Adolescent expectancy-value motivation and learning: A disconnected case in physical education

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Abstract:

This study reports adolescent expectancy-value motivation, and its relation to fitness knowledge and psychomotor skill learning in physical education. Students ($N = 854$) from 12 middle schools provided data on expectancy-value motivation, fitness knowledge and psychomotor skill learning. Results from dependent t-test and MANOVA indicated that 8th grade students rated task values significantly lower than 6th grade while their expectancy beliefs did not significantly differ. Students gained sizable fitness knowledge ($d = 0.58$, $p < 0.05$) and badminton skill ($d = 1.40$, $p < 0.05$). Multiple regression analyses revealed that expectancy-value motivation did not significantly predict learning in fitness knowledge or psychomotor skills. These findings suggest that expectancy-value motivation might predict engagement and performance, but not necessarily learning achievement in physical education.

Keywords: Motivation | Learning | Expectancy belief | Task value | Physical education

Article:

1. Introduction

The expectancy-value theory concerns with students' expectancy beliefs for success in learning and task values of the content (Eccles, 1983). Middle-school years are particularly important as adolescents struggle to build their value and belief system while they are faced with rapid physical and psychological changes (Anfara, Mertens, & Caskey, 2007). According to Eccles (1983), students' motivation derives from and is influenced by (a) expectancy beliefs, (b) attainment, intrinsic, utility values in the content, and (c) cost. The expectancy beliefs are students' thoughts about the possibility of succeeding in upcoming learning tasks. Although closely related to self-efficacy (Bandura, 1986), the expectancy beliefs are tapping into the realization of success that is defined externally by a teacher. Previous studies (Eccles, 1983, Eccles and Wigfield, 2002) indicated that students with high expectancy beliefs are likely to perform better in learning and to be more persistently on challenging tasks than those with low expectancy beliefs in both classrooms (Eccles & Wigfield, 2002) and gymnasia (Xiang, McBride, & Bruene, 2004).

Task values are students' perceptions of worth of a task, consisting of attainment, intrinsic, utility values, and cost (Eccles, 1983). Attainment value refers to the extent to which a learner perceives the importance of succeeding in a task/activity. Intrinsic value refers to perceived enjoyment in the learning experience. Utility value reflects the perception of usefulness of the content. Cost is defined as anything perceived/experienced in an activity that hinders the learner's effort to pursue success. Task values and cost are theorized to be independent from expectancy beliefs and are likely to have distinct impacts on achievement (Wigfield & Eccles, 2000). Expectancy beliefs and task values are domain specific (Wigfield, 1997). Eccles (1983) found that students' task value for mathematics decreased through grades five to 12 whereas the task values for English increased. In physical education, Chen, Martin, Ennis, and Sun (2008) reported that students held significantly higher expectancy beliefs, attainment value, and utility value in learning cardiorespiratory fitness than traditional sport unit.

1.1. Expectancy-value as a motivator for achievement

Expectancy beliefs and task values have been identified as predictors for both academic achievements and students' performance in physical education. Xiang et al. (2004) found that expectancy beliefs were the only positive predictors for elementary students' running performance and explained 22.05% and 20.87% of the variance for boys and girls, respectively. Additionally, Xiang, McBride, and Bruene (2006) verified that expectancy beliefs were significant predictors for student running performance and persistence in running. They further reported that task values are predictors for students' intention for future running participation. There is initial evidence suggesting that at a different developmental stage, the motivation function of expectancy-value components may vary. For instance, Chen and Liu (2008) reported that college students in China were motivated by intrinsic and utility values to continue attending physical education, but motivated by attainment value to participate in self-initiated after-school physical activity programs.

In summary, expectancy beliefs and task values can be motivators for student academic achievements, choices, and after-school activity participation (Chen and Liu, 2008, Eccles and Wigfield, 2002, Xiang et al., 2006). It remains unknown, however, that how expectancy-value motivation relates to adolescent achievement in psychomotor and knowledge learning. Empirical studies on adolescent expectancy beliefs and task values about physical education are still lacking. It appears clear that students' expectancy-value motivation in sport and reading declines (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002) and that their expectancy beliefs about physical education remain unchanged while task values decline as they grow older (Xiang et al., 2006).

This study was designed to determine adolescent expectancy-value motivation in physical education and identify its relation to their learning of fitness knowledge and psychomotor skills. Specifically, we attempted to address the following questions: (a) Do adolescent expectancy beliefs and task values of physical education vary among sixth through eighth graders in the physical education context? (b) How much fitness knowledge and psychomotor skills did adolescent achieve over the year? (c) To what extent do adolescents' expectancy beliefs and task values as motivators directly predict their fitness knowledge and psychomotor achievements? We hope that answering these questions help better understand expectancy beliefs and task values in relation to learning in middle-school physical education.

2. Methods

2.1. Participants

The participants ($N = 854$) were 6th, 7th, and 8th graders from 12 middle schools in an eastern U.S. metropolitan area. Their mean age was 12.30 ($SD = 0.97$). As displayed in Table 1, the sample represented a gender-balanced population of diverse ethnic backgrounds in the school district (National Center for Education Statistics, 2003). We sampled the schools in the district based on the stratified percentage of students on the federal Free-and-Reduced-Meal program, enrollment, and teacher–student ratio. In each participating school, one class from each grade was randomly selected to provide data. The study protocols were approved by the University's Institutional Review Board; parental consent and student ascent were received prior to data collection.

Table 1. Sample descriptors.

	Sample (*n*)	**Sample %**	**District %**
Gender			
Female	430	50.35	50.20
Male	424	49.65	49.80
Ethnicity			
African American	164	19.20	22.70
Asian	118	13.82	15.10
Hispanic	149	17.45	21.30
White	341	39.93	40.60
Other	82	9.60	0.30
Grade			
6th	287	33.61	34.00
7th	286	33.49	33.40
8th	281	32.90	32.60
Total	854	100.00	100.00

2.2. Variables and measures

2.2.1. Expectancy-value motivation

Adolescents' expectancy beliefs and task values were measured using modified Expectancy-Value Questionnaire (EVQ; Eccles & Wigfield, 1995). EVQ is a 5-point Likert scale of 11 items. Five items were designed to measure expectancy beliefs and six items to measure task values. A sample item used to measure student attainment value reads: “How important do you think PE is for you?” In responding to EVQ, students were asked to choose only one of the five choices for each item (one “not important”, five “very important”). Xiang et al. (2004) reported that EVQ produced reliable data for elementary students with the Cronbach alpha coefficients ranging from

0.63 to 0.87. Using a confirmatory factor analysis, Zhu, Chen, Sun, and Ennis (2009) confirmed its construct validity using 903 middle-school students and found that the measurement model of EVQ was well preserved with a latent structural reliability coefficient Rho (ρ) = 0.906. As displayed in Table 2, the Cronbach's alpha values for EVQ ranged from 0.66 to 0.89 in this study.

Table 2. Descriptive statistics of variables.

Variable	**Cronbach's *α***	**Mean**	***SD***	**Skewness**	**Kurtosis**	***ES* (Cohen's *d*)**
Expectancy belief	0.85	4.08	0.65	− 0.95	1.45	–
Attainment value	0.66	3.57	0.93	− 0.56	0.06	–
Interest value	0.89	3.89	1.02	− 0.97	0.43	–
Utility value	0.83	3.76	0.98	− 0.89	0.51	–
Basketball dribbling achievement[a]	–	1.07	9.97	− 0.29	2.77	0.11
Badminton striking achievement[a]	–	8.01	10.45	0.00	0.99	0.87
Fitness knowledge gain[a]	–	4.51	18.62	0.13	0.30	0.27

Note. SD = standard deviation; *ES* = effect size.
[a] Gain score = post − pretest; the unit of analysis is individual student (n = 854).

2.2.2. Fitness knowledge

Knowledge about fitness and physical activity was measured using a set of questions based on standardized fitness knowledge tests developed and validated by Zhu, Safrit, and Cohen (1999). A core criterion for question selection was the consistency between the content specified in the curriculum and the questions that would appear in the test for each grade. The questions were validated with a sample of middle-school students using a known-group method in which the difficulty and discrimination indices were computed. The difficulty index between 40% and 60% and the discrimination index greater than 40% were used to determine the usability of each question. The questions that met the criteria were selected into a question bank. The knowledge tests for each grade included 10–13 multiple-choice questions selected from the bank. An example question for the seventh grade reads (Items are available upon request):

> Which of the following is the best example of muscular endurance?
>
> (a) Five arm curl reps with 20 lbs
> (b) Fifteen bench press reps with 75 lbs (* correct answer)
> (c) Ten sit-ups
> (d) A fifteen-second isometric contraction

2.2.3. Psychomotor skills

Badminton overhand striking and basketball dribbling were measured as assessment indicators of student psychomotor learning. These skills were tested because they emphasized fundamental skills such as striking, hand manipulation, and footwork coordination rather than sport competition (Schmidt & Wrisberg, 2008). Badminton overhand striking was assessed using a test developed by Lockhart and McPherson (1949). It was reported that the predictive validity (actual game performance) coefficients ranged from 0.71 to 0.90, and test–retest reliability was 0.90 (Lockhart & McPherson, 1949). Although the validation was conducted with college samples, it is deemed appropriate for both males and females as young as middle-school age (Strand & Wilson, 1993). The basketball dribbling test was developed by American Alliance of Health, Physical Education, and Dance [AAHPERD] (1984). The reported validity coefficients range from 0.67 to 0.91; and test–retest reliability coefficients were from 0.84 to 0.97. The original scoring methods for both tests were employed for scoring in this study.

2.3. Data collection

Physical education teachers administered the skill tests with assistance of trained data collectors. The researchers and trained data collectors administered and collected knowledge test and EVQ. Skill and knowledge tests were administered at the beginning of the school year as pretest and the end of the year as posttest. Students completed EVQ in their physical education classes during the early spring semester. The psychomotor skill tests, EVQ, and fitness knowledge tests were administered in the gymnasia or classrooms. When taking the knowledge tests and EVQ, students were instructed to sit apart and complete the tests/EVQ independently.

2.4. Data analysis

We first aggregated students' knowledge test scores from the pretest and posttest, then converted them into percentage-correct scores. Second, we standardized psychomotor skill test scores using *T* scores to ensure comparability. Third, students' achievement in psychomotor and knowledge learning was conceptualized and calculated as the change in their performance from pretest to posttest. Finally, expectancy beliefs and task values of physical education were calculated as the arithmetic mean of student rating on the items.

For statistical analysis, we first computed descriptive statistics to examine data distributions. Second, we tested the homogeneity of variance between the variables (e.g., Levene's Test) to determine the selection of further analysis. Subsequently, to answer research question (a), we conducted a multivariate analysis of variances (MANOVA) on students' ratings of expectancy belief and task values to test grade effect on these variables. Follow-up post-hoc tests (Tukey's HSD) were conducted to identify potential differences among three grades. In conducting MANOVA, we used class as the unit of analysis because the participants were in intact classes (Hopkins, 1982). To answer question (b), we used dependent-sample *t*-tests with class as the unit of analysis. To address question (c), we conducted a series of multiple regression analyses to determine the extent to which expectancy beliefs and task values predicted fitness knowledge and psychomotor skill achievements.

3. Results

Descriptive statistics, as reported in Table 2, show a mean of expectancy beliefs as 4.08 on a five-point scale. The means for the task values were all above 3.00. Adolescent badminton striking skill was significantly improved with an effect size of 0.87 (Cohen's *d*); so was their knowledge ($d = 0.27$). However, improvement in basketball dribbling was much smaller than badminton striking with $d = 0.11$.

Box's Test of equal covariance on expectancy beliefs and task values suggested that the equal covariance matrices was assumed (Box's $M = 36.91$, $F = 1.50$, $df = 20$, $p = 0.07$). As seen in Fig. 1, the MANOVA results on class means by grade level showed statistically significant grade-associated decline of scores on task values, attainment value ($F = 3.60$, $df = 2$, $\eta^2 = 0.18$, $p < 0.05$), intrinsic value ($F = 3.87$, $df = 2$, $\eta^2 = 0.20$, $p < 0.05$), and utility value ($F = 3.84$, $df = 2$, $\eta^2 = 0.19$, $p < 0.05$). The decline on expectancy beliefs, however, is not statistically significant ($F = 2.01$, $df = 2$, $\eta^2 = 0.11$, $p = 0.15$). The post-hoc tests (Tukey's HSD) revealed that 6th-grade students rated task values significantly higher than their 8th grade counterparts ($p < 0.05$). The differences in the ratings were not statistically significant between 6th and 7th, or 7th and 8th grades ($p > 0.05$). Results from cross-sectional multiple regression analyses on the expectancy-value motivation variables as displayed in Table 3, showed similar decline of motivation across the three grades (all standardized $\beta < 0$, $p < 0.01$).

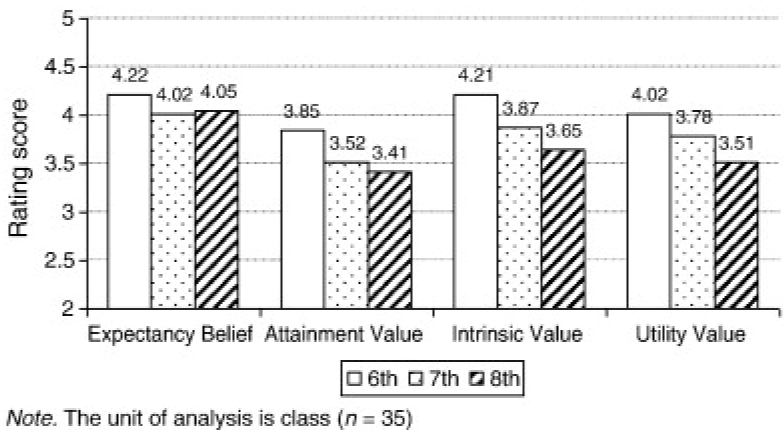


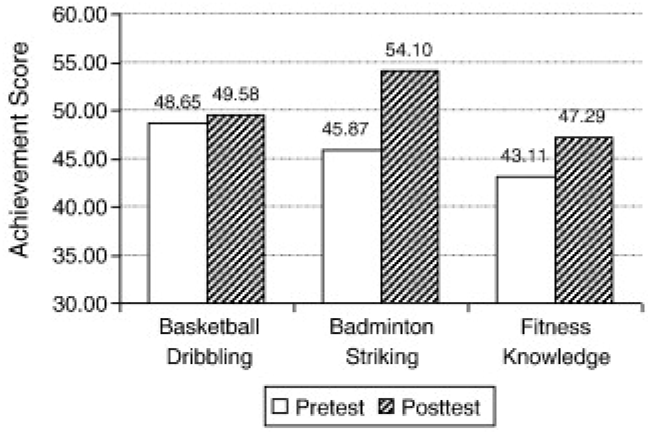
Fig. 1. Rating score of expectancy beliefs and task values by grade level.

Table 3. Cross-sectional multiple regression analysis results (independent variable: grade).

Dependent variable	R^2	**Std.** β	p
Expectancy beliefs	0.015	− 0.124	0.000
Attainment value	0.047	− 0.216	0.000
Intrinsic value	0.057	− 0.239	0.000
Utility value	0.056	− 0.236	0.000

Note. The unit of analysis is individual student ($n = 854$).

Adolescent achievement appears to vary among different content areas. As reported in Fig. 2, the dependent *t*-test suggested that students almost gained one standard deviation in the *T* score ($T_{gain} = 8.23$; $t = 6.50$, $df = 34$, $p < 0.01$; $d = 1.40$) in badminton, whereas they learned a little on basketball dribbling over the same period of time ($T_{gain} = 0.93$; $t = 0.93$, $df = 34$, $p = 0.36$; $d = 0.13$). Adolescents gained fitness knowledge about 4.18% in percent-correct rate ($Percent_{gain} = 4.18$; $t = 3.17$, $df = 34$, $p < 0.01$; $d = 0.58$).



Note. The unit of analysis is class (n = 35); the effect size (Cohen's d) equals .13 for basketball dribbling, 1.40 for badminton striking, and .58 for fitness knowledge at class level.

Fig. 2. Student performance on psychomotor skills and fitness knowledge tests at class level.

In the stepwise multiple regression analyses, achievements in badminton striking, basketball dribbling, and fitness knowledge were the dependent variables. The expectancy beliefs and task values were used as predictors. The results in Table 4 revealed that students' attainment value accounted for 2.4% of the variances in basketball dribbling achievement ($\beta = 0.154$, $p < 0.01$) and intrinsic value accounted for 0.6% in the badminton striking achievement ($\beta = 0.079$, $p < 0.05$), respectively. Neither expectancy beliefs nor task values were identified as predictors for the fitness knowledge achievement.

Table 4. Multiple regression analysis results.

Dependent variable	**Predictor**	**Std. β**	**R^2**	**p**
Badminton striking	Intrinsic value	0.08*	0.006	0.020
Basketball dribbling	Attainment value	0.15**	0.024	0.000
Fitness knowledge	None	–	–	–

Note. The unit of analysis is individual student (n = 854); $^{*}p < 0.05$, $^{**}p < 0.01$.

4. Discussion

4.1. The content specificity of student achievement

In this study, adolescents' performances in psychomotor skills and fitness knowledge improved over a year in various degrees. Specifically, based on Cohen's (1988) criteria, adolescents' achievement in badminton striking skill is large with $d = 0.87$ at individual level, and 1.40 at class level. Fitness knowledge gain is small with $d = 0.27$ at individual level, but medium ($d = 0.58$) at class level. According to Tallmadge (1977), a common guideline for gauging achievement effects in education is an effect size equal to, or greater than 0.25. The effect size at, or over this level can been defined as “educationally significant (p. 34).” Consequently, we considered that adolescents' achievements in badminton striking skill and fitness knowledge are educationally meaningful.

In contrast to their achievements in badminton striking, adolescents' achievement in basketball dribbling appeared to be minimal with an effect size of 0.11 at individual level, and 0.13 at class level. These effect sizes are even smaller than the small effect size threshold 0.20 based on Cohen's (1988) criteria, suggesting that the difference observed may lack educational significance. The achievement difference between students' badminton striking and basketball dribbling pointed to a possibility of content specificity in learning. Chen et al. (2008) reported content specificity of student expectancy-value motivation in physical education, and argued that it resulted from student responses to the content (Bong, 2001). It seems that the data from this study echo Chen et al.'s observation that students might have learned at different paces in team-sport oriented content and in individual sport content.

4.2. Predictability to achievement in psychomotor skills and fitness knowledge

Different from previous studies (Xiang et al., 2004, Xiang et al., 2006, Zhu et al., 2008) where the dependant variables were performance (i.e., one-time measure), this study used achievement (i.e., performance improvement in a pre–posttest context) as dependent variables. Using achievement in educational research is pedagogically meaningful in that learning in the school context emphasizes performance improvement other than performance itself (Alexander, Schaller, & Reynolds, 2008). In this study, attainment value explained 2.4% of variance in basketball dribbling and intrinsic value explained 0.6% of badminton striking improvement. Expectancy beliefs were not identified as significant predictors for adolescent psychomotor achievement. The results suggest that expectancy-value motivation might directly predict students' performance (Xiang et al., 2004, Zhu et al., 2008), but not achievement.

In this study, expectancy-value motivation was not identified as a significant predictor for knowledge gain. Zhu, Chen, Ennis, et al. (2009) reported that interest-based motivation did not significantly predict students' knowledge gain within a curriculum context where conceptual knowledge was primary content being emphasized. Although the curriculum contexts differ between these two studies, the collective evidence seems to point to a tentative conclusion that achievement motivation has a very low predictability for student knowledge gain in physical education. The low predictability might result from multiple sources. A plausible possibility could be that student perceived the expectancy beliefs and task values primarily from physical activity participation, not from learning fitness knowledge (Zhu et al., 2009). Therefore, expectancy-value motivation was not predictive for knowledge achievement in physical education. Future curricula should, as proposed by scholars (e.g., Chen et al., 2008, Corbin, 2002), integrate motivation into the content to focus on achieving tangible, competence-based learning goals.

4.3. A decline trend of task values

Adolescent expectancy beliefs did not vary significantly among the three grades in middle schools; however, eighth graders' task values were significantly lower than sixth graders'. In general, adolescent task values have a decline trend during middle school years (Fig. 1). This finding is consistent with that reported in a 12-year longitudinal study (Jacobs et al., 2002), and that reported by Xiang et al. (2006) about student task values of a running program. The results of this study, in which multiple psychomotor skills and fitness concepts were emphasized, added further evidence on the declining trend of student task values.

As Wigfield and Eccles (2000) described in the expectancy-value theory, it is very difficult for students to value the content without deeply learning it. Hence to foster students' task values, it is important to deepen their learning of the skills and knowledge through curricula that provide such learning opportunities (Lund & Tannehill, 2010), so that the values in physical education will be appreciated and internalized as meaningful and valuable.

4.4. Limitations

This study provided a preliminary picture of adolescents' expectancy beliefs and task values of physical education and their relations to learning achievement, yet two limitations should be considered for findings interpretation. Although a large representative sample was involved, the study is correlational in nature, not indicating a causal relation between adolescent motivation and achievement. In addition, the declining trend of task values was identified with cross-sectional data. Future studies should use longitudinal design to examine the motivation changes across middle-school years.

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