged and older adults. Research has shown that RT interventions can positively affect the aging process, including benefits to muscular strength, bone health, and body composition (for reviews see Chodzko-Zajko et al., 2009; Liu & Latham, 2009; Peterson, Rhea, Sen, & Gordon, 2010). Several randomized control trials (RCTs) and systematic reviews suggest that RT may also play a role in the prevention and management of chronic diseases, including type 2 diabetes (for a review see Irvine & Taylor, 2009), cardiovascular disease (Cornelissen & Smart, 2013), osteoporosis (for a review see Bonaiuti et al., 2002), chronic renal failure (Castaneda et al., 2001), congestive heart failure (for a review see Spruit et al., 2009), arthritis (Farr et al., 2010), and breast cancer (Schmitz et al., 2010). National health organizations, including the American College of Sports Medicine and American Diabetes Association recommend that older and diabetic individuals engage in RT with exercises targeting all major muscle groups two to three times per week with a minimum of one set of 8–12 repetitions per exercise (American Diabetes Association, 2006; Chodzko-Zajko et al., 2009). However, according to a survey conducted in 2009, only 27% of Americans aged 45–64 years and 25% of those aged ≥ 65 years engage in RT at least two days per week, and only 5% in those age groups reported training all seven major muscle groups (Loustalot, Carlson, Kruger, Buchner, & Fulton, 2013). Given the health benefits of RT and the low prevalence rates, empirically-based interventions are needed to increase rates of RT among middle-aged and older adults.

To effectively promote RT among middle-aged to older adults, it is critical that we understand the determinants of RT initiation and maintenance. Several theories of health-related behavior (Ajzen, 1991; Bandura, 1986; Rogers, 1983; Strecher, DeVellis, Becker, & Rosenstock, 1986) are consistent with a broad social cognitive framework (SCF) (cf., Williams & Marcus, 2013) in which behavior is posited to be a function of potential behavior-outcome contingencies, perceived capability to overcome environmental barriers, and use of effective self-regulatory strategies (Bandura, 1986). The SCF has been useful for understanding and predicting aerobic exercise in older adults (Gretebeck et al., 2007; White, Wojcicki, & McAuley, 2012) and thus might also be useful for understanding RT in this population. Indeed, the few studies that have examined psychosocial determinants of RT have shown that beliefs about behavior-outcome contingencies, perceived capability to overcome potential barriers, and self-regulatory strategies (i.e., goals or intentions to RT) were associated with future RT behavior among college students and older adults (Bryan & Rocheleau, 2002; Dean, Farrell, Kelley, Taylor, & Rhodes, 2007; Jette et al., 1998; Plotnikoff, Courneya, Trinh, Karunamuni, & Sigal, 2008).

However, in previous research on the psychosocial determinants of RT behavior, the questionnaires used to assess outcome expectancies, potential barriers, and self-regulation strategies were originally developed for research on aerobic exercise rather than RT or were not specific to the target population in which they were used. While there is likely

to be overlap in the broad psychosocial concepts (i.e., expected outcomes, barriers, and self-regulation strategies) that act as determinants for both aerobic and resistance exercise, as well as overlap in some of the specific outcomes (e.g., better health), barriers (e.g., lack of time), and strategies (e.g., planning and goal-setting), there may be some important contexts and beliefs that are specific to RT (Winett, Williams, & Davy, 2009). For example, performance of RT tends to be time (2–3/week) and place (health club) specific in contrast to many types of aerobic training. RT requires a high degree of effort at the end of a set of repetitions to provide signaling for acute responses (e.g., muscle protein synthesis) and chronic adaptations (e.g., muscle hypertrophy)—simply 'going through the motions' provides minimal benefits (Phillips & Winett, 2010). Thus, some of the salient expected outcomes, perceived barriers, and self-regulation strategies that serve as determinants of RT behavior are likely to be unique for resistance versus aerobic exercise and for middle-aged and older versus younger adults, and therefore must be ascertained through elicitation research in the target population (Ajzen, 1991; Bandura, 1986).

The Present Study

The purpose of the present investigation was to develop questionnaires to assess (a) outcome expectancy for RT, (b) behavioral expectation in the context of perceived barriers to RT, and (c) self-regulation strategies for RT among young-old adults (i.e., 50–69 years of age). The questionnaires were developed and are currently being used to assess potential mediators of the effects of a SCF-based RT promotion intervention among sedentary prediabetic adults. Our decision to develop a questionnaire for behavioral expectation rather than perceived capability (i.e., self-efficacy) was based on prior research indicating that ratings of perceived capability often serve as a proxy for behavioral expectation (for empirical reviews and conceptual analyses see French, 2013; Kirsch, 1995; Williams, 2010). The age range was chosen because of the particularly low rates of RT among adults ≥ 50 years of age (Loustalot et al., 2013) coupled with the potential for behavioral interventions to prevent progression to overt diabetes among young-old adults who fit prediabetes criteria (Knowler, et al., 2002; Nathan et al., 2007). Although individuals 70 years and older also would benefit from regular RT, they were excluded as psychosocial barriers to RT may differ for adults > 70 years of age (relative to the age range of 50–69 years) because of differences in employment status, financial resources, and health status.

Questionnaire development was guided by the SCF and included (a) item generation through elicitation interviews and open-ended questionnaires, (b) expert feedback on a preliminary draft of the questionnaires, and (c) a quantitative longitudinal study for item-reduction and psychometric analyses. To examine the predictive validity of our newly-developed questionnaires, we assessed self-reported RT behavior concurrent with the psychosocial questionnaires and at one-month follow-up. We also examined associations among the newly-developed questionnaires (e.g., outcome expectancy, behavioral expectation, and self-regulation) to ensure that associations were in expected directions (e.g., negative association between negative outcome expectancy and behavioral expectation).

Methods

Item Generation

We used two methods to generate questionnaire items. First, we conducted 14 elicitation interviews among eight women and six men, ages 50–67, who reported RT at least twice per week for the past two years. Half of the interviews were conducted among members of a YMCA in the greater Providence, RI area and the other half were conducted among members of a health club in Blacksburg, VA. Second, we distributed open-ended questionnaires to 56 Rhode Island YMCA attendees (47 females), ages 50–69 (mean = 61.9, SD = 6.0) who engaged in RT regularly (n = 40), sometimes (n = 10), or not at all (n = 6). Interviewees and questionnaire respondents were asked to discuss or list (respectively): (a) benefits of RT, (b) barriers to RT, (c) negative outcomes of RT, and (d) strategies used to help them complete RT on a regular basis. Participants were paid $25 for interviews or $10 for completing the questionnaire.

Expert Feedback

In a preliminary draft of the closed-ended questionnaires, all nonredundant benefits, barriers, negative outcomes, and strategies generated in the interviews and open-ended questionnaires were included as items. Four experts in RT or behavioral science theory provided feedback on the questionnaires regarding face validity, ease of understanding of the instructions, wording of specific items, and additions to our item pool; however, no participant-generated items were eliminated from the questionnaires at this stage. The resulting three questionnaires were used in the quantitative longitudinal study.

Quantitative Longitudinal Study

The goals of the quantitative longitudinal study were to (a) reduce the number of items on each questionnaire, (b) determine the internal consistency of each questionnaire, and (d) establish preliminary predictive validity.

Participants

Participants were 94 YMCA attendees ages 50–69 from one of five YMCAs in the greater Providence, RI area. Participants from the item-generation studies were ineligible.

Measures

The outcome expectancy and value, behavioral expectation, and self-regulation questionnaires were derived from the item generation and expert feedback methods described above.

Outcome Expectancy.—Participants rated their agreement and perceived importance of 54 positive (e.g., helps me feel stronger) and 30 negative (e.g., makes me feel bored) outcomes of regular RT on a seven-point scale with anchors at 1 (completely disagree; not at all important), 4 (neither agree nor disagree; somewhat important), and 7 (completely agree; extremely important).

Behavioral Expectation.—Participants rated their likelihood (0–100%) of engaging in RT in the context of 12 potential barriers (e.g., when you are tired).

Self-regulation.—Participants indicated how frequently they used each of 52 RT self-regulation strategies (e.g., pack ahead of time for the gym) on a seven-point scale with anchors at 1 (never use), 4 (use about half the time), and 7 (always use).

Resistance Training Behavior.—Participants completed three items assessing RT frequency (days/week) and, if relevant, duration of RT (minutes/session) and pace of RT (minutes between sets) in the past month. In addition, an RT timeline-follow-back (TLFB) calendar assessed self-reported participation in RT (yes/no) for each of the previous 30 days.

Procedures

Participants were recruited and completed the baseline questionnaire packet in the lobby of the YMCA. Only participants who reported RT ≥ 1 day/week in the past month were instructed to complete the self-regulation questionnaire, as these items were not applicable to participants who did not engage in regular RT. Research staff reviewed questionnaires at the time of completion and asked participants to complete any missing responses, thus successfully avoiding any missing data. Participants who completed the baseline questionnaire were mailed a follow-up questionnaire one month later assessing RT behavior. Participants were paid $10 each for completing the baseline and follow-up questionnaires. All study procedures were approved by the local institutional review boards.

Analyses

Item Reduction.—We computed cross-sectional bivariate correlation coefficients for baseline responses to each item on the outcome expectancy, self-regulation, and behavioral expectation questionnaires with four indicators of baseline RT: (a) days/week of RT in the past month; (b) days/week weighted by duration of RT; (c) days/week weighted by duration and pace of RT; and (d) number of days of RT (out of 30) on the TLFB. Correlations involving outcome expectancy were computed in two ways: (a) weighted through multiplicative combination with corresponding outcome value items (Ajzen & Fishbein, 2008) and (b) unweighted.

Scoring and Internal Consistency.—Internal consistency coefficients were computed for each questionnaire, with Cronbach's $\alpha > .7$ considered adequate.

Predictive Validity.—Bivariate cross-sectional and longitudinal correlation coefficients were computed to test hypothesized associations among the newly formulated scale scores for positive and negative outcome expectancy, behavioral expectation, and self-regulation, with RT behavior. Cohen's (1992) effect-size descriptors for correlation coefficients were used as guidelines to estimate small ($r = .1$), moderate ($r = .3$), and large ($r = .5$) associations among the variables. We examined only bivariate associations among the variables without employing hierarchical regression or controlling for baseline values of RT (Weinstein, 2007), as our goal was to establish the reliability and validity of the new questionnaires

rather than to test the predictive power of the underlying theoretical constructs. Analyses were conducted using SPSS 19.0 (IBM, Chicago, IL).

Results

Preliminary Analyses

Participants were 65% female with a mean age of 60.6 years (SD = 6.1). At baseline, participants reported a mean of 2.3 (SD = 1.6) days of RT per week on the questionnaire and 9.6 (SD = 6.8) days of RT over the past month on the TLFB calendar, with 79% reporting RT ≥ 1 day/week in the past month. Completion rate for the one-month follow-up questionnaire packet was 83%. Sex, age, and RT behavior for the follow-up subsample did not differ from the overall sample (p > .05).

Item Reduction

Of the four indicators of RT behavior, only two—days/week of RT in the past month and number of days of RT (out of 30) on the TLFB—were used for item reduction and in subsequent analyses, as weighting of RT frequency by RT duration and pace did not improve item-level bivariate correlations. Likewise, bivariate associations with RT behavior were stronger for unweighted versus weighted (by outcome value) outcome expectancy items; thus, only the results for the unweighted outcome expectancy items were used for item reduction.

Twenty-one of the 84 outcome expectancy items (10 positive and 6 negative; Table 1), all 12 behavioral expectation items (Table 2), and 5 of 52 self-regulation items (Table 3) met the item retention criterion (i.e., r ≥ .2 and r ≥ .175 for the two RT behavior indicators) and were thus retained.

Internal Consistency

Internal consistency was adequate among the retained items for positive outcome expectancy (α = .809), negative outcome expectancy (α = .729), behavioral expectation (α = .925), and self-regulation (α = .761).

Predictive Validity

Bivariate associations among the outcome expectancy, behavioral expectation, and self-regulation scale scores, and RT behavior are reported in Table 4. Because the data were nonnormally distributed, we used Spearman's Rho to compute correlation coefficients. Positive and negative outcome expectancy scores had moderate longitudinal associations with both indicators of follow-up RT behavior (unweighted by outcome value: r = .326 to .460; weighted by outcome value: r = .276 to .443), with the exception of a small-in-magnitude association between the negative outcome expectancy score and the TLFB indicator of RT behavior (unweighted by outcome value: r = −.178; weighted by outcome value: r = −.140). Outcome expectancy scores that were weighted by outcome value were generally similar, but in no cases superior, to the unweighted scores, and thus are not shown in Table 4. The behavioral expectation and self-regulation scores had moderate longitudinal associations with the two indicators of follow-up RT behavior (r = .298 to

.506). Cross-sectional associations among outcome expectancy, behavioral expectation, and self-regulation scores were small to moderate in magnitude (r = .189 to .426) and in the expected direction.

Discussion

The goal of this research was to develop questionnaires to assess outcome expectancy, behavioral expectation, and self-regulation strategies for RT among young-old adults. We generated items for the questionnaires through interview and questionnaire elicitation procedures among the target population. We then conducted a quantitative longitudinal study with an independent sample of young-old adults among whom approximately 79% were engaging in RT at baseline. Findings for each questionnaire are discussed in more detail below.

Positive and Negative Outcome Expectancies

Elicitation interviews and questionnaires led to a total of 84 nonredundant outcome expectancy items. Of these 84 items, 16 showed a cross-sectional association with indicators of RT. Weighting of outcome expectancy items by outcome value did not improve their associations with criterion variables, despite our heeding of the warnings of Ajzen and Fishbein (2008) regarding scaling and multiplicative combination procedures. Nonetheless, unless additional assessments create undue participant burden, we recommend retaining the outcome value items for theoretical fidelity (Ajzen & Fishbein, 2008) and to allow for further comparison of the predictive power of weighted versus unweighted outcome expectancy scores.

A majority of the 16 outcome expectancy items that survived the item reduction procedure referred to affective or non-health-related outcomes. The predictive capacity of non-health-related outcome expectancy items is consistent with a recent study in which affective outcome expectancies were superior to health-related outcome expectancies in predicting aerobic exercise among older adults (Gellert, Ziegelmann, & Schwarzer, 2012). Moreover, the inclusion of affect-related and negative outcome expectancy items in the final scale is in line with recommendations to include such components when operationalizing outcome expectancy (Williams, Anderson, & Winett, 2005). Associations between positive outcome expectancy scale scores and both indicators of follow-up RT behavior were of moderate magnitude; however, the association between negative outcome expectancy and one of the two RT indicators was of small magnitude (r = −.178). The reason for the latter finding is unclear and suggests that the predictive ability of the negative outcome expectancy scale may not be as robust.

Behavioral Expectation

Twelve nonredundant barriers to RT were identified in elicitation procedures. These barriers were included in items assessing behavioral expectation for performing RT in the face of each barrier. All 12 items showed a cross-sectional association with one or both indicators of RT. Together the 12 items yielded an internally consistent scale, which showed moderate associations with RT behavior.

Our decision to create a questionnaire for behavioral expectation in the face of potential barriers instead of a more traditional assessment of self-regulatory self-efficacy (i.e., perceived capability) was based on the findings that what people say they 'can [or cannot] do' is a proxy for what they expect they will do (French, 2013; Kirsch, 1995; Williams, 2010). However, carefully designed experimental research is needed to further elucidate the conceptual and empirical overlap between ratings of perceived capability (i.e., self-efficacy) and behavioral expectation.

Self-regulation

Only five of the 52 self-regulation items identified in the elicitation procedures showed cross-sectional associations with one or both indicators of RT behavior. These five items yielded an internally consistent scale, which showed moderate associations with RT behavior, consistent with research on self-regulation and aerobic exercise among older adults (Umstattd, Wilcox, Saunders, Watkins, & Dowda, 2008).

Implications for Intervention

In addition to using the new questionnaires to understand RT behavior, the questionnaires can also be used to develop intervention approaches for RT. Individual variability on item-level scores can serve as the basis for individual tailoring of behavioral interventions, similar to successful intervention approaches for promotion of aerobic exercise (Williams et al., 2011; Winett, Anderson, Wojcik, Winett, & Bowden, 2007). For example, individuals who report low expectation for engaging in RT in the face of instrumental barriers may be given specific strategies to overcome those barriers. Likewise, those who fear negative physical outcomes of RT may be provided with alterations in their RT program to reduce the likelihood of such negative outcomes.

Limitations

Our questionnaire development methods had some limitations that must be addressed in future research. First, the item reduction and predictive validity analyses were based on data from the same participant sample. Future research, with an independent sample of middle-aged and older adults, would help to confirm the predictive validity of the newly developed questionnaires. Second, although participants from the target population provided the content for our questionnaire items, such participants were not consulted (in addition to the RT and behavioral science experts) for the formatting and wording of our questionnaire items. This is a potential limitation as participants from the target population may have provided additional input on use of terminology and perceptions of questionnaire items. Third, our relatively small sample size in the quantitative study precluded factor analysis. Although internal consistencies were adequate for all three questionnaires, future research is needed among a larger sample of middle-aged and older adults to investigate the factor structure of each scale. Fourth, because there was no RT behavior-change intervention delivered in the current study, it was not possible to adequately assess the new questionnaires' sensitivity to change. Future intervention research will be needed to determine whether the newly developed questionnaires are sensitive to changes in the measured constructs. Fifth, the newly-formulated questionnaires total 33 items, which could be burdensome for participants. Finally, we did not directly assess racial-ethnic or

socioeconomic status because of feedback from YMCA staff that this might discourage completion of the questionnaires. Nonetheless, the YMCA facilities from which we drew our participant samples serve predominantly non-Hispanic Caucasian and relatively affluent clientele. Thus, the new questionnaires must be validated in more diverse participant populations, with each questionnaire tested for invariance across characteristics such as age, sex, and diseases status.

Conclusions

The present research led to the development and preliminary validation of psychosocial questionnaires for outcome expectancy, behavioral expectation, and self-regulation strategies for RT among young-old adults. These questionnaires can be used to better understand the psychosocial determinants of RT and to design tailored RT promotion interventions. Future research is needed to examine the questionnaires' sensitivity to change in the context of RT interventions, as well as reliability and validity among larger and more diverse participant samples.

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Table 1

Outcome Expectancy: Scale and Item-level Cross-sectional Correlations with Baseline Resistance Training Behavior

	Correlation	
If I resistance train regularly (at least twice per week for the next three months) it would…	**RT Days/week**	**RT TLFB Days/month**
Outcome expectancy: Positive scale score (α = .809)	**.461*** **	**.468*** **
1. Help me feel good emotionally	.218	.201
2. Give me a purpose for my day	.353**	.409***
3. Benefit my overall attitude (positive attitude)	.382***	.316**
4. Benefit my mental health	.355**	.345**
5. Make me happy to see people I know while I am resistance training	.342**	.378***
6. Be enjoyable while I am resistance training	.261	.176
7. Make me happy to talk with others while I am resistance training	.267*	.200
8. Help me feel good in general	.178	.204
9. Benefit my blood pressure	.213*	.272*
10. Benefit my cholesterol	.278**	.238*
Outcome expectancy: Negative scale score (α = .729)	**−.406*** **	**−.378*** **
11. Make me feel bored while I am resistance training	−.238*	−.197
12. Make me feel embarrassed while I am resistance training	−.275**	−.186
13. Make me feel miserable while I am resistance training	−.203	−.179
14. Result in unwanted muscle soreness	−.221*	−.266*
15. Result in joint pain	−.224*	−.237*
16. Make me short of breathe while I am resistance training	−.350**	−.306**

Note. RT = resistance training; TLFB = timeline-follow-back.

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 2

Behavioral Expectation: Scale and Item-level Cross-sectional Correlations with Baseline Resistance Training Behavior

Please rate how likely you are, on a scale of 0–100%, to resistance train in each of the situations listed below. Please respond about your actual likelihood of resistance training, not your ideal or desired likelihood of resistance training.	**Correlation**	
	RT Days/week	**RT TLFB Days/month**
Behavioral expectation: Scale score (α = .925)	**.530*****	**.381*****
1. When you have many household chores to do	.383***	.235*
2. When the gym is crowded	.472***	.388***
3. When you are busy and short of time	.487***	.382**
4. When you have many work/volunteer obligations	.480***	.374**
5. When you are traveling	.265*	.275*
6. When it is difficult to fit into your schedule	.445***	.307**
7. When you have many family obligations	.388***	.207
8. When there are more fun or more interesting things to do	.393***	.335**
9. When you are tired	.404***	.315**
10. When you feel discouraged about your resistance training	.421***	.264*
11. When there is no positive reinforcement for your resistance training	.242*	.193
12. When there is no one to resistance train with you	.362***	.190

Note. RT = resistance training; TLFB = timeline-follow-back.

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 3

Self-regulation: Scale and Item-level Cross-sectional Correlations with Baseline Resistance Training Behavior

	Correlation	
Please rate, on a scale of 1–7, how much you use each strategy to help you stick to your resistance training schedule.	**RT Days/week**	**RT TLFB Days/month**
Self-regulation: Scale score (α = .761)	**.554*****	**.373****
1. Schedule resistance training into each day	.319**	.209
2. Make my resistance training a priority	.405**	.175
3. Train on the same days each week	.398**	.279*
4. Make resistance training a habit	.505***	.378*
5. Pack ahead of time for the gym	.341**	.191

Note. RT = resistance training; TLFB = timeline-follow-back.

$^{*}p < .05$;

$^{**}p < .01$;

$^{***}p < .001$.

Table 4

Correlations (Spearman's Rho) Among Baseline Outcome Expectancy, Behavioral Expectation, Self-regulation, and Resistance Training at Follow-up

	Mean (SD)	1	2	3	4
1. Outcome expectancy: Positive	5.4 (1.0)	–			
2. Outcome expectancy: Negative	2.3 (1.1)	−.189	–		
3. Behavioral expectation	53.2 (22.6)	.362***	−.426***	–	
4. Self-regulation	5.0 (1.3)	.355**	−.344**	.396**	–
Follow-up RT days/week	2.5 (1.5)	.460***	−.326**	.368**	.506***
Follow-up RT TLFB days/month	10.0 (6.8)	.453***	−.178	.298**	.397**

Note. RT = resistance training; TLFB = timeline-follow-back.

** $p < .01$;

*** $p < .001$.

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