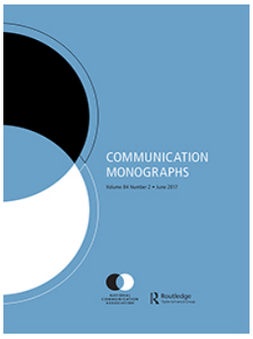

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Latino children's ability to interpret in health settings: A parent–child dyadic perspective on child health literacy

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ABSTRACT
To determine children's ability to interpret in medical settings, 100 dyads of low-income, Spanish-speaking parents and their bilingual children who interpret for the parents were surveyed. Seventy-four children demonstrated adequate health literacy in English. Three theoretical perspectives (social cognitive theory, role-reversal theory, and the team-effort model) guided hypotheses about how parent and child characteristics influenced child health literacy. Structural equation model results supported the team-effort model. Children were more health literate when they were older, had better English abilities, had higher self-efficacy, and had parents with lower self-efficacy and better English language abilities. Children and parents may work as a team in medical interpreting settings, with children simultaneously compensating for and learning from parents.

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Child interpreting; health literacy; Latino; parent–child relationship; medical interpreting; language brokering

Thirty-seven million individuals in the United States speak Spanish at home – 44% of whom cannot speak English well – making Spanish speakers the largest low English-proficiency population in the United States (US Census Bureau, 2013). Language barriers and issues of interpretation are a primary concern for health care providers when treating Spanish-speaking patients (Flores, 2014). Patients with limited ability to understand and process health information have higher mortality (Sudore et al., 2006), worse health outcomes (Kalichman & Rompa, 2000), and limited adherence to treatment regimes (Nielsen-Bohlman, Panzer, & Kindig, 2004) compared to more health literate counterparts (Andrus & Roth, 2002).

Although professionally trained, bilingual health care staff or interpreters are sometimes available (Hsieh, 2013), oftentimes health care providers do not have access to interpretation services, particularly in rural areas (Diamond, Schenker, Curry, Bradley, & Fernandez, 2009; Kuo, O'Connor, Flores, & Minkovitz, 2007). Alternatively, when interpreters are available, health care providers may opt not to use them (Hsieh, 2015) and patients may prefer untrained family members to interpret (Brisset, Leanza, & Laforest, 2013). Spanish-speaking families in the United States often cope by relying on young bilingual members of the family to act as interpreters in a variety of settings, including

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medical and health locales (Corona et al., 2012; Kam & Lazarevic, 2014; see Katz, 2014a). Health researchers have questioned whether untrained child interpreters have adequate ability to function as interpreters in a medical context (Flores, 2005; Hsieh, 2006) and note that untrained children lack the health knowledge necessary to act as medical interpreters (Giordano, 2007).

Numerous terms have been used to refer to children who act as untrained interpreters: informal translators, ad hoc interpreters, family interpreters, and language brokers (Brisset et al., 2013; Kam & Lazarevic, 2014; Leanza, Boivin, & Rosenberg, 2010). For the purposes of this manuscript, the term *child interpreter* is used. These children (or adolescents), who are untrained as interpreters, linguistically and culturally interpret between a family member (often a parent) and another adult (Kam & Lazarevic, 2014). Research on professional medical interpreters asserts interpreters must have adequate health literacy levels (Hsieh, 2013), or "the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions" (Nielsen-Bohlman et al., 2004, p. 1). Because child interpreters are untrained and of varying ages, they may not be fluent in one or both languages, may not have extensive health vocabulary or understanding of health issues, and may alter information or selectively interpret information rather than interpreting all aspects of the conversation verbatim (Corona et al., 2012; Free, Green, Bhavnani, & Newman, 2003; Hsieh, 2006). Child interpreters admit that they may lack sufficient health literacy in some circumstances (Green, Free, Bhavnani, & Newman, 2005), but research has not examined child interpreter health literacy levels despite calls for research on child interpreter abilities (Corona et al., 2012; Leanza et al., 2010) and adolescent health literacy levels (Manganello, 2008).

Moreover, child interpreters navigate a complex communication environment that could both help and harm their skill development. Child interpreter health literacy levels can vary (Manganello, 2008), underscoring the importance of identifying traits that align with more health literate child interpreters (Leanza et al., 2010; Manganello, 2008). Child interpreters uniquely develop health knowledge and linguistic abilities (Angelelli, 2010), as they are exposed to advanced vocabulary and health concepts when interpreting (Valdés, 2003). Because parents actively participate in interpreting situations and child learning (Katz, 2014a), characteristics of the child *and* of the parent are likely to associate with the child's ability to understand and comprehend health information.

The current study examines English health literacy ability in child interpreters (age 9–18 years old) from low-income, Spanish-speaking families living in the United States. Health literacy is first discussed as an assessment metric of child interpreters. Second, child characteristics that should bolster child health literacy are discussed based on previous health literacy research. Finally, parent characteristics are described. Three theoretical models (social cognitive theory, role-reversal theory, and the team-effort model) provide competing hypotheses about how parent characteristics might relate to child interpreter health literacy. Data from parent–child dyads are used to assess how child health literacy is associated with child characteristics and parent characteristics.

Health literacy of child interpreters

Health literacy research from demographically diverse populations paints conflicting pictures about potential child interpreter health literacy levels. Based on demographics

similar to adult populations, children interpreters should have low health literacy. Low-income, less-educated, and non-native English-speaking characteristics are typical of families in which children interpret for their parents (Morales & Hanson, 2005) and of low health literate individuals (Andrus & Roth, 2002; Beacom & Newman, 2010; Nielsen-Bohlman et al., 2004). However, Manganello (2008) posits that adolescent health literacy research needs to focus on specific cultural groups within a particular socio-economic status – such as low-income, bilingual Latino adolescents – because unique group characteristics influence health literacy levels. Adult populations with one or two similar demographic traits may not adequately represent low-income, bilingual child interpreters.

Developmental factors also distinguish adolescents from adult populations, although adolescents are understudied in health literacy research (Manganello, 2008). A popular operationalization of health literacy (the Test of Functional Health Literacy in Adults, TOFHLA) conceptualizes adequate health literacy as including the ability to (a) read and comprehend health information and (b) perform basic numeracy skills (Mancuso, 2009; Parker, Baker, Williams, & Nurss, 1995). Chisolm and Buchanan (2007) noted that numeracy skills in their sample of White, English-speaking adolescents (age 13–17) may not be as developed as in adults.

In a study of 261 Latino adolescents (average age 16 years old), 52% had adequate health literacy (Ghaddar, Valerio, Garcia, & Hansen, 2012). However, adolescents who interpret for their parents may develop medical vocabulary and numeracy skills at a faster rate than their peers, as interpreting exposes adolescents to adult situations, concepts, and advanced vocabulary atypical for their age (Valdés, 2003). Although children interpreter demographics indicate they might be at-risk for low health literacy, their role as interpreters may increase their exposure to medical vocabulary and advance understanding of health concepts. Given the importance of adequate interpreter health literacy and the lack of research on health literacy in child interpreter populations, the following research question is proposed:

RQ1: What are the English health literacy levels for the children in this sample?

Child characteristics and health literacy

Numerous factors could influence child health literacy development (Manganello, 2008), including child characteristics and parent characteristics (described in the subsequent section). Manganello's (2008) framework for studying adolescent health literacy suggests that adolescent age, language abilities, and social skills will predict adolescent health literacy (for a review of adult-based research, see Andrus & Roth, 2002).

Age is especially salient for health literacy levels in child interpreters, given that children can start interpreting quite young (e.g., most interpreters start around age eight or nine; Morales & Hanson, 2005). Research on adult, low-income populations has demonstrated that individuals with higher education levels tend to be higher in health literacy (Jensen, King, Guntzviller, & Davis, 2010). As child interpreters continue their education and become older, they are exposed to increasingly advanced vocabulary and develop more complex ways of thinking. For example, older Latino high schoolers were more health literate than underclassmen (Ghaddar et al., 2012).

Child English and Spanish language ability should also enhance health literacy. English proficiency in Latinos drives their English health literacy levels (Sentell & Braun, 2012). Health care providers claim children interpreting is not as problematic when the child possesses adequate English health literacy (Gray, Hilder, & Donaldson, 2011). English comprehension is essential for understanding English health information, and the ability to speak, understand, read, and write English corresponds with higher English health literacy levels (Britigan, Murnan, & Rojas-Guyler, 2009). The ability to converse in Spanish may also enhance English health literacy for child interpreters. Because their parents predominantly speak Spanish, all health information that child interpreters learn at home is predominantly through communicating in Spanish (Katz, 2014a; Schneider, Martinez, & Owens, 2006). Children fluent in Spanish may advance their health knowledge through parent–child Spanish dialogue and child ability to understand parent Spanish explanations of health concepts.

Self-efficacy – or confidence in one's ability to achieve goals and overcome obstacles (Bandura, 2001) – is also associated with health literacy levels (Wood, Price, Dake, Telljohann, & Khuder, 2010). Children report interpreting increases their feelings of self-worth and pride in their ability to handle various obstacles and adult situations (Weisskirch, 2013). Higher self-efficacy is associated with higher health literacy levels (Donovan-Kicken et al., 2012; Wood et al., 2010), even in children (Sharif & Blank, 2010) and Latino adolescent populations (Ghaddar et al., 2012).

One potential barrier for child interpreters is communication anxiety or apprehension about speaking in a non-heritage language, such as English. Communication apprehension is the "level of fear or anxiety associated with either real or anticipated communication with another person or persons" (McCroskey, 1977, p. 78), but communication anxiety about communicating in a non-native language is distinct from general communication anxiety in one's heritage language (MacIntyre & Gardner, 1989). Some non-native speakers fear making mistakes, feel incompetent, and are anxious about not understanding a native speaker (Horwitz, Horwitz, & Cope, 1986). Medical settings can amplify non-heritage language communication anxiety. Guntzviller, Jensen, King, and Davis (2011) found that native Spanish speakers interacting with an English health care system experienced foreign language anxiety in a medical setting (FLAMOS). High levels of FLAMOS can reduce the ability to understand and accurately interpret information in English, and increase unwillingness and inability to give detailed descriptions and the desire to shorten the interaction (Ganschow & Sparks, 1996; MacIntyre & Gardner, 1989, 1994). Because FLAMOS can impede understanding and ability to adequately describe concepts in English, specifically about health issues, it could be negatively associated with health literacy in child interpreters. The following are hypothesized:

H1: Child interpreters' (a) age, English language ability, Spanish conversational ability, and self-efficacy will be positively associated and (b) child interpreters' FLAMOS will be negatively associated with child health literacy.

Parent role in child health literacy

Manganello's (2008) framework for adolescent health literacy posits that family traits are associated with adolescent individual traits and adolescent health literacy levels. Three

contrasting theories indicate how parent characteristics may associate with child health literacy. Because the theoretical perspectives propose different associations between parent characteristics and child health literacy, two competing models (i.e., indirect versus direct parent effects) and subsequent competing hypotheses are proposed for how parent education, English language ability, self-efficacy, and FLAMOS relate to child health literacy. Figure 1 displays both models and all hypotheses.

Social cognitive theory

Social cognitive theory suggests that humans learn through observing the behavior of others and chose to model and adapt certain behavior, especially if they perceive positive outcomes are associated with the behavior (Bandura, 2001). Family communication researchers posit communication skills (or lack of skills) are passed from parent to child through child observation and modeling of parent communication behavior (Schrodt et al., 2009; Taylor & Segrin, 2010). Children can learn desirable or undesirable communication behaviors through observation of family practices (e.g., social support, verbal abuse; Kunkel, Hummert, & Dennis, 2006; Ledbetter, 2009). Niehaus and Kumpiene (2014) speculate that children interpreters might lack role models, because they frequently interpret for (and observe) adult figures who lack abilities to independently navigate English-speaking situations. If children model their behavior after the parents' less-developed abilities, children will have less-developed abilities themselves (Niehaus & Kumpiene, 2014). This premise may hold if children do not have other role models to frequently observe and imitate (Niehaus & Kumpiene, 2014).

Social cognitive theorizing about how parent characteristics are associated with child interpreter health literacy could be interpreted in two ways. This framework indicates that parent characteristics guide the development level of child characteristics through

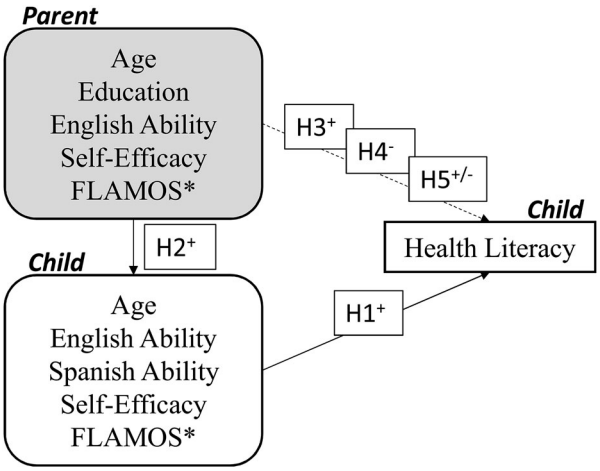

Figure 1. Proposed models and hypotheses. *Model 1 (Indirect parent effects)*: H1 and H2, excludes the dotted line. *Model 2 (Direct parent effects)*: H1 and the dotted line, excludes the H2 indirect effect. H3, H4, and H5 are competing hypotheses about the directionality of the relationships represented by the dotted line. Superscript denotes whether the predicted relationships are positive or negative. *FLAMOS-predicted directionality is reversed.

observational learning, such that more sophisticated parent language abilities, self-efficacy, and FLAMOS align with more sophisticated child qualities. Although these aspects have not been examined in child interpreters, parent linguistic skills are linked to child linguistic skills (Liu, Benner, Lau, & Kim, 2009; Masur, Flynn, & Eichorst, 2005), parent self-efficacy levels are predictive of child self-efficacy (Gardner, 2011), and parent communication is associated with child communication apprehension (Elwood & Schrader, 1998). Thus, the relationship between parent characteristics and child health literacy should be mediated through child characteristics, such that parent characteristics are positively associated with similar child characteristics, and child characteristics are associated with health literacy as described in the previous section (i.e., an indirect model of parent effects, henceforth Model 1).

H2: In Model 1, parent characteristics (parent education, English language ability, self-efficacy, and FLAMOS) will be positively, indirectly associated with child health literacy as mediated through their positive association with matching child characteristics.

Social cognitive theorizing also supports a direct effect model of parent influence. Parent characteristics, such as parent self-efficacy, tend to be directly linked to child health outcomes (de Silva-Sanigorski et al., 2013), and parent communication and characteristics can directly impact child cognitive and social development outcomes (Segrin, 2014). Parent self-efficacy is associated with better child health outcomes (de Silva-Sanigorski et al., 2013) and higher parent English proficiency associates with higher child reading and math scores in English, which are skills required for health literacy (Liu et al., 2009). Thus, parent characteristics may directly relate to child health literacy abilities (i.e., a direct model of parent effects, henceforth Model 2).

H3: In Model 2, (a) parent education, English language ability, and self-efficacy will be directly, positively associated and (b) parent FLAMOS will be directly, negatively associated with child health literacy.

Role-reversal theory

Although social cognitive theory postulates that children might use their parents as role models for health knowledge, research on child interpreters indicates interpreting may shift family dynamics and roles (Trickett & Jones, 2007; Weisskirch, 2005). Children interpret because their parents are not proficient or comfortable speaking English (Morales & Hanson, 2005). Parents who need their children to interpret often have demographic characteristics – such as low education levels, low income, and low English proficiency (Kam & Lazarevic, 2014) – typical of low health literacy populations. Scholars have argued that child interpreters experience role-reversal or parentification, in which the child takes on parent-like responsibilities and the parent cedes agency to the child (e.g., Oznobishin & Kurman, 2009; Trickett & Jones, 2007), particularly in medical contexts (Giordano, 2007).

Children who interpret and experience role-reversal often have to navigate adult situations that go beyond age-typical knowledge, vocabulary, experiences, and social abilities (Hall & Robinson, 1999). Although role-reversal is primarily conceptualized as undesirable for children because of the stress and burden, one potential benefit for parentified children is developing advanced knowledge and skills atypical for their age. For

example, through taking on parent responsibilities, children develop advanced vocabulary (Hall & Robinson, 1999), increase their self-efficacy (De Ment, Buriel, & Villanueva, 2005), and improve their literacy (Schieffelin & Cochran-Smith, 1984). Acting as an interpreter can also enhance cognitive abilities, knowledge, and academic outcomes (Halgunseth, 2003), and child interpreters are often more mature, experienced, and skillful than their non-interpreting peers (Angelelli, 2010; Valdés, 2003). When parents are less educated, of Mexican-heritage (rather than European-American), and have less English-speaking abilities, children are more likely to experience role-reversal (Acevedo, 2000). These children may enhance their health literacy through being thrust into a parentified role and having adult responsibilities. For example, parents with lower self-efficacy and higher FLAMOS may rely more heavily on children to interpret in medical settings, as lack of self-efficacy and high anxiety about communicating in English may erode their ability to take charge of a medical interaction (Guntzviller et al., 2011). Thus, from a role-reversal perspective, parents who lack health-literacy-associated characteristics may have children with higher health literacy levels because these children experience role-reversal through interpreting.

H4: In Model 2, (a) parent education, English language ability, and self-efficacy will be negatively, directly associated and (b) parent FLAMOS will be positively, directly associated with the child's health literacy.

Team-effort model

Scholars studying child interpreters have shunned role-reversal as an appropriate framework, noting that interpreting in healthcare settings is a normative and often expected social function for child interpreters (Angelelli, 2010; Dorner, Orellana, & Jimenez, 2008; Green et al., 2005). Indeed, immigrant families are often collectivistically oriented, and act as a unit or team during interpreting situations (Corona et al., 2012; Dorner et al., 2008; Hua & Costigan, 2012; Katz, 2014b; Orellana, Reynolds, Dorner, & Meza, 2003). Although inconsistently termed (e.g., interdependent/independent scripts, team effort, and reciprocal learning experiences), this framework indicates that parents and children pool their knowledge and resources to accomplish tasks (Kam & Lazarevic, 2014; Katz, 2014b). For example, children use their English-speaking abilities during interpreting situations, but parents may explain certain concepts or vocabulary to children, so that the child can effectively interpret (Katz, 2010). Thus, parent and children work together as a team to augment each other's linguistic abilities, self-efficacy, communication anxiety, and health knowledge (Corona et al., 2012).

The team-effort model combines social cognitive theory and role-reversal predictions, indicating that parent characteristics may be both positively and negatively associated with child health literacy levels. Thus, both positive and negative direct effects of parent characteristics would not contradict H3 and H4, instead they would indicate parent–child collaboration. During collaborative medical interpreting, parents assist children in ways that help bolster child health literacy (e.g., higher parent English-speaking ability is likely associated with higher child health literacy because parents help children define and interpret certain medical vocabulary). However, because children recognize parent skill deficiencies in some areas, children purposely enhance their own skills and knowledge

in order to tutor their parents and compensate for parent lack of knowledge (Orellana et al., 2003; Valenzuela, 1999). For example, child interpreters describe acting as tutors and advocates when their parents lack knowledge – or abilities to acquire knowledge – by calling financial institutions to learn information about loans, learning about health and work policies (Valenzuela, 1999), or looking up unfamiliar English medical terms (Orellana et al., 2003). Unlike role-reversal, children do not learn because they were forced into an adult role, but instead purposely develop skills to augment those of a parent so that the child and parent can work together for the family's benefit. Previous child interpreting research best supports the team-effort model (Corona et al., 2012; Hua & Costigan, 2012), but does not indicate which parent characteristics enhance child knowledge (and specifically health literacy) and for which parent characteristics the child compensates (Katz, 2014b).

H5: In Model 2, parent characteristics (parent education, English language ability, self-efficacy, and FLAMOS) will be directly associated with child health literacy, with a mixture of positive and negative directional effects.

Methods

Participants

This study included 100 low-income, parent–child dyads ($n = 200$), in which the parent was primarily Spanish-speaking and the child was bilingual in both English and Spanish. Children were not required to have interpreted for the parent to participate, although all child participants reported having done so at least once. Recruiting procedures targeted children ranging in age from 11 to 15, although a wider range of ages were sampled ($M = 13.22$, SD = 2.07, range = 9–18). Children education levels corresponded with their age range, with grade levels ranging from third grade to completing high school ($M = 7.72$, SD = 2.31). Children of both genders filled out the survey (females = 55, males = 45). Children were mostly born in the United States ($n = 70$), with a number also being born in Mexico ($n = 23$), and one child participant born in El Salvador, Honduras, and Venezuela, respectively. Four children did not report place of birth.

Parents ranged in age from 25 to 56 years old ($M = 37.96$, SD = 5.56) and were predominantly mothers ($n = 86$). The majority of parents were born in Mexico ($n = 86$), with three born in the United States, two in El Salvador, one in Honduras, one in Venezuela, and seven not reporting birth country. Parents had lived in the United States between 3 and 40 years ($M = 15.41$, SD = 6.66). Of the parents, 18 had less than a 7th-grade education, 43 had completed 7th or 8th grade, 21 completed 9th, 10th, or 11th grade, 10 graduated high school, 3 had vocational or professional training, 3 had two years or less of college education, and 2 did not report education.

Procedures

Participants were recruited by two bilingual employees of a university extension program from the Gary, Indiana, and East Chicago area. The parent–child dyad was compensated $50. Although Spanish language medical care is available in the area, participants did not always have access to language-concurrent care because of the huge demand, limited

participant transportation options, and participant work schedules. Given the low education level of the parents (and thus lack of literacy), parents were asked at the beginning of the study if they wanted the consent form and survey read to them. Children could also request help, although no assistance was given for the health literacy measure. A university institutional review board approved study protocol.

Measures

Children were surveyed in English and parents were surveyed in Spanish. All Spanish measures were from published Spanish translations, with the exception of demographic variables and the perceptions of language ability assessment (Tse, 1996). These items were translated by a professional certified in medical and legal translation, and were back-translated to ensure accuracy.

Demographic variables

Five demographic variables were assessed. Parents were asked the length of time the parent has been in the United States (in years) and whether or not the child was born in the United States (0 = no, 1 = yes). Children answered three questions from Weisskirch and Alva (2002) related to interpreting in a health setting. Children reported how often they had translated at (a) the hospital, and (b) a clinic or the doctor's office on a four-point scale (0 = never, 3 = always). Children also answered one question (0 = no, 1 = yes) about whether they had translated forms from the doctor's office, or medical forms or bills.

Language ability

Tse (1996) developed a scale for child interpreters to rate their Spanish and English language abilities on a four-point scale (1 = not at all or a little, 2 = somewhat, 3 = well, 4 = very well). Child and parents answered four items about their ability to speak, understand, read, and write English. As supported by confirmatory factor analyses, these four items were averaged to form an English language ability variable for parents (reading and writing error terms were correlated; Chi-Square = .17, $df = 1$, $p = .68$, CFI = 1.00, TLI = 1.00, RMSEA = .00, RMSEA CI90 = .00 to .20) and for children (Chi-Square = .54, $df = 2$, $p = .76$, CFI = 1.00, TLI = 1.00, RMSEA = .00, RMSEA CI90 = .00 to .13). The English language ability variable was internally reliable for child (Cronbach's $\alpha = .90$) and parents (Cronbach's $\alpha = .86$). Children also answered an item about their Spanish-speaking ability and an item about their ability to understand Spanish ($r = .45$, $p < .001$). These two items were averaged to form the child Spanish conversational abilities variable.

Self-efficacy

The general perceived self-efficacy scale was answered by both parents and children (Schwarzer & Jerusalem, 1995) and has been validated in both Spanish and English (Bäßler & Schwarzer, 1996). The 10-item survey (e.g., "I can always manage to solve difficult problems if I try hard enough") was measured on a four-point scale (1 = not at all true, 4 = exactly true) and demonstrated reliability for both parents (Cronbach's $\alpha = .91$) and children (Cronbach's $\alpha = .85$).

FLAMOS

The foreign language anxiety in a medical office scale (FLAMOS) assesses an individual's fear of communicating in a non-primary language while in a medical setting (Guntzviller et al., 2011). Both parents and children answered eight items, such as "When speaking to a doctor in English, I can get so nervous I forget things I know," which were measured on a five-point scale (1 = strongly disagree, 5 = strongly agree). The items demonstrated good reliability for both parents (Cronbach's $\alpha = .91$) and children (Cronbach's $\alpha = .84$).

Health literacy

Children's health literacy was assessed using the abbreviated version of the Test of Functional Health Literacy in Adults (TOFHLA) (Baker, Williams, Parker, Gazmararian, & Nurss, 1999). The TOFHLA utilizes sample medical documents to assess numeracy and fill-in-the blank methods to assess literacy. The TOFHLA (English version) has been validated in non-Hispanic, English-speaking adolescents (Chisolm & Buchanan, 2007), and low-income Hispanic populations who speak English (Aguirre, Ebrahim, & Shea, 2005). As suggested when researchers want to incorporate both reading and numeracy elements but do not want to administer the entire TOFHLA, two short exercises from the reading comprehension and two from the numeracy section were used (Baker et al., 1999). Health literacy scores were based on the number of correct answers. Children were given the adult health literacy measure in English, given that this study's purpose was to assess child ability to interact with the English-speaking healthcare system.

Plan of analysis

Analyses were conducted in two steps. First, descriptive statistics were examined to determine child health literacy levels (i.e., RQ1). Additionally, associations between demographic variables and child health literacy were examined to determine control variables for subsequent analyses.

Step two involved structural equation modeling (SEM). To assess predictions about child characteristics (H1) and the competing hypotheses about parent characteristics on child health literacy (H2–H5), we ran two models to determine whether parent characteristics should be indirectly (H2) or directly (H3–H5) associated with child health literacy. Model 1 tested the association between parent characteristics and child health literacy as mediated through child characteristics (i.e., indirect effects only). Indirect effects were assessed through bootstrapping with 5000 samples and bias-corrected confidence intervals (Kline, 2010). Model 2 assessed direct associations from all parent and child characteristics to child health literacy, in support of H3–H5, which predicted parent direct associations would be positive (H3), negative (H4), or a combination of both (H5). Model fit statistics were compared between the two models, and the best fitting model was determined and subsequently used to report hypothesis support.

Both models were assessed with robust maximum likelihood in *MPlus 7.3*, as data were non-normal. All variables were represented as observed (i.e., the model was a path model). All variables from one person were correlated in both models (i.e., child variables were correlated with all other child variables, and parent variables were correlated with all other parent variables; Kenny, Kashy, & Cook, 2006). Model 1 did not include associations between child and parent variables beyond the predicted directional paths. For example,

parent English abilities predicted child English abilities in Model 1, but parent English abilities were not modeled to predict child non-language variables, such as child self-efficacy. In Model 2, all child and parent variables were correlated, because they were represented as exogenous variables (two correlations were constrained to zero so the model was identified: parent age with child FLAMOS, and parent education with child Spanish conversational ability).

Results

Less than 5% of the data were missing and an analysis of missing data provided no evidence that the pattern was nonrandom. Full information maximum likelihood was used.

Child health literacy levels

Descriptive statistics (shown in Table 1) revealed that child participants had an average English health literacy score of 76.74 out of 100 (SD = 19.50), with scores ranging from 16 to 100. TOFHLA health literacy scores can be divided into three categories: inadequate health literacy (scores from 0 to 53), marginal health literacy (scores from 54 to 66), and adequate health literacy (scores from 67 to 100; Baker et al., 1999). Using these categories, 16 child interpreters had inadequate health literacy, 9 had marginal health literacy, and 74 had adequate health literacy. The categories are helpful in describing the data in a meaningful way, but the quantitative range was used for remaining analyses as it provided a richer statistical description. Bivariate correlations are shown in Table 1.

Associations between demographic variables and child health literacy were examined to determine whether child birth location, medical brokering experience, child and parent sex, and child and parent age should be included as control variables. Based on an independent *t*-test, health literacy levels did not vary between children born inside or outside of the United States ($t = 2.63$, $p = .57$). The majority of children reported brokering medical documents (i.e., doctor's forms or medical form bills; $n = 80$). However, an independent *t*-test indicated that health literacy levels did not differ between children who had brokered medical documents and those who had not ($t = -1.62$, $p = .25$). Many children also reported brokering in a hospital ($M = 2.13$, SD = .88) or doctor's office ($M = 2.31$, SD = .90), but medical brokering experience was not correlated with health literacy levels (hospital brokering $r = .11$, $p = .29$; doctor office brokering $r = .05$, $p = .59$). Child health literacy levels did not vary based on child sex ($t = .68$, $p = .50$) or parent sex ($t = .42$, $p = .68$). Child health literacy was significantly associated with parent age ($r = .26$, $p = .01$) and child age ($r = .36$, $p < .001$). Child education and child age were highly correlated ($r = .92$, $p < .001$), and thus only child age was retained to avoid multicollinearity. Therefore, only parent age was included as a control variable in subsequent analyses, and child age was retained as a marker of age and a proxy for child education.

Child and parent characteristics with child health literacy

The two competing structural equation models were compared. In Model 1, parent characteristics indirectly associated with child health literacy through child characteristics (H2). Model 1 did not fit the data well (Chi-Square = 35.61, d*f* = 24, $p = .06$, CFI = .88, TLI

Table 1. Descriptive statistics, correlations, and SEM results.

	Descriptive		SEM			Bivariate correlations									
	M (SD)	Range	*B*	SE	*β*	PAge	PEd	PEng	PSE	PFL	CAge	CEng	CSpan	CSE	CFL
Parent variables															
Age	37.96 (5.65)	25–56	.12	.27	.04										
Education	8.13 (3.94)	0–14	−.38	.38	−.08	−.07									
English ability	1.74 (.65)	1–3.65	5.82*	2.34	.20	−.03	.23*								
Self-efficacy	2.90 (.79)	1–4	−6.33**	1.83	−.26	−.01	.15	.15							
FLAMOS	3.17 (1.11)	1–5	−.99	1.33	−.06	−.08	−.12	−.12	−.13						
Child variables															
Age	13.22 (2.07)	9–18	3.23***	.75	.34	.36***	−.04	−.15	.04	−.01					
English ability	3.62 (.61)	1–4	11.43***	2.48	.36	.14	−.11	.20*	−.04	.00	−.01				
Spanish ability	3.47 (.63)	1–4	.68	2.33	.02	.00	.00	−.03	.06	.04	.16	.02			
Self-efficacy	2.77 (.57)	1.30–4	5.68*	2.87	.17	.18†	.04	.12	−.05	.22*	.11	.24*	.08		
FLAMOS	2.40 (.80)	1–4.13	−2.46	2.00	−.10	−.15	.09	−.01	.08	−.15	−.17†	−.03	.16	−.39***	
Health literacy	76.74 (19.50)	16–100	–	–	–	.26***	−.12	.18†	−.25*	.01	.36***	.46***	.06	.36***	−.26*

Note: SEM = Structural equation model results from the supported model (i.e., model 2: the direct-effects model). For SEM results, *B* and SE represent unstandardized regression coefficients and standard errors, where *β* represents standardized coefficients. Child Spanish ability represents conversational ability only. For bivariate correlation abbreviations, parent variables start with P and child variables start with C.

*$p < .05$.
**$p < .01$.
***$p < .001$.
†$p < .10$.

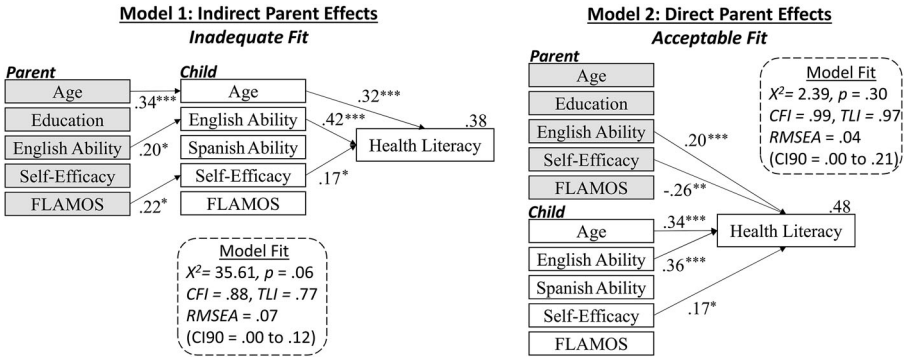

Figure 2. Structural equation model results. Note: For both models, only statistically significant paths are shown. Correlations and error terms excluded for parsimony. Reported statistics are standardized regressions. Child Health Literacy R^2 is reported in the upper right corner of the variable.

= .77, RMSEA = .07, RMSEA CI90 = .00 to .12). H2 was not supported. In Model 2, parent characteristics directly associated with child health literacy (H3-H5). Model 2 demonstrated acceptable fit (Chi-Square = 2.39, df = 2, p = .30, CFI = .99, TLI = .97, RMSEA = .04, RMSEA CI90 = .00 to .21). Results of both models are presented in Figure 2. Because Model 2 had superior fit, Model 2 was retained and used to assess remaining hypotheses. Table 1 includes Model 2 standardized and unstandardized results, although only statistically significant, standardized results are discussed in the text.

Overall, Model 2 predicted 48.1% of the variance in child health literacy. In answer to H1, which hypothesized child characteristics would be positively associated with child health literacy, three paths were statistically significant. Older children had higher health literacy levels (β = .34, p < .001). As child interpreters self-rated their English abilities as better, they obtained higher health literacy scores (β = .36, p < .001). Additionally, as children increased in self-efficacy, they also increased in health literacy (β = .17, p = .047). H1 was partially supported.

With regard to the three competing hypotheses about the direction of parent effects on child health literacy (H3–H5), two parent characteristics were significantly associated with child health literacy. As parent English language ability increased, child health literacy also increased (β = .20, p = .03). However, as parent self-efficacy decreased, child health literacy increased (β = −.26, p < .001). Thus, of the three competing hypotheses for Model 2, H5 was best supported as both positive and negative direct parent effects were present.

Discussion

The current study examined low-income, parent–child dyads in which the child had interpreted for the parent at least once. We investigated health literacy levels of these children and the ways in which both child and parent characteristics were associated with child English health literacy. Overall, children were remarkably high in health literacy for their age, given that 74 of the 100 children interpreters had adequate English health literacy (Baker et al., 1999). The ways in which parent and child characteristics associated with child health literacy supported the team-effort model. Children might compensate

for lack of parent skills (e.g., self-efficacy) by developing their health literacy, but parents also likely assist children. These findings support the notion that parents and children work together as a team during medical interpreting situations.

Health literacy in child interpreters

Approximately 75% of child participants had "adequate" or high-school-level English health literacy (the highest level of health literacy possible on measure). According to the creators of the TOFHLA, adequate health literacy indicates children participants can read and comprehend English medical information encountered in health care settings, such as prescription labels and appointment cards. If this skewed distribution of child interpreter health literacy levels is representative of child interpreters beyond current participants, we find this relatively encouraging. The children in this sample would typically be considered at-risk for inadequate health literacy, given their education level, low-income status, and status as a non-native English speaker (Andrus & Roth, 2002; Beacom & Newman, 2010). Potentially the act of interpreting for a parent mitigates or even reverses the association between these characteristics and health literacy. Children participants showed advanced skill development for their age (although child age ranged from 9 to 18 years old).

Child characteristics and child health literacy

Child characteristic effects broadly fit within Manganello's (2008) adolescent health literacy model, which states that adolescent individual traits and social skills impact their health literacy. Child age, self-rated English ability, and self-efficacy were positively associated with child health literacy. The positive association between child age and health literacy is not surprising. As children get older they develop greater understanding of health issues and expand their vocabulary. Furthermore, past research has linked education level with health literacy level (Andrus & Roth, 2002). In the current study, child age and education level (i.e., grade) were virtually interchangeable ($r = .92$, $p < .001$), supporting assertions that education level is linked with health literacy, even in children. Baker et al. (1999) noted that individuals with less than eight years of schooling are likely to have inadequate health literacy, but that was not true of the current study participants.

In line with health literacy definitions, child self-rated English language ability was positively associated with their English health literacy. The English language ability variable was composed of ability to speak, understand, read, and write in English. The ability to communicate in English is essential for English health literacy, as is English literacy (Manganello, 2008). The majority of child interpreters who live in the United States are enrolled in an English-speaking educational system, allowing them to develop their English literacy abilities (Schneider et al., 2006), whereas other demographically similar non-adolescent populations might not have formal English education.

As predicted by social cognitive theory, children with higher self-efficacy levels also had higher health literacy levels. Social cognitive theory notes that self-efficacy is often related to one's ability to perform a task (Bandura, 2001) and researchers posit self-efficacy may be crucial to promoting self-care in adolescents (Massey et al., 2013). In answer to Manganello's (2008) call for researchers to examine and extrapolate which adolescent traits

predict adolescent health literacy, the current findings suggest that older children with more developed English abilities and greater self-confidence are more health literate.

Parent characteristics and child health literacy

To understand how parental traits play a role in adolescent health literacy (Manganello, 2008), we examined three theoretical frameworks that offered competing predictions for how parent characteristics associated with child health literacy: social cognitive theory, role-reversal theory, and the team-effort model. The findings supported the team-effort model, which states parents and children worked together to utilize both parties' strengths and compensate for partner limitations. Results indicated children compensate for a lack of parent confidence (i.e., parent self-efficacy was negatively associated with child health literacy), and parents assist children in building health literacy (i.e., parent English ability was positively linked to child health literacy). Parents with lower health literacy might feel less confident about their ability to interact competently with the United States health care system, and thus, may rely more on their children during medical encounters. Children might offset a lack of parent efficacy by bolstering their own self-beliefs and skills. Parents with stronger English skills can recognize or provide medical vocabulary in English to help their children interpret when children are struggling with concepts. These findings indicate that children compensate for skills that parents are lacking in interpreting situations and parents similarly compensate for child inadequacies, such as explaining advanced or adult concepts to the child (Corona et al., 2012).

Whether or not role-reversal occurs between the parent and child during interpreting has been debated in the literature (e.g., Dorner et al., 2008; Kam & Lazarevic, 2014; Trickett & Jones, 2007). The current findings do not directly speak to the primary debate on whether parents and children reverse authoritative and decision-making positions, in which the child takes on responsibility for the parent and the parent decreases support to the child. However, the findings indicate that although children may compensate for a lack of parent English language abilities and self-efficacy, parents also contribute to children's learning of health concepts and do not completely withdraw support from the child. This team-oriented perspective aligns with researchers who propose that child interpreting can be viewed through interdependence and independence scripts (Dorner et al., 2008) and that it could be considered a normal activity for adolescent development rather than a role-reversal. Latino families are often high in collectivism (i.e., orienting to the group rather than the individual) and familism (i.e., identification, attachment, and solidarity to one's family; Sabogal, Marín, Otero-Sabogal, Marín, & Perez-Stable, 1987). Thus, interpreting may be an activity that simultaneously builds child independence through responsibility and interdependence through helping the family (Dorner et al., 2008). Parent encouragement and assistance with health concepts, at home and during the interpreting process, can assist with interpreting and facilitate child development.

Although social cognitive theory predictions about child self-efficacy and health literacy were corroborated, child observational learning with parents as role models (i.e., mediation of parent effects) was not supported by the data. Researchers have suggested that child interpreters use parents as role models because children lack more culturally or linguistically adapted role models (Niehaus & Kumpiene, 2014). However, the current findings indicate that children interpreters are resourceful and savvy enough to

recognize parental shortcomings, and cultivate their own linguistic ability and communication skills. Children might seek out other role models to develop these skills or simply learn to adapt through trial and error during interpreting situations. Given the unique role that child interpreters play in their family, observational learning may function differently in families in which the child interprets.

Limitations and future directions

Although the current study offers guidance for future research, the results must be interpreted with caution. The current study examined low-income, primarily Mexican-heritage families in a large Midwestern city. The results of this study may not generalize to families of different heritage, socio-economic status, or to child interpreters of differing ages. Furthermore, the experience of each child interpreter is unique, and blanket statements about the adequacy or inadequacy of child interpreters to function in a medical setting are inappropriate based solely on this study. Health literacy is a general measure of an individual's ability to comprehend and understand health information, but having an "adequate" health literacy score does not mean that the individual will fully understand health information in all medical conversations – especially if the health information is complex and difficult. The medical context can also determine how parents and children share knowledge, navigate situations in which one or both are lacking certain skills, and communicate. Future research should explore how parent–child communicative strategies during brokering vary within and across health contexts, and if certain strategies link to more desirable relational, social, and psychological outcomes.

Approximately three-quarters of child interpreters sampled in the current study had adequate health literacy in English, but these findings do not advocate for using children to interpret in a medical setting. These children are still untrained (i.e., health literacy does not indicate an ability to interpret) and cannot be expected to act in similar ways as a professional (Flores, 2005; Meeuwesen, Twilt, ten Thije, & Harmsen, 2010). Furthermore, the current study focuses on English health literacy, but children may not have adequate vocabulary or health literacy in Spanish – which is equally important for the interpreting process. Even when Spanish is their native language, children may find that their Spanish language abilities atrophy and their reading, writing, and vocabulary growth is stunted by a lack of a continued formal education in Spanish. Future research could assess Spanish health literacy and how parent and child characteristics relate to the child's ability to comprehend and read Spanish health information. The extent to which parents explain health concepts in Spanish and teach medical vocabulary in Spanish or English likely also factors into the child's health literacy in both languages and should be explored. Examining a child's understanding of health in Spanish and English would provide a more holistic picture on the child's ability to interpret health concepts.

Conclusion

The current study provided an initial step in understanding child interpreter health knowledge. Building on past research that examines the impact of medical interpreting on child or parent health outcomes, the current study focused on children's health knowledge and the ways in which parents and children may work together during interpreting.

The results supported a team-effort model where children and parents work together to manage the challenges of interpreting. Moreover, most of the child interpreters demonstrated adequate health literacy skills. Thus, the current study suggests that children typically possess the basic health literacy skills to navigate medical interactions, and that parents and children often work together in meaningful ways. Despite these promising findings, considerable work remains to fully understand the complex dynamics of parent–child dyads in medical interpreting settings.

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