

Structural and convergent validity of the homework performance questionnaire

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Homework is a requirement for most school-age children, but research on the benefits and drawbacks of homework is limited by lack of psychometrically sound measurement of homework performance. This study examined the structural and convergent validity of scores from the newly developed Homework Performance Questionnaire – Teacher Scale (HPQ-T). Participants were 112 teachers of 224 students in six Illinois school districts. Common factor analysis with principal axis extraction and promax rotation was used for data analysis. Results revealed three salient factors: Parent support, student competence and homework completion. Subsequently, convergent validity of HPQ-T subscale scores with subscale scores from the Learning Behaviours Scale was examined. Findings suggest that the HPQ-T may potentially be a useful tool for improving research on homework and identifying strengths and weaknesses in student homework performance. However, modifications are recommended to optimise the utility of the scores.

Keywords: homework; factor analysis; academic achievement

As in many other countries, homework is an integral component of American education. Defined as ‘tasks assigned to students by school teachers that are meant to be carried out during non-school hours’ (Cooper, 1989), homework has become a duty of childhood. Over two-thirds of 9-year-olds and three-fourths of 13- to 17-year-olds complete homework daily (Cooper, Robinson, & Patall, 2006). Though pervasive, homework is controversial, and the debate over the value of homework has been prominent in the media (Wallis, 2006). The Homework Performance Questionnaire (HPQ; Power, Dombrowski, Watkins, Mautone, & Eagle, 2007) is a measure of homework performance, which was designed for use in research on homework and homework interventions. The purpose of the present study was to evaluate the psychometric properties of scores from the teacher version of the HPQ (HPQ-T).

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The homework debate

For proponents, the notion that homework results in immediate, long-term improvements in student achievement serves as the rationale for assigning it, and empirical studies have supported this view. Cooper et al. (2006) conducted a comprehensive meta-analysis synthesising the relevant findings of 32 studies completed between 1984 and 2004 and identified a positive relationship between time spent on homework and academic achievement in middle and high school students ($R = .20$). However, no significant relationship was identified at the elementary level ($R = .05$).

Further, homework supporters contend that homework has many benefits that have not yet been empirically studied. Some advocates propose that homework may produce long-term benefits by fostering the development of behaviours conducive to learning (Bryan, Burstein, & Bryan, 2001) such as improved study habits and skills (Xu, 2007). Proponents also posit that homework provides advantages in non-academic domains by facilitating the development of self-direction, self-discipline, time management skills and inquisitiveness (Cooper et al., 2006; Hoover-Dempsey et al., 2001; Muhlenbruck, Cooper, Nye & Lindsay, 2000). Finally, supporters suggest that homework may benefit families in many ways, such as increasing parental involvement in their children's education and helping them to understand the connection between home and school (Epstein & Van Voorhis, 2001).

Conversely, opponents of homework argue that its consequences outweigh potential benefits, and that it should be limited or abolished. Kralovec and Buell (2000) suggest that homework might incite family conflict and detract from important family time. Critics also contend that homework contributes to the achievement gap between students of high and low socio-economic statuses (Kohn, 2006; Kralovec & Buell, 2000).

A major criticism of homework is that a dearth of research exists on its effects. Kohn (2006) asserted that, at best, researchers could claim that homework *might* improve student achievement, but this alone is an insufficient reason to assign it. He criticised Cooper's research on homework, claiming that although some studies identified a correlation between time spent on homework and academic achievement, a causal relationship has yet to be established. Kohn concluded that in the absence of a consistently used measure of homework that produces reliable and valid scores, research evaluating the potential merit of homework is limited (Kohn, 2006).

Measurement of homework

As recognised by Kohn (2006), research on homework has been limited by the lack of measurement tools that produce reliable and valid results. Research results have been disparate, and many questions have been left unanswered. Discussing the importance of measurement in science, Edwards and Bagozzi (2000) noted that:

Presentations of theories often place great emphasis on explaining causal relationships among constructs but devote little attention to the nature and direction of relationships between constructs and measures. These relationships are of paramount importance because they constitute an auxiliary theory that bridges the gap between abstract theoretical constructs and measurable empirical phenomena. Without this auxiliary theory, the mapping of theoretical constructs onto empirical phenomena is ambiguous, and theories cannot be meaningfully tested. (p. 155)

The ambiguity concerning the value of homework and its relationship to other variables (i.e. academic achievement) might be mitigated by research conducted using an instrument capable of producing reliable and valid scores.

Two available measures of homework behaviours are the Homework Management Scale (HMS; Xu, 2007) and the Homework Problem Checklist (HPC; Anesko, Schoiock, Ramirez, & Levine, 1987). The HMS is a 23-item, student self-report measure, which is designed to tap the extent to which students engage in behaviours necessary for managing homework. The HMS is designed to assess homework management in respect to five domains: arranging environment, managing time, handling distraction, monitoring motivation, and controlling emotion. A benefit of the HMS is that it measures homework strengths and deficits relative to specific behaviours, which can be easily linked to interventions. However, the scale only measures behaviours that occur during homework completion and does not consider antecedent factors (e.g. student competence and ability to complete assignments), which may contribute to homework completion and accuracy (Sheridan, 2009). Additionally, the HMS examines homework management solely from the student's perspective. Although self-report measures can be valuable, parents and teachers provide crucial insights into homework performance (Power et al., 2007).

Alternatively, the HPC is a parental questionnaire that examines the extent to which children experience homework difficulties. It consists of 20 statements about problems students experience related to homework. Parents indicate the frequency at each problem behaviour occurs with their child. Power, Werba, Watkins, Angelucci and Eiraldi (2006) conducted a factor analysis of the HPC and discovered that the scale measured two factors: inattention/work avoidance and poor productivity/non-adherence with homework rules.

Although the HPC has been applied in homework research with regular and special education populations (Epstein, Polloway, Foley, & Patton, 1993; Power et al., 2006; Soderlund & Bursuck, 1995), it has several critical limitations. First, the items on the HPC have a deficit orientation and emphasise only negative homework behaviours, thus providing a narrow frame of reference for interpretation and intervention. Second, a study by Power et al. (2006) determined that many HPC items are correlated with symptoms of attention deficit hyperactivity disorder (ADHD). Ideally, an instrument designed to assess homework problems should distinguish homework difficulties from ADHD symptoms. Third, although homework problems can be identified in home and school settings, the HPC assesses homework problems solely from a parental perspective and does not account for teacher perspectives on homework problems.

The homework performance questionnaire

The HPQ (see Power et al., 2007 for detailed information about scale development) is a homework assessment instrument that was developed to mitigate the limitations of other instruments. The HPQ includes items designed to tap both homework assets and deficits. In other words, the scale examines behaviours that facilitate homework performance, as well as those that are detrimental. Additionally, the HPQ includes measures of antecedent factors (i.e. student competence), which influence homework behaviour and can inform intervention. Furthermore, the HPQ excludes items that clearly overlap with symptoms of ADHD listed in the *Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition, Text*

Revision (DSM-IV TR); (American Psychiatric Association, 2000). Excluding such items might enhance the utility of the HPQ in evaluating the effectiveness of interventions for children with ADHD because it may allow researchers to better differentiate ADHD symptoms (distractibility) from associated outcomes (e.g. poor quality homework or failure to complete homework). Finally, the HPQ includes teacher and parent versions to allow users to gather information from informants in the home and school settings. Because teachers assign, collect, and check homework, it is logical to assume that they could provide important and unique information regarding homework performance, which could, in turn, be used to inform homework interventions.

As a first step towards selecting interventions for school-based problems, one must determine whether the problem is the result of a skill deficit or a performance deficit (Hosp & Ardoine, 2008). Accordingly, pilot studies of the HPQ-T were conducted and two factors were identified: student competence (Can the student complete homework?) and student responsibility (Will the student complete homework? see Power et al., 2007 for a full review). Items on the student competence factor are intended to evaluate a student's ability to complete assigned homework (e.g. 'Student understands assignments' and 'Homework is difficult for this student'). In other words, the student competence factor is designed to assess whether the difficulty level of typical homework assignments is commensurate with the student's academic skill level (i.e. instructional match). Items on the student responsibility factor are designed to tap the extent to which the student engages in behaviours that are conducive to successful homework performance (e.g. 'Homework assignments are turned in by the deadline' and 'Student organises homework materials effectively').

Early versions of the HPQ-T were comprised of only homework competence and homework responsibility factors. However, pilot studies of the HPQ-T resulted in major revisions to the instrument. Most notably, several items were added that were designed to measure a third factor related to teacher perceptions of parent support during homework. Findings from a recent meta-analysis indicated that parent involvement in homework is related to student achievement and that interventions targeting parent involvement improve homework outcomes for elementary but not middle school students (Patall, Cooper, & Robinson, 2008). Thus, the inclusion of a parent support factor on the HPQ-T could potentially improve the scale's utility for homework interventions and, if deemed valid for elementary and middle school students, scores from the scale might be used in research aimed at understanding the changing role of parent involvement in homework during the middle school years.

Though potentially informative, the addition of items designed to measure parent involvement presents an obstacle in the clinical use of the HPQ-T because the structural validity of scores from the revised HPQ-T is unknown. When tests are revised, research is needed to examine structural equivalence and to understand potential fluctuations in scores (Strauss, Spreen, & Hunter, 2000). Additionally, pilot studies of the HPQ-T were conducted exclusively in urban school districts in the north eastern region of the country and included predominantly Caucasian and African-American students. When discussing the limitations of the HPQ-T, Power et al. noted:

In future research, it will be important to include schools throughout the country that are representative of the diverse ethnic, racial and socioeconomic groupings that comprise the United States. The sample size of this study is relatively small and the external validity of the rating scales has not yet been established. Because additional

research is needed to determine the validity of the measures and to establish normative parameters, the scales are not yet recommended for clinical use. (p. 345)

Because validity is a property of scores from a specific sample rather than from the test itself, replication of validation results in new samples is vital to scientific progress (Thompson & Daniel, 1996). As noted by Howell and Nolet (2000), 'conclusions about reliability and validity cannot be safely generalised (applied) to populations that differ along important variables from those populations used in the validation studies' (p. 111). Therefore, the primary objective of the present study was to examine the structural validity of this revised version of the HPQ-T with a different population. Specifically, this study examined the validity of HPQ-T scores with predominantly Caucasian and Latino elementary and middle school students from rural and suburban school districts in the Midwestern region of the United States. Additionally, convergent validity with scores from the Learning Behaviours Scale (LBS; McDermott, Green, Francis, & Stott, 1999) was examined.

Methods

Participants

Participants in this study were 112 teachers from six Illinois school districts located in rural and suburban regions of the state. Each teacher rated the homework performance of two students, yielding a total of 224 students in grades from 1 to 8. The student sample included 102 girls (46%) and 117 boys (53%), and the sex of one student was not reported. The majority (95%) of teacher respondents were female. The racial composition of the students was 60% Caucasian, 12% African-American, 28% Latino and less than 1% Asian and multi-racial. In regard to grade level, 32% of the students were in first or second grade, 27% of the students were in third or fourth grade, 16% were in fifth or sixth grade and 25% were in seventh or eighth grade. Finally, 78% of the students were exclusively in regular education classes, while 22% were enrolled in special education. Teachers from three schools ($n=81$ teachers of 162 students) completed the LBS (McDermott et al., 1999) in addition to the HPQ-T for examination of convergent validity. The demographic makeup of the convergent validity subsample was nearly identical to that of the larger sample.

Instruments

Learning behaviours scale

The LBS is a 29-item, nationally normed, teacher rating scale that is designed to assess the extent to which children engage in classroom behaviours conducive to learning (McDermott et al., 1999). Each item on the LBS describes specific learning-related behaviours (e.g. 'Is willing to be helped when a task proves too difficult', and 'Follows peculiar and inflexible procedures in tackling tasks'), and teachers are asked to indicate whether a behaviour *most often applies*, *sometimes applies*, or *does not apply* in regard to a particular child. The LBS includes four factors: competence/motivation, attitude toward learning, attention/persistence, and strategy/flexibility, and two independent studies have supported the four factors structures (Canivez & Beran, 2011; Canivez, Willenborg & Kearney, 2006). Findings from several other published studies have supported the validity of the LBS (see Buchanan, McDermott, & Schaefer, 1998, for a review).

HPQ: teacher scale

The HPQ-T is comprised of 33 items. The first eight items pertain to the teacher's general views, policies, and procedures regarding homework. These items do not directly relate to the student being assessed and were therefore not included in factor analyses of the scale. For the next 25 items, the teacher is asked to estimate the percentage of time a particular behaviour or performance has occurred in the past four weeks. Percentages are divided into ten equal intervals, and the teacher is instructed to select one.

The HPQ-T was designed to assess factors related to teacher's perceptions of student homework performance. The factor structure of HPQ-T scores was based on data from two pilot studies of a preliminary version of the HPQ-T with 259 primarily Caucasian and African-American students in grades 1 to 8 from urban school districts in the north east region of the country. A common factor analysis of this HPQ teacher version yielded student responsibility and student competence factors (Power et al., 2007). The student responsibility factor described student productivity and compliance with homework rules. Eight items loaded saliently on this factor, but only seven were retained. The internal consistency of scores for this factor was .88. The student competence factor referred to the degree of match between difficulty of homework and the student's ability to complete homework tasks (Power et al., 2007). Six items were loaded saliently on this factor, and the internal consistency of scores was .90.

However, pilot analyses led to modification of the HPQ-T. One particularly salient new feature was the addition of 8 items designed to measure teacher perceptions of parent support during homework. Three items from the previous scale (Power et al., 2007) were deleted because they did not strongly contribute to their hypothesised factor, and 6 items were generated in an attempt to strengthen the previously identified factors. Four of the items retained from the previous scale were reworded for clarity. Retained, revised, and new items are identified in Table 2. A final major modification was expansion of the response scale from the previous five response options to the current 10 response options.

Procedure

The present study was approved by the Institutional Review Board at the Pennsylvania State University as well as school district administrators. All classroom teachers received a letter in their school mailbox inviting them to participate in the study. Participating teachers were then asked to complete the HPQ-T for the third boy and the third girl on their alphabetised class roster. Teachers from three of the six participating schools ($n=82$) also completed the LBS for both identified children. Data from any teacher who indicated that they did not assign homework were excluded. No information that could be used to identify students or teachers was included on the forms.

Data analyses

Factor analyses

Exploratory factor analysis (EFA) was selected over confirmatory factor analysis (CFA) because the HPQ-T is a new instrument, and the theory behind its factor structure is just beginning to emerge. EFA should be utilised for theory

development, while CFA is more suitable for assessing existing theories (Keith, 2005). Prior to beginning analysis, a series of tests were conducted to determine whether factor analysis was appropriate for these data. Bartlett's Test of Sphericity (Bartlett, 1950) was used to ensure that the correlation matrix was not random. Additionally, the Kaiser–Meyer–Olkin statistic was required to be above .6, a minimum standard for conducting a factor analysis (Kaiser, 1974). After determining that the correlation matrix was factorable, it was submitted for factor analysis. Common factor analysis was selected instead of principal components analysis because the purpose of this study was to identify the latent factor structure of the HPQ-T (Fabrigar, Wegener, MacCullum, & Strahan, 1999). The principal axis method was utilised for extraction due to its ability to recover weak factors and its relative tolerance of multivariate non-normality (Briggs & MacCallum, 2003; Curran, West, & Finch, 1996). Communalities were initially estimated with squared multiple correlations (Gorsuch, 2003). Several procedures were used to determine the number of factors to retain for rotation, including: parallel analysis (Horn, 1965; Watkins, 2006), minimum average partials (MAP; Velicer, 1976) and the visual scree test (Cattell, 1966). Interpretability and parsimony were also considered. Because it was assumed that the factors would be correlated, Promax rotation with a k value of four was utilised (Gorsuch, 1997; Tataryn, Wood, & Gorsuch, 1999).

A priori criteria were established for determining salience and factor adequacy. Factor pattern coefficients $\geq .40$ in absolute magnitude were determined to be salient for the purposes of interpretation (Stevens, 2009). To honour simple structure, complex loadings that were salient on more than one factor were rejected (Thurstone, 1947). Factors with a minimum of four salient pattern coefficients, internal consistency of scores $\geq .70$, and interpretability were considered adequate.

Correlation analyses

The convergent validity of HPQ-T scores with LBS scores was also evaluated. Convergence of scores from each of the three HPQ-T subscales was compared with LBS subscale scores. Pearson product-moment correlation coefficients were calculated to provide indices of convergent validity. LBS scores reflect classroom behaviours that are conducive to learning. Consequently, HPQ-T scales were expected to be positively related to LBS scores because they are intended to reflect behaviours conducive to learning.

Results

Preliminary analyses

Some respondents failed to complete all HPQ-T items. Specifically, 10% of respondents had four or more missing data points. Missing data were particularly problematic for items on which teachers were asked to make inferences about parental attitudes and behaviours. Although missing data appeared to be systematic based on item, the presence or absence of missing data did not seem to be related to the latent construct or participant characteristics. Therefore, the data were considered missing at random, and missing values were imputed via regression with the addition of random error using the SPSS missing values routines. Two analyses were conducted (with and without missing data). Each analysis supported a similar factor structure and yielded comparable pattern coefficients. Therefore, the analysis that

Table 1. Descriptive statistics of items on the HPQ-T ($N=224$).

Item	<i>M</i>	SD	Skewness	Kurtosis
Homework is finished	8.05	1.61	-2.47	7.47
Student can do homework independently	7.86	1.82	-2.48	7.10
Parents understand teachers' challenges	7.40	2.49	-1.75	2.13
Homework is turned in by deadline	7.95	1.69	-2.23	5.50
Parents communicate effectively	7.35	2.98	-1.71	1.38
Student manages homework time well	7.22	2.44	-1.51	1.27
Parents will work with me	7.55	2.71	-1.86	2.14
Forms are signed promptly	7.62	2.43	-1.90	2.54
Homework is easy for student	7.54	2.03	-2.01	4.01
Parents disagree with homework policies	8.09	2.49	-2.71	5.81
Homework is messy	6.17	3.51	-.72	-1.23
Student understands assignments	8.33	1.12	-2.60	8.64
Parents and I have similar expectations	7.76	2.29	-2.08	3.40
Student organises homework materials well	6.96	2.96	-1.37	.44
Student needs assistance with homework	5.75	3.63	-.54	-1.49
Parents supervise homework	7.46	2.70	-1.81	1.98
Student knows what to do for homework	8.48	1.00	-2.86	10.79
Homework assignments are accurate	7.58	1.90	-2.07	4.45
Parents criticise my homework approach	7.18	3.41	-1.53	.47
Student tries to do homework	7.94	1.95	-2.33	5.46
Homework is difficult for student	7.33	2.76	-1.58	1.05
Parents try to assist with homework	7.25	2.87	-1.59	1.10
Percentage of homework understood in class	7.92	1.75	-3.00	10.06
Percentage of homework finished	8.20	1.49	-2.86	9.48
Percentage of homework child can do independently	7.41	2.12	-2.06	4.05

was conducted with inputted missing data were described. After missing data were inputted, a Mahalanobis distance test was conducted to identify significant outliers. Four outlying cases were detected and deleted listwise. Item-level descriptive statistics are reported in Table 1.

Factor analyses

Bartlett's test of sphericity was statistically significant, and the Kaiser–Meyer–Olkin statistic was .91, well above the minimum standard (Kaiser, 1974). Therefore, it was determined that the correlation matrix was appropriate for factor analysis. Parallel analysis indicated that a three factor solution should be retained, while MAP suggested a five-factor solution and examination of the visual scree plot suggested retention of either two or three factors. Because the recommended number of factors varied, four solutions were examined sequentially, starting with the five-factor solution and ending with a two-factor solution. The five- and four-factor solutions were discarded as neither met criteria for factor adequacy (i.e. the solutions had one or more factors containing only two-items with salient pattern coefficients). In contrast, the two- and three-factor solutions met a priori criteria for factor adequacy. The three-factor solution was retained instead of the two-factor solution because the three-factor solution had higher pattern and structure coefficients, produced higher factor reliability estimates and was more theoretically meaningful. Also, research suggests that over-factoring is preferable to under-factoring (Fabrigar et al., 1999).

Table 2. Three and two factor HPQ-T solutions from principal axis extraction and promax rotation ($N=224$) with factor pattern (structure) coefficients.

Items	Three-factor solution			Two-factor solution			h^2
	Factor I Parent support	Factor II Student competence	Factor III Homework completion	Factor I Homework completion	Factor II Homework completion	Factor I Factor II	
Homework is finished ^P	-.04 (.61)	-.07 (.41)	.98 (.94)	.78 (.81)	.06 (.47)	.92	
Student can do assignments independently ^P	.09 (.47)	.86 (.90)	.01 (.46)	.05 (.51)	.87 (.90)	.81	
Parents understand teachers challenges ^N	.82 (.79)	.09 (.41)	-.11 (.49)	.68 (.71)	.05 (.40)	.65	
Homework is turned in by deadline ^N	.08 (.68)	-.06 (.40)	.92 (.95)	.85 (.86)	.01 (.45)	.92	
Parents communicate effectively with teacher ^N	.99 (.89)	.03 (.39)	-.20 (.50)	.77 (.76)	-.01 (.39)	.85	
Student manages homework time well ^R	.33 (.70)	.48 (.73)	.23 (.67)	.50 (.75)	.49 (.74)	.78	
Parents will work with me ^N	.99 (.90)	.01 (.38)	-.21 (.50)	.78 (.77)	-.03 (.38)	.86	
Forms are signed promptly ^N	.54 (.74)	-.03 (.35)	.31 (.66)	.79 (.78)	-.03 (.38)	.64	
Homework is easy for student ^P	.16 (.46)	.80 (.84)	-.07 (.40)	.05 (.47)	.80 (.83)	.70	
Parents disagree with homework policies ^N	-.12 (.16)	.08 (.19)	.37 (.32)	.20 (.25)	.11 (.21)	.38	
Homework is messy ^N	-.07 (.29)	.38 (.47)	.28 (.41)	.16 (.37)	.40 (.49)	.39	
Student understands assignments ^N	-.14 (.23)	.67 (.66)	.10 (.31)	-.08 (.29)	.70 (.66)	.65	
Parents and I have similar expectations ^N	.74 (.82)	-.15 (.23)	.22 (.70)	.90 (.81)	-.18 (.47)	.74	
Student organises homework materials well ^R	-.06 (.32)	.40 (.51)	.30 (.44)	.18 (.40)	.43 (.53)	.50	
Student needs assistance with homework ^N	-.01 (.19)	.63 (.57)	-.13 (.15)	-.15 (.18)	.64 (.56)	.46	
Parents supervise homework ^N	.66 (.81)	-.16 (.28)	.33 (.70)	.93 (.84)	-.18 (.30)	.83	
Student knows what to do for homework ^R	-.25 (.18)	.55 (.56)	.28 (.36)	-.03 (.28)	.59 (.57)	.64	
Homework assignments are accurate ^R	-.18 (.66)	.32 (.63)	.50 (.77)	.59 (.77)	.35 (.66)	.79	
Parents criticise my homework approach ^N	-.11 (-.02)	.21 (.16)	-.01 (.02)	-.12 (-.01)	.22 (.16)	.12	
Student tries to do homework ^N	-.16 (.61)	.12 (.45)	.58 (.74)	.65 (.73)	.15 (.49)	.74	
Homework is difficult for student ^N	-.05 (.17)	.59 (.56)	-.06 (.36)	-.12 (.19)	.60 (.53)	.45	
Parents try to assist with homework ^N	.69 (.80)	-.19 (.25)	.30 (.67)	.93 (.73)	-.21 (.45)	.82	
Percentage of homework understood in class ^P	.13 (.36)	.64 (.66)	-.08 (.30)	.03 (.36)	.64 (.65)	.52	
Percentage of homework finished ^P	.05 (.64)	-.11 (.34)	.95 (.93)	.84 (.82)	-.04 (.34)	.90	
Percentage of homework can do independently ^P	.01 (.35)	.79 (.79)	-.01 (.67)	.05 (.36)	.87 (.65)	.70	
Eigenvalue	10.53	3.33	1.65	10.53	3.33		
Percent of variance	42.12	13.31	6.60	42.12	13.31		
Cronbach's α	.94	.86	.94	.94	.84		

Note: Salient pattern coefficients are presented in bold. Items retained from the HPQ-T pilot version (Power et al., 2007) are indicated with^P, new items are indicated with^N, and revised items are indicated with^R.

On the three-factor solution, 7 items were salient on Factor I with an internal consistency of .94. These items seemed to measure a parent support dimension, and the factor was named accordingly. Ten items were salient on Factor II, which was named student competence, with an internal consistency of .86. Five items met saliency criteria on the third factor ($\alpha = .94$), which was named homework completion. The homework completion factor was similar to the student responsibility factor identified in the scale development research but appeared to measure a narrower range of behaviours (i.e. only those related to homework completion). Three items were not effective because pattern coefficients failed to reach the threshold for saliency on any factor. Pattern and structure coefficients are reported in Table 2. Notably, items without salient loadings were deleted, and analyses of each structure were re-run. No meaningful changes in structure were evident; thus, findings from analyses with all items included are reported. In regard to factor inter-correlations, for factors I and II, $r = .44$, for factors II and III, $r = .45$ and for factors I and III, $r = .67$.

Correlation analyses

Pearson product-moment correlations between raw scores from the three HPQ-T and four LBS subscales, as well as descriptive statistics, are presented in Table 3. Convergent validity was supported by the significant correlations between all HPQ-T and LBS subscales. Most notably, the HPQ-T student competence subscale had significant and moderate correlations ($r = .61$; $p < .001$) with the LBS competence motivation and attention persistence subscales. Also, both the parent support and the homework completion subscales of the HPQ-T were moderately and significantly correlated with the attitude toward learning subscale of the LBS ($r = .50$ and $.65$, respectively, $p < .001$).

Discussion

The findings of this study supported a three-factor structure of the HPQ-T, which includes student competence, homework completion, and parent support factors. The items on the student competence factor loaded as expected based on findings from the Power et al. (2007) study. The student competence factor was predominantly composed of items that reflect the degree of match between student

Table 3. Descriptive statistics and Pearson product-moment correlations between the HPQ raw scores and the learning behaviors scale raw scores ($N = 162$).

LBS	<i>M</i>	SD	HPQ			
			Parent support	Student competence	Homework completion	HPQ total
CM	11.41	14.68	.28	.61	.53	.55
AL	13.94	14.98	.50	.56	.65	.67
AP	9.81	14.87	.36	.61	.57	.60
SF	10.99	14.66	.30	.42	.36	.43
Total	37.16	15.92	.40	.62	.60	.64
			<i>M</i>	50.44	71.77	38.23
			SD	17.88	14.81	9.79
						160.43
						35.02

Note: LBS = Learning Behaviors Scale, CM = Competence Motivation, AL = Attitude toward Learning, AP = Attention/Persistence, SF = Strategy/Flexibility. All correlations statistically significant ($p < .001$).

ability and homework difficulty and was robustly related to the LBS. Research suggests that high-ability students successfully complete more homework than low-ability students (Epstein & Van Voorhis, 2001). Additionally, Keith and Keith (2006) suggested that students in special education have more difficulty completing homework assignments, spend less time on homework and produce lower quality homework than students who are not in special education. These difficulties may be partially due to homework assignments that are too difficult for low-ability students. Scores on this factor may be useful in identifying important antecedent factors (i.e. task difficulty) related to poor homework performance.

The homework completion factor was also robustly related to the LBS and resembled the student responsibility factor derived by Power et al., but the homework completion factor appeared to measure a narrower dimension than the previously identified factor. In the present analysis, items related to completion of homework (e.g. 'Homework is finished' and 'Homework is turned in by deadline') loaded on the intended factor, while other items presumably related to student responsibility or homework completion (e.g. 'Student manages homework time well' and 'Student organises homework materials well') loaded on the student competence factor. Additionally, one item ('Homework is accurate') that loaded on the student competence factor in the development research loaded on the homework completion factor in this analysis. Thus, it seems that, in this sample, teachers did not differentiate student ability from student behaviour in regard to time management skills, organisation and accuracy of work. Nonetheless, scores on the homework completion factor may be useful for informing interventions targeting homework completion or evaluating impairment associated with conditions such as ADHD.

The newly added items related to parent support appeared to be largely effective in this study with most loading on the intended factor, and the factor scores yielded lower albeit significant correlations with LBS subscales. However, items included on the parent support factor were more likely than other items to be left blank. Also, several teachers provided written notes in the margins and made verbal comments to research assistants suggesting that they felt uncomfortable making inferences about parental beliefs and behaviours. Therefore, although scores on this factor appear to be valid from a factor-analytic and convergence perspective, their clinical utility is presently unclear.

Limitations and future directions

The external validity of this study may be limited due to a small, homogenous sample. Although the sample was relatively diverse with regard to racial grouping, it consisted of only suburban and rural Illinois school districts. Students attending schools in urban areas were not represented in this sample. Additionally, small sample sizes can lead to imprecise statistics in studies using EFA. Thus, it is recommended that future research to be conducted with larger samples that are representative of the population of the United States.

This study examined homework exclusively from the teacher perspective. Because homework is typically completed in the home, parents are likely to be able to provide a unique perspective about homework difficulties. It would be beneficial for future research to examine the HPQ-T in conjunction with the Homework Performance Questionnaire – Parent Scale to assess homework performance from a broader, more comprehensive perspective.

Additionally, the sample in this study included elementary and middle school students. Findings from recent meta-analyses indicate that important changes in the effectiveness of homework and parent involvement therein occur between elementary and middle school. The validation of HPQ scores with both elementary and middle school students could provide researchers with a useful tool for evaluating changes in homework performance between elementary and middle school and creating developmentally appropriate interventions. However, additional research examining the structural invariance of the scores across levels of development is warranted.

Missing data on items that required teachers to provide their perceptions of parental views and practices related to homework constituted a third limitation of this study. In addition to omitting responses, teachers frequently wrote comments in the margin indicating that they did not know the information or did not feel comfortable providing it. Because missing data can be highly problematic in research and asking teachers to respond to questions that they may not have adequate knowledge to answer may pose a threat to the accuracy of the information gathered, researchers should consider revising or deleting these items if such missing data occurs in research conducted with a larger sample. If these items are revised, it may be beneficial to ask the teacher to provide information about overt parent behaviours rather than to make inferences about parent beliefs.

Finally, three items on this scale may warrant revision due to insufficient loadings on all factors. Of these three items, two may need to be revised or deleted because teachers are asked to provide information that they may be uncomfortable discussing (i.e. whether parents are critical of or disagree with homework policies). In regard to the third unloaded item ('messy homework'), it is possible that this item may simply have relatively little to do with student competence, parent support, or homework completion. Conversely, three other items appeared to relate to multiple factors and did not load on the intended factor. Revisions targeting unidimensionality of these items may be beneficial.

Conclusions

In conclusion, these findings generally support a three-factor structure for the HPQ-T. However, the homework completion (previously student responsibility) factor tapped a narrower dimension than was true in the development research (Power et al., 2007). Additionally, items on the parent support factor were effective but not well received by teachers. The results of this study suggested that modifications to the HPQ-T may be necessary, but additional research with larger sample sizes is recommended to confirm this conclusion. Moreover, the objective of this study was to study only two forms of validity evidence – internal structure and convergent validity. Nonetheless, multiple forms of validity evidence are necessary before clinical use of a scale is appropriate (Sattler, 2001); thus, future research examining other forms of validity evidence in relation to the HPQ would be beneficial.

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