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Title	Phonological awareness, vocabulary and internalizing behavior. A closer look at the associations in preschoolers using a structural equation modeling approach
Author(s)	Girard, Lisa-Christine ; Girolametto, Luigi
Publication date	2016-09-30
Series	UCD Geary Institute for Public Policy Discussion Paper Series; WP2016/11
Publisher	UCD Geary Institute For Public Policy
Item record/more information	http://hdl.handle.net/10197/8117

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**UCD GEARY INSTITUTE FOR PUBLIC POLICY
DISCUSSION PAPER SERIES**

**Phonological awareness, vocabulary and
internalizing behavior. A closer look at the
associations in preschoolers using a
structural equation modeling approach**

Lisa-Christine Girard
Geary Institute for Public Policy and School of Public Health, Physiotherapy & Sports Science
University College Dublin

Luigi Girolametto
Department of Speech-Language Pathology,
University of Toronto

Geary WP2016/11
September 30, 2016

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Abstract

Purpose: This study examined the associations among phonological awareness skills, expressive vocabulary and children's internalizing behavior within a preschool setting. **Method:** Ninety-four children (48 boys, 46 girls) were recruited from 11 schools serving low-income neighborhoods in a large metropolitan city. All children were assessed at the beginning and end of the preschool year using a mixed-methods approach. Children completed standardized assessments of phonological awareness skills and expressive vocabulary. Teacher reports were used to assess children's internalizing behavior. A structural equation model was estimated to test for moderating effects of children's sex. **Results:** The model fit the data well and revealed that poorer phonological awareness skills at the beginning of the year, but not vocabulary, predicted increased internalizing behavior at the end of the year, even after accounting for initial internalizing behavior. The association was moderated by the child's sex and was significant for boys only. **Conclusion:** Poorer phonological awareness skills are associated with increased solitary behavior over time, with the association already present in the preschool years. However, the association at this age was only found for boys. These results might suggest that for boys, the academic skill level that they enter into preschool with may exert a small role in their ease of social engagement with peers within a classroom setting.

Keywords: preschool, phonological awareness, internalizing behavior, solitary behavior, expressive vocabulary, sex differences

Author Acknowledgments: The authors also thank the participants and their families for their commitment to this study.

Disclosure: There are no conflicts of interest for any author listed in the byline of this manuscript. Further, the authors report no financial relationships with commercial interests.

Introduction

Emergent literacy is comprised of a set of foundational skills necessary for the mastery of reading ability later in childhood and includes children's alphabet knowledge, phonological awareness, oral language (e.g., vocabulary), and print concepts (Whitehurst & Lonigan, 1998). Phonological awareness skills in particular, which is the ability to identify, name, and manipulate sounds in written and oral language (Lonigan et al., 1999), have been found to be precursory to children's development of decoding and success with future reading (Ehri et al., 2001; Lonigan et al., 1999; Savage et al., 2005; Savage, Carless, & Ferraro, 2007; Whitehurst & Lonigan, 1998). It is during the preschool years (i.e., from three to five years of age) that children become routinely exposed to, and begin learning phonological awareness skills. Children's vocabulary is also developing rapidly during this period and is an important tool for both later reading ability and for facilitating social interactions with peers (e.g., Lee, 2011; Ouellette, 2006; Séguin, Parent, Tremblay & Zelazo, 2009). Concurrently, the ability to interact with peers in an age appropriate manner, in preschool settings, is important to children's development during this time period. The purpose of this study is to examine the associations between emergent literacy skills (i.e., phonological awareness, vocabulary) and social development.

Previous research in the area of academic and social development has largely focused upon the associations between children's early social externalizing behavior and subsequent emergent literacy skills (Doctoroff, Greer, & Arnold, 2006; Girard & Girolametto, 2013; Lonigan et al., 1999; Miles & Stipek, 2006). More specifically, aggression (e.g., Doctoroff et al., 2006), hyperactivity/inattention (e.g., Lonigan et al., 1999), and exclusion by peers (Girard & Girolametto, 2013) have been found to be negatively associated with phonological awareness and other emergent literacy skills, both cross-sectionally and longitudinally, in the early years of formal schooling (i.e., between three and six years of age). However, few studies have focused on the possible inverse direction of association (i.e., the impact of early emergent literacy skills on the development of subsequent social behavior). With few notable exceptions, even less work has been conducted examining the specific associations with internalizing (i.e., inward focused

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behavior) rather than externalizing behavior, in particular during the preschool period (e.g., Coolahan, Fantuzzo, Mendez & McDermott, 2000; Doctoroff et al., 2006). Coolahan et al., (2000) for example found a negative association between preschooler's teacher-rated academic motivation and withdrawn play behavior with peers. Further, Doctoroff et al., (2006) found support for solitary behavior negatively predicting emergent literacy outcomes in a sample of preschool children. While the directional path from emergent literacy difficulties to future internalizing behavior in particular was not examined, it is possible that children who struggle with academic skills at entry to preschool may also be at increased risk of developing internalizing types of behavior; possibly as a consequence of social comparisons within a new type of classroom environment (Banaji & Prentice, 1994).

Social comparison theory dates back to the early 50's when Festinger proposed that evaluation of oneself and one's own abilities in the context of others' abilities is a fundamental occurrence within social environments (Festinger, 1954). These comparisons, dependent on whether the comparative has similar, weaker, or stronger abilities may impact on our self-perception, esteem and behavioural response styles. The concept of social comparison is often applied to work within educational settings given that the classroom provides an important setting for implicit social comparisons to occur. While there have been mixed findings pertaining to the age at which social comparisons start to become a normative part of the child's thinking, some studies have found support for social comparisons in samples of children as young as four to five years age (e.g., Butler, 1998; Chefal, 1984). Theoretically, children who struggle with academic skills, and in particular upon first entry into formal schooling, may become discouraged and resort to behavior which helps to alleviate or mask feelings of frustration (Hinshaw, 1992; McGee, Williams, Share, Anderson, & Silva, 1986; Miles & Stipek, 2006). It is important to evaluate the implications of internalizing behavior within this framework, as not all children will display with a disposition for using outwardly negative behavior. This may be especially the case for girls where a higher propensity for internalizing as compared to externalizing behavior may be observed (Leve, Kim & Pears, 2005).

Because classroom teaching is largely focused around whole class and/or group-based instruction during the preschool years, the possibility of withdrawn or solitary behavior resulting from difficulty with learning must also be considered. For example, children who struggle with

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academic skills may become embarrassed by their challenges and may not know how to appropriately handle their emotions, thus resorting to withdrawn behavior within the peer group during group-based learning activities. This may especially be the case for children as they progress through the academic year and become more aware of their performance in comparison to their peers (Hinshaw, 1992). Thus, studies are needed that examine internalizing behaviors and their development in association with children's emergent literacy skills at entry to a preschool environment.

Objectives

The first objective of the current study was to examine whether early difficulties with phonological awareness skills and expressive vocabulary contribute to internalizing behavior across the preschool year after controlling for internalizing behavior at the beginning of the preschool year. To the best of our knowledge there is no prior research examining this direction of association in preschoolers. However, grounded in a social comparison framework, it was predicted that poorer phonological awareness skills at entry into preschool would contribute to higher levels of asocial behavior by the end of the year. This prediction was based on the assumption that learning often occurs in whole or small group formats such as shared storybook reading, carpet time or activity centers, increasing the possibility that subsequent social withdrawal may be more prevalent in preschool settings. A second objective of this study was to examine the role of vocabulary in contributing to internalizing behavior across the school year. Regarding vocabulary, it is conceivable that children who have poorer expressive vocabulary skills may be more shy or withdrawn with peers as a result of challenges arising from their inability to express themselves orally (Coplan & Armer, 2005). This may cause a decrease in confidence within the peer group resulting in solitary play behavior over time. Thus, given the important role of expressive vocabulary during communicative social exchanges with peers, it was predicted that children with poorer expressive vocabulary would also score higher on the internalizing subscale over time. The third objective was to examine the role of children's sex as a moderator in the predicted associations. Given the mixed findings within the literature surrounding the effects of sex on both academic and behavioural outcomes (e.g., Matthews, Ponitz & Morrison, 2009; Ready, LoGerfo, Burkam & Lee, 2005), no specific hypotheses were made.

Method

The current study is a within-participants, short-term longitudinal mixed-methods design employing Time 1 testing for phonological awareness skills and expressive vocabulary and Time 1 and 2 testing for internalizing behavior. Time 1 testing was conducted during the fall of the preschool year, approximately four weeks after the academic year commenced. Time 2 testing was conducted five months later, during the spring of the same academic year. The study took place in 11 elementary schools located in low-income neighborhoods in the North, East, South and West quadrants of a large metropolitan city in Ontario, Canada. Sampling from a lower SES neighborhood was the result of previous work suggesting that children in lower SES families may be at increased risk for problems in both learning and behavioral domains (e.g., Dodge, Pettit & Bates, 1994; Lonigan, Burgess, Anthony & Baker, 1998). Median neighbourhood income ranged from \$12, 401- \$28, 953 as reported by Statistics Canada (Statistics Canada, 2011). All participating schools belonged to the Toronto District School Board. Ethics approval for the study was obtained from both the University of Toronto Research Ethics

Board and the Toronto District School Board External Research Review Committee. A detailed description of the methodology can be found in (Girard & Girolametto, 2013).

Participants

Children: One hundred and two children were initially recruited and were assessed at Time 1. Fifty-two children were male (51%) and 50 were female. However, at time 2 eight children had moved schools and could not be contacted for further testing as no forwarding information was given. As a result of having missing data on the outcome variable these children were not included in the final analysis. This reduced the final sample size to 94 children (48 boys and 46 girls). The ethnic background of children was diverse with 27% of children identified by parents as Caucasian, 21% as African Heritage, 42% as Asian Heritage, 4% as Latino, 6% as Mixed Heritage, and in the case of one child ethnic background was not reported and could not be determined. At time 1, the children ranged in age from 44-58 months. The majority of children in the current study scored within the average range for expressive vocabulary however seven children scored below 1.5 standard deviations from the mean, falling into the low range for

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expressive vocabulary. The mean and standard deviation in the current sample was 95.9 (13.7) with a range of 55-128.

Measures

Independent measures: The Wide Range Achievement Test-Early Reading Assessment (WRAT-ERA) (Robertson, 2003). The WRAT-ERA is a standardized norm-referenced achievement test for children aged 4:6-7:11 (Robertson, 2003). Only the *Letter/Sound Discrimination* subtest was administered to children. This subtest requires children to identify beginning and ending consonant sounds (i.e., single, blended, and diagraphs). This subtest was administered at Time 1. Cronbach's alpha for this subtest is reported as .83 (Robertson, 2003) and in the current study was .82. Raw scores were used.

The Comprehensive Test of Phonological Processing (CTOPP). The CTOPP is a standardized measure that is normed for ages 5:0-6:11 (Wagner, Torgesen & Rashotte, 1999). While the CTOPP is normed for slightly older children than were included in the current study, it was selected given its excellent psychometric properties. The *Elision*, *Blending Words*, and *Sound Matching* were the only three subtests administered. These subtests require children to recognize compound words, syllables within words, onset and rimes, combine different sounds to form words, and match the initial and ending sounds of target words with other words. All three subtests were administered at Time 1. As noted, this measure has been well validated in the literature with Cronbach's alpha for the Elision subtest reported as .90, Blending Words as .88, and Sound Matching as .93 (Wagner et al., 1999). In the current study reliability was lower but acceptable at .79, .70, and .67 respectively. Raw scores were used.

The Expressive One Word Picture Vocabulary Test (Brownell, 2000). The *EOWPVT* was administered at Time 1 to assess the child's proficiency in expressive vocabulary. The *EOWPVT* is a standardized measure that is normed for children ages 2-18 (Brownell, 2000). It consists of 170 pictures that depict concepts, objects, and actions that the child must label. Cronbach's alpha is .96 for 4-year-olds (Brownell, 2000). Standard scores were used.

Dependent measure: The Child Behavior Scale (Ladd & Profilet, 1996). At both Time 1 and Time 2 teachers completed the CBS for each child enrolled in the study. This measure is a teacher

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report of children's social behavior in the classroom environment. It is comprised of six subscales to assess internalizing, externalizing, peer problems, and prosocial behavior. One subscale assessing internalizing behavior (*Asocial with Peers*) was used. Behavior was rated on a 3-point Likert scale ranging from 1 ("doesn't apply") to 3 ("certainly applies"). Cronbach's alpha in the current sample was .89 for *Asocial with peers*.

Statistical Approach

The descriptive analyses were conducted using IBM SPSS Statistics (Version 20.0. Armonk, NY: IBM Corp). All other analyses were conducted using Mplus Version 7.4 (Muthén & Muthén, 1998-2015). Model fit was assessed using the chi-square test, the root mean square error of approximation (RMSEA), the Tucker-Lewis index (TLI), and the comparative fit index (CFI). A good model fit is achieved with a non-significant chi-square test, a RMSEA that is equal to or less than .06 (Bentler, 1990) and when both the CFI and TLI are equal to or above .95 (Hu & Bentler, 1999). To note, large confidence intervals of the RMSEA can be expected with smaller sample sizes such as in the current study. It has been suggested that the confidence intervals of a well-fitting model will be close to 0 for the lower limit and less than 0.08 for the upper limit (Hopper, Coughlan & Mullen, 2008) First, a confirmatory factor analysis was conducted using four subtests from two assessment tools (i.e., *WRAT-ERA Letter/Sound Discrimination*, *CTOPP Elision*, *CTOPP Blending Words*, and *CTOPP Sound Matching*) to assess the latent variable of preschoolers' phonological awareness skills. The model fit the data well (i.e., $\chi^2(10) = 5.26, p = .873$; RMSEA = .000; RMSEA CI₉₀ = 0.000-0.081; TLI = 1.13; CFI = 1.00) with each subtest contributing medium to high explanatory power towards the latent variable. Next, measurement invariance was tested to ensure equality could be assumed across groups (i.e., boys and girls). Measurement invariance (configural, metric, scalar) was achieved at all three levels (i.e., $\chi^2(4) = 2.76, p = .599$; $\chi^2(7) = 3.01, p = .876$; $\chi^2(10) = 5.26, p = .873$). Comparison of fit indices of nested models is presented in Table 1. Next, the full structural equation model was tested. Standardized betas (β) are provided in the model as an estimate of effect size.

Please insert Table 1 here

Results

Descriptive Statistics

A series of bivariate correlations were first conducted among sex, the composite measure of phonological awareness and expressive vocabulary at Time 1 and the *Asocial with Peers* subscale at both Times 1 and 2. These data are presented in Table 2. An inspection of the data in Table 2 reveals no significant associations between phonological awareness skills and internalizing behavior or between expressive vocabulary and internalizing behavior at Time 1. However, a negative association between expressive vocabulary and asocial behavior at Time 1 approached significance. A significant negative association between phonological awareness at Time 1 and asocial behavior at Time 2 was found. Additionally, sex and asocial behavior at Time 2 were negatively associated. Bonferroni-Holmes adjustment was applied. The descriptive statistics for all four measures of phonological awareness, expressive vocabulary scores at Time 1 and the internalizing subscale of the *Child Behavior Scale* at Times 1 and 2 are presented in Table 2.

Please insert Table 2 here

The Structural Equation Model

The results of the full structural equation model were a good fit to the data, $\chi^2(32) = 30.28, p = .554$; RMSEA = .000; RMSEA CI₉₀ = 0.000-0.100; TLI = 1.03; CFI = 1.00. We present the models separately for boys and girls with the boys presented first. Within the measurement model the letter/sound, elision, blending words, and sound matching subtests all contributed medium explanatory power towards our latent variable of phonological awareness skills (i.e., $\beta = .43, p < .001$, $\beta = .64, p < .001$, $\beta = .48, p < .001$ and $\beta = .51, p < .001$, respectively). The structural model revealed that phonological awareness skills at the beginning of the year were a statistically significant predictor of increased asocial behavior at the end of the year ($\beta = -.61, p = .001$). Asocial behavior at the beginning of the year also predicted asocial behavior at the end of the year although with a smaller effect ($\beta = .29, p = .032$). Expressive vocabulary at the start of the year was not a statistically significant predictor of boys' asocial behavior at the end of the year (β

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= .19, $p = .288$). Finally, phonological awareness skills and expressive vocabulary at the beginning of the year were significantly associated ($\beta = .41, p = .013$). Please see Figure 1.

Please insert Figure 1 here

For girls, the letter/sound, elision, blending words, and sound matching subtests all contributed medium to high explanatory power towards phonological awareness skills (i.e., $\beta = .46, p < .001, \beta = .86, p < .001, \beta = .65, p < .001$ and $\beta = .45, p < .001$, respectively). Asocial behavior at Time 1 was at the threshold of statistical significance in predicting asocial behavior at Time 2 ($\beta = .27, p = .057$). In contrast to boys, phonological awareness at entry to preschool was not a statistically significant predictor of asocial behavior at the end of the year for girls ($\beta = .08, p = .690$). Similar to boys, expressive vocabulary at entry to preschool was also not significantly associated with asocial behavior at the end of the year ($\beta = -.08, p = .645$), however expressive vocabulary and phonological awareness skills were positively associated ($\beta = .52, p < .001$). Please see Figure 2.

Please insert Figure 2 here

Discussion

The results of the current study suggest that the level of phonological awareness skills that preschool boys enter the classroom with may impact upon their engagement in solitary behavior by the end of the year. More specifically, boys who scored lower on standardized assessments of phonological awareness skills in the fall of the preschool year were reported as having a higher frequency of asocial behavior with peers by the spring of the same academic year. In contrast, we found no support for an association between phonological awareness and asocial behavior across the preschool year for girls and no association between expressive vocabulary and asocial behavior for either boys or girls. These results add to the current literature in an important way. To the best of our knowledge, no previous studies have looked at the specific role of phonological awareness skills and expressive vocabulary towards the development of internalizing behavior, and more specifically asocial behavior, as early as the preschool years. Instead, the relatively few studies that have looked at the associations between internalizing behavior and emergent literacy or learning at this age have focused on the

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alternative direction, from internalizing behavior to academic difficulties. Thus, the novelty of this finding is a first step towards a better understanding of the emerging stages in which associations between academic skills and internalizing behavior may start to present. However, replication with larger samples is warranted.

Drawing from the literature with samples of same age and older school-age children, a possible theoretical explanation for the negative contribution of early phonological awareness skills may be derived from social comparisons with peers (Butler, 1998; Chefal, 1984; Hinshaw, 1992). This social comparison may result in negative affect or frustration leading to the development of internalizing behavior such as withdrawing from peers (Dijkstra, Kuyser, van der Werf, Buunk & van der Zee, 2008; Hinshaw, 1992; Levine, 1983). In a majority of preschool settings, learning is structured in either small or large group-based activities. According to Festinger's (1954) theory of social comparison, later adapted by Buunk & Gibbons (2000), the classroom would provide an important environment for which children can evaluate and compare themselves to their peers. The preschool classroom is often the first exposure to this type of setting. It may be possible that some children develop withdrawn behavior that may be due to poor understanding of lessons, being overwhelmed upon first entry into formal schooling, and an ensuing comparison of how their peers are adjusting in the same setting.

Of interest, the negative association between phonological awareness and asocial behavior was not statistically significant for the girls in this sample. The effect of sex in the association between internalizing behavior and learning outcomes in preschool samples have been mixed. For example, Coolahan et al., (2000) found that boys were rated higher on withdrawn behavior, which was negatively associated with their learning. In contrast, Doctoroff et al., (2006) found no effects of sex; the negative association between solitary play and emergent literacy outcomes was statistically significant for both boys and girls. Inspection of the data revealed no statistically significant differences between boys and girls on any measure of phonological awareness or asocial behavior at Time 1 in the current sample. Similar to Coolahan et al., (2000), the boys in the current study were rated higher on asocial behavior as compared to girls at Time 2 and the difference was statistically significant. It may be possible that social comparisons impact upon boy's behavior at an earlier age or alternatively that the effect of social comparisons manifest in different ways between boys and girls. For example, girls who

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experience difficulties with learning may actively seek help from educators or peers rather than withdrawing and becoming asocial with their peers. Given that previous studies have not examined the direction from poor initial phonological awareness skills to subsequent asocial behavior in samples of preschoolers, and that sex effects have been mixed when looking at the association in the opposite direction, the theoretical perspectives put forth warrant further investigation before conclusions can be drawn. Taken together, the results of the above mentioned studies and those of the current study highlight the need for more research examining the possible bi-directional associations between academic skills and internalizing behavior in very early childhood and the differences between boys and girls.

Surprisingly, no statistically significant effects of expressive vocabulary were found to contribute to asocial behavior at the end of the year for either boys or girls. While many studies have established links between language problems and internalizing behavior across childhood, adolescence, and even into adulthood (e.g., Brownlie, Bao & Beitchman, 2015), the exclusive focus on expressive vocabulary in the current study (i.e., the ability to label common objects, concepts, actions) may have been a limiting factor. Other aspects of language may be more heavily implicated in internalizing behavior that were not captured by the expressive vocabulary measure, such as the ability to comprehend and formulate sentences. Further, only seven children in the current sample fell below 1.5 standard deviations of the mean and into a low expressive vocabulary range. Thus overall, the current sample did not display low levels of expressive vocabulary development, possibly also contributing to the null findings.

Limitations

Despite the strength of using of multiple types of assessments in the current study (i.e., teacher reports for behavior and standardized measures for phonological awareness skills), several limitations must be noted. First, our measures of phonological awareness skills were normed for a slightly older age group of children than were included in the current study. While raw scores were used to account for this limitation, visual inspection of the data reveals possible floor effects for these four subtests, and in particular for the elision subtest. Floor effects create concern in the interpretation of any significant association, as there is a restricted range of observations in the data. Thus, the finding in the current study may be underestimated and needs to be interpreted with caution until replication with more age appropriate measures are

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conducted. Second, the current study used one measure of oral language: expressive vocabulary. While this measure was theoretically motivated, no information on children's general language development was collected. Collecting more information on multiple language processes may be more informative for interpretation of the ways in which oral language and internalizing behavior in the preschool period are associated. Finally, examining the current study objectives within a more longitudinal developmental framework would have strengthened the findings of the current study in being able to examine the stability of associations across a longer time period.

Conclusions

Overall, the results support a negative association between poorer phonological awareness skills at entry to preschool and increased asocial behavior with peers at the end of the year for boys only. Given the lack of previous studies on this topic, caution is warranted in interpreting these results until additional replication studies are conducted. Further studies are also needed to enhance our understanding of the exact mechanisms of asocial behavior development during the preschool period.

Theoretically, our finding may suggest that boys who enter into preschool with poorer academic skills may perceive their lack of competence within a social comparison framework that impacts negatively on their peer interactions. Practical implications of this finding may include developing boy's phonological awareness skills through family literacy programs and initiating early remediation efforts in the classroom environment.

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Table 1
Measurement Invariance Models

Phonological Awareness Skills						
Measurement Invariance model (Constraints)	Estimated parameters	Chi-square (DF)	CFI	RMSEA (90% CI)	ΔCFI	ΔRMSEA
Configural (No equality constraints)	24	2.759 (4)	1.000	.000 (.000-.186)		
Weak (Metric Invariance) (Loadings)	21	3.099 (7)	1.000	.000 (.000-.090)	.000	.000
Strong (Scalar Invariance) (Loadings, thresholds)	18	5.263 (10)	1.000	.000 (.000-.081)	.000	.000

Note: ΔCFI and ΔRMSEA refers to the difference between one model and the preceding one.

Table 2

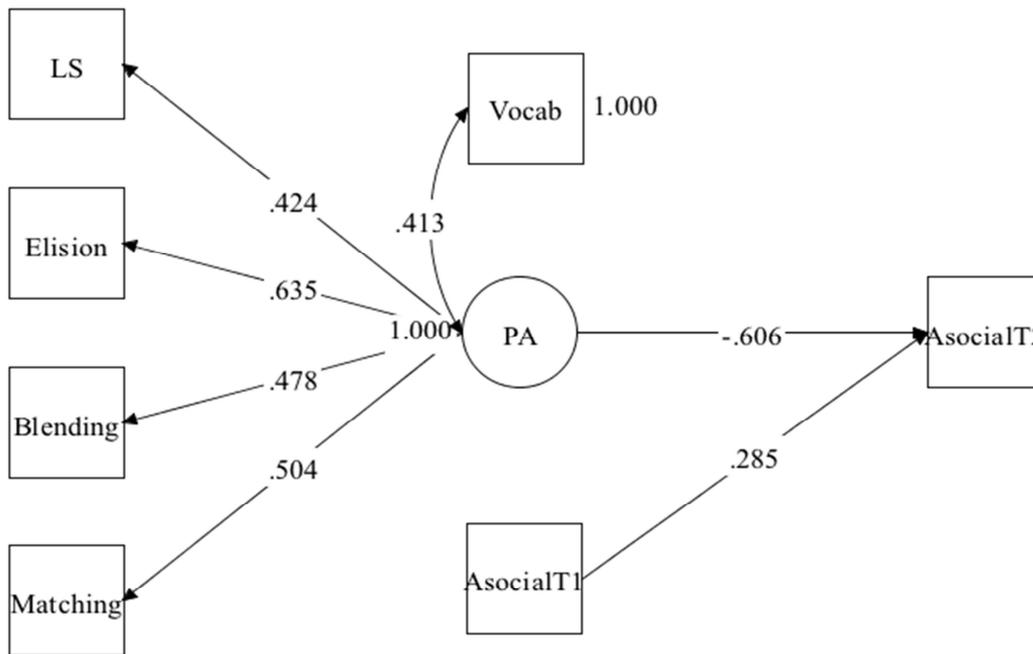
Bivariate Correlations, Means, and Standard Deviations among Phonological Awareness Skills, Expressive Vocabulary, Asocial Behavior and Sex

	Phonological Awareness Time 1	Expressive Vocabulary Time 1	Child Sex	Mean (Median ⁺)	Standard Deviation	Min-Max
Asocial with Peers T1	-.018	-.175 ^t	-.096	1.7 ⁺		1.0-3.0
Asocial with Peers T2	-.275**	-.098	-.414**	1.2 ⁺		1.0-3.0
Expressive Vocabulary T1	.348**	1.00	.019	95.9	13.7	55-128
Letter/Sound Discrimination ¹				3.9	4.3	0-18
Elision ²				0.7	1.2	0-6
Blending Words ²				2.3	2.2	0-10
Sound Matching ²				3.2	2.7	0-11

Note: ** significant at the 0.01 level, ^t approaching significance. ¹ Refers to the Wide Range Achievement Test - Early Reading Assessment (*WRAT-ERA*; Robertson, 2003). There are a total of 25 items on this subtest of the *WRAT-ERA*. ² Refers to the *Comprehensive Test of Phonological Processing (CTOPP)*; Wagner, Torgesen & Rashotte, 1999). There are a total of 20 items on the *CTOPP* subtests. Raw scores are presented for all *WRAT-ERA* and *CTOPP* subtests. Asocial behavior is reported on scale ranging from 1 “doesn’t apply” to 3 “certainly applies”.

Figure 1

Boys' Phonological Awareness Skills, Expressive Vocabulary and Internalizing Behavior across the Preschool Year

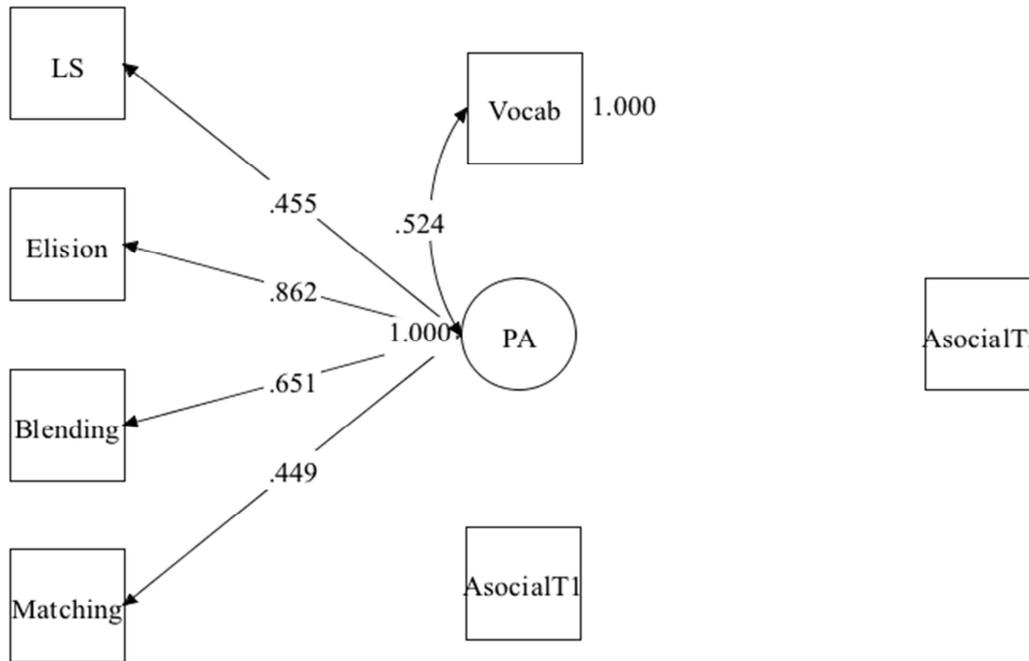


Note: LS represents the letter/sound discrimination subtest of the WRAT-ERA. Elision, blending and matching are subtests from the CTOPP. All subtests were administered at entry into preschool. PA represents phonological awareness skills at entry to preschool. Vocab represents children's expressive vocabulary at entry to preschool. Only significant paths are presented in the model for visual simplicity.

Preschool Internalizing Outcomes

Figure 2

Girls' Phonological Awareness Skills, Expressive Vocabulary and Internalizing Behavior across the Preschool Year



Note: LS represents the letter/sound discrimination subtest of the WRAT-ERA. Elision, blending and matching are subtests from the CTOPP. All subtests were administered at entry into preschool. PA represents phonological awareness skills at entry to preschool. Vocab represents children's expressive vocabulary at entry to preschool. Only significant paths are presented in the model for visual simplicity.