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DEVELOPMENT OF AN ELECTRONIC VERSION OF THE HOMEWORK PERFORMANCE QUESTIONNAIRE FOR PARENTS

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ABSTRACT

Homework is a standard, yet controversial, component of the American educational system. Unfortunately, research on parent pereeptions of the efficacy of homework has been limited by a lack of reliable, valid measurement. The present study assessed the structural validity of an electronie version of a newly developed homework performance scale. Partieipants were 126 parents of students in a rural Illinois school district. A common factor analysis with principal axis extraction and promax rotation was employed. Three salient factors resulted: Student Task Engagement/Efficiency; Student Competence; and Teacher Support. These results indicate that scores on the electronic Homework Performance Questionnaire–Parent Scale (HPQ-PE) have a factor structure similar to the factor structure found previously with the paper-and-pencil version. Given these results, the HPQ-PE has the potential to become a useful tool for improving research on homework and informing the development of homework policies.

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Homework is a standard, commonly accepted component of the American child's academic experience. More than two-thirds of 9-year-olds and three-fourths of 13- to 17-year-olds complete homework regularly (Cooper, Robinson, & Patall, 2006). Despite its ubiquity, homework has been highly controversial. While many researchers, parents, and educators strongly support the use of homework as a pedagogical tool, other parents and educational scholars fervently oppose its use.

Proponents of homework believe that assigning homework is likely to result in improvements in academic achievement, and empirical studies have partially supported this claim. A systematic review of the literature on homework identified a positive relationship between time spent on homework and academic achievement for middle and high school students with a medium effect size ($d = .64$; Cooper et al., 2006). Additionally, some homework advocates believe that homework completion may be associated with other benefits that have not yet been empirically validated, such as fostering the development of behaviors conducive to learning (Bryan, Burstein, & Bryan, 2001), improved attitude toward school (Xu, 2007), and the development of self-discipline and time-management skills (Hoover-Dempsey, Battiato, Walker, Reed, DeJong, & Jones, 2001).

In contrast, the arguments against homework have centered around the notion that homework is an intrusion by the school into the hours reserved for the family, thus threatening parent's authority to manage their children's time and interfering with other endeavors such as chores, extra-curricular activities, and social interaction (Gill & Schlossman, 2003). Opponents of homework assert that the negative consequences of homework outweigh potential benefits, and that it should be limited or abolished (Kohn, 2006; Kralovec & Buell, 2000).

To resolve this debate, researchers have attempted to empirically examine the utility and efficacy of homework in a variety of ways. Most homework researchers have exclusively studied the relationship between time spent on homework and various student outcomes. Others researchers have focused on theory development. For example, Trautwein, Ludtke, Schnyder, and Niggli (2006) posited a comprehensive, multi-level homework model comprised of dimensions such as homework behavior, homework motivation, parent characteristics, student personality, etc. However, the relationships between constructs (such as homework motivation) and measures of those constructs "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" (Edwards & Bagozzi, 2000, p. 155).

In both cases, the study of homework has been limited by the lack of consistently used, reliable, and valid measurement tools (Kohn, 2006). In fact, the only available, objective measure of homework behavior is the Homework Problem Checklist (HPC; Anesko, Schoiock, Ramirez, & Levine, 1987). Unfortunately, the HPC has several critical limitations. First, it was developed with a sample of elementary school students, thus its utility with more advanced students

may be limited. Second, factor analytic research on the HPC has yielded two salient factors: inattention/work avoidance and poor productivity/non-adherence to homework rules (Power, Werba, Watkins, Angelucci, & Eiraldi, et al., 2006). These factors are closely related to specific Attention Deficit Hyperactivity Disorder (ADHD) symptoms (i.e., fails to finish schoolwork, avoids tasks requiring sustained mental effort, distractibility, difficulty attending to tasks, etc.; American Psychiatric Association, 2000). Homework performance measures can be used to assess the degree of *impairment* that results from ADHD symptoms and the success of interventions designed to mitigate such impairment (Habboushe, Daniel-Crotty, Karustis, Leff, Costigan, Goldstein, et al., 2001). Therefore, it is important to be able to assess homework performance (a domain in which ADHD may cause impairment) independent of actual ADHD symptoms. The overlap between HPC factors and ADHD symptoms prevents researchers and school professionals from assessing homework difficulties apart from ADHD and/or controlling for ADHD symptoms in their research. Additionally, the HPC provides only a parent scale, thus assessing homework problems solely from the parent's perspective. Further, the normative sample for the HPC is small, homogenous, and dated. Finally, the HPC places an exclusive emphasis on negative behaviors, thus providing a narrow frame of reference for interpretation and reducing the extent to which school professionals can identify and capitalize on student strengths when selecting or designing interventions.

The Homework Performance Questionnaire (HPQ; Power, Dombrowski, Watkins, Mautone, & Eagle, et al., 2007) is a new homework assessment instrument that was developed to mitigate the limitations of the HPC and to provide schools with a reliable, valid, multi-dimensional measure of homework performance. Power et al. (2004, 2007) employed a variety of strategies in the development of the HPQ scales. The developers conducted an extensive review of the literature on homework, conducted a series of focus groups with parents and teachers, and developed items based on the results of the literature review and frequently emerging themes from the focus groups. Next, individual interviews were conducted with parents and teachers, the items were refined, and pilot tests were conducted. Please refer to Power et al. (2007) for a review of the development of the HPQ.

The HPQ has several unique features, allowing for a more comprehensive assessment of homework performance. First, the HPQ includes an emphasis on homework assets (i.e., *child works steadily, child brings homework home*). Because the HPQ focuses on positive homework behaviors, school professionals can identify students' strengths related to homework, as well as identify specific target behaviors to encourage (via positive reinforcement or other techniques). Additionally, the availability of parent and teacher versions allows homework to be assessed from both home and school perspectives. Although potentially useful, student perceptions were not included because of concern regarding the validity of child self-reports (Kuncel, Crede, & Thomas, 2005; Smith, 2007) as well as difficulty in developing a psychometrically sound instrument. Finally, the sample

on which psychometric research on the HPQ was based is diverse in regard to race/ethnicity and socio-economic status.

Scores on pilot versions of the HPQ questionnaires (parent and teacher, paper-and-pencil versions) were reliable and valid (Power et al., 2007). Factor analytic research on the Homework Performance Questionnaire–Teacher version (HPQ-T) yielded two salient factors: student responsibility and student competence—factors that do not clearly overlap with ADHD symptoms.

Power et al. (2007) also examined the structure of the HPQ-P and accepted a 3-factor solution: Student Task Engagement/Efficiency; Student Competence; and Teacher Support. Again, it should be noted that these factors do not directly overlap with ADHD symptoms, as was found with the HPC. The Student Task Engagement/Efficiency items provided information about student behaviors while preparing for and completing homework. Surprisingly, boys received more positive ratings than girls on this factor (although it was a small effect, partial $eta^2 = .039$). The Student Competence dimension tapped the match between the difficulty level of homework assignments and the student's ability to complete assignments; that is, the degree of instructional match. There were no gender or grade differences on the Student Competence dimension. Finally, the Teacher Support factor revealed perceptions of teacher support to families in coping with the challenges of homework. Parents typically saw teachers of elementary school children as more supportive than teachers of middle school children. The internal consistency estimates for these factors were .82, .80, and .76, respectively.

All previous research on the HPQ has been conducted using a traditional paper-and-pencil version. An electronic version of the HPQ parent scale could potentially provide school districts with a more cost effective way to collect data about parent perceptions of the homework performance of students in their district, which, in turn, could inform the development of district-wide homework policies. Further, it is possible that busy parents may be more likely to complete and return the electronic version, as it is likely to be less time-consuming. Additionally, an electronic HPQ might provide researchers with an efficient, inexpensive tool for assessing homework performance and/or monitoring the effectiveness of interventions targeting homework difficulties. However, it is possible that an electronic version may differ psychometrically from the traditional version. It is well established that question wording and context can influence self-reports (Schwarz, 1999) and that test administration, format, and setting can affect test scores (Lee, Reynolds, & Willson, 2003). More specifically, computer-administered psychological tests have been found to be prone to false positive diagnoses (Garb, 2007). Accordingly, the *Guidelines on Computer-Based and Internet-Delivered Testing* (International Test Commission, 2006) mandate that test developers demonstrate that "current psychometric standards (test reliability, validity, etc.) apply" (p. 155), including "equivalence between the CBT/Internet test and noncomputer versions" (p. 156). Consequently, the purpose of the present

study was to examine the reliability and structural validity of an electronic version of the HPQ-P.

METHOD

Participants

Participants in this study were 126 parents of students in grades 1–12, from a rural Illinois school district. Each parent rated one of his or her children. Of the participating parents, 89% were mothers, 8% were fathers, and 3% were other legal guardians (such as step-mothers or grandmothers). Sixty percent of the children were boys and 40% were girls. Seventeen (13.5%) of the students were in first, second, or third grade, 35 (27.8%) of the students were in fourth, fifth, or sixth grade, 39 (30.9%) of the students were in seventh, eighth, or ninth grade, and 35 (27.8%) of the students were in tenth, eleventh, or twelfth grade.

Setting

The participating school district is located in central Illinois. It enrolls approximately 875 students in two elementary schools (n = 460), one middle school (n = 135), and one high school (n = 280). All four schools agreed to participate in this study. Approximately 30.6% of students in this district are considered economically disadvantaged under No Child Left Behind (NCLB). The students from this district are relatively homogenous in ethnicity: 95.3% of students are Caucasian; 2.3% are African American; 1.3% are Hispanic; and less than 1% are Native American, Asian, or Multi-racial. According to the NCLB school report cards on the district website, all schools in this district are performing at or above the state average in all subjects based on standardized test scores.

Instrumentation

This study focused on the development of an electronic form of the parent version of the HPQ. The HPQ-PE consists of 32 items. The first seven items collect basic homework information, such as the amount of time the child spends on homework daily, and inquires about whether or not the parent feels that district-wide homework practices, such as a homework hotline or posting homework assignments online would be helpful. For the next 26 items, the parent is asked to estimate how often each behavior had occurred in the 4 four weeks on a 4-point response scale: *Rarely/Never; Some of the Time; Most of the Time;* or *Always/- Almost Always*. At the end of the questionnaire, parents are provided with an opportunity to volunteer additional comments.

Procedure

Prior to data collection, the Homework Performance Questionnaire–Parent Scale (HPQ-P) was converted to an electronic form using Survey Monkey (Surveymonkey, 2008). Subsequently, the link to the HPQ-PE was placed on the district website. Parents were invited to participate in the study through an ad in the local newspaper, an invitation in the district newsletter, and information on the district website. Participating parents completed the HPQ-PE anonymously online. Directions indicated that parents should complete the scale based on the homework performance of one specific child, rather than on homework policies in general.

Data Analysis

Exploratory factor analysis (EFA) was selected over confirmatory factor analysis (CFA) because the HPQ-PE is a newly developed instrument, and although the factor structure is likely to be similar to that of the HPQ-P, it has not yet been examined. Furthermore, the theory behind the factor structure of the HPQ-P is emergent rather than well established. EFA is preferable for theory generation whereas CFA is more appropriate for theory testing (Goldberg & Velicer, 2006; Haig, 2005). Additionally, EFA is less vulnerable to confirmatory bias (Greenwald, Pratkanis, Leippe, & Baumgardner, 1986) and better able to deal with complex items and between-factor covariance (McQuitty & Bishop, 2006). It was determined that a sample size of 100 would be adequate because previous analyses of the HPQ-P (Power et al., 2007) indicated high levels of communality and a low number of factors (Mundfrom & Shaw, 2005).

Prior to conducting the EFA, Bartlett's test of sphericity (Bartlett, 1950) was used to ensure that the correlation matrix was not random. Further, the Kaiser-Meyer-Olkin statistic was required to be above a minimum standard of .6 (Kaiser, 1974). Common factor analysis was selected instead of principal components analysis because the intent of the study was to identify a latent factor structure (Fabrigar, Wegener, MacCallum, & Strahan, 1999). The principal axis factoring method was used because of its relative tolerance of non-normality and demonstrated ability to recover weak factors (Briggs & MacCallum, 2003). Squared multiple correlations were used to estimate the initial communalities (Gorsuch, 2003). The procedures used to determine the appropriate number of factors for retention and rotation included parallel analysis (Horn, 1965), minimum average partials (MAP; Velicer, 1976), and a visual scree test (Cattell, 1966). Parsimony and theoretical convergence were also considered. Due to the nature of the construct, it was assumed that the factors would be correlated. Therefore, a Promax rotation with a k value of 4 was utilized (Tataryn, Wood, & Gorsuch, 1999).

Criteria for determining factor adequacy were established a priori. Pattern coefficients $\geq .40$ were considered salient and practically significant (Stevens, 2002).

Complex loadings which were salient on more than one factor were rejected in the interest of parsimony and to honor simple structure (Thurstone, 1947). Factors with a minimum of three salient pattern coefficients, internal consistency reliability ≥ .70, and that were theoretically meaningful were considered adequate.

RESULTS

Of the 126 respondents, ten failed to complete one item, three omitted two items, and three skipped three items. To avoid loss of these cases, missing data were imputed with the SPSS (Macintosh Version 16) regression with random error routine (McDonald, Thurston, & Nelson, 2000). EFA results of imputed data were identical to analyses of listwise deleted data. Consequently, the imputed results are subsequently reported.

The results of Bartlett's test of sphericity indicated that the correlation matrix was not random, $X^2 = 1998.69, p < .001$, and the Kaiser-Meyer-Olkin statistic was .91, well above the minimum standard for conducting factor analysis. Therefore, it was determined that the correlation matrix was appropriate for factor analysis.

Parallel analysis suggested that two factors should be retained, the scree test indicated three factors, and MAP suggested four factors. Therefore, the 2-, 3-, and 4-factor solutions were sequentially examined. The 4-factor solution was problematic due to an inadequate number of items with salient loadings on the fourth factor. Both the 2- and 3-factor solutions met criteria for factor adequacy. Because the 3-factor solution demonstrated a higher level of theoretical convergence and consistency with prior research, the 3-factor solution was retained. As expected, the factors were moderately correlated: Factors I and II at .63, Factors I and II at .40, and Factors II and III at .49.

Communalities and pattern coefficients for the 3-factor solution are reported in Table 1. Ten items loaded saliently on factor I, with an internal consistency of .91. These items appeared to tap a Student Task Engagement/Efficiency dimension. Eight items had salient loadings on factor II ($\alpha = .90$). These items seemed to refer to a Student Competence dimension. Another eight items had salient loadings on factor III with an internal consistency of .88. These items appeared to assess a Teacher Support dimension.

Scores for each factor were created by summing the responses to salient items and dividing by the total number of items for each factor. Means and standard deviations for gender and grade level on each factor are reported in Table 2. Because we were interested in each homework dimension, univariate mean difference tests were conducted. An independent *t*-test revealed that females scored significantly higher than males on factor I, $t(124) = -2.172, p = .032, d = .37$. ANOVAs indicated a significant main effect for grade level on factor III, $F(2, 123) = 3.85, p < .02$. Follow-up analyses indicated that students in Grades 1-5

Table 1. Factor Pattern coefficients for Principal Axis Extraction and Promax Rotation of the 3-Factor Structure of the Homework Performance Questionnaire–Parent Scale, Electronic Version (n = 126)

Item	Factor I	Factor II	Factor III
Child wastes times	**.754**	.011	−.068
Child tries to avoid	**.752**	.051	−.069
Child must be reminded to begin	**.742**	.173	−.146
Child denies knowing assignments	**.738**	.085	−.033
Child is ready to begin on time	**.715**	−.072	.053
Child returns completed homework	**.703**	−.138	.114
Child works steadily	**.679**	.163	−.013
Child reminds parent to return materials	**.617**	−.165	.144
Child brings homework home	**.605**	.074	.095
Child needs supervision	**.592**	.197	−.086
Homework assignments too difficult	−.160	**.835**	.077
Homework assignments are easy	.016	**.749**	.098
Completes math homework by self	.029	**.717**	−.045
Child understands homework	.021	**.679**	.090
Child gets confused	.201	**.602**	.073
Child needs help	−.088	**.596**	.086
Completes reading homework by self	.308	**.583**	−.108
Child completes homework independently	.342	**.492**	−.047
Teacher communicates effectively	.011	−.172	**.804**
Teacher is willing to help	.200	−.038	**.736**
Teacher understands challenges	−.032	.050	**.739**
Teacher is interested in helping	.360	−.125	**.691**
Teacher and I have similar expectations	.031	.032	**.683**
Teacher gives too much homework	−.327	.304	**.579**
I disagree with teacher's homework policies	.023	.119	**.540**
I am confused by child's homework	−.170	.291	**.526**
Eigenvalues	10.07	2.54	1.36
Percent of total variance accounted for	38.74	9.76	5.24
α	.91	.90	.88

Note: The correlation matrix is available upon request by contacting the first author. Salient pattern coefficients are noted in bold.

Table 2. Means and Standard Deviations by Gender and Grade Level for Homework Performance Questionnaire–Parent Scale, Electronic Version Factors

		Gender		Grade level		
HPQ–PE		Girls	Boys	1–5	6–8	9–12
Factor I	*M*	2.94	3.20*	3.12	2.88	3.11
	SD	.78	.56	.57	.73	.77
Factor II	*M*	3.10	3.05	3.13	2.91	3.17
	SD	.68	.66	.68	.60	.66
Factor III	*M*	2.93	2.97	3.19*	2.85	2.85
	SD	.65	.62	.62	.64	.61

Note: $N = 126$.
*$p < .05$.

scored significantly higher than students in both Grades 6–8 and Grades 9–12 on factor III ($d = .53$ and .56, respectively).

DISCUSSION

The results of this study indicated a three-factor structure for the HPQ-PE that is consistent with the findings of previous research on the HPQ-P. Specifically, the results suggested that the primary factors of the HPQ-PE are:

a) Student Task Engagement/Efficiency;
b) Student Competence; and
c) Teacher Support.

The factors were composed of ten, eight, and eight items, respectively. Prior studies utilized pilot versions of the HPQ-P so exact comparisons cannot be made. However, 16 items were identical across the electronic and prior paper-and-pencil versions of the HPQ-P and all 16 items loaded on the same factors in each scale.

The HPQ-PE assessed a Student Task Engagement/Efficiency factor. This factor provides information about the student's behavior while preparing for and completing homework. Critics of homework have suggested that homework incites family conflict partially because parents have difficulty managing their children's behavior during homework (Kralovec & Buell, 2000). Scores on this factor may be useful in gathering information about parental perceptions of student behavior during homework, and informing the development of

interventions (i.e., parent training in behavior management techniques) to improve homework behaviors.

The HPQ-PE also measured a Student Competence dimension. The Student Competence factor assesses the extent to which the difficulty of homework assignments corresponds to the ability of the student (Power et al., 2007). Predictably, research indicates that high ability students are able to successfully complete more homework than low ability students (Epstein & Van Voorhis, 2001), and that students in special education have substantially more difficulty with homework than their regular education peers (Keith & Keith, 2006). Scores on the Student Competence factor could potentially be used to help address these issues. For example, the HPQ-PE data could be used to determine whether or not homework assignments are at an appropriate level of difficulty.

Finally, the HPQ-PE assessed a Teacher Support dimension. Parents reported lower levels of teacher support for students in 9th–12th grade than for their elementary and middle school counterparts. This is not surprising, given that students in 9th–12th grade are often expected to be more independent that students in 1st–8th grade. In most schools, secondary teachers have many more students than elementary school teachers and may be less able to provide assistance with homework and other academic endeavors. Finally, at the secondary level, most students have several teachers, rather than one. This is likely to result in less frequent contact between parents and teachers, which may influence parental beliefs regarding teacher support.

Limitations and Suggestions

Because the sample utilized in this study was small and homogenous, external validity may be compromised. The sample in this study consisted of primarily Caucasian students from one rural Illinois school district. These results may not apply to students of color or to students from urban or suburban school districts. Furthermore, small sample sizes can lead to imprecise statistics in studies using exploratory factor analysis. Therefore, future research should be conducted with larger samples that are more representative of the population of the United States.

Further, this study examined an electronic scale that was only available to participants via the internet. Nationally, approximately 74% of the population has internet access (Internet World Stats, 2009). Therefore, it is possible that the roughly 24% of families without access to the internet may have been unable to participate in this study. Additionally, participation in this study was entirely voluntary, so it is possible that parents who chose to participate may differ in some way from the general population of parents in this district. For example, they may be more invested, have more time, or possess a greater degree of concern about homework than did parents who did not choose to participate.

Finally, the scope of this study was limited to an examination of the construct validity of the scores from the HPQ-PE. Future research examining other types of

validity (i.e., concurrent and predictive validity) is necessary. Development of and research examining an electronic version of the HPQ-T may also prove a fruitful endeavor for homework researchers.

CONCLUSIONS

Gill and Schlossman (2003) asserted that homework can be "a linchpin in the relationship between home and school" (p. 846) and that it serves as a means of keeping parents involved in their children's education. The HPQ-PE has the potential to be a reliable, cost-effective tool that can be used to elicit parent feedback to inform interventions and the development of homework policies, thus continuing to foster a positive relationship between home and school. However, additional research must be conducted before the HPQ-PE can be used for individual decision making.

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