



Reading interest and family literacy practices from prekindergarten to kindergarten: Contributions from a cross-lagged analysis

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ABSTRACT

Most studies investigating the relationship between children's reading interest and their parents' literacy practices have assumed that it is the latter that sparks the former. Nevertheless, the transactional model of development (Sameroff, 2010) suggests that the relationship might run the other way as well. This research examined how children's reading interest (as reported by their parents) and parents' literacy practices remain stable or change over time, as well as cross-lagged relationships between reading interest and parents' literacy practices from the beginning of prekindergarten to the end of kindergarten. The 721 participants were drawn from low-SES Chilean families participating in a larger study. The results show that in these low-income Chilean families, it is more likely for reading interest to predict parents' practices than the other way around. Results suggest that interventions designed to improve the home literacy environment could be attained through improving parents' perceptions of children's reading interest rather than seeking only to change parents' practices directly.

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1. Introduction

Even in the earliest years of life, it is possible to observe children behaving in ways that indicate reading interest (Whitehurst & Lonigan, 1998). These relatively stable dispositions towards activities associated with reading and books (Schiefele, 1991) have been shown to be related to early literacy skills such as vocabulary, knowledge of print conventions (Crain-Thoreson & Dale, 1992), letter and word knowledge (Baroody & Diamond, 2012; Frijters, Barron, & Brunello, 2000; Roberts, Jurgens, & Burchinal, 2005), and subsequent academic achievement (Morrow, 1983). This connection can be explained by the affective behaviors, persistence, effort, and attention a learner displays in response to objects of interest (Ainley, Hidi, & Berndorff, 2002), which, in turn, are essential to fostering learning (Dunst et al., 2001).

There is converging evidence for the association between parents' literacy practices, such as shared book reading or teaching of letters, and the early interest children show in reading. Based on longitudinal designs, researchers have claimed that parents' literacy practices influence the child's reading interest (Frijters et al., 2000; Hume, Lonigan, & McQueen, 2015; Malin, Cabrera, & Rowe,

2014; Roberts et al., 2005; Sénéchal, 2006), but there is only one study we are aware of that has tested this relation experimentally and was able to establish a short-term causal relationship (Ortiz, Stowe, & Arnold, 2001). In contrast with the view that parental practices cause child interest, some researchers have claimed that children's reading interest may also affect parents' practices, suggesting a bidirectional influence (Scarborough & Dobrich, 1994; Saçkes, Işitan, Avcı, & Justice, 2016; Hume et al., 2015). From this point of view, parents who perceive that their children are interested in reading, would offer to engage with them in reading activities more often. This cycle is coherent with a transactional view of development, which holds that an individual's behaviors can influence their context of development (Sameroff, 2010). If this were the case, it would be likely that children who are initially interested in reading would bring about more parental literacy behaviors, and in turn they would develop an even stronger interest in the future (Lonigan, 1994), illustrating the effects of children's agency on their own development.

Although the directionality of causal relationships is best tested through experimental designs, well-crafted longitudinal designs can shed light on the likelihood of alternative models. However, most longitudinal designs that look at reading interest and parents' practices show some weaknesses, the most common one being the omission of autoregressive effects (e.g., the effect of the same construct from the previous time period). Autoregressive effects are important because they remove variance explained by past

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individual differences and therefore allow us to estimate effects on the change of the construct, not just its present state. For example, if exposure to print were to predict interest even after accounting for the autoregressive effect of interest a year before, we can infer that print exposure continues to contribute to interest through the years, not just that it does so at one point in the past. Relevant studies that do look at these effects are [Sénéchal and LeFevre \(2002\)](#), and [Sénéchal \(2006\)](#). However, even these studies have not attempted to estimate reciprocal influences between parent practices and reading interest, looking instead at only one possible directionality. Our study uses a cross-lagged model to examine both longitudinal and reciprocal relationships ([Selig & Little, 2012](#)) between parents' practices and reading interest across time points.

1.1. Reading interest: definition and measurement

An inclination to read has been conceptualized in several different ways: as a set of attitudes ([Spearling & Head, 2002](#); [Saracho & Dayton, 1989, 1991](#)), as motivation ([Baker & Scher, 2002](#); [Baker, Scher, & Mackler, 1997](#); ; [Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006](#)), and as interest ([Ortiz et al., 2001](#); [Hume et al., 2015](#)). The attitude approach includes affective, cognitive, and behavioral elements; a positive attitude towards reading means that a child holds reading to be a desirable activity and may voluntarily engage in it ([Baker et al., 1997](#)). On the other hand, when conceptualized in terms of motivation, the focus on the reasons that children engage in reading related activities. Children may be motivated by how fun reading is, because they believe it is important, because they feel they are good at it, or because they enjoy activities related to reading, like going to the library ([Baker & Scher, 2002](#)). The interest or intrinsic motivation interpretation, on other hand, refers to an inclination or feeling of esteem ([Schiefele, 1991](#)), and is distinct from attitude and motivation because it is related only to the object, rather than to the relationship between the object and other objects ([Wigfield et al., 2006](#)). That is to say, an intrinsic motivation in reading would be related only to reading itself, and not to the purposes of reading (such as searching for information). In the present study, interest in reading will be understood to refer to a relatively stable disposition towards reading and to the engagement in specific activities related with books ([Schiefele, 1991](#)), regardless of whether the motivation to engage in them is intrinsic or extrinsic.

Studies have measured reading interest through information reported by the parents ([Hume et al., 2015](#); [Ortiz et al., 2001](#); [Roberts et al., 2005](#); [Saçkes et al., 2016](#)) or teachers ([Morrow, 1983](#)), surveys administered directly to children ([Baker & Scher, 2002](#); [Morrow, 1983](#), [Spearling & Head, 2002](#)), and by observing children's behavior ([Morrow, 1983](#); [Ortiz et al., 2001](#)). When asking parents to report on their children's interest in reading, researchers can ask about directly observable behaviors (e.g. how often children read books) or about their evaluation of their child's interest (e.g. does your child like to be read to). This distinction is relevant because an observable behavioral reference framework can reduce the error variance and the potential for parent reporting bias ([Seifer, 2005](#)). Therefore, in this study we used parent-reported information about concrete behaviors that are consistent with our definition of reading interest in young children ([Seifer, 2005](#)).

1.2. The effect of family literacy practices on reading interest

Through a bioecological lens, development is explained by proximal processes, meaning transactions between the subject and his or her closest environment or microsystem, which are in turn influenced by more distant or peripheral systems ([Bronfenbrenner & Morris, 2006](#)). From that standpoint, the Home Literacy Environment model highlights two proximal processes associated with

reading interest and early language and literacy skills ([Sénéchal & LeFevre, 2002](#)). Specifically, *informal activities*, in which adults direct the child's attention to the meaning of print (i.e., shared storybook reading) and *parents' teaching practices*, in which the adult directs the child's attention to the code (e.g. helping children read or write letters and words). [Sénéchal \(2006\)](#) tested this model in a Canadian sample of mid-SES children and found that storybook exposure in kindergarten predicted the frequency of reading for pleasure in Grade 4, as reported by children, while [Martini & Sénéchal \(2012\)](#) tested and found a concurrent association between kindergarteners' self-reported interest in learning about letters and their parents' teaching of reading. Experimental evidence also supports a direction from practices to interest. One intervention on print exposure for parents of children aged 26–37 months old found that reading interest rose one week after the intervention, but that the effect faded after one month ([Ortiz et al., 2001](#)). In other words, if the practices that foster interest are not maintained over time, interest can wane or disappear.

Evidence for an association between print exposure and interest is stronger than that for teaching practices and interest. [Hume et al.'s \(2015\)](#) study exploring the relationship between literacy interest and parents' literacy-promoting practices with children aged 32–77 months old modelled regressions controlling for age and previous interest. The authors measured interest through the frequency with which children engaged in activities such as playing with letter blocks and reading books by themselves, and found that exposure to print predicted interest 10–20 months later, but teaching practices did not significantly predict reading interest or in letters at a subsequent point in time. Findings from these studies are consistent with a meta-analysis ([Bus, Van Ijzendoorn, & Pellegrini, 1995](#)) and a literature review ([Scarborough & Dobrich, 1994](#)) suggesting that shared reading promotes reading interest, but letter-teaching practices do not.

1.3. Does reading interest influence family literacy practices?

Studies fail to find evidence that children's reading interest influences parents' literacy practices. For example, after controlling for family practices and child age at time 1, the [Hume et al. \(2015\)](#) study found that reading interest did not predict print exposure later on, but that there was a marginal interaction effect such that parents of children with greater interest at Time 1 exhibited more teaching practices at Time 2. However, in that study, the lack of evidence that reading interest predicts family practices could be due to the wide age range of the children involved in the initial measurement (45 months), and failure to control for mothers' schooling. Our study, in contrast, restricts the measurement timespan to 18 months beginning in the pre-K year, and controls for mothers' education and child's age.

1.4. Stability and change of literacy practices and reading interest

Once the potential influences between the literacy practice and reading interest constructs have been determined, this information can be used to test these relations experimentally, and eventually, to devise interventions designed to modify one construct through the other. For that reason, it is also important to gain more insight into whether literacy practices and reading interest vary over time. For example, if reading interest has a longitudinal contribution to literacy practices, and reading interest increases from the end of pre-K to the end of kindergarten, this would help us pinpoint that kindergarten could be an optimal time to intervene interest in order to modify home literacy practices. Also, if individual differences in reading interest remain stable over time, increase or decrease, this is informative with regards to whether we should look at possible influences that alter a child's interest trajectory – for example,

entering a quality preschool education program, or being exposed to more books.

Changes over time in the constructs of literacy practices and reading interest have mainly been tackled using correlations and partial correlations between longitudinal measurements of a single construct (e.g., Hume et al., 2015; Roberts et al., 2005). Analyses of this sort do elucidate the degree to which a single construct covaries at a later point in time, but do not necessarily reveal anything about whether the construct's score increase or decrease on average. For example, a large covariance coefficient might indicate that a construct's scores do not vary over time, or that the construct's scores go up or down while individual differences hold steady (Selig & Little, 2012). Because a situation where individual differences fluctuate is very different from a situation where a construct's average scores go up or down, this study will estimate both stability (of individual differences) and change (average) separately.

Given the prominence of the family environment in young children's lives (Bronfenbrenner & Morris, 2006), one might think that reading interest is closely tied to the opportunities facilitated by parents, especially before children enter school. Nevertheless, once children enter the school system, new proximal processes appear, creating new sources of individual differences for reading interest. Consistently, one descriptive study found a reduction (change) in children's positive attitudes towards reading between pre-K and kindergarten (Spearling & Head, 2002), while two other studies have found that between the ages of 2 and 6, literacy practices were more stable than reading interest (Hume et al., 2015; Roberts et al., 2005). In other words, even if reading interest changes, it may be that literacy practices remain stable.

Accordingly, the present study evaluates the change in reading interest and literacy practices between the start of pre-K – which in Chile is when most children enter formal education (Ministerio de Educación, 2014) – and it also assesses the stability of individual differences in the same time period, through the significance and magnitude of autoregressive coefficients, using a model that permits standardized comparisons.

1.5. The Chilean context

The relationship between home literacy practices and the development of reading interest in low-SES Chilean children may be different from other contexts around the world. To begin with, in Chile reading is neither a widespread nor socially-valued habit: 53% of adults state they are non-readers, and one of the most frequently-cited reasons for not reading is “lack of interest” (37%) (Fundación La Fuente & Adimark, 2010). In addition, according to a questionnaire administered to a sample of 188 people from various districts in the city of Santiago, Chile, 46% of parents never engage in shared reading with their five-year-old children (Susperreguy, Strasser, Lissi, & Mendive, 2007). By contrast, in a survey administered to 400 parents of children aged 2–5 years old, 84.7% reported that their children watch television every day. In the same survey only 2% of parents felt that children between the ages of 0 and 5 would find shared reading fun (Consejo Nacional de Televisión, 2007).

Add to this the high cost of books in Chile, and it is easy to understand the small numbers of books in Chilean households. In the United States, a paperback children's book might cost between 7 and 12 USD. The price for a book of the same sort in Chile starts at around 12 USD (Strasser, Vergara, & del Río, 2016). This gap is even wider considering that the International Monetary Fund has reported that in 2014, GDP per capita in the United States was 54,629 USD, but just 22,333 USD in Chile. Thus, forty two percent of the population reports having no more than 10 books at home, with this figure reaching 81% in low-SES homes (Instituto Nacional de Estadísticas, 2004). Given these context factors, low SES children in Chile may be more at risk of not being exposed to books than low

SES children in developed countries. One study (Susperreguy et al., 2007) showed that Chilean low and even middle-income parents read to their children even less frequently than low-income parents in the US. The consequences of this for the development of their reading interest may not be trivial.

In short, there is ample reason to believe that Chilean low-SES children face risk factors that may affect their exposure to literacy practices and the effect of those practices on the development of reading interest, in comparison with high-SES groups, as well as with low-SES groups in other countries (Buckingham, Beaman, & Wheldall, 2014).

1.6. The present study

The goals of this study are twofold: a) evaluating the transactional relationship between reading interest and parents' literacy practices, from the beginning of pre-K to the end of kindergarten; and b) describing the dynamics related to the stability of individual differences and change in reading interest and home literacy practices between the start of pre-K and the completion of kindergarten. These goals are examined in a low-SES sample in the Chilean context. A better understanding of the factors associated with children's interest in books in specific social contexts, in this case, the low-socioeconomic swath of the Chilean population, will provide valuable insight into designing interventions that help close the socioeconomic gap in literacy development that emerges at an early age.

2. Method

2.1. Participants

The sample was drawn from the impact study conducted by the program *Un Buen Comienzo* (“A Good Start”). The study was performed with 1874 children and their families attending 64 public urban schools in six low-income municipalities from the Chilean capital, 1033 children in the intervention condition and 843 children in the comparison condition (Yoshikawa et al., 2015). Because the objective of this study entails specifying a longitudinal model in which reading interest and teaching practices are controlled by the autoregressor, it is necessary that the informant be the same person at all three points in time (to avoid error due to different frequency of practices or different perceptions of interest of different informants). As such, 1062 cases in which the questionnaires had been filled out by different people at the three points in time were discarded. Another 55 cases in which the people who responded to the questionnaire did not live with their children were also eliminated, to ensure that parents' reports of interest and the frequency of literacy practices would be grounded in sufficient real-life experience. The choice was also made to work only with fathers and mothers, as the variable for caretaker on the study gave the options of Father, Mother, or Other, but it was not possible to further define “Other” (28 cases). Finally, to make sure that the effects found were not a result of belonging to the experimental group, cases of families that changed between the intervention and control groups (8 cases) were tossed out. To make sure that dropping these eight cases did not have either substantive or statistic consequences, analyses were conducted with and without these eight cases. As the results did not change, and for the sake of clarity, results reported here do not include the 8 cases which changed group during the intervention period. Consequently, as shown in Table 1, the final sample consisted of 721 children and their families, of which 54% were in the intervention group ($n = 392$) and 46% in the comparison group ($n = 329$). Most of the questionnaires ($n = 711$) were answered by mothers, and 10 by fathers. Forty six percent of children in the final

Table 1
Participants' characteristics.

Variable	Average (or%)	SD	Range
Gender (male)	46%		
Age of child Time 1 (months)	52.65	3.65	45.01–63.54
Age of child Time 2 (months)	59.26	3.68	51.75–70.01
Age of child Time 3 (months)	71.27	3.72	63.67–81.71
Prior school experience (1 = yes)	54%		
Mother's education			
Some primary school	14%		
Completed primary school	16%		
Some secondary school	24%		
Completed secondary school	44%		
Some higher education	2%		
Intervention group (1 = UBC)	54%		

sample were male, 13% had mothers who had not completed primary education ($n=92$); 15% of mothers had completed primary education ($n=104$); 21% had some secondary education ($n=151$); 39% had completed secondary education ($n=278$); and 12% had some postsecondary education ($n=84$).

T-tests revealed no significant differences in the responses given by fathers and mothers to the practice and interest scales, so no differentiation was made between the results for fathers and mothers. Same results were obtained when we compared averages between the full and restricted sample at the item-level, except for one item of teaching practices ($M=3.26$ vs. 3.39 , $p=0.006$, respectively) at the beginning of prekindergarten. Consequently, results reported in this study can be generalized to the population with similar characteristics of the full sample (see Yoshikawa et al., 2015).

2.2. Intervention description and effects

The original study compared an intervention and control group. Teachers in the intervention classrooms received training, coaching, and roughly 100 books per classroom, while teachers in the control condition received 10 books per classroom and one workshop about self-care. The theory of change assumed that professional development delivered to teachers and teacher aids for a two-year period would produce changes in classrooms practices, which in turn would produce changes in child development domains. Professional development included a workshop and two coaching sessions per month for six months every year.

Teaching domains switched monthly but strategies to develop language and literacy skills was the main focus of the program. Twice a year classroom teams, supported by coaches, implemented meetings with families (90 min) to communicate them the intervention. This included explaining one specific topic regarding language development, socioemotional development, or child health, and an interactive workshop in the classroom, where the parent-child dyad would cycle through four "stations", each one related with one of the program's core topics. The program had no impacts on the targeted child language, literacy and socioemotional developmental domains, but moderate-to-large impacts on quality of interaction in classrooms (Yoshikawa et al., 2015). Effects on family practices have not been studied, but because of the program's focus on information and complementing classroom changes, no modifications in parent behavior were expected.

2.3. Procedure

Parental permission to participate in the study and parent questionnaires were collected in person by the evaluation team in the participating schools, at parent meetings scheduled by the school, or at home if parents did not attend. The evaluation teams, mainly master's degree students or graduates from the education and/or social science fields, were in charge of this process. The evaluators

were trained in administering and reading the questions on the questionnaires to parents with low literacy levels. For parents who did not know how to write, the evaluators were permitted to write their answers down for them. Questionnaire administration took 75 min on average.

Data on the age of the child, gender of the child, mother's level of schooling, and child's prior school experience were collected from school records and compared with the questionnaire answers from parents and medical records. Where inconsistencies arose, cases underwent further examination on an individual basis.

For this study, reading interest and literacy practices were measured at three points in time: beginning of pre-K, or T1 (March–May); end of pre-K, or T2 (October–December); and end of kindergarten, or T3 (October–December). When they entered pre-K, children were between the ages of 3 years, 8 months and 5 years, 3 months ($SD=3.6$ months); children at the end of pre-K were between the ages of 4 years, 3 months and 5 years, 9 months ($SD=3.6$ months); and at the end of kindergarten, the age range was 5 years, 3 months to 6 years, 9 months ($SD=3.7$ months).

2.4. Instruments and variables

To gather the data on reading interest, initial literacy practices, mother's schooling, age, child gender, and previous preschool experience, a questionnaire based on the Family Environment Survey (Romero-Contreras, 2006) was administered to the parents at each time point.

2.4.1. Exposure to print

In keeping with the conceptualization of formal and informal activities (Sénéchal & LeFevre, 2002, 2014), and Authors (2017) study, the variable of *exposure to print* by parents was constructed from the average frequency of shared reading at home (the 4-point scale—1 = Never or almost never; 2 = One to two times per month; 3 = One to two times per week; 4 = Three or more times per week—was recoded as 1, 2.33, 3.67, and 5, thereby giving it the same range as the other two items), number of children's books at home (1 = 0 books; 2 = 1–3 books; 3 = 4–10 books; 4 = 11–29 books; 5 = 30 books or more), and number of books at home (1 = 0 books; 2 = 1–10 books; 3 = 11–29 books; 4 = 30–50 books; 5 = 60 books or more). In the first confirmatory factor analysis (CFA) conducted to evaluate the latent variables the print exposure items did not come together into one factor, whereas the items in the other two latent variables did. This may have been partly because the frequency of shared reading item correlated highly with items indexing parents' perception of their child's reading interest. However, for theoretical reasons we decided to keep exposure to print as a separate construct, since our interest was to analyze relations between parents' practices and their perception of their child's interest. Therefore, we built an observed print exposure score by averaging the print exposure items (0.5, 0.5, and 0.5 for Cronbach's alphas at the beginning of pre-K, end of pre-K, and the end of kindergarten, respectively). This was entered in the models as an observed variable.

2.4.2. Teaching practices

Contrary to what happened with print exposure, the latent variable constructed to measure teaching practices fit adequately into the CFA,¹ with items measuring how often parents help their children write letters and numbers, and how often parents help their

¹ Confirmatory factor analysis was used to check the fit of the teaching practices and reading interest factors for each of the three time points. The fit indices were good (beginning of pre K: CFI = 0.99; TLI = 0.99; RMSEA = 0.023; SRMR = 0.015; End of pre K: CFI = 1; TLI = 1; RMSEA = 0; SRMR = 0.014; end of Kindergarten: CFI = 0.99; TLI = 0.98; RMSEA = 0.036; SRMR = 0.023).

children read letters and numbers. Both measurements used a four-point scale (1 = never or almost never; 2 = once or twice a month; 3 = once or twice a week; and 4 = three times a week or more).

Reading interest is also a latent variable derived from responses to the following questions: How often does your child look at or read books or magazines on his or her own at home? How often does your child ask you to read to him or her? How often does your child read to you (or act like he or she is reading to you)? All of these questions were scored on a scale of 1–4 (1 = never or almost never; 2 = once or twice a month; 3 = once or twice a week; and 4 = three times a week or more).

2.4.3. Control variables

To remove possible influences of other variables on the relations of interest, we included a set of control variables. First, mother's education, which has been associated with print exposure and teaching practices in Chile (Authors, 2009). Mother education was divided into five levels (some primary school, completed primary school, some secondary school, completed secondary school, some higher education). Second, we controlled for children's previous participation in a preschool program. We assumed that preschool experience would expose children to at least some books or teaching practices in the classroom, and it could expose parents to children's books or book sharing practices, possibly influencing the relation between reading interest and family practices, so we controlled for it. Similarly, we reasoned that, if cultural beliefs about what is adequate for children of different ages are influencing parents' provision of literacy experiences, then children's age could influence their perception, and the relations between perceived interest and parents' practices, and therefore controlled for it. Another control variable was child's sex, since it has been previously observed that parents of daughters tend to report their child is more interested in reading than parents of sons (Baroody & Diamond, 2013). Finally, we included participation in the UBC study's intervention group, to account for any possible effects of the program.

2.5. Analytic plan

In order to meet the goals of the study, a cross-lagged model was used. This type of analysis requires at least two variables measured on at least two different occasions, where the relationships between the variables at one point in time and a later point in time are tested. For our first goal, the crossed relationships were interpreted. These relationships reveal the longitudinal predictions between the constructs and make it possible to longitudinally evaluate which prediction is most likely between the constructs, controlling for both the autoregressive effect and the correlation between the two constructs at the earlier point in time (Martens & Haase, 2006; Selig & Little, 2012). In short, a cross-lagged model with three time points was tested, which included the two latent variables (teaching practices and reading interest), as well as exposure to print as an observed variable. The model included the control variables already mentioned.

Aiming to determine whether or not the stability of the pre-K constructs was significantly different from the stability of the kindergarten constructs, and in order to obtain as parsimonious a model as possible, the coefficients of the paths going from the beginning of pre-K to the end of pre-K, and from the end of pre-K to the end of kindergarten, were tested, and proved to be statistically equivalent or invariant. When invariance is found in an autoregressive path, it can be said that the stability of the scores of one path's construct is statistically equivalent to the stability of the scores of the other path's construct. When invariance is found between the longitudinal crossed predictions, it can be said that the predictive

effect of one construct on another different construct does not vary between the two times.

Once the final model is obtained, the path coefficients might be reported either in standardized or non-standardized forms. In the non-standardized form (as we report in all figures in this article), coefficients from the start of pre-K to the end of pre-K, and from the end of pre-K to the end of kindergarten are identical. In the standardized form, coefficients vary because their magnitude is expressed in terms of standard deviation (as we report in Section 3.3 in Section 3).

To select the final and most parsimonious model, different nested models were compared using the Chi-squared test. If the differences were not significant, the most parsimonious model was chosen. The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), which are indicators of the fit of the model with respect to a null model, were also estimated. In order for the model to be considered a good fit for the data, the values should come close to 0.95. The Root Mean Square Error of Approximation (RMSEA) looks for the best fit in terms of parsimony with respect to the model's degrees of freedom. For this indicator, a good fit was considered to be less than 0.05. The Standardized Root Mean Square Residual (SRMR) was used to determine whether the estimation has a lot of residual variance. Values less than 0.05 are considered good for this indicator.

To estimate the cross-lagged model, the robust standard error estimator (Huber-White) was used, as well as a scaled statistical test that is asymptotically equal to the Yuan-Bentler statistical test (MLR) from the Lavaan package 0.5–23.1097 suggested for non-normal data (Rosseel, 2016) in the statistics software R, version 1.0.136. Because there were few missing data points (less than 3% for all the variables), and upon inspecting the patterns it appeared to be a case of data missing at random, the data were treated using the MLR estimator.

The second goal of the study was tackled with two analyses. First, to evaluate the stability of the constructs, the paths that predict the same variable at a later time were interpreted. These paths are called autoregressive, and make it possible to evaluate the stability of individual differences or of the ranking of the scores on each variable (Selig & Little, 2012). Second, in order to evaluate the average change across each construct, paired-samples T-tests were performed and comparisons were conducted with the Yuen method, which allows for a robust comparison of averages in the absence of normality (Field, Miles, & Field, 2012; Wilcox, 2012). These comparisons were done between the start and end of pre-K, and between the end of pre-K and the end of kindergarten. The hypothesis to test was: $H_0: \mu_{t1} - \mu_{t2} = 0$; $H_1: \mu_{t1} - \mu_{t2} \neq 0$, where μ_{t1} y μ_{t2} are the population averages at consecutive points in time for the same construct (reading interest, teaching practices, and exposure to print). The variances were not set as equal, essentially because it was expected that the variance in parent practices and child reading interest would rise over time (e.g., we expected that parents' perception of reading interest and parent's practices would vary more when children interact with other contexts, like pre-K or kindergarten).

Considering that the models were estimated robustly, which influences the Chi-squared estimate, the Chi-squared values were rescaled for each model in order to make them statistically comparable (Satorra & Bentler, 2001).

3. Results

3.1. Descriptive results

The reading interest items displayed low variation in average scores across time, but greater variability as expressed in their

Table 2
Descriptive statistics of the study's key variables.

	Variable	Average	(SD)	Asymmetry	Kurtosis	Min.	Max
1	Help writing – T1	3.39	0.86	–1.38	1.15	1.00	4.00
2	Help reading – T1	3.43	0.83	–1.47	1.45	1.00	4.00
3	Help writing – T2	3.59	0.68	–1.81	3.18	1.00	4.00
4	Help reading – T2	3.59	0.65	–1.67	2.77	1.00	4.00
5	Help writing – T3	3.65	0.67	–2.19	4.86	1.00	4.00
6	Help reading – T3	3.69	0.61	–2.27	5.42	1.00	4.00
7	Reads books – T1	3.20	1.00	–1.02	–0.17	1.00	4.00
8	Asks to be read to – T1	2.70	1.20	–0.31	–1.46	1.00	4.00
9	Reads to adult – T1	2.94	1.15	–0.63	–1.09	1.00	4.00
10	Reads books – T2	3.23	0.92	–1.02	0.13	1.00	4.00
11	Asks to be read to – T2	2.98	1.07	–0.67	–0.85	1.00	4.00
12	Reads to adult – T2	3.14	1.00	–0.92	–0.31	1.00	4.00
13	Reads books – T3	3.18	0.94	–0.95	–0.07	1.00	4.00
14	Asks to be read to – T3	3.04	1.07	–0.79	–0.69	1.00	4.00
15	Reads to adult – T3	3.29	0.94	–1.18	0.33	1.00	4.00
16	Exposure to print T1	3.00	0.88	–0.12	–0.44	1.00	5.00
17	Exposure to print T2	3.17	0.89	–0.34	–0.15	1.00	5.00
18	Exposure to print T3	3.24	0.87	–0.33	–0.18	1.00	5.00

Note. T1 = at the start of pre-K. T2 = at the end of pre-K. T3 = at the end of kindergarten.

standard deviations. By contrast, average scores on the exposure to print and teaching practices items did increase over time (Table 2). Table 2 shows that the values for asymmetry and kurtosis were acceptable, except for the teaching practice variables at Time 2 and Time 3. For that reason, robust estimates were used in the cross-lagged model and in the change analysis. There is a pattern of moderate intercorrelations between reading interest, teaching practices, and exposure to print items (Table 3). However, reading interest showed a slightly higher pattern of correlations with exposure to print items (r = from 0.23 to 0.53) compared with those of teaching practices (r = from 0.05 to 0.33).

3.2. Cross-lagged relationships between reading interest and parents' literacy practices

In order to obtain the most parsimonious model possible to evaluate the cross-lagged relationship between reading interest and parents' literacy practices, as well as the stability of the constructs, a three-step analysis was performed. The first step entailed specifying an autoregressive model with the literacy practice variables (teaching practices and exposure to print) and children's reading interest, predicted by the same construct from the previous time point, leaving all coefficients free (Model 1). This free-coefficients model was statistically and independently compared against three models using the Chi-squared test. Each of these three model comparisons tested invariance on the paths of each construct (fixing as equal the two coefficients of each of the paths for the same construct, and freeing the coefficients of the other two constructs). This analysis produced a non-significant difference between the free- and fixed-coefficients models in the teaching practices ($X_{\text{diff}}^2(1) = 0.527, p = 0.46$); reading interest ($X_{\text{diff}}^2(1) = 0.580, p = 0.44$); and exposure to print ($X_{\text{diff}}^2(1) = 0.007, p = 0.93$) constructs. Nor was the difference between the autoregressive model with the free coefficients (model 1) and the invariant autoregressive model in the three constructs (Model 2) significant ($X_{\text{diff}}^2(3) = 1.360, p = 0.72$), meaning that the invariant model explains the data observed just as well as the free-coefficients model, but with a gain of three degrees of freedom (Table 4). The models built below are nested in this model, which contains all of their invariant autoregressive constructs (Model 2, see Fig. 1).

The second step sought to test invariance in the longitudinal predictions between different constructs – interest predicting family literacy practices (i.e., print exposure and teaching practices) and the latter predicting interest. To do so, the significance of said paths

was evaluated using two models: one model with family literacy practices predicting interest and the other with interest predicting practices. The first model was literacy practices predicting reading interest at a subsequent point in time ($X^2(230) = 514, p = 0.00$; CFI = 0.94; TLI = 0.92; RMSEA = 0.039; SRMR = 0.042). The directionality in this model is at the heart of most of the concurrent studies in the pre-existing literature that have explored the relationship between literacy practices and reading interest (Scarborough & Dobrich, 1994; Lonigan, 1994; Roberts et al., 2005) (Model 3, see Fig. 2). In this model, none of the paths from teaching practices or exposure to print towards reading interest proved significant, so it was not possible to test invariance.

The second model of path significance was specified with reading interest predicting in the subsequent time point teaching practices and exposure to print (Model A²) ($X^2(230) = 478, p = 0.00$; CFI = 0.956; TLI = 0.937; RMSEA = 0.036; SRMR = 0.029). In this model, all paths were significant, so it was possible to test invariance of the paths from reading interest to literacy practices. To do so, the model described in the previous step (Model A) was compared against two other models. The first comparison was against a model equal to the previous model (Model A), but which constrained both paths from reading interest to teaching practices to be equal (Model A.1). This model did not have a significantly different fit from the original model ($X_{\text{diff}}^2(1) = 0.060, p = 0.80$). The second comparison was between Model A and a model that constrained the two paths from interest to exposure to print to be equal (Model A.2). The fit of this model was also not significantly different from the fit of model A ($X_{\text{diff}}^2(1) = 0.858, p = 0.35$).

Since the constrained models are more parsimonious, we conclude that neither the path from reading interest to teaching practices nor the one from reading interest to exposure to print, vary significantly between the start of pre-K and the end of kindergarten. Thus, the most parsimonious model can be specified with invariant autoregressive paths, invariant reading interest predicting literacy practice paths, and by allowing the coefficients for literacy practices predicting reading interest at a subsequent time to vary freely ($X^2(228) = 476, p = 0.00$); CFI = 0.956; TLI = 0.936; RMSEA = 0.036; SRMR = 0.028) (Model 4, see Fig. 3). This model where reading interest predicts family literacy practices fits the

² The models named with numbers are those that are substantially important to the research. The models named with letters were modeled only to test the invariance of the coefficients. They were given letter names to facilitate understanding of this paper and do not appear in the figures or comparison tables.

Table 4
Fit indices of the cross-lagged models evaluated.

Model	Scaled χ^2	df	p	CFI	TLI	RMSEA	SRMR	Comparison with nested model
1 Autoregressive with free coefficients	515.1	231	$p < 0.000$	0.949	0.927	0.039	0.043	NA
2 Autoregressive with invariant coefficients	516.7	234	$p < 0.000$	0.949	0.928	0.039	0.042	$\chi^2_{diff}(3) = 1.30, p = 0.72$
3 Literacy practices ₁ → Reading interest ₂	514.3	230	$p < 0.000$	0.949	0.926	0.039	0.042	NA
4 Cross-lagged with reciprocal effects.	476.1	228	$p < 0.000$	0.956	0.936	0.036	0.028	$\chi^2_{diff}(2) = 36.8, p < 0.000$

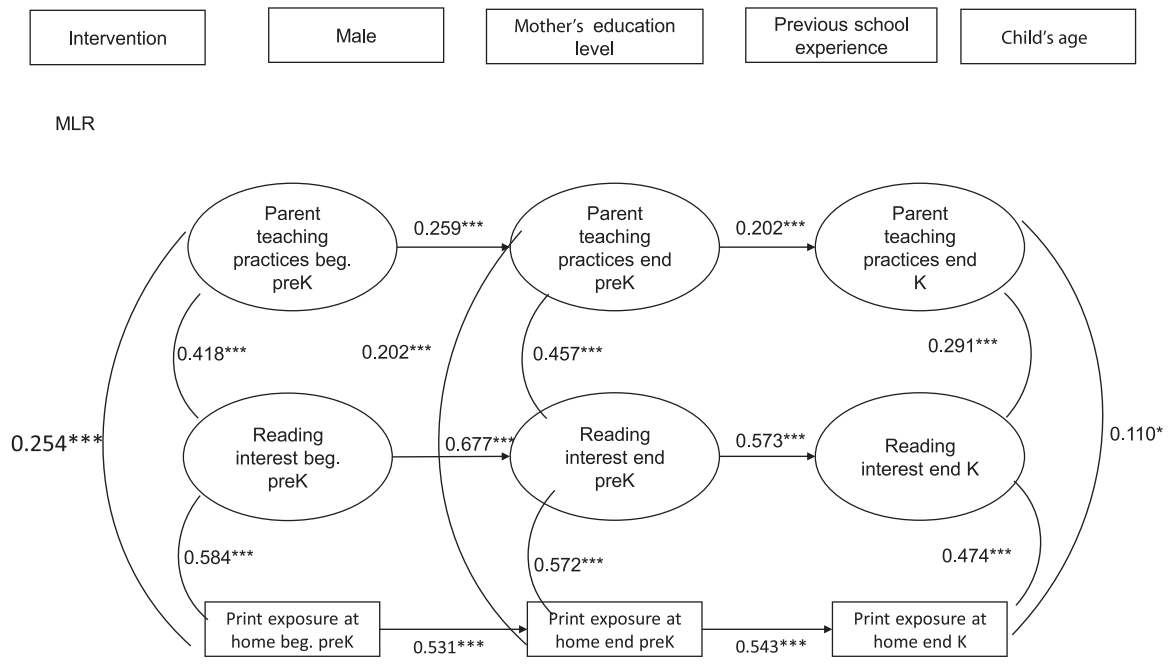


Fig. 1. Autoregressive paths model (Model 2). The boxes at the top of the figure represent the control variables used in the estimates of the three times. All coefficients are standardized. * $p < 0.05$. ** $p < 0.01$, *** $p < 0.001$.

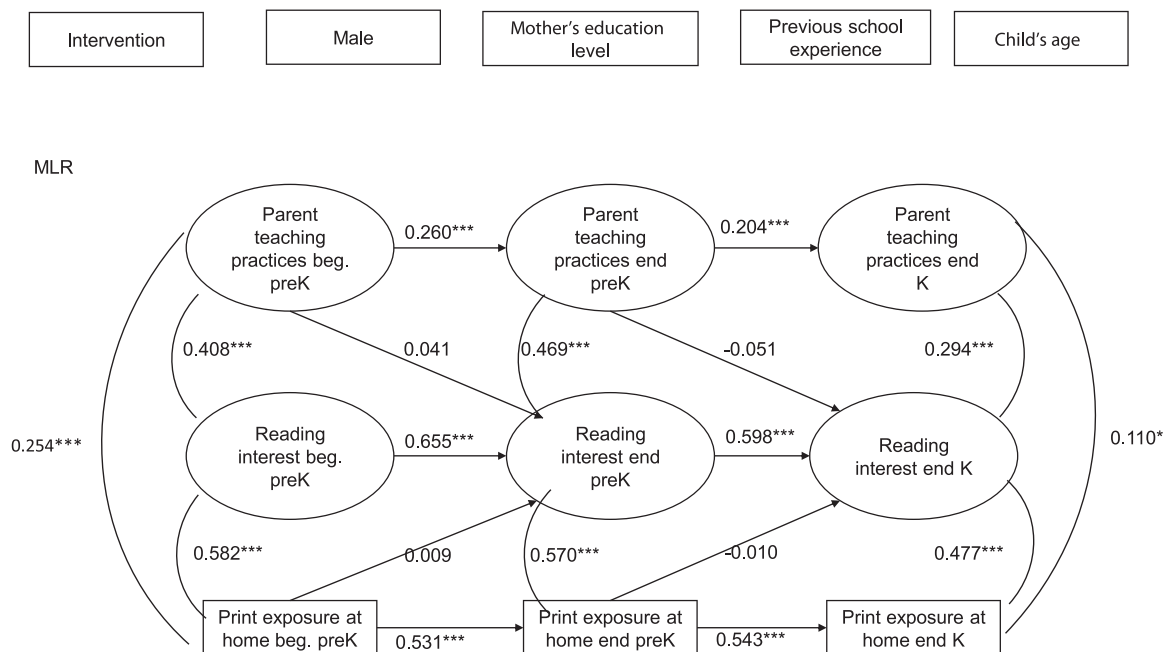


Fig. 2. Model of literacy practices predicting reading interest longitudinally (Model 3). The correlation between parent teaching practices at Time 2 and print exposure at home at Time 2 was .201***, not shown in the figure for ease of interpretation. All coefficients are standardized. * $p < 0.05$. ** $p < 0.01$, *** $p < 0.001$.

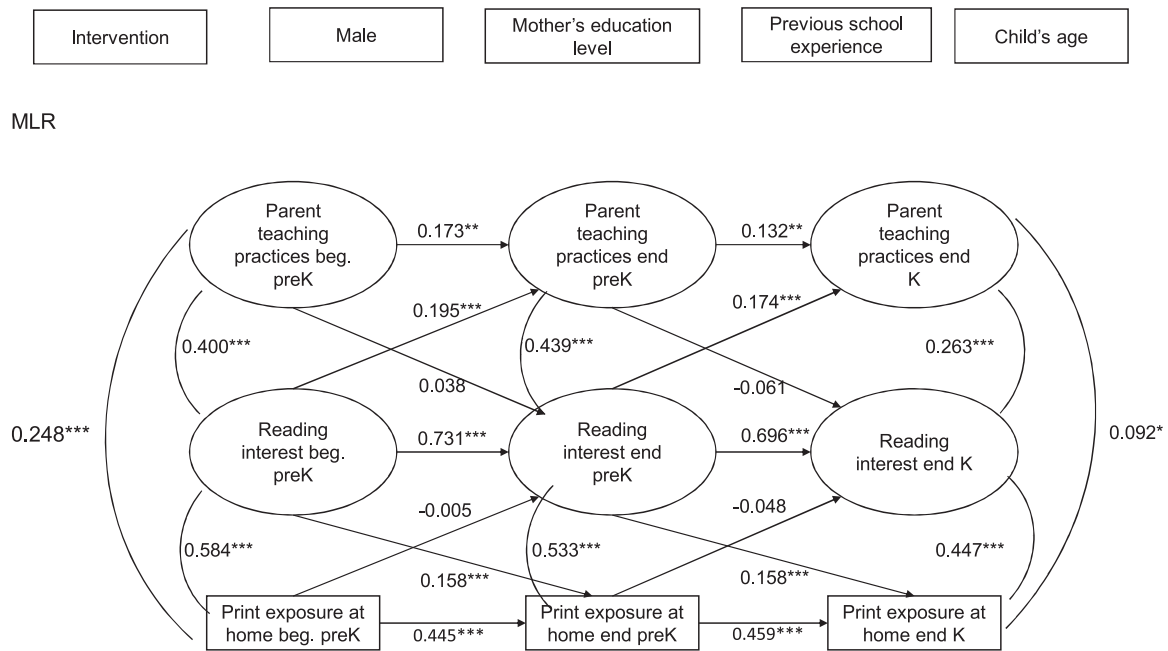


Fig. 3. Final model of longitudinal relationships between reading interest and parents' literacy practices (Model 4). Correlation between parent teaching practices at Time 2 and print exposure at home at Time 2 is .188***, not shown for ease of interpretation. All coefficients are standardized. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

data significantly better than the model where parents' practices predict reading interest (Model 3): $X_{diff}^2(2) = 36.8$, $p < 0.000$ (see Table 4).

The final model obtained (Model 4, see Fig. 3) addresses all aims of the study. There is evidence of significant autoregressive effects, but not of reciprocal effects between family literacy practices and reading interest. Rather, reading interest displays one-way longitudinal contributions to teaching practices and exposure to print. Reading interest as perceived by parents, significantly and invariantly predicts parents' teaching practices ($\beta = 0.173$, $p < 0.000$) and exposure to print ($\beta = 0.222$, $p < 0.000$). In other words, on average, for every one-unit change in parents' perception of their child's reading interest, parents' practices change 0.17 units, and exposure to print changes 0.22 units. Reviewing the standardized coefficients for these predictions, it emerges that reading interest displays similar predictive value towards teaching practices ($\beta t1 = 0.195$, $p < 0.000$; $\beta t2 = 0.174$, $p < 0.000$) and exposure to print ($\beta t1 = 0.158$, $p < 0.000$; $\beta t2 = 0.158$, $p < 0.000$).

3.3. Stability of individual differences in reading interest, teaching practices, and exposure to print

The autoregressive paths in the final model can be interpreted in terms of stability of construct's scores (Martens & Haase, 2006). Teaching practices stability is statistically invariant from the beginning of pre-K to the end of kindergarten. These stability levels are small in magnitude ($\beta = 0.146$, $p = 0.001$), which means that the ranking of how often parents teach their children to identify letters and numbers tends to change, and this change in individual differences occurs constantly between pre-K and kindergarten.

Stability of reading interest as reported by the parents is also invariant from the beginning of pre-K to the end of kindergarten. Reading interest is highly stable ($\beta = 0.722$, $p < 0.000$), so it could be said that children's reading interest scores tend to stay in the same order over time. In other words, on average, the parents who express that their children have greater reading interest at the beginning of pre-K are the same parents who report greater reading interest at the end of kindergarten.

The exposure to print construct also displays invariant stability, albeit more moderate ($\beta = 0.45$, $p < 0.000$). Parents moderately maintain their ranking in terms of how much they expose their children to texts. The change in individual differences in the amount of exposure to print is greater than the change in individual differences for frequency of teaching practices, but smaller than the change in individual differences for reading interest.

Regarding change in averages, we can say that levels of reading interest, exposure to print, and teaching practices rise significantly between the start of pre-K and the end of pre-K (respectively, $M = 2.9-3.1$, $p < 0.000$), $M = 3.0-3.2$, $p < 0.000$, and $M = 3.4-3.6$, $p < 0.000$). On the other hand, reading interest did not increase significantly between the end of pre-K and the end of kindergarten ($p = 0.07$), even as teaching practices and exposure to print both did (respectively $M = 3.6-3.7$, $p = 0.000$; $M = 3.2-3.2$, $p = 0.013$).

4. Discussion

This study evaluated the transactional relationship between reading interest and parents' literacy practices, as well as changes and stability in individual differences across these constructs between the beginning of pre-K and the end of kindergarten, in a low-SES Chilean sample. The main result, which expands on previous literature, is that reading interest longitudinally predicted parents' practices, both for exposure to print and letter-teaching practices, parents' practices did not predict children's reading interest.

This study advances our understanding of the relationship between reading interest and parents' literacy practices, as it is the first study to simultaneously evaluate both directionalities, controlling for both autoregressive effects and the concurrent relationships between the constructs after controlling for the effects of child and background variables that could affect these relationships. By contrast, the majority of studies in the past had evaluated only models in which the direction was from parents' practices to their children's reading interest (Frijters et al., 2000; Malin et al., 2014; Ortiz et al., 2001; Sénéchal, 2006; Spearling & Head, 2002).

Essentially, we found that the model with two-way predictions is the best fit, and can explain the data significantly better than the model that considers only parents' literacy practices predicting reading interest. In short, our results suggest that children's reading interest has a transactional influence (Sameroff, 2010) on parents' literacy practices. Thus the results also provide evidence for children's ability to produce, and not only reproduce, the structure of their environments, and to be agents capable of changing their social circumstances (Bourdieu, 1997; Giroux, 1992; Sameroff, 2010).

The transactional relationship found suggests that interventions designed to improve home literacy environment should also bring children into the equation, rather than seeking only to change parents' practices directly. For example, in addition to interventions that provide quality storybook for children and parents to share in places such as preschool settings or the waiting rooms at doctors' offices, parents could be taught to recognize their children's interest in books and in reading. Changing parents' perceptions of children's interest in books may, according to our results, increase the degree of exposure to print parents provide to their children. Additionally, providing parents with exemplars that show that young children can express an interest in books and reading, may change their attitude towards providing a more literacy rich home environment. An intervention that mainly seeks to make parents more aware of their children's reading interest could boost participant responsiveness (Dane & Schneider, 1998), and thus, it could have bigger impacts than interventions that explicitly aim to change only parent practices and beliefs.

However, we are indeed surprised that we did not find that exposure to print by parents had any effect on children's reading interest, and that according to the standardized predictions (Model 4, Fig. 3), reading interest predicts teaching practices to a greater extent than exposure to print. This could be due to factors inherent to the low-SES Chilean context. Because book access is difficult for low income families in Chile, due to high cost of books and inefficient policies to provide access to books to poor families (e.g. few public libraries, understaffed school libraries; Mendive, Lissi, Bakeman, & Reyes, 2017), it becomes very likely that the quality of books parents read with their children is low. In effect, an earlier study performed in Chile in diverse socioeconomic contexts did report that frequency of shared reading is lower even compared with low-income families in the U.S. In that same study, parents' favorite books to read to their children were mainly poor-quality books, such as coloring books or books based on children's movies (Susperreguy et al., 2007). We hypothesize that by using low-quality books in shared reading, parents might mainly perform teaching practices, and these practices may foster reading and writing of letters and numbers (e.g., coloring letters or numbers) more than the reading interest that results from exposure to narration.

It is still necessary to study the quality of books that low-SES parents in Chile are using in their shared reading, and how this variable mediates the relationship between reading interest and literacy practices. Further qualitative studies will also be necessary to understand how parents read these books to their children. It is also possible that parents' practices influence children's subsequent reading interest, but that this influence is briefer than the timeframes considered in this study (e.g., six months and one year). This would be consistent only with a short-term effect, and therefore not be inconsistent with studies such as that of Ortiz et al. (2001) who found effects on a follow-up measurement after an intervention in parent practices.

Recognizing that our results are correlational, we would still caution that it is necessary to remove diverse sources of spurious influence. In order to gain a thorough understanding of the directionality between literacy interest and practices, it will be essential to use experimental designs that determine the direction of causal-

ity between practices and interest. In order to gain a thorough understanding of the directionality between literacy interest and practices, it will be essential to use experimental designs that determine the direction of causality between practices and interest. Such studies could for example manipulate parents' perceptions of children's interest in literacy, in order to determine whether parents provide more literacy activities as a result of the change in those perceptions.

Looking at the changes in the constructs evaluated, in contrast with the literature (Hume et al., 2015; Roberts et al., 2005), our study found that for the ages of 54–81 months, teaching practices and exposure to print scores were less stable (e.g. rankings changed) than scores for reading interest between the end of pre-K and kindergarten. Similarly, although the average scores for reading interest, teaching practices, and exposure to print rose during pre-K, only the frequency with which parents teach their children to read and write letters and words and the frequency with which parents expose their children to print rose between the end of pre-K and end of kindergarten. This may be because parents respond to their perception of their children's reading interest by changing the behaviors they believe are most important, such as how often they help their children read or write letters and numbers or expose them to print. Nevertheless, although the frequency with which parents expose their children to print does rise between pre-K and kindergarten, reading interest does not. It is possible that exposing children to low quality books (e.g. coloring books), as many low-income parents do, (Susperreguy et al., 2007), does not increase reading interest substantially.

Another possible reason why teaching practices and exposure to print grow while reading interest stays flat is that schools provide more support for families to systematically develop letter- and number-reading and writing routines. This is consistent with the fact that writing events rose more than book-reading events between the beginning of pre-K and the end of kindergarten in a study that observed literacy practices in approximately 90 min distributed throughout the school day in the classrooms of the children in the sample (Mendive, Weiland, Yoshikawa, & Snow, 2016).

In terms of the change in reading interest, we found an average increase between the start and end of pre-K, and subsequent stagnation between the end of pre-K and the end of kindergarten. It could be surmised that reading interest gets an initial boost when children come into contact with the quality children's literature that ought to be expected in classrooms, or that parents' get a similar boost from being exposed to teachers' beliefs about children's interest in books. However, our results show that whatever influence the school has on parents' beliefs regarding children's reading interest, it is most significant at the point of entry into the school system, and does not continue to grow throughout the kindergarten year.

4.1. Limitations

One limitation of the study is that both literacy practices and reading interest were reported by the parents. It may be that these two measurements were related to one another, considering that they were both nested in the same subjects and their perceptions of what their families do. In spite of this limitation, precautions were taken to use multiple observations, model the error, and create exclusion criteria to ensure that there was real-life experience underlying what parents were reporting (Bollen, 2002; Seifer, 2005). Even so, it is important to remember that it is the parents' perceptions of their children's interest that is being measured. It would also be prudent to compare the results of this study with another study that measures reading interest directly with the children.

On another note, the autoregressive paths of the cross-lagged model made it possible to evaluate the stability of individual differences, but not the within-person stability for each variable (Selig & Little, 2012). Future studies will need to use change models to delve deeper into how the constructs for reading interest, teaching practices, and exposure to print change, or whether different groups experience different change trajectories over time.

This study, like most studies in the past, was focused more on reading frequency than reading quality. This caveat becomes important as it is evident that the majority of studies that emphasize reading quality do so in order to explore its relationship to literacy skills, not literacy interest (Mol, Bus, De Jong, & Smeets, 2008; Ortiz et al., 2001). Future studies might explore book quality as a mediator of the relationship between literacy practices and reading interest, or use qualitative designs to understand how parents are really reading to their children, given that book quality can be an important aspect of understanding reading quality.

Another limitation of the study is the low internal consistency of the print exposure variable. This may indicate that the items in the scale do not measure the same construct, making it difficult to interpret the aggregate score of those items (Kline, 2015). If we take into account the lack of access to books in Chilean society, it is understandable that number of books at home and frequency of sharing books with the child are not highly correlated, and this could explain the low internal consistency in this factor. Low internal consistency may have diminished effect sizes of this scale (Kline, 2015), so it is possible that the relation between print exposure and reading interest is actually larger than it appears in this study.

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