EMERGENT LITERACY DEVELOPMENT AND THE IMPACT OF HOME

LITERACY ENVIRONMENT ON ORAL VOCABULARY AMONG CHILDREN

WTH ASD

A Dissertation

by

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ABSTRACT

Autism Spectrum Disorder (ASD), which is characterized by language impairments, social interaction deficits and abnormal behaviors, has become one of the most prevalent disorders in children today. Extensive studies have been conducted to investigate the development of language production and social interaction among children with ASD. Nevertheless, relatively limited research has concentrated on the literacy development among children with ASD. Over the past decade, increasing numbers of studies regarding children with ASD in the English-speaking context have examined particular difficulties in advancing emergent literacy skills and knowledge, and have identified the significance of home literacy environment on literacy development. Nevertheless, findings should be further investigated and expanded in other cultural and linguistic contexts. The present research aims to fill this gap by exploring emergent literacy development and the impact of home literacy environment on oral vocabulary among children with ASD in China. Participants included 21 children with ASD and 28 typically-developing children from two kindergartens in China. Emergent literacy skills were measured by valid measures on phonological awareness, morphological awareness, character recognition, RAN, receptive and expressive vocabulary in Chinese. Data on home literacy environment was collected by an adapted survey. Findings indicated that, compared with typically-developing children, children with ASD faced challenges in both coding- and meaning-related emergent literacy skills.

In addition, technology use for literacy-related practices at home was a significant

predictor for oral vocabulary development among children with ASD.

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1. INTRODUCTION

Autism Spectrum Disorder (ASD) has been considered as one of the most prevalent disorders among young children today. Thus, statistics from different countries and regions consistently demonstrated the prevalence of ASD among children. For instance, statistics from the Center of Disease Control and Prevention (2020) reported that the ratio of children who were diagnosed as having ASD increased from 1:68 to 1:54 between 2010 and 2016. Another report by Autism Spectrum Disorders in the European Union (2018) indicated that the ratio of children with ASD, on average, was 12.2:1000 across European countries. In China, Autism Spectrum Disorder was found to affect at least 2 million children.

According to May, Kiss and Carter (2016), Autism Spectrum Disorder (ASD) is characterized by three deficits: a) language impairments; b) deficits in social interaction; and c) restricted and repetitive behaviors. Specifically, children with ASD present typical difficulties and challenges in developing language proficiency, advancing literacy skills and knowledge, and promoting social communicative skills, with impaired conversational patterns, struggles in understanding oral and written language, atypical behaviors, and abnormal and limited language production (Howlin, 2003; Eigsti, Bennetto, & Dadlani, 2007). Considering the prevalence of ASD and its influence on children's growth, the research for children with ASD has received escalating attention during the past decade.

1.1. Existing Research on Children with ASD

Existing research on children with ASD can be classified into two categories: a) investigating impaired patterns in language, behavior and social interaction among children with ASD (e.g., Howlin, 2003; McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007; Shriberg, Paul, McSweeny, Klinm Cohen, & Volkmar, 2001); and b) designing and evaluating interventions on the development of language, behavior and social communication among children with ASD (e.g., Lawton & Kasari, 2012; Parsons, et al., 2019; Strain & Bovey, 2011). Research on impaired language, behavior and social interaction among children with ASD has identified three common impaired patterns: a) early language delays (e.g., Howlin, 2003; Weismer, Lord, & Esler, 2010; Hudry., Leadbitter, Temple, et al., 2010), b) abnormal language production and behaviors (Eigsti, Bennetto, & Dadlani, 2007), and c) impaired discourse/pragmatic patterns (e.g., McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007; Peppe, McCann, Gibbon, O'Hare, & Rutherford, 2007; Shriberg, Paul, McSweeny, Klinm Cohen, & Volkmar, 2001). Specifically, children with ASD were found to generate first words at the age of 38 months (8-14 months among typically-developing children) (Howlin, 2003). In terms of abnormal language production, three major impaired language patterns were identified: a) echolalia, language imitation and repetition; b) jargon, nonsense language patterns or language with abnormal meanings; c) atypical patterns of suprasegmental features (e.g., inappropriate speech volume, flat or singsong intonation, hoarseness, hyper-nasality, inaccurate lexical stress) (e.g., Eigsti, Bennetto, & Dadlani, 2007; Eigsti, de Marchena, Schuh, & Kelley, 2011; Peppe, McCann, Gibbon, O'Hare, & Rutherford,

2007). With respect to difficulties in developing pragmatics, existing evidence indicated that children with ASD faced challenges in understanding and processing non-linguistic functions (e.g., body language and facial expression), social relationships, and conversational contexts (e.g., Deliens, Papastamou, Ruytenbeek, Geelhand, & Kissine, 2018; Reisinger, Cornish, Fombonne, 2011; Volden, Joanne; Phillips, Linda, 2010).

Existing research has also been conducted to design and evaluate interventions for children with ASD. The effectiveness of treatments such as specific instructional models, dialogic reading, shared reading and digital reading have been assessed (e.g., Mandak, Light, & McNaughton, 2019; Pamparo, 2013; Plattos, 2012; Whalon, et al., 2015). Extant interventions varied across different features, including intervention purposes (e.g. behavior control and language development), implementation (e.g., parent-implemented and teacher-implemented), size (e.g., individual and group intervention), and technology (traditional and digital intervention) (e.g., Asaro-Saddler, Knox, Meredith, & Akhmedjanova, 2015; Goods et al., 2013; Parsons, Cordier, Munro, Joosten, Speyer, & Renée, 2017). Results from empirical studies, literature reviews and meta-analyses confirmed the contribution of interventions to the growth among children with ASD across different contexts.

Over the past decades, the significant contribution of literacy development to academic and career success has been highlighted by extensive research for typically-developing children. Nevertheless, a handful of studies has been conducted to explore the literacy development among children with ASD (e.g., Davidson, & Weismer, 2014; Lanter, Watson, Erickson, and Freeman 2012; Nash & Arciuli, 2016; Westerveld,

Paynter, Trembath, Webster, Hodge, & Roberts, 2017). Related research regarding

literacy development among children with ASD concentrated on: a) differences in the

developmental trajectory of literacy development and the performance of literacy skills

between children with ASD and typically-developing children; and b) significant

predictors which contribute to the development of literacy knowledge and skills. As for

young children, two major factors have been addressed by existing literature, which are

emergent literacy skills and home literacy environment. (e.g., Niklas & Schneider,

2013; Puranik, Lonigan, & Kim, 2008; Tong, McBride-Chang, Shu, & Wong, 2009; Wu,

Anderson, Li, et al., 2009).

Emergent literacy refers to early-developed and fundamental knowledge of

reading and writing (e.g., phonological awareness, word reading, print concept and

alphabet knowledge). Emergent literacy skills can be further classified into two

categories: a) "code-related", making the connections between oral and written

languages (e.g., decoding and phonological awareness); and b) "meaning-related",

producing and understanding oral and written languages (e.g., listening comprehension

and oral vocabulary). Empirical evidence has demonstrated that emergent literacy skills

were significantly associated with later-developed literacy skills such as vocabulary

knowledge, reading proficiency and reading comprehension (e.g., Dynia, Brock, Logan,

Justice, & Kaderavek, 2016; Kimhi, Achtarad, & Tubul-Lavy, 2017; Lanter, Watson,

Erickson, & Freeman, 2012; Nash & Arciuli, 2016).

Home literacy environment consists of several components, including family

background, home literacy resources, home literacy practices and perspectives on

literacy development and home literacy practices. Research on typically-developing children and struggling readers has revealed that an engaging and supportive home literacy environment is of significance in advancing language and literacy development (e.g., Edwards, 2007; Hamilton, Hayiou-Thomas, Hulme, Snowling, 2016; Sénéchal, 2006; Tichnor-Wagner, Garwood, Bratsch-Hines, & Vernon-Feagans, 2007). Condensing that children with ASD have struggles in language production and social interaction, the home literacy environment may be more essential. Specifically, on the one hand, children with ASD may benefit from literacy practices and activities. On the other hand, they may be more likely to participate in literacy-related activities in a more familiar and comfortable environment (i.e. reading and writing with their parents/family members at home).

Over the past decade, limited research has been conducted to investigate the emergent literacy development and home literacy environment among children with ASD (e.g., Lanter, et al., 2012; Dynia et al., 2014; Lucas & Norbury, 2017). Evidence from existing literature provided insights on: (a) disparities in emergent literacy skills and home literacy environment between children with ASD and typically-developing children (e.g., Dynia et al., 2014; Lucas & Norbury 2017); and (b) the impact of emergent literacy development and home literacy environment on language and literacy development among children with ASD (e.g., Tipton, Blacher, & Eisenhower, 2017; Westerveld et al., 2017). For instance, Westerveld and colleagues (2017) identified that, compared with typically-developing children, children with ASD had struggles in developing meaning-related skills but not code-related skills. Another study by Dynia et

al. (2014) reported that, although children with ASD were less motivated to participate in home literacy practices, the home literacy environment was a significant predictor for the development of alphabet knowledge among children with ASD. Although increasing numbers of research has been conducted, the area of emergent literacy development and home literacy environment among children with ASD remains largely unexplored. Findings from existing literature should be further investigated and evaluated with more empirical evidence. In addition, most existing research was conducted in the English-speaking context (e.g., US and Australia). Thus, the impact of linguistic and sociocultural contexts should not be neglected. On the one hand, the disparities in language structure and features may influence the focus on specific skills and knowledge in language and literacy development. On the other hand, the differences in sociocultural contexts may affect the preference of literacy-related practices and perspectives on language and literacy development. Therefore, the present research aims to expand the current scope of literature by investigating emergent literacy development and home literacy environment among Chinese-speaking children who come from a non-English-speaking context

1.2. Chinese Language Structure and Features

The differences in linguistic structure and features between Chinese and other alphabetic languages have been explored by extensive studies (e.g., Anderson, Ku, Li, Chen, Wu & Shu, 2013; Kuo, Li, Sadoski, Kim, 2014). Unlike English and other alphabetic languages, Chinese is referred to as a logographic (or morphosyllabic) language in which a character represents a syllable and a lexical morpheme. Compared

with English letters and words, Chinese characters are more visually complex and are composed of stroke patterns (Anderson et al., 2013). Considering that there are no letter-sound correspondences in Chinese, syllable awareness is considered as one of the significant facets of phonological awareness in Chinese (e.g., Li et al., 2012; Shu, Peng & McBride-Chang 2008). However, it should be noted that the relationship between phonological awareness and written symbols in Chinese was not as consistent as English or other alphabetic languages, and there are less reliable clues regarding pronunciation in Chinese characters.

Two specific facets of morphological awareness have been addressed in Chinese, which are homophone awareness and compounding awareness. Chinese is a homophone-dense language in which a tonal syllable represents multiple characters that differ in both graphic features and meanings. Specifically, one tonal syllable may represent five to eight characters with different meanings (McBride-Chang, & Zhong, 2003). For instance, the tonal syllable /jing4/ can produce at least five different characters: "境" (environment), "净" (clean), "静" (quiet), "颈" (neck), "镜" (mirror) and "敬" (respect). Considering the prevalence of homophones in Chinese, the ability to differentiate homophones is essential for both character acquisition and vocabulary development in Chinese. Homophonic characters can be differentiated through: (a) comparing the orthographic or graphic features (e.g., stroke patterns); (b) comparing the word contexts: "做" (/zuo4/, do) and "坐" (/zuo4/, sit), "坐下" (/zuo4 xia4/, sit down); and (c) comparing the sentence contexts: "终" (/zhong1/, end) and "中" (/zhong1/, middle), "车 到达了终点" (The bus reaches the terminus).

Chinese is also rich in compounding words. According to Sun, Sun, Huang, Li, and Xing (1996), approximately 65% of Chinese words are two-syllable words, while roughly 10% of them are three-syllable. Although the mapping between phonological awareness and written symbols are relatively less reliable, the relationship between meaning and written symbols are relatively more transparent. The meaning of a given compounding words can be understood by combining the meanings of its internal characters. For instance, the word "足球" (football) consists of two characters 足 (foot) and 球 (ball). In addition, Chinese compounding words may represent various structures such as subordinate, coordinative, subject-predicate, verb-object, and verb/adjective complement (Kuo & Anderson, 2006). Given the prevalence of the compounding convention in Chinese, the awareness of word construction and structure is significant for literacy development among children in China.

1.3. The Purpose of the Dissertation Research

The dissertation research aims to expand the existing literature through investigating emergent literacy development and home literacy environment among children with ASD in China. One the one hand, these two mentioned areas, which are significant for language and literacy development, remain under-researched for children with ASD. One the other hand, according to Chen and Kuo (2017), the majority of research on children with ASD has been performed in English-speaking contexts. Therefore, the dissertation research not only provided more evidence on emergent literacy development and home literacy environment among children with ASD, but also

expanded the existing literature through addressing the possible impact of linguistic and sociocultural contexts.

The dissertation research consists of three studies. Study one aims to provide a systematic review on emergent literacy and home literacy environment among children with ASD. Over the past decade, only one relevant review has been published (Westerveld, Trembath, Shellshear, & Paynter, 2016). Authors screened published articles between 1995 and 2015, and only three relevant studies have been selected. Study one expanded the current review by adding more empirical evidence from more recently-published studies from 2010 to 2020, and synthesizing findings on emergent literacy and home literacy environment among children with ASD. The purposes of study two is to examine possible differences in emergent literacy skills between children with ASD and typically-developing peers in China and to identify significant predictors for vocabulary knowledge among children with ASD. Findings from a different linguistic and cultural context enriched the current understanding on emergent literacy skills among children with ASD. In study three, the contribution of home literacy environment was investigated, and results provided insights on the possible impact of home literacy environment, combined with emergent literacy skills, on vocabulary knowledge among children with ASD.

1.4. References

Anderson, R. C., Ku, Y. M., Li, W., Chen, X., Wu, X., & Shu, H. (2013). Learning to

    see the patterns in Chinese characters. *Scientific Studies of Reading*, *17*(1), 41-56.

Asaro-Saddler, K., Knox, H. M., Meredith, H., & Akhmedjanova, D. (2015). Using

    Technology to Support Students with Autism Spectrum Disorders in the Writing

    Process: A Pilot Study. *Insights into Learning Disabilities*, *12*(2), 103-119.

ASDEU Consortium. (2018). Autism Spectrum Disorders in the European Union

    (ASDEU): final report: main results of the ASDEU project-28/08/2018.

Centers for Disease Control and Prevention (2020). Data & Statistics on Autism

    Spectrum Disorder. Retrieved from

    https://www.cdc.gov/ncbddd/autism/data.html

Chen, Z., & Kuo, L. J. (2017). Language and literacy development among children with

    autism spectrum disorder. *Journal of Childhood and Developmental Disorders*,

    3(3), 1-3.

China Autism Education Rehabilitation Industry Development Report (2015). Beijing

    Normal University Press.

Deliens, G., Papastamou, F., Ruytenbeek, N., Geelhand, P., & Kissine, M. (2018).

    Selective pragmatic impairment in autism spectrum disorder: Indirect requests

    versus irony. *Journal of autism and developmental disorders*, *48*(9), 2938-2952.

Davidson, M. M., & Weismer, S. E. (2014). Characterization and prediction of early

    reading abilities in children on the autism spectrum. *Journal of autism and*

    developmental disorders, *44*(4), 828-845.

Dynia, J. M., Brock, M. E., Logan, J. A., Justice, L. M., & Kaderavek, J. N. (2016). Comparing children with ASD and their peers' growth in print knowledge. *Journal of autism and developmental disorders*, *46*(7), 2490-2500.

Dynia, J. M., Lawton, K., Logan, J. A., & Justice, L. M. (2014). Comparing emergent-literacy skills and home-literacy environment of children with autism and their peers. *Topics in Early Childhood Special Education*, *34*(3), 142-153.

Edwards, P. A. (2007). Home literacy environments: What we know and what we need to know. *Shaping literacy research: Research we have, research we need*, 42-76.

Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics: Morphosyntactic development in autism. *Journal of autism and developmental disorders*, *37*(6), 1007-1023.

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language acquisition in autism spectrum disorders: A developmental review. *Research in Autism Spectrum Disorders*, *5*(2), 681-691.

Goods, K. S., Ishijima, E., Chang, Y. C., & Kasari, C. (2013). Preschool based JASPER intervention in minimally verbal children with autism: Pilot RCT. *Journal of autism and developmental disorders*, *43*(5), 1050-1056.

Hamilton, L. G., Hayiou-Thomas, M. E., Hulme, C., & Snowling, M. J. (2016). The home literacy environment as a predictor of the early literacy development of children at family-risk of dyslexia. *Scientific Studies of Reading*, *20*(5), 401-419.

Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger syndrome. *Journal of autism and developmental disorders*, *33*(1), 3-13.

Hudry, Kristelle, Kathy Leadbitter, Kathryn Temple, Vicky Slonims, Helen McConachie, Catherine Aldred, Patricia Howlin, Tony Charman, and Pact Consortium. "Preschoolers with autism show greater impairment in receptive compared with expressive language abilities." *International journal of language & communication disorders* 45, no. 6 (2010): 681-690.

Kimhi, Y., Achtarzad, M., & Tubul-Lavy, G. (2018). Emergent literacy skills for five kindergartners with autism spectrum disorder: a pilot study. *Journal of Research in Special Educational Needs*, *18*(3), 211-221.

Kuo, L. J., & Anderson, R. C. (2006). Morphological awareness and learning to read: A cross-language perspective. *Educational psychologist*, *41*(3), 161-180.

Kuo, L. J., Li, Y., Sadoski, M., & Kim, T. J. (2014). Acquisition of Chinese characters: the effects of character properties and individual differences among learners. *Contemporary educational psychology*, *39*(4), 287-300.

Lanter, E., Watson, L. R., Erickson, K. A., & Freeman, D. (2012). Emergent literacy in children with autism: An exploration of developmental and contextual dynamic processes. *Language, speech, and hearing services in schools*.

Lawton, K., & Kasari, C. (2012). Teacher-implemented joint attention intervention: Pilot randomized controlled study for preschoolers with autism. *Journal of consulting and clinical psychology*, *80*(4), 687.

Li, H., Shu, H., McBride-Chang, C., Liu, H., & Peng, H. (2012). Chinese children's
character recognition: Visuo-orthographic, phonological processing and
morphological skills. *Journal of Research in Reading*, *35*(3), 287-307.

Lucas, R., Thomas, L., & Norbury, C. F. (2017). Can children with autism spectrum
disorders learn new vocabulary from linguistic context?. *Journal of Autism and
Developmental Disorders*, *47*(7), 2205-2216.

Mandak, K., Light, J., & McNaughton, D. (2019). Digital books with dynamic text and
speech output: Effects on sight word reading for preschoolers with autism
spectrum disorder. *Journal of autism and developmental disorders*, *49*(3), 1193-
1204.

Maye, M. P., Kiss, I., & Carter, A. S. (2017). Definitions and classification of autism
spectrum disorders. *Autism spectrum disorders: Identification, education, and
treatment*, 1-23.

McBride-Chang, C., & Zhong, Y. (2003). A longitudinal study of effects of
phonological processing, visual skills, and speed of processing on Chinese
character acquisition among Hong Kong Chinese kindergartners. *Reading
development in Chinese children*, 37-49.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and
its relationship to language in school-aged children with high-functioning autism.
International Journal of Language & Communication Disorders, *42*(6), 682-702.

Nash, R., & Arciuli, J. (2016). Prosodic awareness is related to reading ability in

    children with autism spectrum disorders. *Journal of Research in Reading*, *39*(1),

    72-87.

Niklas, F., & Schneider, W. (2013). Home literacy environment and the beginning of

    reading and spelling. *Contemporary educational psychology*, *38*(1), 40-50.

Pamparo, V. (2012). *The effect of dialogic reading on early literacy outcomes for*

    children with autism spectrum disorders (Doctoral dissertation).

Parsons, L., Cordier, R., Munro, N., Joosten, A., & Speyer, R. (2017). A systematic

    review of pragmatic language interventions for children with autism spectrum

    disorder. *PLoS One*, *12*(4), e0172242.

Parsons, D., Wilson, N. J., Vaz, S., Lee, H., & Cordier, R. (2019). Appropriateness of

    the TOBY Application, an iPad Intervention for Children with Autism Spectrum

    Disorder: A Thematic Approach. *Journal of Autism and Developmental*

    Disorders, *49*(10), 4053-4066.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2007). Receptive and

    expressive prosodic ability in children with high-functioning autism. *Journal of*

    Speech, Language, and Hearing Research.

Plattos, G. (2011). Effects of Dialogic Reading on the Expressive Vocabulary of

    Children with Autism Characteristics.

Reisinger, L. M., Cornish, K. M., & Fombonne, É. (2011). Diagnostic differentiation of

    autism spectrum disorders and pragmatic language impairment. *Journal of*

    autism and developmental disorders, *41*(12), 1694-1704.

Sénéchal, M. (2006). Testing the home literacy model: Parent involvement in

    kindergarten is differentially related to grade 4 reading comprehension, fluency,

    spelling, and reading for pleasure. *Scientific studies of reading*, *10*(1), 59-87.

Shriberg, L. D., Paul, R., McSweeny, J. L., Klin, A., Cohen, D. J., & Volkmar, F. R.

    (2001). Speech and prosody characteristics of adolescents and adults with high-

    functioning autism and Asperger syndrome. *Journal of Speech, Language, and*

    Hearing Research.

Shu, H., Peng, H., & McBride-Chang, C. (2008). Phonological awareness in young

    Chinese children. *Developmental science*, *11*(1), 171-181.

Strain, P. S., & Bovey, E. H. (2011). Randomized, controlled trial of the LEAP model of

    early intervention for young children with autism spectrum disorders. *Topics in*

    Early Childhood Special Education, *31*(3), 133-154.

Sun, H. L., Sun, D. J., Huang, J. P., Li, D. J., & Xing, H. B. (1996). The description on

    the corpus system of modern Chinese studies. *Studies of Chinese and Chinese*

    character in the computer era. Tsinghua University Publisher.

Tichnor-Wagner, A., Garwood, J. D., Bratsch-Hines, M., & Vernon-Feagans, L. (2016).

    Home literacy environments and foundational literacy skills for struggling and

    nonstruggling readers in rural early elementary schools. *Learning Disabilities*

    Research & Practice, *31*(1), 6-21.

Tipton, L. A., Blacher, J. B., & Eisenhower, A. S. (2017). Young children with ASD:

    Parent strategies for interaction during adapted book reading activity. *Remedial*

    and Special Education, *38*(3), 171-180.

Tong, X., McBride-Chang, C., Shu, H., & Wong, A. M. (2009). Morphological awareness, orthographic knowledge, and spelling errors: Keys to understanding early Chinese literacy acquisition. *Scientific Studies of Reading*, *13*(5), 426-452.

Volden, J., & Phillips, L. (2010). Measuring pragmatic language in speakers with autism spectrum disorders: Comparing the Children's Communication Checklist—2 and the Test of Pragmatic Language. *American Journal of Speech-Language Pathology*.

Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of autism and developmental disorders*, *40*(10), 1259-1273.

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts, J. (2017). The emergent literacy skills of preschool children with autism spectrum disorder. *Journal of autism and developmental disorders*, *47*(2), 424-438.

Westerveld, M. F., Trembath, D., Shellshear, L., & Paynter, J. (2016). A systematic review of the literature on emergent literacy skills of preschool children with autism spectrum disorder. *The Journal of Special Education*, *50*(1), 37-48.

Whalon, K., Martinez, J. R., Shannon, D., Butcher, C., & Hanline, M. F. (2015). The impact of reading to engage children with autism in language and learning (RECALL). *Topics in Early Childhood Special Education*, *35*(2), 102-115.

Wu, X., Anderson, R. C., Li, W., Wu, X., Li, H., Zhang, J., ... & Chen, X. (2009).

Morphological awareness and Chinese children's literacy development: An

intervention study. *Scientific Studies of Reading*, *13*(1), 26-52.

2. EMERGENT LITERACY SKILLS AND HOME LITERACY ENVIRONMENT AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER: A SYSTEMATIC LITERATURE REVIEW

2.1. Introduction

Over the past decade, escalating attention has been given to the growth and development among children with autism spectrum disorder (ASD) (Wong et al., 2015; Westerveld et al., 2017). As one of the most prevalent disorders, increasing numbers of children were affected by autism spectrum disorder with deficits in behavioral, language and social development such as abnormal language production and behaviors, and impaired social patterns (Maye, Kiss, & Carter, 2016). The relatively large ratios of children who are diagnosed with ASD have been identified in different countries and regions such as the United States (Center of Disease Control and Prevention, 2020), European countries (Autism Spectrum Disorders in the European Union, 2018), Australia (Australian Bureau of Statistics, 2014), and China (China Autism Education Rehabilitation Industry Development Report, 2015). For instance, statistics from Center of Disease Control and Prevention (2020) revealed that, on average, 1 in 54 of children was diagnosed as having ASD in the United States. In China, roughly more than 2 million children were affected by ASD (China Autism Education Rehabilitation Industry Development Report, 2015). Although countries and regions applied different standards regarding definitions of ASD, identification measures, and the age of children, it should

be noteworthy that autism spectrum disorder is increasingly influencing the current and future growth among young children today.

With escalating attention to the prevalence of Autism Spectrum Disorder, a generation of research on Autism Spectrum Disorder has been conducted. Three major areas of research on children with ASD have been investigated. Specifically, existing research aims to: a) investigate impaired language behaviors and social interaction patterns (e.g., Eigsti, de Marchena, Schuh, & Kelley, 2011; Howlin, 2003; Kelley, Paul, Fein, & Naigles, 2006); b) examine the effectiveness of interventions and therapies on cognitive, language and interaction behaviors; and c) explore and identify key factors that promote literacy development among children with ASD (e.g., Dynia, Brock, Justice, & Kaderavek, 2017; Knight, Blacher, & Eisenhower, 2018; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017).

Extensive research has been conducted to investigate language and social interaction patterns among children with ASD. Evidence from both clinical and diagnosis, as well as empirical studies have identified three major deficits in language and social interaction behaviors: a) early language delays (e.g., Howlin, 2003; Hudry., Leadbitter, Temple, et al., 2010; Weismer, Lord, & Esler, 2010); b) atypical language production (Eigsti, Bennetto, & Dadlani, 2007); and c) discourse/pragmatic difficulties (e.g., McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007; Peppe, McCann, Gibbon, O'Hare, & Rutherford, 2007; Shriberg, Paul, McSweeny, Klinm Cohen, & Volkmar, 2001). In terms of delays in early language production, compared with typically-developing children who generate their first words at the age of 8-14 months, children

with ASD generally don't produce their first words until around 38 months (Howlin, 2003). Additionally, delays in both receptive and expressive language have been identified, with receptive language found to be the most severely impacted (Weismer, Lord & Esler, 2010; Hudry, Leadbitter, Temple, et al., 2010). With respect to atypical language production, children with ASD are characterized by: a) echolalia, which means the imitation and repetition of the speech from others; b) jargon, which refers to idiosyncratic labels, nonsense-terms, and phrases with atypical meanings; and c) abnormal production regarding suprasegmental features such as accents, rhythm, stress and intonation (e.g., Eigsti, Bennetto, & Dadlani, 2007; Eigsti, de Marchena, Schuh, & Kelley, 2011; McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007; Peppe, McCann, Gibbon, O'Hare, & Rutherford, 2007; Shriberg et al., 2001). As for disorders in pragmatics, which is defined as the use of language for communication in different contexts and it requires non-linguistic language, children with ASD are found to have difficulties in understanding non-linguistic functions (e.g., body language and facial expression), social relationships, and conversational contexts (e.g., Deliens, Papastamou, Ruytenbeek, Geelhand, & Kissine, 2018; Kelley, Paul, Fein, & Naigles, 2006; Reisinger, Cornish, Fombonne, 2011; Volden, Joanne; Phillips, Linda, 2010).

A majority of research also concentrates on the design and effectiveness of interventions on the development of language and social interaction among children with ASD. Extant interventions or models are classified into different categories: a) intervention purposes such as behavior problems, autism symptoms, language and social communication (e.g., Parsons, Cordier, Munro, Joosten, Speyer, & Renée, 2017; Strain

& Bovey, 2011); b) intervention implementation such as therapist-implemented, parent-mediated and teacher-implemented (e.g., Goods et al., 2013; Lawton & Kasari, 2012); (c) intervention size: group vs individual (e.g., Ichikawa et al., 2013); and (d) intervention with technology (e.g., Asaro-Saddler, Knox, Meredith, & Akhmedjanova, 2015; Parsons, et al., 2019). The effectiveness of interventions has been evaluated by empirical studies, literature reviews and meta-analyses (e.g., Delli, Polychronopoulou, Kolaitis, & Antoniou, 2018; Tachibana, et al., 2018). Results confirmed the overall contribution of intervention and models of development among children with ASD. Nevertheless, the effectiveness might differ based on the intervention categories in different contexts.

Over the past decade, increasing numbers of studies have been conducted to explore literacy development among children with ASD. Considering the significance of the ability of reading and writing on academic and career success, examining literacy development among children with ASD should be emphasized. Relevant research on literacy development provided insights into: a) disparities in development literacy skills between children with ASD and typically-developing children; b) key factor of promoting literacy development; and c) interventions on the development of literacy skills. Among existing research on literacy development among children with ASD, two specific areas, which are emergent literacy development in the home literacy environment, received escalating attention. The significance of emergent literacy and home literacy environment on literacy development has been highlighted among typically-developing children (e.g., Niklas & Schneider, 2013; Puranik, Lonigan, &

Kim, 2008; Tong, McBride-Chang, Shu, & Wong, 2009; Wu, Anderson, Li, et al., 2009).

Emergent literacy skills refer to relevant skills or techniques for acquiring fundamental knowledge in reading and writing (National Early Literacy Panel, 2008). Specifically, emergent literacy skills include basic knowledge and skills such as letter knowledge, print knowledge, decoding, phonological awareness, morphological awareness, word recognition, oral language, and early writing. These early-developing skills can be further classified into two categories, which are coding-related skills (e.g., alphabet knowledge, phonological awareness, print concept, and emergent name writing) and meaning-related skills (e.g., receptive vocabulary, expressive vocabulary and oral narrative competence. Research on emergent literacy skills among typically developing children revealed that emergent literacy skills were critical for learners to achieve success in later literacy development such as vocabulary acquisition, reading fluency, reading comprehension and writing (e.g., Piasta, Justice, Mcginty, & Kaderavek, 2012; Puranik, Lonigan, & Kim, 2011; Roberts, Jurgens, & Burchinal, 2005).

The contribution of home literacy environment to the literacy acquisition of typically-developing children has also been widely investigated and acknowledged as important (e.g., Edwards, 2007; Sénéchal, 2006; Yuet-Han Lau & McBride-Chang, 2005). In general, home literacy environment encompasses various aspects, including opportunities of parent-child and individual reading, formal and informal literacy practices, reading resources, parental education background and attitudes towards literacy development. An appropriate and supportive home literacy environment can

promote and accelerate the growth of both language and literacy skills. The significance of home literacy environment on language and literacy development has been further expanded and well documented in research with struggling readers (e.g., Edwards, 2007; Tichnor-Wagner, Garwood, Bratsch-Hines, & Vernon-Feagans, 2007; Hamilton, Hayiou-Thomas, Hulme, Snowling, 2016).

Although the significance of emergent literacy skills and home literacy environment has been thoroughly examined among typically-developing children, these two areas remain largely unexamined among children with ASD. Over the past decade, limited research (e.g., Davidson & Weismer, 2014; Dynia, Lawton, Logan, & Justice, 2014; Gabig, 2010; Lanter, Watson, Erickson, & Freeman, 2012; Kimhi, Achtarzad, & Tubul-Lavy, 2017; Westerveld, Paynter, Webster, Hodge, & Roberts, 2017) was conducted to address these two mentioned areas, and only one study (Westerveld, Trembath, Shellshear & Paynter, 2015) provided a systematic literature review specifically on emergent literacy development among children with ASD. Westerveld and colleagues (2015) examined the strengths and weaknesses in emergent literacy skills among children with ASD through synthesizing results from relevant research between 1995 and 2015. Only three quantitative studies were included (Davidson & Weismer, 2014; Dynia, Lawton, Logan, & Justice, 2014; Lanter, Wastson, Erickson, & Freeman, 2012), and results from these studies indicated that the disparities in developing code-related and meaning-related skills between children with ASD and typically-developing children. Specifically, compared with their typically-developing peers, children with ASD demonstrated comparable performance in certain code-related skills such as

alphabet knowledge and phonological awareness. Nevertheless, children with ASD were found to lag behind their typically-developing peers in meaning-related skills such as oral narratives competence and oral vocabulary knowledge. Although only three studies were available for the literature review (Westerveld et al., 2015), findings provided preliminary insights on emergent literacy development among children with ASD and highlighted the need of conducting research in this area.

The present study aims to provide a systematic literature review on both emergent literacy development and home literacy environment among children with ASD. The present systematic literature review differs from the existing review (Westerveld et al., 2015) in four aspects. The current literature review aims to expand existing findings on emergent literacy skills among children with ASD through: a) synthesizing results from more recently-published studies between 2008 and 2018; and b) investigating findings from qualitative studies. Considering that only three quantitative studies were included in the previous literature review (Westerveld et al., 2015), findings on emergent literacy skills among children with ASD were limited. For instance, only one meaning-related skill (i.e., definitional vocabulary) was evaluated across previous selected studies. In this case, the performance on emergent literacy skills among children with ASD will be further explored through including more research involving other relevant skills such as emergent writing, oral narrative competence, and receptive and expressive vocabulary.

Additionally, the present literature review investigates the impact of home literacy environment on literacy development among children with ASD. As mentioned

in the previous section, it has been well-documented in research with typically-developing children and struggling readers that a supportive home literacy environment is critical for promoting and accelerating both language and literacy skills. The home literacy environment may even be more crucial for children with ASD. First of all, these children typically show deficits across multiple areas of language and literacy development, and thus would benefit from a print-rich home environment. Secondly, they may be more likely to engage in challenging or unfamiliar literacy activities in an environment that is familiar and comfortable (e.g., reading environment and reading with their parents), making at-home practice particularly essential.

Moreover, another purpose of the current literature review is to address the study design on existing research on children with ASD, presenting methodological features such as participant characteristics, research location, diagnosis of Autism Spectrum Disorder, and measures on emergent literacy skills and home literacy environment. Given that the majority of research on ASD has been conducted with European or European-American children and their families, the present study will also include research on children with ASD from other cultural and linguistic backgrounds to present a more comprehensive understanding of emergent literacy development and home literacy environment in children on the spectrum.

The current study is guided by the following research questions:

1. What were the substantive features of the included studies, such as publication year, journal, and research locations?

2. What were the methodological features of the included studies, such as the research design, research sites, participants, and measures?

3. What were the challenges and difficulties in developing emergent literacy skills among children with ASD in comparison with typically-developing children?

4. What knowledge and skills were significantly associated with emergent literacy development?

5. What were differences in home literacy environment between children with ASD and typically-developing children?

6. How does home literacy environment influence literacy development among children with ASD?

2.2. Methodology

2.2.1. Study Search

In the present literature review, studies were searched in five research databases which focus on general education, language and literacy development, and special education to cover all aspects of the current literature review. Selected databases were ERIC, Science Direct, Web of Science, PsycINFO and Scopus. Search terms were created to address three major aspects of emergent literacy, home literacy environment and children with ASD. The preliminary search included research with selected terms or keywords in the title or abstract fields. Specifically, terms of emergent literacy included emergent literacy skills, early-developed skills and specific skills such as phonological awareness, alphabet knowledge, decoding, vocabulary and phonics. Keywords of

children with ASD included autism, autism spectrum disorder, ASD and autis. Terms of home literacy environment included, home literacy practices, reading/writing at home and specific literacy activities such as shared reading and picture books. The Boolean operator OR was used between synonyms of each concept, and the Boolean operator AND was used to combine the search terms for each of the three main aspects. The search was modified for each database.

2.2.2. Inclusion/Exclusion Criteria

After finishing preliminary searches, all article titles and abstracts were read. Studies were included if they met the following criteria:

a) The selected studies examined emergent literacy skills and home literacy environment among children with ASD.

b) The selected studies were recently-published between January 2010 and June, 2020, including using quantitative, qualitative and mixed-method studies, intervention and correlational studies, dissertations, conference papers, literature reviews and book chapters.

c) Participants were diagnosed as "ASD only". Articles were excluded if participants had ASD with other disabilities (e.g., Autism and Fragile X Syndrome)

d) Participants were selected from kindergartens and preschools with no no formal schooling experiences.

2.2.3. Coding Scheme

The coding spreadsheet was designed to organize study coding and to facilitate information retrieval. Two major aspects were covered for each selected study, including substantive features and methodological characteristics

2.2.3.1. Substantive Features

Substantive features of the studies included the major characteristics of the studies, including journal, publication year, and research location. Coding journal title and publication year not only provides insights of the major journals contributing to emergent literacy development and home literacy environment among children with ASD, but also identified changes in research focus on this area. Research location was coded as the countries where the research was conducted.

2.2.3.2. Methodological Features

Methodological features of the studies included research design, research site, participant and measures used in studies. Research design was defined by three major approaches: quantitative (with statistical procedures), qualitative (without statistical procedures), and a combination of the two labeled as mixed-method. Research site was coded into two categories: inclusive and exclusive sites. Specifically, inclusive research sites are designed to provide equal opportunities of education for children/students of all abilities in the same environment. In the current literature review, the inclusive site refers to school sites and kindergartens in which both children with ASD and typically developing peers were living and learning in the same classroom. In contrast, exclusive sites were designed to provide specific training for children with ASD only.

Participant number was coded to demonstrate the size of selected studies. Considering that research on children with ASD tends to enroll a relatively small sample size, the number of participants were coded as: 1 (less than 50) and 2 (more than 50). In addition, the research which involves both children with ASD and their typically-developing peers was also coded. Moreover, the instrument used for autism identification was coded to provide insights into how children with ASD were identified across included studies. Example identification instruments included commonly-applied standardized approaches of autism diagnosis such as DSM-IV-TR criteria, Autism Diagnostic Observation Schedule, Social Responsiveness Scale, Autism Diagnostic Interview–Revised, and Autism Diagnostic Observation Schedule. The research coded reports from parents and schools as "not specified".

Measures refer to specific tests of emergent literacy skills and home literacy environment utilized in selected studies. Major emergent literacy skills included alphabet/letter knowledge, print knowledge, phonological awareness, prosodic awareness, decoding, word recognition, rapid automatized naming, syntax, emergent writing, reading fluency, definitional vocabulary, receptive vocabulary, expressive vocabulary, oral narrative competence, and reading and listening comprehension. As for home literacy environment, specific home-literacy related items were coded to explore which aspects of home literacy environment were investigated across existing research. Example items included frequency of home reading, frequency of teaching during reading, the duration of home reading, materials selection, interaction, and engagement in home literacy practices. In addition, other significant measures on non-verbal

cognitive ability (e.g., IQ and executive function), autism severity, and communication skills were also coded.

2.2.4. Data Collection and Data Analysis

After deduplication, the database searches retrieved 3,065 results. All article titles and abstracts were reviewed. Following the inclusion criteria, more than 90% of preliminary search articles were excluded. After the full text screening, 31 studies were selected for the present study. Each of the studies was coded in Microsoft Excel using the developed coding scheme. Inter-rater reliability of the coding was 90.2% and disagreements were resolved through discussion until reaching 100% agreement. The data set was examined using a content analysis approach. Specifically, descriptive statistical analyses were conducted to answer the research questions stated previously.

2.3. Results and Discussion

2.3.1. Substantive Features

2.3.1.1. Publication Year and Journal

Findings indicated that, over the past decade, the research on emergent literacy development and home literacy environment among children with ASD has received escalating attention. Specifically, the analysis revealed that, among thirty-one selected studies, 32.3% of studies (n = 10) were published between 2010 and 2015, while 67.7% of studies (n = 21) were published during the period between 2016 and 2020. Among selected studies, twenty-six studies investigated the emergent literacy development among children with ASD. In contrast, only eleven studies discussed the home literacy environment among children with ASD such as the contribution of home literacy

environment to advancing language and literacy development for children with ASD, strategies and interventions in home literacy practices, with 4 studies published between 2010 and 2015 and 9 studies published between 2016 and 2020. Additionally, 30 out of 33 included studies were journal articles, which were published in peer-reviewed journals, while three studies were dissertations. Table 2.1 demonstrated the number of included articles in each journal.

Table 2.1 Selected Studies in Academic Journals

Journal Title	No.
Advances in Neurodevelopmental Disorders	1
Autism	1
Autism & Developmental Language Impairments	2
Autism Research	1
Communication Disorders Quarterly	1
Education and Training in Autism And Developmental Disabilities	1
Exceptional Children	1
Focus on Autism And Other Developmental Disabilities	1
International Journal of Child-computer Interaction	1
Journal of Autism and Developmental Disorders	8
Journal of Research in Reading	1
Journal of Research in Special Educational Needs	1
Language, Speech, And Hearing Services In Schools	1
Remedial and Special Education	1
Research in Autism Spectrum Disorders	1
School Psychology Quarterly	1
Topics in Early Childhood Special Education	4

2.3.1.2. Research Location

Table 2.2 demonstrated the location where the research was conducted. Specifically, 22 out of 31 studies were conducted in the US, seven in Australia, one in Israel and one in China between 2010 and 2020. Findings indicated that, over the past decade, most studies regarding emergent literacy and home literacy environment among

children with ASD were conducted in the English-speaking context (29 out of 31, 93.5%). Although findings indicated a burgeoning trend of research for children with ASD, the influence of the linguistic and cultural context should be further considered. Thus, the disparities of the linguistic and cultural context may contribute to the differences related to the development of emergent literacy skills and the impact of home literacy environment among children with ASD. For instance, existing literature in English-speaking context indicated that, compared with typically-developing children, children with ASD consistently had particular difficulties in processing and developing meaning related skills but not code-related skills (e.g., Dynia et al., 2014; Lanter et al., 2012; Westveld et al., 2017). However, Zhao and colleagues (2020) reported that there was a statistically significant difference on the task of phonological awareness between children with ASD and typically-developing children in China. Findings revealed that children with ASD in Chinese-speaking contexts also faced difficulties in developing code-related skills. Considering that Chinese is a logographic language with no consistent relationship between phonemes and graphemes (i.e., letter-sound correspondences), processing and manipulating phonological units in Chinese tended to be relatively more difficult for Chinese-speaking children. Although research on home literacy environment among children with ASD in non-English-speaking contexts is lacking, the impact of the sociocultural context should not be neglected because cultural and linguistic backgrounds may influence and shape people's behaviors and thoughts. In other words, the perspectives on literacy development and the practices in home literacy settings might vary across different sociocultural contexts.

Table 2.2 Research Location of Selected Studies

Location	Language	No.
Australia	English	7
China	Chinese	1
Israel	Hebrew	1
US	English	22

2.3.2. Methodological Features

2.3.2.1. Participants and Autism Identification

A total of twenty-six studies (83.9%) enrolled 50 or fewer children with ASD, while only five studies were conducted with more than 50 children with ASD. Among these twenty-seven studies, eleven studies reported that the number of participants was less than 25 (see Table 2.3). Findings indicated that extant research tended to have relatively less number of participants with ASD. Thus, the number of participants was one of the common limitations reported by existing research (e.g., Bean, Perez, Dynia, Kaderavek, & Justice, 2020; Mandak, Light, & McNaughton, 2019; Gabig, 2010). According to Bean et al. (2010), the small sample size might give rise to the attenuation of potentially significant relationships or differences in research. Therefore, findings from existing literature needed to be further investigated with a larger sample size of children with ASD.

Table 2.3 Participant Number of Selected Studies

Participant Number	No.
0-25	11
26-50	15
> 50	5

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In terms of the instruments regarding autism identification, existing research has applied multiple approaches to identify their participants with Autism (see Table 2.4). Specifically, commonly-used measures reported by researchers included: a) Autism Diagnostic Observation Schedule (ADOS) (e.g., Gabig, 2010; Westerveld, Paynter, O'Leary, & Trembath, 2018; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017); b) Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (e.g., Kimhi, Achtarzad, & Tubul-Lavy, 2017; Nash, & Arciuli, 2016); and c) Social Communication Questionnaire (e.g., Simpson, Paynter, Wicks, & Westerveld, 2020; Westerveld et al., 2017). Specifically, as an instrument of autism diagnosis and assessment, the Autism Diagnostic Observation Schedule (ADOS) is composed of structured and semi-structured tasks of social interaction for examiners to observe communicative behaviors among people with ASD. The Diagnostic and Statistical Manual of Mental Disorders is a diagnostic tool, which covers all categories of mental health disorders. It provides descriptions, symptoms, and criteria for diagnosing mental health disorders for both children and adults. The Social Communication Questionnaire (SCQ) is a specific tool for screening children with ASD. It consists of 40 yes-or-no questions for parents or caregivers to evaluate children's autism spectrum. In addition to these mentioned diagnostic instruments, other selected measures included Autism Diagnostic Interview–Revised (Gabig, 2010), Gilliam Autism Rating Scale (Tipton, Blacher, & Eisenhower, 2017), Autism Spectrum Quotient (Knight, Blacher, & Eisenhower, 2019), and Social Responsiveness Scale, which is a valid diagnostic instrument in China (Zhao, Chen, Tong, & Yi, 2019).

Although various standardized instruments were reported by researchers to assess their participants with ASD, 17 out of 31 studies did not specify their measures of identifying children with ASD. More specifically, these studies only reported that participants were selected based on records from parents, schools, centers and school districts (e.g., Dynia, Brock, Logan, Justice, & Kaderavek, 2016; Lanter, Watson, Erickson, & Freeman, 2012; Whalon, Martinez, Shannon, Butcher, & Hanline, 2015). However, it should be noted that clarifying the diagnostic instruments should be of significance in reducing possible participant bias and interpreting findings. For instance, Lanter and colleges (2012) reported that the diagnoses of children with ASD might vary with different instruments across parents, centers, and schools. Therefore, the use of different instruments might lead to the enrollment of participants with different autism severity or symptoms, which could influence the investigation and interpretation of research findings (Nation et al., 2006).

Table 2.4 Instruments of Autism Identification in Selected Studies

Instrument	No.
Autism Diagnostic Interview–Revised	1
Autism Diagnostic Observation Schedule	8
Autism Spectrum Quotient	1
Diagnostic and Statistical Manual of Mental Disorders	2
Gilliam Autism Rating Scale	1
Social Communication Questionnaire	3
Social Responsiveness Scale	1
Not Specified	17

2.3.2.2. Research Site

As mentioned in the previous section, the research site was coded as inclusive and exclusive. Specifically, the inclusive site refers to the kindergartens/preschools with

both typically-developing children and children with ASD, while the exclusive site was designed to provide specific training and practices for children with ASD only. Out of thirty-one studies (see Table 2.5), eleven of them (35.5%) were conducted in an inclusive setting (e.g., Fleury, 2015; Zimmer, 2017) and four studies (12.9%) enrolled participants from an exclusive setting (Kimhi, Achtarzad, & Tubul-Lavy, 2017; Monroe, 2010; Pamparo, 2013; Plattos, 2012). In addition, two studies recruited participants from both inclusive and exclusive settings (Hudson et al., 2017; Nash & Arciuli, 2016) and fourteen studies (45.2%) did not specify the research site. Although the type of research set has been reported by most existing research, its influence on children's language and literacy development has not been explored. Considering that the living and learning environment, daily activities, practices and training vary in different settings (i.e., with/without typically developing children), the impact of inclusive and exclusive sites on the development of language and literacy knowledge, and social skills among children with ASD should be further examined by studies.

Table 2.5 Research Site in Selected Studies

Research Site	No.
Inclusive	11
Exclusive	4
Both	2
Not Specified	14

2.3.2.3. Study Design

Among thirty-one studies, twenty of them (64.5%) employed quantitative methodology (e.g., Dynia, Bean, Justice, & Kaderavek, 2019; Westerveld, Paynter, Brignell, & Reilly, 2020). In contrast, only two qualitative studies were identified

between 2010 and 2020 (Monroe, 2010; Whalon et al., 2015) and nine studies utilized the mixed-method methodology (e.g., Armstrong, Paynter, & Westerveld, 2019; Lanter, Freeman, & Dove, 2013; Wicks, Paynter, & Westerveld, 2020). Additionally, findings also demonstrated that 71% studies (n = 22) were correlational, which investigated the differences between children with and without ASD in emergent literacy development and home literacy environment (e.g., Bean et al., 2020; Simpson et al., 2020, Westerveld et al., 2017), and the development of emergent literacy knowledge and skills (e.g., Knight, Blacher, & Eisenhower, 2019; Lante et al., 2012). In contrast, nine studies investigated the effectiveness of specific interventions for children with ASD such as shared reading (e.g., Rvachew et al., 2017; Whalon, et al., 2015), dialogic reading (e.g., Pamparo, 2013; Plattos, 2012), digital reading (e.g., Mandak, Light, & McNaughton, 2019) and emergent literacy interventions (Hudson et al., 2017).

2.3.3. Emergent Literacy Development among Children with ASD

21 out of 33 studies have been conducted to investigate the development of emergent literacy skills among children with ASD. The National Early Literacy Panel (2008) defines emergent literacy as basic knowledge and skills for developing reading and writing abilities. These emergent literacy skills can be further categorized as code-related and meaning-related. Specifically, the code-related skills focus on the relationship between written and oral language (i.e., print-to-sound or sound-to-print) such as letter/alphabet knowledge, phonological awareness, print knowledge and decoding. In contrast, the meaning-related skills refers to the ability of understanding oral and written language such as vocabulary knowledge and oral narratives. Over the

past decade, existing research has been conducted to explore the development of

emergent literacy skills, including both code-related and meaning-related skills, among

children with ASD. Table 2.6 presented the code-related emergent literacy skills that

have been addressed by extant research between 2010 and 2020. Major selected code-

related skills were alphabet/letter knowledge (e.g., Kimhi, Achtarzad, & Tubul-Lavy,

2017; Pamparo, 2013; Westerveld, et al., 2017), phonological awareness (e.g., Dynia et

al., 2017; Tipton, Blacher, & Eisenhower, 2017; Westerveld et al., 2018). and print

concept (e.g., Hudson et al., 2017; Simpson et al., 2020; Westerveld et al., 2020). In

terms of meaning-related skills, several major skills were examined by existing

literature, including receptive vocabulary (e.g., Hudson et al., 2017; Plattos, 2012;

Westerveld et al., 2018), oral narratives (e.g., Kimhi, Achtarzad, & Tubul-Lavy, 2017;

Whalon et al., 2015; Westerveld, et al., 2017) and listening comprehension (e.g.,

Pamparo, 2013; Zhao, et al., 2019) (see Table 2.7).

Table 2.6 Code-related Skills in Selected Studies

Code-related Skills	No.
Alphabet/letter knowledge	16
Decoding	2
Phonological awareness	15
Print concept	11
Print interest	1
Prosodic awareness	1
Word reading	5

Across thirty-one selected studies, there were seven studies exploring the

differences on the tasks of emergent literacy skills between children with ASD and

typically-developing children. Findings from existing research consistently indicated

that, compared with their typically-developing peers, children with ASD had comparable

performance on the task of letter/alphabet knowledge (e.g., Dynia et al., 2014; Lanter et

al., 2012; Westerveld et al., 2017). Evidence suggested that there were no significant

differences in the ability of knowing letter names and letter sounds between typically

developing children and children with ASD. According to Dynia et al., (2016), the

developmental trajectory of letter/alphabet knowledge was similar between children with

ASD and typically developing children. In another word, children with ASD seemed to

have fewer struggles in recognizing letters or alphabets and to enhance their knowledge

at a similar rate in comparison to their typically developing peers. The findings

suggested that children with ASD were able to develop the discrete skill (i.e.

alphabet/letter knowledge) which can be achieved through explicit instructions, repeated

practices and trials (e.g., Levin et al., 2006).

Table 2.7 Meaning-related Skills in Selected Studies

Meaning-related Skills	No.
Definitional Vocabulary	3
Emergent Writing	3
Expressive Vocabulary	2
Listening Comprehension	4
Oral Narratives	3
Reading Comprehension	2
Receptive Vocabulary	9

However, results from existing research indicated that children with ASD faced

difficulties in developing certain code-related skills. For instance, researchers

consistently reported that children with ASD had difficulties in developing print-concept

knowledge which refers to the knowledge of how print works (e.g., Davidson & Ellis

Weismer, 2014; Dynia et al., 2014, 2016; Lanter et al., 2012). Findings revealed that children with ASD lagged behind their typically developing peers in understanding a series of print and book conventions. Compared with the development of letter/alphabet knowledge, the print concept refers to the awareness of how to navigate written text, which cannot be memorized through trials and practices (Dynia et al., 2016; Justice et al., 2009). In this case, developing the print concept requires the observations and practices in the natural print-exposure context. Therefore, it tended to be more challenging for children with ASD to develop their knowledge of print concepts.

The comparison of phonological awareness between children with ASD and typically developing children yielded mixed findings. For instance, Westerveld and colleagues (2017) reported that there was no significant difference in the ability of producing the initial sound of a given word between children with ASD and typically developing children. In a more recently-published study by Westeveld et al. (2020), authors also reported that the difference in the performance of initial phoneme awareness was not statistically significant. However, Dynia et al. (2014) investigated the disparities of emergent literacy skills between children with ASD and typically developing children, and their results indicated that children with ASD had difficulties on the tasks of phoneme elision and blending. Findings indicated that children with ASD tended to have less difficulty in phoneme segmentation (i.e., first sound isolation) than phoneme manipulation (i.e., blending and elision). Considering that phonological awareness refers to a set of skills of understanding and manipulating sound units such as syllables, onsets and rimes, and phonemes, clarifying the specific facets of phonological awareness

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should be emphasized. Future research should further investigate the development of phonological awareness among children with ASD by specifying what types of skills on phonological awareness that were examined.

Additionally, the impact of the linguistic context should not be neglected. Thus, differences in linguistic structure and features influence children's language and literacy development. For instance, existing research in the English-speaking context mainly concentrated on the development of phonemic awareness among children with ASD. However, Zhao and colleagues (2019) examined the development of emergent literacy skills among children with ASD in China and identified that Chinese-speaking children with ASD had struggles in developing syllable awareness. Thus, considering the disparities in language system, syllable awareness was found to be one significant facet of phonological awareness for Chinese-speaking children (e.g., Shu, Peng & McBride Chang, 2008; Ziegler & Goswami, 2005). In this case, the linguistic structure and features should be addressed by future research to expand the understanding of emergent literacy development among children with ASD.

With respect to meaning-related skills, existing evidence consistently revealed that children with ASD faced particular difficulties in developing different types of meaning-related skills. Specifically, children with ASD were found to have struggles in: a) oral narratives (Westerveld et al., 2017); b) emergent writing (Lanter et al., 2012); c) receptive vocabulary (Zhao et al., 2019); d) definitional vocabulary (Fleury & Lease, 2018); and e) listening comprehension (Zhao et al., 2019) and reading comprehension (Davidson & Ellis Weismer, 2014). Compared with research on code-related skills,

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evidence on the development of meaning-related skills was relatively limited. Nevertheless, existing literature indicated that children with ASD face challenges in expressing ideas and understanding oral and written language. Given that children with ASD had deficits in language production and social interaction, it was more challenging to develop their skills and knowledge of processing and expressing meanings in both oral and written languages.

Only a handful of studies investigated the predictive contribution of emergent literacy to the development of literacy skills among children with ASD (Davidson & Ellis Weismer, 2014; Dynia et al., 2017; Westerveld et al., 2017, 2018; Zhao et al., 2019). For instance, Westerveld and colleagues (2017) investigated the code- and meaning-related skills among preschoolers with ASD. Authors reported that oral receptive vocabulary was a significant predictor for the performance for code- related skills. Another study by Dynia and colleagues (2017) examined predictors of decoding for children with ASD. Findings demonstrated the significance of phonological awareness in predicting children's reading performance. In a more recently-published research, Zhao et al. (2019) reported that phonological awareness (i.e., syllable awareness) was significantly associated with Chinese character recognition among children with ASD. The significance of early-developing skills has been thoroughly examined by research for typically developing children. Relevant research has revealed that emergent literacy skills were essential for future language learning and literacy development (e.g., Piasta, Justice, Mcginty, & Kaderavek, 2012; Puranik, Lonigan, & Kim, 2011; Roberts, Jurgens, & Burchinal, 2005). Although relevant research regarding

the contribution of emergent literacy to concurrent and longitudinal literacy development of children with ASD remains largely uninvestigated, limited evidence suggested the possible significance of emergent literacy to the growth of language and literacy development among children with ASD.

One specific component of the participant's background should be highlighted in examining the contribution of emergent literacy skills among children with ASD. Specifically, the participant's background, which consists of autism severity, non-verbal cognitive abilities, oral/communication skills and socio-economic status, was significantly associated with language and literacy development among children with ASD (e.g., Dynia et al., 2014, 2017; Lanter et al., 2012; Westerveld et al., 2017, 2018; Zhao et al., 2019). For instance, Dynia and colleagues (2014) identified that children's non-verbal reasoning and oral language skills were significantly associated with the performance of code-related skills. Similarly, Davidson and Ellis Weismer (2014) also found the significant contribution of nonverbal cognitive ability and expressive language to children's later reading performance. Another study by Westerveld et al. (2017) reported that children's autism severity, non-verbal cognitive ability and communication skills were significant for developing meaning-related skills. In this case, participant's background was a significant predictor, which was strongly associated with emergent and later literacy development among children with ASD. Therefore, taking participants' background into account is critical to investigate the unique contribution of emergent literacy skills among children with ASD.

2.3.4. Home Literacy Environment among Children with ASD

11 out of 31 studies investigated the home literacy environment among children with ASD. Specifically, relevant research can be further classified into two categories: (a) to compare the differences in home literacy environment between typically developing children and children with ASD (e.g., Dynia et al., 2014; Lucas & Norbury 2017); and (b) to investigate the impact of home literacy environment on language and literacy development (e.g., Tipton, Blacher, & Eisenhower, 2017; Westerveld et al., 2017). According to Bus, Van Ijzendoorn and Pellegrini, (1995), home literacy environment refers to the frequency of literacy-related activities between parents/caregivers and their children. This definition was further developed through including more components of home literacy environment such as home literacy resources, perspectives on home literacy practices and strategies for teaching literacy at home (e.g., Bean et al., 2020; Bracken & Fischel, 2008; Burgess, Hecht, & Lonigan, 2002; Zimmer, 2017). Existing literature for children with ASD has highlighted and investigated several significant components of home literacy environment: a) frequency of home literacy practices (e.g., how often parents read to their children, how often children ask their parents to read and the frequency of independent reading) (Dynia et al., 2014; Lanter, Freeman, & Dove, 2013; Westerveld et al., 2017); b) home literacy resources (e.g., Amonstrong, Paynter & Westerveld, 2019; Lanter et al., 2012; Zimmer, 2017); c) engagement in home literacy practices (e.g., Lanter, Freeman, & Dove, 2013; Wicks, Paynter, & Westerveld, 2020); and d) parental perspectives on home literacy practices (e.g., Lanter et al., 2012; Dynia et al., 2014; Monroe, 2010).

Limited studies have been conducted to explore differences in home literacy environment between typically developing children and children with ASD (e.g., Dynia, et al., 2014; Lanter et al., 2013). Findings from existing literature indicated that children with ASD tended to be less engaged in home literacy practices in comparison to their typically developing peers. For instance, Lanter and colleagues (2013) identified that, compared with typically-developing children, children with ASD were less engaged in shared reading practices with their parents at home. Similarly, another study by Dynia et al. (2014) also identified that children with ASD were less motivated to participate in home literacy practices. The less engagement might be associated with children's language and communication impairments, and the lack of appropriate strategies and materials. In this case, increasing attention has also been given on how to promote and maintain the engagement of home literacy practices and to provide suggestions and directions for children with ASD (e.g., Armstrong, Paynter, & Westerveld, 2019; Fleury, 2015; Wicks, Paynter, & Westerveld, 2020; Zimmer, 2017). For instance, Fleury (2015) addressed the significance of promoting compliance during reading with children with ASD. The author highlighted that it was significant to provide children with autonomy of selecting books and to consider their interests. Zimmer (2017) suggested that parents should provide more opportunities of interacting with children with ASD in diagnostic and shared reading. Armstrong, Payner and Westerveld (2019) investigated the parental book preferences for children with ASD. Results from parental reports revealed that children with ASD preferred fiction books with animal topics. In a more recently-published study, Wicks, Paynter and Westerveld (2020) identified that visual attention

and verbal engagement were two significant components of effective shared reading practices with children with ASD.

In addition to exploring the differences of home literacy environment between typically developing children and children with ASD, two studies also investigated the contribution of home literacy environment to the language and literacy development among children with ASD. Limited empirical evidence revealed that specific home literacy components were significantly associated with the language and literacy development among children with ASD (e.g., Dynia et al., 2014; Lucas & Norbury, 2017). Dynia and colleagues (2014) identified that the frequency of home literacy practices was significantly associated with the performance of alphabet knowledge among children with ASD after controlling oral language and autism severity. Lucas and Norbury (2017) further examined the impact of home literacy environment on literacy development among children through taking the duration of home literacy practices into consideration. Authors identified that the frequency and duration of independent reading at home were positively associated with reading development among children with ASD.

Despite the fact that home literacy environment among children with ASD has been increasingly addressed by scholars and researchers, evidence on the impact of home literacy environment among children with ASD was still lacking. Therefore, the contribution of home literacy environment to language and literacy development among children with ASD should be further investigated. Considering existing studies mainly applied quantitative methodology and were conducted in the English-speaking context,

future research should consider utilizing more types of data analysis methods and to investigate the home literacy environment in different contexts. Specifically, qualitative instruments, including observations and interviews, should be employed to collect detailed evidence of the process and performance of home literacy activities between parents/caregivers and children with ASD, and parental perceptions of home literacy practices. In addition, existing research in the English-speaking context consistently highlighted the parental role of facilitating their children's literacy development (e.g., encouragement and scaffolding) and the contribution of shared reading in enhancing literacy development among children with ASD (e.g., Dynia, et al., 2014; Lanter et al., 2013; Lucas & Norbury, 2018). However, parents from other sociocultural contexts may apply other approaches to lead and manage literacy-related activities.

2.4. Conclusion

The present literature review aims to investigate the existing research on emergent literacy development and home literacy environment among children with ASD between 2010 and 2020. As two significant components of promoting language and literacy development among young children, the contribution of emergent literacy skills and home literacy environment among typically developing children has been extensively investigated. However, limited studies have been conducted to explore the development of emergent literacy skills and the impact of home literacy environment on language and literacy development among children with ASD. Findings from the present literature review will not only synthesize empirical evidence regarding children with ASD, but also provide directions and suggestions for future research.

Findings indicated that, first of all, research on emergent literacy and home literacy environment among children with ASD has received escalating attention over the past decade. Evidence from existing literature demonstrated that there were significant differences in emergent literacy development and home literacy environment between typically developing children and children with ASD. Specifically, children with ASD tended to have comparable performance on specific code-related skills such as alphabet/letter knowledge and initial phoneme awareness but have struggles in developing skills of print concept and phoneme manipulation (e.g., Dynia et al., 2014; Lanter et al., 2012; Westerveld et al., 2017). In addition, children with ASD faced particular challenges in processing and understanding meanings of oral and written language. Research consistently reported that children with ASD lagged behind their typically developing peers on the tasks of oral narrative, vocabulary knowledge, listening and reading comprehension (e.g., Fleury & Lease, 2018; Lanter et al., 2012; Westerveld et al., 2017; Zhao et al., 2019). In terms of home literacy environment, children with ASD were found to be less engaged in home literacy practices with their parents (Dynia, et al., 2014; Lanter et al., 2013). Furthermore, specific home literacy components such as the frequency and duration of reading at home were significantly associated with literacy development among children with ASD (e.g. Dynia et al., 2014; Lucas & Norbury, 2017).

Based on the findings, there are three suggestions for future research on emergent literacy and home literacy environment among children with ASD. First of all, participant selection is considered as one of the major limitations across existing

literature with ASD. Studies consistently reported that results and findings might be limited by: (a) the small sample size; (b) the selection bias (e.g., only recruit children with high-functioning ASD who can produce and understand oral language); (c) no typically-developing children in the studies; and (d) no control group in intervention studies (e.g., Dynia et al., 2016; Lanter et al., 2012; Monroe, 2010; Westerveld et al, 2018). In this case, researchers should, on the one hand, recruit more children with ASD in their studies. On the other hand, future research should be designed with the consideration of the participant issue (e.g., children with low-functioning ASD, typically developing children/control group for comparison). Additionally, it is noteworthy that existing research explored emergent literacy skills and home literacy environment mainly with quantitative methodology. More types of research design should be conducted such as qualitative, longitudinal and case studies. For instance, qualitative design research with interviews and observations will be helpful for further exploring how children develop their emergent literacy skills and how they are engaged in home literacy practices with their parents. Moreover, the measures for emergent literacy skills and home literacy environment should be further explored for children with ASD. On the one hand, some measures for emergent literacy skills, which were designed for typically-developing children, might be challenging for children with ASD. On the other hand, the current home literacy environment survey might not be sufficient enough to provide detailed evidence on home literacy practices (Dynia et al., 2014). Therefore, future research might design and employ specific measures for children with ASD (e.g., with visual assistance), and continue to develop the home literacy environment survey

with more specific items such as types of activities with technology and the purposes of

using technology as a supportive tool.

2.5. References

Armstrong, R. M., Paynter, J., & Westerveld, M. F. (2019). Fiction or non-fiction: Parent-reported book preferences of their preschoolers with autism spectrum disorder. *Autism & Developmental Language Impairments*, *4*, 2396941519896736.

Asaro-Saddler, K., Knox, H. M., Meredith, H., & Akhmedjanova, D. (2015). Using Technology to Support Students with Autism Spectrum Disorders in the Writing Process: A Pilot Study. *Insights into Learning Disabilities*, *12*(2), 103-119.

ASDEU Consortium. (2018). Autism Spectrum Disorders in the European Union (ASDEU): final report: main results of the ASDEU project-28/08/2018.

Australian Bureau of Statistics (Producer). (2014). *Autism in Australia, 2012*. Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4428.0Main%20Features12012?opendocument&tabname=Summary&prodno=4428.0&issue=2012&num=&view=.

Bean, A. F., Perez, B. I., Dynia, J. M., Kaderavek, J. N., & Justice, L. M. (2020). Book-Reading Engagement in Children with Autism and Language Impairment: Associations with Emergent-Literacy Skills. *Journal of Autism and Developmental Disorders*, *50*(3), 1018-1030.

Bracken, S. S., & Fischel, J. E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education and Development*, *19*(1), 45-67.

Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy

environment (HLE) to the development of reading-related abilities: A one-year

longitudinal study. *Reading Research Quarterly*, *37*(4), 408-426.

Centers for Disease Control and Prevention (2020). Data & Statistics on Autism

Spectrum Disorder. Retrieved from

https://www.cdc.gov/ncbddd/autism/data.html

China Autism Education Rehabilitation Industry Development Report (2015). Beijing

Normal University Press.

Davidson, M. M., & Weismer, S. E. (2014). Characterization and prediction of early

reading abilities in children on the autism spectrum. *Journal of autism and*

developmental disorders, *44*(4), 828-845.

Deliens, G., Papastamou, F., Ruytenbeek, N., Geelhand, P., & Kissine, M. (2018).

Selective pragmatic impairment in autism spectrum disorder: Indirect requests

versus irony. *Journal of autism and developmental disorders*, *48*(9), 2938-2952.

Dynia, J. M., Bean, A., Justice, L. M., & Kaderavek, J. N. (2019). Phonological

awareness emergence in preschool children with autism spectrum disorder.

Autism & Developmental Language Impairments, *4*, 2396941518822453.

Dynia, J. M., Brock, M. E., Justice, L. M., & Kaderavek, J. N. (2017). Predictors of

decoding for children with autism spectrum disorder in comparison to their peers.

Research in Autism Spectrum Disorders, *37*, 41-48.

Dynia, J. M., Brock, M. E., Logan, J. A., Justice, L. M., & Kaderavek, J. N. (2016).

    Comparing children with ASD and their peers' growth in print knowledge.

    Journal of autism and developmental disorders, *46*(7), 2490-2500.

Dynia, J. M., Lawton, K., Logan, J. A., & Justice, L. M. (2014). Comparing emergent-

    literacy skills and home-literacy environment of children with autism and their

    peers. *Topics in Early Childhood Special Education*, *34*(3), 142-153.

Fleury, V. P. (2015). Engaging children with autism in shared book reading: Strategies

    for parents. *Young Exceptional Children*, *18*(1), 3-16.

Fleury, V. P., & Lease, E. M. (2018). Early indication of reading difficulty? A

    descriptive analysis of emergent literacy skills in children with autism spectrum

    disorder. *Topics in Early Childhood Special Education*, *38*(2), 82-93.

Edwards, P. A. (2007). Home literacy environments: What we know and what we need

    to know. *Shaping literacy research: Research we have, research we need*, 42-76.

Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics:

    Morphosyntactic development in autism. *Journal of autism and developmental*

    disorders, *37*(6), 1007-1023.

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language

    acquisition in autism spectrum disorders: A developmental review. *Research in*

    Autism Spectrum Disorders, *5*(2), 681-691.

Goods, K. S., Ishijima, E., Chang, Y. C., & Kasari, C. (2013). Preschool based JASPER

    intervention in minimally verbal children with autism: Pilot RCT. *Journal of*

    autism and developmental disorders, *43*(5), 1050-1056.

Hamilton, L. G., Hayiou-Thomas, M. E., Hulme, C., & Snowling, M. J. (2016). The

    home literacy environment as a predictor of the early literacy development of

    children at family-risk of dyslexia. *Scientific Studies of Reading*, *20*(5), 401-419.

Howlin, P. (2003). Outcome in high-functioning adults with autism with and without

    early language delays: Implications for the differentiation between autism and

    Asperger syndrome. *Journal of autism and developmental disorders*, *33*(1), 3-13.

Hudry, Kristelle, Kathy Leadbitter, Kathryn Temple, Vicky Slonims, Helen

    McConachie, Catherine Aldred, Patricia Howlin, Tony Charman, and Pact

    Consortium. "Preschoolers with autism show greater impairment in receptive

    compared with expressive language abilities." *International journal of language

    & communication disorders* 45, no. 6 (2010): 681-690.

Ichikawa, K., Takahashi, Y., Ando, M., Anme, T., Ishizaki, T., Yamaguchi, H., &

    Nakayama, T. (2013). TEACCH-based group social skills training for children

    with high-functioning autism: a pilot randomized controlled trial.

    BioPsychoSocial medicine, *7*(1), 14.

Kelley, E., Paul, J. J., Fein, D., & Naigles, L. R. (2006). Residual language deficits in

    optimal outcome children with a history of autism. *Journal of autism and

    developmental disorders*, *36*(6), 807.

Kimhi, Y., Achtarzad, M., & Tubul-Lavy, G. (2018). Emergent literacy skills for five

    kindergartners with autism spectrum disorder: a pilot study. *Journal of Research

    in Special Educational Needs*, *18*(3), 211-221.

Knight, E., Blacher, J., & Eisenhower, A. (2019). Predicting reading comprehension in young children with autism spectrum disorder. *School Psychology*, *34*(2), 168.

Lanter, E., Freeman, D., & Dove, S. (2013). Procedural and conceptual print-related achievements in young children with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *28*(1), 14-25.

Lanter, E., Watson, L. R., Erickson, K. A., & Freeman, D. (2012). Emergent literacy in children with autism: An exploration of developmental and contextual dynamic processes. *Language, speech, and hearing services in schools*.

Lawton, K., & Kasari, C. (2012). Teacher-implemented joint attention intervention: Pilot randomized controlled study for preschoolers with autism. *Journal of consulting and clinical psychology*, *80*(4), 687.

Levin, I., Shatil-Carmon, S., & Asif-Rave, O. (2006). Learning of letter names and sounds and their contribution to word recognition. *Journal of Experimental Child Psychology*, *93*(2), 139-165.

Lucas, R., Thomas, L., & Norbury, C. F. (2017). Can children with autism spectrum disorders learn new vocabulary from linguistic context?. *Journal of Autism and Developmental Disorders*, *47*(7), 2205-2216.

Mandak, K., Light, J., & McNaughton, D. (2019). Digital books with dynamic text and speech output: Effects on sight word reading for preschoolers with autism spectrum disorder. *Journal of autism and developmental disorders*, *49*(3), 1193-1204.

Maye, M. P., Kiss, I., & Carter, A. S. (2017). Definitions and classification of autism

    spectrum disorders. *Autism spectrum disorders: Identification, education, and*

    treatment, 1-23.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and

    its relationship to language in school-aged children with high-functioning autism.

    International Journal of Language & Communication Disorders, *42*(6), 682-702.

Monroe, D. M. (2009). Literacy and Autism: Case Studies of Two Kindergarten

    Children, Their Teachers and Their Parents.

Nash, R., & Arciuli, J. (2016). Prosodic awareness is related to reading ability in

    children with autism spectrum disorders. *Journal of Research in Reading*, *39*(1),

    72-87.

Nation, K., Clarke, P., Wright, B., & Williams, C. (2006). Patterns of reading ability in

    children with autism spectrum disorder. *Journal of autism and developmental*

    disorders, *36*(7), 911.

National Mathematics Advisory Panel . (2008). *Foundations for success: The final*

    report of the National Mathematics Advisory Panel. Washington, DC: U.S.

    Department of Education.

Niklas, F., & Schneider, W. (2013). Home literacy environment and the beginning of

    reading and spelling. *Contemporary educational psychology*, *38*(1), 40-50.

Pamparo, V. (2012). *The effect of dialogic reading on early literacy outcomes for*

    children with autism spectrum disorders (Doctoral dissertation).

Parsons, L., Cordier, R., Munro, N., Joosten, A., & Speyer, R. (2017). A systematic

    review of pragmatic language interventions for children with autism spectrum

    disorder. *PLoS One*, *12*(4), e0172242.

Parsons, D., Wilson, N. J., Vaz, S., Lee, H., & Cordier, R. (2019). Appropriateness of

    the TOBY Application, an iPad Intervention for Children with Autism Spectrum

    Disorder: A Thematic Approach. *Journal of Autism and Developmental*

    Disorders, *49*(10), 4053-4066.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2007). Receptive and

    expressive prosodic ability in children with high-functioning autism. *Journal of*

    Speech, Language, and Hearing Research.

Piasta, S. B., Justice, L. M., McGinty, A. S., & Kaderavek, J. N. (2012). Increasing

    young children's contact with print during shared reading: Longitudinal effects

    on literacy achievement. *Child development*, *83*(3), 810-820.

Plattos, G. (2011). Effects of Dialogic Reading on the Expressive Vocabulary of

    Children with Autism Characteristics.

Puranik, C. S., Lonigan, C. J., & Kim, Y. S. (2011). Contributions of emergent literacy

    skills to name writing, letter writing, and spelling in preschool children. *Early*

    childhood research quarterly, *26*(4), 465-474.

Reisinger, L. M., Cornish, K. M., & Fombonne, É. (2011). Diagnostic differentiation of

    autism spectrum disorders and pragmatic language impairment. *Journal of*

    autism and developmental disorders, *41*(12), 1694-1704.

Roberts, J., Jurgens, J., & Burchinal, M. J. (2005). J Speech Lang Hear Res.

Sénéchal, M. (2006). Testing the home literacy model: Parent involvement in

kindergarten is differentially related to grade 4 reading comprehension, fluency,

spelling, and reading for pleasure. *Scientific studies of reading*, *10*(1), 59-87.

Shriberg, L. D., Paul, R., McSweeny, J. L., Klin, A., Cohen, D. J., & Volkmar, F. R.

(2001). Speech and prosody characteristics of adolescents and adults with high-

functioning autism and Asperger syndrome. *Journal of Speech, Language, and*

Hearing Research.

Simpson, K., Paynter, J., Wicks, R. T., & Westerveld, M. F. (2020). Early literacy

learning experiences across home and community libraries for young children

who have autism. *Advances in Neurodevelopmental Disorders*, *4*(1), 74-84.

Smith Gabig, C. (2010). Phonological awareness and word recognition in reading by

children with autism. *Communication Disorders Quarterly*, *31*(2), 67-85.

Strain, P. S., & Bovey, E. H. (2011). Randomized, controlled trial of the LEAP model of

early intervention for young children with autism spectrum disorders. *Topics in*

Early Childhood Special Education, *31*(3), 133-154.

Tachibana, Yoshiyuki, Celine Miyazaki, Masashi Mikami, Erika Ota, Rintaro Mori,

Yeonhee Hwang, Akiko Terasaka, Eriko Kobayashi, and Yoko Kamio. "Meta-

analyses of individual versus group interventions for pre-school children with

autism spectrum disorder (ASD)." *PloS one* 13, no. 5 (2018): e0196272.

Tichnor-Wagner, A., Garwood, J. D., Bratsch-Hines, M., & Vernon-Feagans, L. (2016).

Home literacy environments and foundational literacy skills for struggling and

nonstruggling readers in rural early elementary schools. *Learning Disabilities Research & Practice*, *31*(1), 6-21.

Tipton, L. A., Blacher, J. B., & Eisenhower, A. S. (2017). Young children with ASD: Parent strategies for interaction during adapted book reading activity. *Remedial and Special Education*, *38*(3), 171-180.

Tong, X., McBride-Chang, C., Shu, H., & Wong, A. M. (2009). Morphological awareness, orthographic knowledge, and spelling errors: Keys to understanding early Chinese literacy acquisition. *Scientific Studies of Reading*, *13*(5), 426-452.

Volden, J., & Phillips, L. (2010). Measuring pragmatic language in speakers with autism spectrum disorders: Comparing the Children's Communication Checklist—2 and the Test of Pragmatic Language. *American Journal of Speech-Language Pathology*.

Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of autism and developmental disorders*, *40*(10), 1259-1273.

Westerveld, M. F., Paynter, J., Brignell, A., & Reilly, S. (2020). No Differences in Code-Related Emergent Literacy Skills in Well-Matched 4-Year-Old Children With and Without ASD. *Journal of Autism and Developmental Disorders*, 1-6.

Westerveld, M. F., Paynter, J., O'Leary, K., & Trembath, D. (2018). Preschool predictors of reading ability in the first year of schooling in children with ASD. *Autism Research*, *11*(10), 1332-1344.

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts, J. (2017). The emergent literacy skills of preschool children with autism spectrum disorder. *Journal of autism and developmental disorders*, *47*(2), 424-438.

Westerveld, M. F., Trembath, D., Shellshear, L., & Paynter, J. (2016). A systematic review of the literature on emergent literacy skills of preschool children with autism spectrum disorder. *The Journal of Special Education*, *50*(1), 37-48.

Whalon, K., Martinez, J. R., Shannon, D., Butcher, C., & Hanline, M. F. (2015). The impact of reading to engage children with autism in language and learning (RECALL). *Topics in Early Childhood Special Education*, *35*(2), 102-115.

Wicks, R., Paynter, J., & Westerveld, M. F. (2020). Looking or talking: Visual attention and verbal engagement during shared book reading of preschool children on the autism spectrum. *Autism*, 1362361319900594.

Wong, C., Odom, S. L., Hume, K. A., Cox, A. W., Fettig, A., Kucharczyk, S., ... & Schultz, T. R. (2015). Evidence-based practices for children, youth, and young adults with autism spectrum disorder: A comprehensive review. *Journal of autism and developmental disorders*, *45*(7), 1951-1966.

Wu, X., Anderson, R. C., Li, W., Wu, X., Li, H., Zhang, J., ... & Chen, X. (2009). Morphological awareness and Chinese children's literacy development: An intervention study. *Scientific Studies of Reading*, *13*(1), 26-52.

Yuet-Han Lau, J., & McBride-Chang, C. (2005). Home literacy and Chinese reading in Hong Kong children. *Early education and development*, *16*(1), 5-22.

Zhao, J., Chen, S., Tong, X., & Yi, L. (2019). Advantage in Character Recognition Among Chinese Preschool Children with Autism Spectrum Disorder. *Journal of autism and developmental disorders*, *49*(12), 4929-4940.

Zimmer, K. (2017). Enhancing interactions with children with autism through storybook reading: A caregiver's guide. *Young exceptional children*, *20*(3), 133-144.

3. THE DEVELOPMENT OF EMERGENT LITERACY SKILLS AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER IN CHINA

3.1. Introduction

Autism Spectrum Disorder (ASD) refers to a developmental disorder which involves social interaction deficits, language impairments, and restricted and repetitive behaviors (Maye, Kiss, & Carter, 2016). As one developmental disorder that appears during early childhood, a large number of children are affected by ASD worldwide. Statistics from the Center of Disease Control and Prevention (2020) indicated that 1 in 54 of children in the United States were diagnosed as having ASD during 2016. According to Autism Spectrum Disorders in the European Union (2018), the number of children with ASD, on average, was 12.2 per 1,000 across European countries. In China, approximately 2 million children were affected by Autism Spectrum Disorder (China Autism Education Rehabilitation Industry Development Report, 2015). Considering the prevalence of autism, a generation of research on children with ASD has been conducted.

Over the past decades, existing research on children with ASD has explored: (a) characteristics on deficits in language and social interaction (e.g., Eigsti, de Marchena, Schuh, & Kelley, 2011; Howlin, 2003; Kelley, Paul, Fein, & Naigles, 2006); and (b) potent and applicable interventions (e.g., Asaro-Saddler, Knox, Meredith, & Akhmedjanova, 2015; Delli, Polychronopoulou, Kolaitis, & Antoniou, 2018; Parsons, Cordier, Munro, Joosten, Speyer, & Renée, 2017). Specifically, both clinical and

empirical evidence, on the one hand, demonstrated typical and common impairments in language and social interaction among children with ASD, including early language delay (e.g., Howlin, 2003; Weismer, Lord, & Esler, 2010; Hudry, Leadbitter, Temple, et al., 2010), atypical language production (Eigsti, Bennetto, & Dadlani, 2007), and discourse and pragmatic disorders (e.g., McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007; Peppe, McCann, Gibbon, O'Hare, & Rutherford, 2007; Shriberg, Paul, McSweeny, Klinm Cohen, & Volkmar, 2001). On the other hand, early interventions and treatments on behavior, language and social communication were developed and evaluated such as Early Start Denver Model (Rogers & Dawson, 2010), Learning Experiences: Alternative Program for Preschoolers and their Parents (Strain & Bovey, 2011), and interventions with technologies (e.g., Asaro-Saddler, Knox, Meredith, & Akhmedjanova, 2015; Parsons, Cordier, Lee, Falkmer, & Vaz, 2019).

Although ample evidence from existing research has identified the characterization of autism and applicable interventions, limited studies have been conducted to explicitly investigate emergent literacy development among children with ASD. As one significant predictor of future literacy development and academic success, emergent literacy refers to fundamental knowledge of reading and writing. Exploring emergent literacy development among children with ASD, on the one hand, provides evidence on possible difficulties in developing specific emergent literacy skills. On the other hand, evidence from relevant research provides insights on early interventions of promoting emergent literacy development. Therefore, the purposes of the present study are: (a) to investigate emergent literacy development among children with ASD in

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comparison with their typically developing peers; and (b) to examine the role of

emergent literacy skills in predicting oral vocabulary development.

3.1.1. Emergent Literacy Skills among Children with ASD

According to Whitehurst and Lonigan (1998), emergent literacy consists of: a)

basic skills and knowledge of exploring and showing interest in reading and writing

(e.g., Teale & Sulzby, 1989; Sulzby & Teale, 1991); and b) supportive and engaging

environment for literacy development (Loniganet al., 1999; Roberts, Jergens, &

Burchinal, 2005). As one key component of emergent literacy, *emergent literacy skills*

are defined as basic knowledge and techniques of reading and writing in the process of

being literate such as print concept, word recognition, oral language and phonological

awareness (National Early Literacy Panel, 2008; Restrepo & Towle-Harmon, 2008).

These developmental precursors can be further developed as "code-related" (e.g.,

alphabet knowledge, phonological awareness, print concept) and meaning-related skills

and "meaning-related" (e.g., vocabulary, oral narrative competence and listening

comprehension) (Pullen & Justice 2003; Westerveld, Paynter, Trembath, Webster,

Hodge, & Roberts, 2017). Considering the association between emergent literacy skills

and later literacy development, evidence from related research has revealed that early-

developed precursors lay the foundation for the development of vocabulary acquisition,

reading and writing fluency, and reading comprehension (e.g., Oakhill & Cain 2012;

Westerveld, Gillon, van Bysterveldt, & Boyd, 2015; Whitehurst & Lonigan, 1998).

Only a handful of research has been conducted to examine the development of

emergent literacy skills among children with ASD (e.g., Dynia, Lawton, Logan, &

Justice, 2014; Dynia, Brock, Logan, Justice, & Kaderavek, 2016; Kimhi, Achtarzad, & Tubul-Lavy, 2017; Lanter, Watson, Erickson, & Freeman, 2012; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017). Findings from extant research identified that, compared with their typically-developing peers, children with ASD faced difficulties in developing specific emergent literacy skills. In one of the pioneering studies on emergent literacy skills among children with ASD, Lanter et al. (2012) examined the performance of emergent literacy skills, including letter name identification, letter-sound correspondence, print concept and emergent writing, among children with ASD. Findings indicated that children with ASD showed strengths in letter identification and letter-sound correspondences, and weaknesses in meaning-related skills such as print concept and emergent writing. Dynia and colleagues (2014) investigated the performance among both typically-developing children and children with ASD on measures of alphabet knowledge, print concept, phonological awareness (i.e. phoneme elision and blending), and definitional vocabulary. Authors identified that typically developing children outperformed children with ASD on three tasks, which were print concept, phonological awareness, and definitional vocabulary. However, children with ASD performed significantly higher on the measure of identifying uppercase and lowercase letters. In another study by Westveld et al. (2017), authors explicitly examined the performance of code- and meaning-related skills among children with ASD in preschools. Specifically, code-related skills consisted of name writing, letter-name knowledge, letter-sound knowledge, and phonological awareness, while meaning-related skills were composed of oral narrative competence and receptive

vocabulary. Findings revealed that children with ASD demonstrated particular difficulties in meaning-related emergent literacy skills. In contrast, performance on code-related tasks among children with ASD were found to be within the normal range based on existing standards for typically-developing children.

Despite the fact that research on children with ASD has consistently identified deficits in language development and social interaction, the development of emergent literacy skills, which plays a significant role in promoting later literacy skills and knowledge, remains largely under-investigated. Empirical evidence from research regarding emergent literacy skills among children with ASD revealed that: (a) children with ASD showed their strengths in certain code-related skills such as letter identification and knowledge; and (b) children with ASD faced particular difficulties in developing emergent literacy skills of acquiring and processing meanings. However, findings need to be further explored with more clinical and empirical evidence.

3.1.2. Characters and Vocabulary in Chinese

The linguistic structure and features of the Chinese language significantly contrast with those of English and other alphabetic languages (e.g., Anderson, Ku, Li, Chen, Wu & Shu, 2013; Kuo, Li, Sadoski, Kim, 2014). First, Chinese is defined as a logographic language in which a character represents a syllable and a lexical morpheme. In contrast, an alphabet letter typically represents a phoneme and does not contain semantic information. Morphologically, the most productive word formation mechanism in Chinese is compounding rather than derivation or inflection.

Unlike alphabetic words, Chinese characters are more visually-complex and consist of stroke patterns (Anderson et al., 2013). As building blocks of Chinese compounding words, more than 80% of Chinese characters are semantic-phonetic compounds, consisting of two functional components: a phonetic radical, which provides a clue to the sound, and a semantic radical, which provides a hint to its meaning (Kuo, Li, Sadoski, & Kim, 2014; Shu & Anderson, 1997). For instance, the Chinese character "清" /qing1/ (clean), contains one phonetic radical "青" to the right pronunciation of /qing1/, which shares the same pronunciation as "清," and one semantic radical "氵" to the left which means *water.* As can be seen, both the phonetic radical and the semantic radical serve specific roles (pronunciation and meaning), providing evidence that knowledge of the functional subcomponents of Chinese characters is foundational for vocabulary acquisition.

Chinese is rich in compounding words, or words which consist of at least two characters. According to Sun, Sun, Huang, Li, and Xing (1996), approximately 65% of Chinese words are two-syllable words, while roughly 10% of them are three-syllable. Constructing Chinese words is generally straightforward and transparent, as words derive meaning from the combination of the meaning of its characters. This can be illustrated with the word "长颈鹿" (giraffe), which is composed of three characters: "长颈鹿" (long-neck-deer, giraffe). In addition, Chinese words represent various substructures, including subordinate, coordinative, subject-predicate, verb-object, and verb/adjective complement, which provide contextual clues for vocabulary acquisition (Kuo & Anderson, 2006). In the two-character subordinate structure, the head character

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indicates the categorical or descriptive information of the word, whereas the second character indicates the main object such as "篮球" (basket-ball, basketball). "黄金" (yellow-gold, gold) and "金黄" (gold-yellow, golden) are two words which consist of the same characters in different positions, representing two different meanings: gold and golden. In contrast, characters in coordinative-structure words are equally as essential for representing the meaning of a given word such as "花草" (flower-grass, field). The prevalence of Chinese compound words probably accounts for why lexical compounding awareness develops as early as age two in children (Chen et al., 2009).

The present research aims to investigate the emergent literacy skills among children with ASD in China and to extend the scope of existing research in two directions. First, it is noteworthy that most of the relevant studies were conducted in European or European-American contexts. Considering the linguistic and orthographic disparities between Chinese and alphabetic language, evidence from a different cultural and linguistic background can yield a more comprehensive understanding of how emergent literacy skills develop among children with ASD (Chen & Kuo, 2017). Second, although the significance of emergent literacy skills has been established among typically-developing children, only a handful of studies investigated the contribution of emergent literacy skills to literacy development among children with ASD. Thus, evidence from existing research indicates that autism severity, oral language and non-verbal reasoning were significantly associated with literacy development among children with ASD. In this case, the present study aims to further explore the unique contribution of emergent literacy skills to two fundamental aspects of literacy-related knowledge,

which are character recognition and oral vocabulary, in Chinese after controlling for

autism severity and nonverbal reasoning.

3.1.3. Research Questions

1. What are the differences in emergent literacy skills between children with ASD

   and typically-developing children in China?

2. How do emergent literacy skills contribute to character recognition and oral

   vocabulary among children with ASD and typically-developing children in

   China?

3.2. Method

3.2.1. Participants

Two separate groups of participants (aged from 4 to 6) were recruited for the

present research. The first group included 28 typically-developing (TD) children and the

second group consisted of 21 children with ASD. All participants came from working-

class families. Participants were recruited from one exclusive kindergarten and one

inclusive kindergarten in a coastal city in China. The exclusive kindergarten was

designed for providing specific training for children with ASD. In contrast, both children

with ASD and their TD peers were in the same classroom in the inclusive kindergarten.

Daily activities included playing, singing and storytelling; children with ASD received

extra services such as speech therapy, applied behavior analysis, and motor- sensory

training from special education teachers. Given that the present research is one of the

first studies on emergent literacy skills and home literacy environment among young

children in China, we chose to study high functioning children with ASD who are able

to: a) produce spoken/oral language; and b) understand oral instruction/language

3.2.2. Measures

3.2.2.1. Control Variables

3.2.2.1.1. Autism Severity

The severity of autism was measured by the Social Responsiveness Scale (SRS)

(Constantino & Gruber, 2002), a 65-item rating scale that measures the severity of ASD

for children between the ages of 4 and 18. Unlike other existing measures, SRS

evaluates the severity of autism with a Likert scale of 4 (e.g., 1 Not True; 2 Sometimes

true; 3 Often true; 4 Almost always true) across different symptoms instead of a

checklist with yes/no questions. The SRS evaluates children's severity of autism

regarding impairments in social communication, the capacity for reciprocal social

communication and social anxiety/avoidance, yielding both separate scores for each

section and a total score for autism severity. The SRS was completed by a parent or

teacher and took about 15 to 20 minutes.

3.2.2.1.2. Nonverbal Reasoning.

Nonverbal reasoning was evaluated through Raven's Colored Progressive

Matrices (Raven, Court, & Raven, 1996), which was designed for children aged from 1

to 5. Raven's Colored Progressive Matrices was also an appropriate measure for

individuals with physical and mental impairments. A total of 24 items are presented with

colored backgrounds. Children were asked to identify the correct pattern from 6 choices

to complete a big figure. Participants were awarded one point for the correct answer.

3.2.2.1.3. Rapid Naming (RAN)

Rapid automatized naming was measured by a rapid naming of numbers task developed by Denckla & Rudel (1976). In this task, five numbers, 1, 4, 5, 7, and 8, were repeated 5 times on one single paper. The numbers were arranged in different orders, and participants were asked to name the digits from left to right and from top to bottom as quickly and accurately as possible.

3.2.2.2. Emergent Literacy Skills

3.2.2.2.1. Character Recognition

The Chinese character recognition task developed by Pan et al. (2016) was utilized in the present research. The task consists of 60 single Chinese characters that are arranged in order of increasing difficulty. Specifically, participants were asked to read characters with increasing numbers of strokes and visual complexity. Each correct answer was awarded one point. The max score was 60 and Cronbach's alpha was 0.88.

3.2.2.2.2. Phonological Awareness

Participants' phonological awareness was assessed through an adapted version of the syllable deletion task by Pan et al. (2016). Participants were asked to delete one of the syllables from an orally presented two- or three-syllable word. For instance, the child was asked to say bread, *mian bao,* without the syllable *bao*. Items were arranged in an order with increasing difficulty. The test consists of 19 items and each correct answer was awarded one point (Cronbach alpha = 0.81).

3.2.2.2.3. Morphological Awareness

The morphological construction task (Pan et al., 2016) was administered to measure morphological awareness. In this task, participants were asked to construct a novel compound word based on a given scenario. For example, the participant was asked: a machine that can wash clothes is called *wash clothes machine*, what do you call a machine that can wash shoes. The task consisted of 18 items and the items were arranged with increasing difficulty of character number and compound meaning (Cronbach alpha = 0.78).

3.2.2.3. Oral Vocabulary

3.2.2.3.1. Receptive Oral Vocabulary

Peabody Picture Vocabulary Test-Revised (Sang & Miao, 1990), a standardized measure of receptive oral vocabulary, was adapted by modifying words and pictures of the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981). The adapted Peabody Picture Vocabulary Test-Revised (Sang & Miao, 1990) was evaluated by two pilot studies and standardized on 600 Chinese children aged 3.5 to 9 years old in Shanghai. Children were asked to look at four pictures and point to the picture that best matches the word the experimenter says. Each correct answer was awarded one point. The test stops when the child makes six errors from 8 consecutive pictures.

3.2.2.3.2. Expressive Oral Vocabulary

The picture naming task (Chen, Hao, Geva, Zhu, & Shu, 2008) was used to evaluate participants' expressive oral vocabulary. Participants were asked to orally name the pictures shown by the experimenter. The task consists of 80 pictures (Snodgrass and

Vanderwart, 1980), and the average age of acquisition of words/concepts in these pictures was 6.5 years and the range of acquisition was from 2.5 to 12 years (Liu, 2006). The max score of the test was 80 and Cronbach alpha was 0.87

3.3. Results

3.3.1. Comparison of Children with ASD and TD Children on Emergent Literacy Skills

In order to examine the differences in literacy-related tasks between children with ASD and typically-developing children, a one-way MANOVA was performed. Group (ASD vs TD) was the between-group variable. Table 3.1 presents the descriptive statistics of the measures for children with ASD and their typically-developing peers. Results revealed a statistically significant difference in the literacy performance between children with ASD and typically-developing children, $F (5, 43) = 7.91$, $p < 0.001$; Wilk's $\Lambda = 0.495$, partial $\eta2 = 0.504$. As presented in Table 3.2, the two groups differed significantly in phonological awareness, morphological awareness, receptive and expressive vocabulary.

Table 3.1 Descriptive Statistics of the Measures

Measures	Group	Mean	SD
Character Recognition	ASD	30.62	25.03
	TD	23.89	22.44
Phonological Awareness	ASD	8.62	8.90
	TD	17.18	2.57
Morphological Awareness	ASD	3.10	3.13
	TD	8.46	1.71
Receptive Vocabulary	ASD	47.71	22.13
	TD	77.86	25.62
Expressive Vocabulary	ASD	45.91	8.50
	TD	64.07	11.03

Table 3.2 Tests of Between-Subjects Effects

Dependent Variables	SOS	df	MS	F	Sig.	Eta Squared
Character Recognition	395.28	1	395.28	1.10	0.30	0.03
Phonological Awareness	364.00	1	364.00	12.31	0.00	0.22
Morphological Awareness	172.35	1	172.35	31.74	0.00	0.43
Receptive Vocabulary	5274.39	1	5274.39	9.828	0.00	0.19
Expressive Vocabulary	1803.46	1	1803.46	20.03	0.00	0.32

3.3.2. The Impact of Emergent Literacy Skills on Character Recognition and Oral Vocabulary

The second research question investigates the key predictors of emergent literacy skills for character recognition and oral vocabulary among children with ASD and typically-developing children. Three regression models were performed separately for typically development children and children with ASD. Specifically, three dependent variables were character recognition, receptive vocabulary, and expressive vocabulary. The predictors for the model with character recognition as DV included scores on the tasks of phonological awareness, and morphological awareness, with age, nonverbal reasoning, RAN and autism severity as control variables. As for oral vocabulary, it should be noteworthy that the performance of character recognition was included as an independent variable. Specifically, the independent variables were scores on the tasks of character recognition, phonological awareness, morphological awareness, and rapid automatized naming. The controlled variables included participants' age, nonverbal reasoning (IQ), RAN and autism severity.

3.3.2.1. Character recognition

Table 3.3 presents the results of regression analysis with character recognition as the dependent variable. Results indicated that emergent literacy skills accounted for a statistically significant amount of variance only for children with ASD, beyond the controlled variables (16.8% of the variance, $p < 0.05$). For children with ASD, phonological awareness was the only significant predictor (b = 1.3, $p < 0.05$). For typically-developing children, both phonological awareness and morphological awareness were not statistically significant in predicting character recognition after controlling age, non-verbal reasoning (IQ) and RAN.

Table 3.3 Multiple Regression with Character Recognition as Dependent Variable

Model	Predictors	b	SE	beta	t	Sig.
TD	Phonological Awareness	0.51	1.4	0.06	0.36	0.72
	Morphological Awareness	-1.67	2.17	-0.13	-0.77	0.45
ASD	Phonological Awareness	1.31	0.45	0.47	2.89	0.01
	Morphological Awareness	0.5	1.18	0.06	0.42	0.68

3.3.2.2. Receptive vocabulary

Table 3.4 presents the results of regression analysis with receptive vocabulary as the dependent variable for both children with ASD and typically-developing children. The variance explained by emergent literacy skills was statistically significant for typically-developing children (26.3% of the variance, $p < 0.05$) beyond the controlled variables. For TD children, morphological awareness was found to be the only significant predictor for oral receptive vocabulary ($b = 8.07$, $p < 0.05$). For children with ASD, none of the emergent literacy skills were strongly or statistically significantly associated with receptive vocabulary after controlling for age, IQ, RAN and autism

severity; however, morphological awareness approached significance ($p = 0.058$) and

thus should be investigated further.

Table 3.4 Multiple Regression with Receptive Vocabulary as Dependent Variable

Model	Predictors	b	SE	beta	t	Sig.
TD	Character Recognition	-0.08	0.30	-0.07	-0.25	0.81
	Phonological Awareness	2.03	1.92	0.20	1.06	0.30
	Morphological Awareness	8.07	3.01	0.54	2.68	0.01
ASD	Character Recognition	0.45	0.34	0.51	1.35	0.20
	Phonological Awareness	0.03	0.70	0.01	0.04	0.97
	Morphological Awareness	3.00	1.43	0.42	2.10	0.06

3.3.2.3. Expressive vocabulary

The regression analysis with expressive vocabulary as the dependent variable

yields similar results (see Table 3.5). Specifically, the explained variance of emergent

literacy skills was statistically significant only for typically developing children (21.8%

of the variance, $p < 0.05$) after controlling age, non-verbal reasoning, and RAN, but not

for children with ASD. For TD children, morphological awareness remained a unique

variable in predicting expressive vocabulary ($b = 2.91$, $p < 0.05$). In contrast, for

children with ASD, none of the emergent literacy skills was identified as a statistically

significant predictor for expressive vocabulary.

Table 3.5 Multiple Regression with Expressive Vocabulary as Dependent Variable

Model	Predictors	b	SE	beta	t	Sig.
TD	Character Recognition	-0.16	0.10	-0.32	-1.55	0.14
	Phonological Awareness	0.42	0.66	0.10	0.64	0.53
	Morphological Awareness	2.91	1.03	0.45	2.82	0.01
ASD	Character Recognition	0.08	0.18	0.23	0.43	0.67
	Phonological Awareness	0.14	0.38	0.15	0.37	0.72
	Morphological Awareness	0.59	0.78	0.22	0.76	0.46

3.4. Discussion

3.4.1. Comparison of Children with ASD and TD Children on Emergent Literacy Skills

Results from the present research identified that typically-developing children outperformed children with ASD on tasks of morphological awareness, oral receptive and expressive vocabulary. The task of morphological awareness evaluated participants' awareness of Chinese compounds through creating novel compounding words. The tasks of receptive and expressive vocabulary assessed their knowledge of oral vocabulary. Given that all these mentioned tasks tapped into skills of processing word meanings, the findings suggested that children with ASD may have particular difficulties in developing meaning-related emergent literacy skills, which were consistent with existing research (e.g., Cabell, Justice, Zucker, & McGinty, 2009; Dynia et al., 2014; Westveld et al., 2017). Although limited studies have been conducted to investigate the emergent literacy skills among children with ASD, evidence consistently revealed that children with ASD showed their weaknesses on meaning-related tasks. Specifically, children with ASD have been found to face challenges on the tasks of print concept (Cabell, Justice, Zucker, & McGinty, 2009; Dynia et al, 2014; Westveld et al., 2017), oral narrative competence and receptive vocabulary (Eigsti et al. 2011; Westveld et al., 2017). In addition to receptive vocabulary, the present research expanded current literature through identifying weaknesses in morphological awareness and expressive vocabulary among children with ASD in China.

In contrast, results also indicated that there was a statistically significant difference between children with ASD and typically-developing children in phonological awareness, which was considered as a coding-related skill. This finding was not consistent with results from existing studies in the English-speaking context, which yielded the mixed findings in developing phonological awareness among children with ASD (e.g., Dynia et al., 2014; Lanter et al., 2012; Westveld et al., 2017). However, it should be noted that three facets of phonological awareness were evaluated by existing literature in the English-speaking context, which were initial sound production, phoneme blending and elision. For instance, Dynia and colleagues (2014) investigated the differences of emergent literacy skills between children with ASD and typically-developing children. Authors reported that children with ASD performed worse on the tasks of phoneme blending and elision in comparison to typically-developing children. However, Westveld and colleagues (2017) found that there were no significant differences in the performance of initial sound production between children with ASD and typically-developing children. Results indicated that children with ASD tended to have less difficulties in phoneme segmentation (i.e., first sound isolation) but phoneme manipulation (i.e., blending and elision). In this case, it was significant to specify which facets of phonological awareness were evaluated for children with ASD in future research. In addition, the difficulty in phonological awareness among children with ASD in China might also be explained by the different language contexts. Chinese is a logographic language in which a character represents a syllable and a lexical morpheme, whereas English is an alphabetic language with letters and sounds. (Mcbride-Chang,

Bialystok, Chong, & Li, 2004). In this case, Chinese is an opaque language and the relationship between phonemes and graphemes are not as consistent as in alphabetic languages. In Chinese, syllable awareness was found to be one significant facet of phonological awareness and its development is mainly influenced by the language exposure and instruction (e.g., Shu, Peng & McBride Chang, 2008; Ziegler & Goswami, 2005). As for children with ASD, considering their impairments in language development and social interaction, the difficulties in processing language units and the lack of instruction, combined with the inconsistency between syllables and written symbols in Chinese, made it difficult for children with ASD process and manipulate phonological units in Chinese.

3.4.2. The Impact of Emergent Literacy Skills on Character Recognition and Oral Vocabulary

3.4.2.1. Character Recognition

Results from multiple regressions demonstrated that only phonological awareness was found as a significant predictor of character recognition children with ASD. Since each Chinese character represents one morpheme and its corresponding syllable, syllable awareness is theoretically and practically essential for early literacy development in Chinese. The role of syllable awareness in early literacy development has been documented in empirical studies (e.g., Chow et al., 2005; Li et al., 2012; McBride-Chang et al., 2008; Shu, Peng & McBride-Chang 2008). For instance, Shu and colleagues (2008) investigated the relationship between phonological awareness and character recognition among Chinese kindergarteners and primary school students

through utilizing deletion tasks of syllables, rimes and tones. It was reported that both syllable and tone awareness were significantly associated with early character recognition. In a study that explored the role of syllable, phoneme and tone awareness in word recognition in both Chinese and English among children aged 4 and 5 in Hong Kong, McBride-Chang et al. (2008) also identified that syllable awareness was significantly associated with Chinese word recognition. In a more recently-published research, Pan and colleagues (2016) conducted a 8-year longitudinal study to examine the contribution of phonological awareness and morphological awareness to the development of Chinese literacy skills among children at ages of 4 to 6. Results underscored the significance of syllable awareness in the early development of character recognition among children who are 4 to 6 years old. findings from the present study expanded the existing literature through identifying the strong association between syllable awareness and Chinese character recognition among children with ASD. Nonetheless, the role of syllable awareness to character recognition should be further examined with larger numbers of participants in the future studies.

3.4.2.2. Oral Vocabulary

As for oral vocabulary, only morphological awareness was found to be significantly associated with both receptive and expressive vocabulary among typically-developing children. This finding was in line with existing studies which addressed the significance of morphological awareness in developing literacy skills in Chinese (e.g., Cheng et al., 2016; Liu et al., 2013; Liu & McBride-Chang, 2010). Compared with alphabetic languages, the relationship between phonological awareness and written

symbols was relatively less inconsistent. However, the mapping between the word and meaning is relatively more transparent and consistent because of the compounding convention in constructing Chinese words (Chung et al., 2010). The meaning of a given Chinese word can be processed through analyzing and combining meanings of internal characters. In addition, a large number of homophones also makes it difficult to infer the meanings of compound words in oral language in Chinese. According to Anderson and Li (2005), thousands of daily-used characters or morphemes are represented by roughly 1,200 tonal syllables. As a fact, one syllable may represent five to eight characters after being differentiated by four tones (McBride-Chang & Zhong, 2003). Homophone awareness, which is relevant to orthographic features of characters, may advance character acquisition and vocabulary development. (e.g., McBride-Chang, Shu, Zhou, Wat, & Wager, 2003; Yeung et al., 2013). However, it should be noteworthy that the contribution of homophone awareness is significantly associated with the word contexts and vocabulary exposure. For instance, Children can learn homophones of "做" (do) and "坐" (sit) in two different word contexts "做事" (do something) and "坐下" (sit down). Another example is that children can differentiate homophones of "终" (end) and "中" (middle) can be clarified in the sentence of "车到达了终点" (The bus reaches the terminus). Considering that homophone acquisition and differentiation require contextual, homophone awareness develops along with children's orthographic vocabulary and linguistic knowledge (Liu, McBride-Chang, Wong, Shu, & Wong, 2013). The prevalence of compounding convention and homophones, and the transparent relationship between the word and meaning underscored the significance of the

morphological awareness in developing Chinese literacy skills, especially for Chinese vocabulary (e.g., Liu et al., 2013; Zhou et al., 2012).

In the present study, participants' compounding awareness, which refers to the knowledge of word construction and structure, was evaluated. Findings confirmed the significant association between compounding awareness and oral vocabulary among Chinese children. As one facet of morphological awareness in Chinese, the significance of compounding awareness in literacy development in Chinese has been constantly explored (e.g., Cheng et al., 2017; Liu et al., 2013; Liu & McBride-Chang, 2010). Because of the prevalence of compound words in Chinese vocabulary, the ability to construct words and analyze internal word structure plays a significant role in developing Chinese vocabulary development (e.g., Cheng et al., 2017; Cheng, Li, & Wu, 2015; Zhuo et al., 2012). For instance, in a 2-month intervention study, Zhou et al (2012) reported that children who received instruction on lexical compounding knowledge significantly outperformed the control group" in both word reading and vocabulary knowledge.

In terms of oral vocabulary among children with ASD, after controlling for their autism severity, nonverbal reasoning, and automatized naming, neither phonological awareness nor morphological awareness made a significant unique contribution to oral vocabulary. Results indicated that phonological awareness and morphological awareness were not significant predictors of vocabulary development among children with ASD. Thus, existing research on children with ASD constantly addressed the significance of autism severity, nonverbal reasoning and oral language competence in developing

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literacy skills among children with ASD (Dynia et al., 2014; Lanter et al., 2012; Westveld et al., 2017). Considering that these mentioned variables were significantly associated with children's language and literacy development, the unique contribution of phonological and morphological awareness might be minimized.

3.5. Conclusion

The purpose of the present research was to explore the development of emergent literacy skills and its contribution to oral vocabulary among children with ASD in China. Findings expanded the scope of current research on the development of emergent literacy skills among children with ASD. Specifically, the present study showed that children with ASD in China faced challenges in both coding- and meaning-related emergent literacy skills. Evidence from research in English-speaking contexts revealed that children with ASD tended to have less difficulties in developing their phonological awareness at the phoneme level (i.e., phoneme isolation). However, considering the differences in linguistic structure and features between Chinese and English, the disparities in phonological structure and features give rise to difficulties in processing and manipulating phonological units (i.e., syllable) in Chinese. Additionally, compounding awareness, which was considered as one facet of morphological awareness, was identified to be strongly associated with oral vocabulary among typically-developing children. Nevertheless, neither phonological awareness nor morphological awareness contributed significantly to oral vocabulary among children with ASD). Results indicated that, as for children with ASD, there were other significant predictors for their literacy development such as autism severity and nonverbal

reasoning. Although the present research provided new insights to expand the current literature on emergent literacy development among children with ASD, findings should be further investigated by future studies with more types of study designs and larger populations.

There are several limitations that should be addressed for future studies. First, the design of the present study is correlational. Hence, the causal relation between emergent literacy skills and oral vocabulary development cannot be inferred (Dynia et al., 2014; Westerveld, et al., 2017). In this case, other types of research such as longitudinal-design research is needed to further investigate the effect of the emergent literacy development among children with ASD. Second, only syllable awareness and compounding awareness were assessed for phonological and morphological awareness. Thus, other facets of these two types of awareness should be considered, such as rime and phonemic awareness for phonological awareness, and homophone awareness for morphological awareness. Third, the number of participants was considered as one of common limitations in studies for children with ASD. In the present research, only children with high-functioning ASD were recruited. Therefore, results from quantitative analyses might be influenced or biased by the limitations of participants number and selection. Further research should enroll more participants or conduct the second data analysis from the school districts or regions. Despite the limitations outlined above, the present study extended the scope of current research by demonstrating the development of emergent literacy skills among children with ASD in China and it is the first to present

the possible differences or challenges in developing literacy skills among children with

ASD in a non-alphabetic language.

3.6. References

Anderson, R. C., Ku, Y. M., Li, W., Chen, X., Wu, X., & Shu, H. (2013). Learning to
see the patterns in Chinese characters. *Scientific Studies of Reading*, *17*(1), 41-56.

Asaro-Saddler, K., Knox, H. M., Meredith, H., & Akhmedjanova, D. (2015). Using
Technology to Support Students with Autism Spectrum Disorders in the Writing
Process: A Pilot Study. *Insights into Learning Disabilities*, *12*(2), 103-119.

ASDEU Consortium. (2018). Autism Spectrum Disorders in the European Union
(ASDEU): final report: main results of the ASDEU project-28/08/2018.

Cabell, S. Q., Justice, L. M., Zucker, T. A., & McGinty, A. S. (2009). Emergent name-
writing abilities of preschool-age children with language impairment. *Language,
Speech, and Hearing Services in Schools*.

Centers for Disease Control and Prevention (2020). Data & Statistics on Autism
Spectrum Disorder. Retrieved from
https://www.cdc.gov/ncbddd/autism/data.html

Chen, X., Hao, M., Geva, E., Zhu, J., & Shu, H. (2009). The role of compound
awareness in Chinese children's vocabulary acquisition and character reading.
Reading and Writing, *22*(5), 615.

Chen, Z., & Kuo, L. J. (2017). Language and literacy development among children with
autism spectrum disorder. *Journal of Childhood and Developmental Disorders*,
3(3), 1-3.

Cheng, Y., Li, L., & Wu, X. (2015). The reciprocal relationship between compounding

    awareness and vocabulary knowledge in Chinese: A latent growth model study.

    Frontiers in Psychology, *6*, 440.

Cheng, Y., Zhang, J., Li, H., Wu, X., Liu, H., Dong, Q., ... & Sun, P. (2017). Growth of

    compounding awareness predicts reading comprehension in young Chinese

    students: A longitudinal study from grade 1 to grade 2. *Reading Research*

    Quarterly, *52*(1), 91-104.

China Autism Education Rehabilitation Industry Development Report (2015). Beijing

    Normal University Press.

Chow, B. W. Y., McBride-Chang, C., & Burgess, S. (2005). Phonological processing

    skills and early reading abilities in Hong Kong Chinese kindergarteners learning

    to read English as a second language. *Journal of educational psychology*, *97*(1),

    81.

Chung, K. K., Ho, C. S. H., Chan, D. W., Tsang, S. M., & Lee, S. H. (2013).

    Contributions of syntactic awareness to reading in Chinese-speaking adolescent

    readers with and without dyslexia. *Dyslexia*, *19*(1), 11-36.

Constantino, J. N., & Gruber, C. P. (2002). The Social Responsiveness Scale. Los

    Angeles: Western Psychological Services.

Delli, C. K. S., Polychronopoulou, S. A., Kolaitis, G. A., & Antoniou, A. S. G. (2018).

    Review of interventions for the management of anxiety symptoms in children

    with ASD. *Neuroscience & Biobehavioral Reviews*, *95*, 449-463.

Denckla, M. B., & Rudel, R. G. (1976). Rapid 'automatized'naming (RAN): Dyslexia

    differentiated from other learning disabilities. *Neuropsychologia*, *14*(4), 471-479.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody picture vocabulary test-revised*. American

    guidance service, Incorporated.

Dynia, J. M., Brock, M. E., Logan, J. A., Justice, L. M., & Kaderavek, J. N. (2016).

    Comparing children with ASD and their peers' growth in print knowledge.

    Journal of autism and developmental disorders, *46*(7), 2490-2500.

Dynia, J. M., Lawton, K., Logan, J. A., & Justice, L. M. (2014). Comparing emergent-

    literacy skills and home-literacy environment of children with autism and their

    peers. *Topics in Early Childhood Special Education*, *34*(3), 142-153.

Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics:

    Morphosyntactic development in autism. *Journal of autism and developmental

    disorders*, *37*(6), 1007-1023.

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language

    acquisition in autism spectrum disorders: A developmental review. *Research in

    Autism Spectrum Disorders*, *5*(2), 681-691.

Howlin, P. (2003). Outcome in high-functioning adults with autism with and without

    early language delays: Implications for the differentiation between autism and

    Asperger syndrome. *Journal of autism and developmental disorders*, *33*(1), 3-13.

Hudry, K., Leadbitter, K., Temple, K., Slonims, V., McConachie, H., Aldred, C., ... &

    Pact Consortium. (2010). Preschoolers with autism show greater impairment in

receptive compared with expressive language abilities. *International journal of language & communication disorders*, *45*(6), 681-690.

Kelley, E., Paul, J. J., Fein, D., & Naigles, L. R. (2006). Residual language deficits in optimal outcome children with a history of autism. *Journal of autism and developmental disorders*, *36*(6), 807.

Kimhi, Y., Achtarzad, M., & Tubul-Lavy, G. (2018). Emergent literacy skills for five kindergartners with autism spectrum disorder: a pilot study. *Journal of Research in Special Educational Needs*, *18*(3), 211-221.

Kuo, L. J., Li, Y., Sadoski, M., & Kim, T. J. (2014). Acquisition of Chinese characters: the effects of character properties and individual differences among learners. *Contemporary educational psychology*, *39*(4), 287-300.

Lanter, E., Watson, L. R., Erickson, K. A., & Freeman, D. (2012). Emergent literacy in children with autism: An exploration of developmental and contextual dynamic processes. *Language, speech, and hearing services in schools*.

Li, H., Shu, H., McBride-Chang, C., Liu, H., & Peng, H. (2012). Chinese children's character recognition: Visuo-orthographic, phonological processing and morphological skills. *Journal of Research in Reading*, *35*(3), 287-307.

Liu, P. D., & McBride-Chang, C. (2010). What is morphological awareness? Tapping lexical compounding awareness in Chinese third graders. *Journal of Educational Psychology*, *102*(1), 62.

Liu, P. D., McBride-Chang, C., Wong, T. T. Y., Shu, H., & Wong, A. M. Y. (2013). Morphological awareness in Chinese: Unique associations of homophone

awareness and lexical compounding to word reading and vocabulary knowledge in Chinese children. *Applied Psycholinguistics*, *34*(4), 755-775.

Lonigan, C. J., Anthony, J. L., Bloomfield, B. G., Dyer, S. M., & Samwel, C. S. (1999). Effects of two shared-reading interventions on emergent literacy skills of at-risk preschoolers. *Journal of Early Intervention*, *22*(4), 306-322.

Maye, M. P., Kiss, I., & Carter, A. S. (2017). Definitions and classification of autism spectrum disorders. *Autism spectrum disorders: Identification, education, and treatment*, 1-23.

McBride-Chang, C., Bialystok, E., Chong, K. K., & Li, Y. (2004). Levels of phonological awareness in three cultures. *Journal of Experimental Child Psychology*, *89*(2), 93-111.

McBride-Chang, C., Liu, P. D., Wong, T., Wong, A., & Shu, H. (2012). Specific reading difficulties in Chinese, English, or both: Longitudinal markers of phonological awareness, morphological awareness, and RAN in Hong Kong Chinese children. *Journal of learning disabilities*, *45*(6), 503-514.

McBride-Chang, C., & Zhong, Y. (2003). A longitudinal study of effects of phonological processing, visual skills, and speed of processing on Chinese character acquisition among Hong Kong Chinese kindergartners. *Reading development in Chinese children*, 37-49.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and its relationship to language in school-aged children with high-functioning autism. *International Journal of Language & Communication Disorders*, *42*(6), 682-702.

National Mathematics Advisory Panel . (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel*. Washington, DC: U.S. Department of Education.

Oakhill, J. V., & Cain, K. (2012). The precursors of reading ability in young readers: Evidence from a four-year longitudinal study. *Scientific studies of reading*, *16*(2), 91-121.

Raven, J. C., JH Court, & Raven, J. (1996). *Raven Manual: Section 3 Standard ProgressiveMatrices With Adult US Norms by JC Raven, JH Court AndJ. Raven*. Oxford Psychologist Press.

Pan, J., McBride-Chang, C., Shu, H., Liu, H., Zhang, Y., & Li, H. (2011). What is in the naming? A 5-year longitudinal study of early rapid naming and phonological sensitivity in relation to subsequent reading skills in both native Chinese and English as a second language. *Journal of educational psychology*, *103*(4), 897.

Parsons, D., Cordier, R., Lee, H., Falkmer, T., & Vaz, S. (2019). A randomised controlled trial of an information communication technology delivered intervention for children with autism spectrum disorder living in regional Australia. *Journal of autism and developmental disorders*, *49*(2), 569-581.

Parsons, L., Cordier, R., Munro, N., Joosten, A., & Speyer, R. (2017). A systematic review of pragmatic language interventions for children with autism spectrum disorder. *PLoS One*, *12*(4), e0172242.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2007). Receptive and expressive prosodic ability in children with high-functioning autism. *Journal of Speech, Language, and Hearing Research*.

Pullen, P. C., & Justice, L. M. (2003). Enhancing phonological awareness, print awareness, and oral language skills in preschool children. *Intervention in school and clinic*, *39*(2), 87-98.

Restrepo, M. A., & Towle-Harmon, M. (2008). Addressing emergent literacy skills in English-language learners. *The ASHA Leader*, *13*(13), 10-13.

Roberts, J., Jergens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of speech, language, and hearing research*.

Rogers, S. J., & Dawson, G. (2010). Early Start Denver Model for young children with autism. *New York, NY: Guilford*.

Sang, B., & Miao, X. (1990). The revision of trail norm of Peabody picture vocabulary test revised (PPVT-R) In Shanghai proper. *Psychological Science*, *5*, 20-25.

Shu, H., & Anderson, R. C. (1997). Role of radical awareness in the character and word acquisition of Chinese children. *Reading Research Quarterly*, *32*(1), 78-89.

Shu, H., McBride-Chang, C., Wu, S., & Liu, H. (2006). Understanding Chinese developmental dyslexia: morphological awareness as a core cognitive construct. *Journal of educational psychology*, *98*(1), 122.

Shriberg, L. D., Paul, R., McSweeny, J. L., Klin, A., Cohen, D. J., & Volkmar, F. R. (2001). Speech and prosody characteristics of adolescents and adults with high-

functioning autism and Asperger syndrome. *Journal of Speech, Language, and Hearing Research*.

Strain, P. S., & Bovey, E. H. (2011). Randomized, controlled trial of the LEAP model of early intervention for young children with autism spectrum disorders. *Topics in Early Childhood Special Education*, *31*(3), 133-154.

Sulzby, E., & Teale, W. H. (1991). The development of the young child and the emergence of literacy. *Handbook of research on teaching the English language arts*, 273-285.

Shu, H., Peng, H., & McBride-Chang, C. (2008). Phonological awareness in young Chinese children. *Developmental science*, *11*(1), 171-181.

Sun, H. L., Sun, D. J., Huang, J. P., Li, D. J., & Xing, H. B. (1996). The description on the corpus system of modern Chinese studies. *Studies of Chinese and Chinese character in the computer era. Tsinghua University Publisher*.

Teale, W. H., & Sulzby, E. (1989). Emergent literacy: New perspectives. *Emerging literacy: Young children learn to read and write*, 1-15.

Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of autism and developmental disorders*, *40*(10), 1259-1273.

Westerveld, M. F., Gillon, G. T., van Bysterveldt, A. K., & Boyd, L. (2015). The emergent literacy skills of four-year-old children receiving free kindergarten early childhood education in New Zealand. *International Journal of Early Years Education*, *23*(4), 339-351.

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts, J. (2017). The emergent literacy skills of preschool children with autism spectrum disorder. *Journal of autism and developmental disorders*, *47*(2), 424-438.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child development*, *69*(3), 848-872.

Yeung, P. S., Ho, C. S. H., Chan, D. W. O., & Chung, K. K. H. (2013). Contribution of oral language skills, linguistic skills, and transcription skills to Chinese written composition among fourth-grade students. *Discourse Processes*, *50*(7), 498-529.

Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: a psycholinguistic grain size theory. *Psychological bulletin*, *131*(1), 3.

Zhou, Y. L., McBride-Chang, C., Fong, C. Y. C., Wong, T. T. Y., & Cheung, S. K. (2012). A comparison of phonological awareness, lexical compounding, and homophone training for Chinese word reading in Hong Kong kindergartners. *Early Education & Development*, *23*(4), 475-492.

4. THE IMPACT OF HOME LITERACY ENVIRONMENT AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER IN CHINA

4.1. Introduction

Autism Spectrum Disorder (ASD) is characterized by deficits and impairments in language development, social interaction, and behavioral patterns (Maye, Kiss & Carter, 2016). As an early-developing disorder, Autism Spectrum Disorder was found to be one of the most prevalent disorders in children today. For instance, the ratio of being diagnosed as having ASD increased from 1 in 68 to 1 in 54 of children in the United States during 2016 (Center of Disease Control, 2020). Autism Spectrum Disorder was found to affect 4.4 to 19.7 per 1000 of children across European countries (Autism Spectrum Disorders in the European Union, 2018). Statistics from Australian Bureau of Statistics (2014) indicated that 1 in 200 children was diagnosed as having ASD in Australia. In China, at least 2 million children were affected by ASD (China Autism Education Rehabilitation Industry Development Report, 2015). However, it should be noted that the disparities of the rates of children with ASD varies across different countries and regions with considerations of the definitions of ASD, identification measures, and the age of children. Because of the ASD prevalence and its influences on children's future development, escalating attention has been given to studies on children with ASD.

Research on children with ASD has provided both clinical and empirical evidence on characterization of children with ASD (e.g., Delli, Polychronopoulou,

Kolaitis, & Antoniou, 2018; Eigsti, de Marchena, Schuh, & Kelley, 2011; Howlin, 2003). Findings from existing studies have identified three common deficits in both language development and social interaction. Specifically, compared with typically-developing children, the delay in early language production was found among children with ASD (e.g., Howlin, 2003; Weismer, Lord, & Esler, 2010). Additionally, children with ASD "overcame" difficulties in cognitive processing, language production and social interaction by utilizing abnormal language patterns of: (a) echolalia, imitation and repetition of language from others; and (b) jardon, meaningless words and phrases (e.g., Eigsti, Bennetto, & Dadlani, 2007). Evidence also demonstrated that children with ASD had difficulties in processing suprasegmental features in language, including accents, stress and intonation (e.g., Eigsti, de Marchena, Schuh, & Kelley, 2011; McCann, Peppe, Gibbon, O'Hare, & Rutherford, 2007). Furthermore, the deficit in pragmatics was also considered as one specific feature of children with ASD. Specifically, children with ASD had difficulties in understanding and processing conversational elements including body language and facial expression, social relationship and distance, and conversational contexts.

Despite the fact that existing research on children with ASD provided evidence of impaired behaviors in language and social interaction and insights on potent interventions/treatments, limited research concentrated on emergent literacy development among children with ASD. According to Whitehurst and Lonigan (1998), emergent literacy, which plays a significant role for future literacy development and academic success, consists of two major components: (a) emergent literacy skills and

knowledge (e.g., phonological awareness, letter knowledge and print concepts); and (b) supportive and engaging literacy environment (Roberts, Jurgens, & Burchinal, 2005). Existing research on emergent literacy among children with ASD specifically investigated the development of emergent literacy skills among children with ASD (e.g., Dynia, Brock, Logan, Justice, & Kaderavek, 2016; Kimhi, Achtarzad, &Tubul-Lavy, 2017; Travers, Higgins, Pierce, Boone, Miller, & Tandy, 2011; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017). Evidence from relevant studies identified that children with ASD had specific difficulties in developing specific emergent literacy skills, especially for skills of processing meanings (e.g., Dynia, Lawton, Logan, & Justice, 2014; Lanter, Watson, Erickson, & Freeman, 2012; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017). Nevertheless, few studies have been conducted to explore the impact of home literacy environment among children with ASD. Thus, considering that children with ASD show deficits in language production and social interaction, the home literacy environment tends to be more significant for the development of emergent literacy. Therefore, the present paper aims to investigate the role of home literacy environment in the emergent literacy development among children with ASD. The objectives of the present research are: (a) to examine the home literacy environment among children with ASD in comparison with their typically-developing peers; and (b) to investigate the contribution of home literacy environment to oral vocabulary development among children with ASD.

4.1.1. Home Literacy Environment among Children with ASD

As one key component of emergent literacy development, home literacy environment was initially defined as the frequency of reading-related practices between parents and their children (Bus, Van Ijzendoorn & Pellegrini, 1995). Researchers further developed the scope of home literacy environment which was referred to as a general term for describing literacy-related practices between parents and children, home literacy resources, and attitudes towards literacy practices (e.g., Bracken & Fischel, 2008; Burgess, Hecht, & Lonigan, 2002; Payne, Whitehurst & Angell, 1994). The contribution of home literacy environment to children's language and literacy development has been extensively investigated. Evidence from existing research from linguistically- and culturally-diverse contexts consistently revealed that an engaging and supportive home literacy environment was significantly associated with language and literacy development such as phonological awareness, reading fluency and vocabulary knowledge among typically developing children (e.g., Farver, Xu, Lonigan, & Eppe, 2013; Niklas, & Schneider, 2013; Yuet-Han Lau & McBride-Chang, 2005), struggling readers (e.g., Sawyer, et al., 2014; Sun, et al., 2013; Hamilton, Hayiou-Thomas, Hulme, Snowling, 2016), and language learners (e.g., Li & Tan, 2016; Yeung & King, 2016).

Although the significance of home literacy environment in promoting and accelerating literacy development among typically developing children and struggling readers has been well-documented, very few studies have been conducted to examine the contribution of home literacy environment among children with ASD. Over the past decade, limited studies specifically explored the association between home literacy

environment and emergent literacy development among children with ASD (Dynia, Lawton, Logan, & Justice, 2014; Lanter, Watson, Erickson, & Freeman, 2012; Lucas & Norbury 2017; Westerveld, Paynter, Trembath, Webster, Hodge, & Roberts, 2017). Lanter and colleagues (2012) examined the differences of home literacy environment between children with ASD and their typically-developing peers. Results from parental reports revealed that, compared with typically-developing children, children with ASD were less engaged in reading and writing practices (e.g., shared reading) at home. In addition, parents of children with ASD taught reading to their children through direct instruction rather than shared reading. Although parents of children with ASD acknowledged that literacy development was of significance for children's future development, they were less confident in their competence to teach literacy skills to their children with ASD.

In addition to investigating the differences of home literacy environment between children with ASD and typically-developing children, Dynia et al. (2014) further examined the contribution of home literacy components, including the frequency of home literacy practices, literacy skill teaching and parental attitudes toward reading with their children, to the development of emergent literacy skills (e.g., alphabet knowledge, print-concept knowledge, definitional vocabulary and phonological awareness). The researchers identified that, compared with typically-developing peers, children with ASD were less engaged in home literacy practices. However, the frequency of home literacy practices was a significant predictor of alphabet knowledge among children with ASD after controlling language performance and autism severity. In a more recent study,

Lucas and Norbury (2017) further explored the home literacy environment among children with ASD by taking both frequency and duration of home reading into consideration. Results also confirmed that, compared with typically-developing peers, children with ASD were less motivated to participate in home literacy practices with shorter duration. Moreover, the frequency and duration of independent reading at home was positively associated with reading development among children with ASD.

The purpose of the present research is to explore the impact of home literacy environment on oral vocabulary among children with ASD in China. Although evidence from limited research indicated that children with ASD were less likely to engage in home literacy practices, the home literacy environment may be still more important for children with ASD because of their difficulties in language production and social interaction (Chen & Kuo, 2017). Specifically, children with ASD may benefit from a supportive home literacy environment in developing their emergent literacy skills and may be more likely to participate in literacy practices in a familiar and comfortable environment (e.g., reading at home with their parents). The present study aims to provide more insights on the understanding of home literacy development among children with ASD. Considering that existing research was conducted in the European-American context, investigating the home literacy environment in a different linguistic and sociocultural context can contribute to the comprehensive understanding of home literacy environment among children with ASD. Additionally, the present study also aims to examine the unique contribution of home literacy environment in predicting oral vocabulary in Chinese while controlling emergent literacy skills.

4.1.2. Research Questions

1. What are differences in home literacy environment between children with ASD and typically-developing children in China?

2. How does home literacy environment uniquely contribute to oral vocabulary among children with ASD and typically-developing children in China?

4.2. Method

4.2.1. Participants

Participants were kindergarteners aged from 4 to 6 years old. Children in the present research came from working class families in a coastal city in China. Participants were divided into two groups: a) 21 children with ASD; and b) 28 typically-developing children (TD). Children were recruited from two different kindergartens. Specifically, 15 children with ASD came from one exclusive kindergarten in which children with ASD received specific training and interventions for cognitive, linguistic and behavioral development. Five children with ASD and 20 TD children were recruited from one inclusive kindergarten. In the inclusive kindergarten, children with ASD not only learned with TD children in the same classrooms, but also received additional support from special education teachers. Considering that the present research is one of the very first studies on language and literacy development among children with ASD, children with high-functioning ASD were recruited who were able to produce and understand oral language and instructions.

4.2.2. Measures: Participants' Background

4.2.2.1. Autism Severity

Social Responsiveness Scale (Constantino & Gruber, 2002) (SRS) with 65 items was utilized to evaluate the severity of autism. The SRS is a valid measure for evaluating autism level for children aged from 4 to 18. Compared with other existing measures which use yes/no questions, the SRS assessed the autism severity through using a Likert scale of 4 (e.g., 1 Not True; 2 Sometimes true; 3 Often true; 4 Almost always true) across various symptoms. The SRS consisted of rating sections on autism severity, including communication impairments, communication capacity and social anxiety and avoidance. Parents and teachers completed the SRS about children with ASD in about 15-20 minutes.

4.2.2.2. Nonverbal Reasoning

Raven's Progressive Matrices (Raven, Court, & Raven, 1996) was used to measure children's nonverbal reasoning. Raven's Colored Progressive Matrices is a valid measure for children aged from 5 to 11 and individuals with physical and mental impairments. Raven's Colored Progressive Matrices consisted of 24 items presented with colored backgrounds. Participants were asked to identify the pattern and select the correct picture from 6 choices to complete a big figure.

4.2.2.3. Rapid Naming

Rapid automatized naming (Denckla & Rudel, 1976) was measured by the task of rapid naming numbers. The task consists of 5 digits strings with 5 numbers: 1, 4, 5, 7, 8. These five numbers were arranged in different orders across digit strings. Participants

were asked to name the digits from left to right and from top to bottom as quickly and accurately as possible.

4.2.3. Measures: Emergent Literacy Skills

4.2.3.1. Character Recognition

Participants' character recognition was measured by a Chinese character recognition task developed by Shu, Peng, & McBride-Chang (2008). This measure consisted of 60 single simplified Chinese characters. Participants were asked to read single characters that are arranged in order of increasing difficulty: a) from characters with fewer strokes to more strokes; and b) from characters with less visual complexity to more visual complexity. Participants received one point for each correct answer; the Cronbach alpha of the character recognition task was 0.88.

4.2.3.2. Phonological Awareness

An adapted version of a syllable deletion task (Pan et al., 2016) was performed to measure participants' phonological awareness. Given that each Chinese character represents a syllabic morpheme, the syllable deletion task was a valid measure for assessing phonological awareness among children in Chinese. In this task, participants were asked to delete one of the syllables from an orally presented two- or three-syllable word (e.g., say bread, *mian bao*, without the syllable *bao*). Items were arranged in an increasing difficulty order based on the number of syllables in given words and the position of the deleted syllable. The task consisted of 19 items, and the Cronbach alpha was 0. 81.

4.2.3.3. Morphological Awareness

Participants' morphological awareness was measured by the morphological construction task (Pan et al., 2016). In the morphological construction task. participants were asked to construct a novel compounding word based on a given scenario. The child was asked questions such as "a machine that can wash clothes is called a wash-clothes machine, what do you call a machine that can wash shoes?" The task consisted of 18 items in an increasing difficulty order based on the number of characters in given compounds and the meaning of compounds, and the Cronbach alpha was 0.78.

4.2.4. Measures: Oral Vocabulary

4.2.4.1. Receptive Vocabulary

Receptive vocabulary was evaluated by the standardized measure of the Peabody Picture Vocabulary Test-Revised (Sang & Miao, 1990). The Chinese version of PPVT-R was adapted by modifying words and pictures of the PPVT by Dunn and Dunn (1981). As a standardized measure of receptive oral vocabulary in Chinese, PPVT-R (Snag & Miao, 1990) was developed with two pilot studies with 600 Chinese children aged from 3.5 to 9 years old. Participants were asked to select the picture that best matches the orally-presented word from four choices. Each correct answer was awarded one point. The test stops when the child makes six errors in 8 consecutive items.

4.2.4.2. Expressive Vocabulary

An adapted version of the picture naming task (Chen, Hao, Geva, Zhu, & Shu, 2008) was performed to investigate children's expressive oral vocabulary. The task consisted of 80 pictures (Snodgrass and Vanderwart, 1980), and the average age of

acquisition of meanings of these pictures was 6.5 years old with the acquisition range

from 2.5 to 12 years old (Liu, 2006). Participants were asked to name given pictures

presented by the experimenter. One point was awarded for each correct answer and the

Cronbach alpha was 0.87.

4.2.5. Home Literacy Environment

4.2.5.1. Home Literacy Environment Survey

An adapted and translated home literacy environment survey was utilized to

collect information of home literacy environment among young children (e.g., Dynia et

al., 2014; Lanter et al., 2012; Lucas & Norbury, 2017; Westveld et al., 2017). The survey

consists of a total of 22 items, which cover three major aspects. Specifically, the Family

Background section includes items regarding parental education, family income and

home literacy resources. The Home Literacy Activities and Practices section asks

parents to rate the frequency and duration of parent-to-child reading, shared reading,

individual reading, and the use of technology for literacy-related activities at home. In

the section on Perspectives on Reading, parents are asked to rate on a scale of four their

attitudes toward reading experiences with their children at home.

4.3. Results

4.3.1. Group Differences of Home Literacy Environment

The first research question on whether there was a significant difference in home

literacy environment between children with ASD and typically-developing children was

answered by descriptive statistics and a one-way MANOVA. A principal component

analysis with the oblique rotation was performed to explore the latent structure of the

home literacy survey. The analysis identified three major components, which explained

66.3% of the total variance. Table 4.1 presents the three major components with specific

items and factor loadings. The three major components were: a) Home Literacy Practices

(HLP, e.g., frequency of parent reading, frequency of reading by other family members,

frequency of interactions during reading, and frequency of individual reading); b)

Technology (TECH, frequency of watching TV, frequency of using an iPad, smartphone

or computer for literacy purposes); and c) Parental Perspectives on Home Reading

(PPHR, e.g., the importance of home reading practices on language and literacy

development). Factor scores of three major home literacy components were computed

for further analyses.

Table 4.1 Principal Component Analysis of Home Literacy Environment Survey

No.	Items	HLE	TECH	POHR
1	Home Literacy Resources	0.60		
2	Frequency of Reading	0.82		
3	Frequency of Telling story	0.75		
4	Frequency of Reading by Others	0.56		
5	Frequency of P-C Interaction during Reading	0.59		
6	Frequency of C-P Interaction during Reading	0.82		
7	Frequency of Children Ask-for-Reading	0.81		
8	Frequency of Individual Reading	0.84		
9	Frequency of Going to Library	0.78		
10	Frequency of TV		0.81	
11	Frequency of iPad, Phone & Computer		0.74	
12	Perspectives on Reading with Children			0.74
13	Home Reading and Literacy Development			0.93
14	Home Reading and Character Recognition			0.83
15	Home Reading and Language Production			0.89

Note. HLP, Home Literacy Practices; TECH, Technology Use;
POHL, Perspectives on Home Literacy

Table 4.2 presents the descriptive statistics of components of home literacy practices, technology use, and parental perspectives in the home literacy in the Home Literacy Environment Survey. A one-way MANOVA (typically-developing children vs children with ASD) was performed to explore the possible difference in the overall home literacy environment between the two groups. Specifically, group (TD vs ASD) was the between-group variable, and age and non-verbal reasoning were covariates. Results from the one-way MANOVA indicated that the difference in the overall home literacy environment was not statistically significant between the two groups, $F(3, 45) = 2.14$, $p = 0.11$; Wilk's $\Lambda = 0.875$, partial $\eta2 = 0.13$.

Table 4.2 Descriptive Statistics of Home Literacy Environment

Items	ASD		TD	
	Mean	SD	Mean	SD
Home Literacy Practices	-0.36	0.2	0.28	0.17
Technology Use	-0.04	0.21	-0.1	0.18
Perspectives on Home Literacy	0.14	0.23	-0.16	0.2

Note. HLP, Home Literacy Practices; TECH, Technology Use; POHL, Perspectives on Home Literacy

4.3.2. Contribution of Home Literacy Environment to Oral Vocabulary Skills

The second research question investigated the contribution of emergent literacy skills and home literacy environment to the oral vocabulary skills for both children with ASD and typically-developing children. In order to examine the contribution of emergent literacy skills and home literacy environment to oral vocabulary among children with ASD and typically developing children, hierarchical linear regression models were conducted. The dependent variables were the scores on the receptive oral vocabulary and expressive oral vocabulary tasks. The independent variables included

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age, non-verbal reasoning, autism severity, scores on the tasks of character recognition, phonological awareness, morphological awareness and rapid automatized naming, and composite scores of home literacy practices, technology use, and parental perspectives on home reading. Participants' background, including participants' age, nonverbal reasoning and autism severity, were entered as the first block in the regression model as control variables. Considering that both emergent literacy skills and home literacy environment were two critical components of emergent literacy development, they were entered as the second and the third blocks with different orders. In total, eight hierarchical regression analyses were conducted: two hierarchical regression analyses with age, SES, autism severity and non-verbal cognitive abilities controlled were conducted separately for both children with ASD and typically-developing children for each of the two outcome variables, receptive vocabulary and expressive vocabulary. For each outcome variable for each group, the order of the blocks of predictor variables was varied: emergent literacy skills followed by home literacy components, and vice-versa.

4.3.2.1. Receptive Vocabulary

Table 4.3 presents four regression models on receptive oral vocabulary, two each for typically-developing children and children with ASD. With respect to models for typically-developing children, participants' background (age and nonverbal reasoning) explained 22.7% of the variance. In addition, the contribution of emergent literacy skills (explained variance: 26.3% or 27.3% depending on order) to receptive oral vocabulary was statistically significant regardless of the entry order. In contrast, the contribution of the home literacy environment was not statistically significant in both entry orders.

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Finally, morphological awareness, which was entered as part of the emergent literacy skills block, was identified as a unique predictor for receptive oral vocabulary among typically-developing children. Regarding models for children with ASD, the contribution of emergent literacy skills was statistically significant (additional explained variance: 32.8%) when it was entered before the emergent literacy environment. Only home literacy environment was found to be significantly associated with receptive oral vocabulary when it was entered before emergent literacy skills (explained variance = 34.2%), and technology use, which was entered as part of the home literacy environment block, was a marginally significant predictor ($b = 8.06$, $p = 0.07$) for receptive oral vocabulary among children with ASD.

Table 4.3 Hierarchical Linear Analyses Predicting Receptive Vocabulary among Children with ASD Typically-developing Children

Model	Variables	R	R Square	Adjusted R Square	R Square Change	F Change	Sig.
TD	Background	0.48	0.23	0.09	0.23	1.69	
	ELS	0.70	0.49	0.31	0.26	3.44	*
	HLE	0.72	0.51	0.23	0.02	0.28	
	Background	0.48	0.23	0.09	0.23	1.69	
	HLE	0.49	0.24	-0.02	0.02	0.13	
	ELS	0.72	0.51	0.23	0.27	3.18	*
ASD	Background	0.57	0.32	0.15	0.32	1.88	
	ELS	0.81	0.66	0.43	0.34	2.98	*
	HLE	0.88	0.78	0.51	0.12	1.62	
	Background	0.57	0.32	0.15	0.32	1.88	
	HLE	0.82	0.67	0.49	0.35	4.50	*
	ELS	0.88	0.78	0.51	0.11	1.14	

Note. ELS, Emergent Literacy Skills; HLE, Home Literacy Environment

4.3.2.2. Expressive Vocabulary

The contribution of emergent literacy skills and home literacy environment to expressive oral vocabulary is presented in Table 4.4. For typically-developing children, participants' background (age, nonverbal reasoning and RAN) contributed significantly to predicting expressive oral vocabulary, accounting for 46% of the variance. The effect of emergent literacy skills was statistically significant across both models, and it accounted for an additional 21.8% or 22% of the variance, depending on the entry order. The contribution of the home literacy environment was not statistically significant regardless of the entry order. Similar to the results for receptive oral vocabulary, morphological awareness, which was entered as one predictor of the emergent literacy skills block, was a unique variable that significantly predicted expressive oral vocabulary among typically-developing children. Regarding models for children with ASD, compared with the results of typically-developing children, the unique contribution of emergent literacy was not significant across either model for children with ASD. Results of typically-developing children indicated that the home literacy environment was not statistically significant regardless of its entry order. In contrast, the home literacy environment contributed significantly when it was entered before emergent literacy skills, explaining an additional 44.1% of the variance beyond the effect of participants' background. Similar to the findings of receptive oral vocabulary among children with ASD, technology use, which was entered as part of home literacy environment block, was uniquely associated with expressive oral vocabulary among children with ASD ($b = 4.83$, $p < 0.05$).

Table 4.4 Hierarchical Linear Analyses Predicting Expressive Vocabulary among Children with ASD and Typically-developing Children

Model	Variables	R	R Square	Adjusted R Square	R Square Change	F Change	Sig.
TD	Background	0.68	0.46	0.37	0.46	4.90	**
	ELS	0.82	0.68	0.57	0.22	4.49	*
	HLE	0.84	0.70	0.52	0.02	0.43	
	Background	0.68	0.46	0.37	0.46	4.90	**
	HLE	0.69	0.48	0.30	0.02	0.26	
	ELS	0.84	0.70	0.52	0.22	4.17	*
ASD	Background	0.43	0.19	-0.02	0.19	0.70	
	ELS	0.57	0.32	-0.13	0.14	0.78	
	HLE	0.80	0.64	0.20	0.32	2.67	
	Background	0.43	0.19	-0.02	0.19	0.70	
	HLE	0.74	0.55	0.31	0.37	4.76	*
	ELS	0.80	0.64	0.20	0.09	0.91	

Note. ELS, Emergent Literacy Skills; HLE, Home Literacy Environment

4.4. Discussion

4.4.1. Group Differences of Home Literacy Environment

The present research indicated that there were no statistically significant differences in home literacy environment between children with ASD and typically-developing children. However, cautions should be made on the interpretation of the non-significant difference in home literacy environment between the two groups in the present study. Because the present research applied MANOVA to examine the group difference with consideration of various home literacy items such as the frequency and duration of home reading and the use of technology for literacy-related activities, the overall non-significant group difference did not imply that there were no significant differences in specific home literacy items/aspects between children with ASD and their

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typically developing peers. Findings on specific home literacy items revealed that there were significant differences in the frequency of reading with children between children with ASD and their typically-developing peers in China. This finding regarding the lower engagement of home literacy practices among children with ASD was supported by extant studies in the US (e.g., Dynia, et al., 2014; Lanter et al., 2013). Thus, existing research that focused on the home literacy environment among children with ASD revealed that, compared with typically-developing children, children with ASD tended to be engaged less frequently in literacy activities at home. Specifically, empirical evidence on group comparisons demonstrated that children with ASD were less motivated to participate in shared reading and learning reading and writing at home. Therefore, although results in the present research indicated that there was no significant difference in the overall home literacy environment between groups, children with ASD still tended to be less engaged in home literacy practices. This less engagement may be caused by: a) language deficits and communicative impairments among children with ASD; and b) parents'/family members' limited knowledge, materials and skills of providing literacy-related activities to their children with ASD. The disparities of the home literacy environment needed to be further investigated. The disparities of home literacy environment needed to be further investigated with the consideration of data analysis methods and culture contexts. Specifically, the qualitative instruments, including observations and interviews, are helpful to provide detailed and supportive evidence of how parents performed literacy-related activities at home and how parents perceive the effectiveness and outcomes of these activities. In addition, existing research in the

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English-speaking context consistently highlighted the significant role of facilitating their children's literacy development (e.g., encouragement and scaffolding) and the contribution of shared reading in enhancing literacy development among children with ASD (e.g., Dynia, et al., 2014; Lanter et al., 2013; Lucas & Norbury, 2017). However, parents in the present research tended to apply more read-to-children approaches to lead the literacy-related activities. Therefore, cultural and contextual differences needed to be further considered.

4.4.2. Contribution of Home Literacy Environment to Oral Vocabulary

One key finding of the present research is the significant contribution of home literacy environment to both oral receptive and expressive vocabulary among children with ASD. The result indicated that the home literacy environment plays an essential role in oral vocabulary performance among children with ASD. Although limited research on home literacy environment among children with ASD has been conducted, the finding on the contribution of home literacy environment was consistent with existing studies (e.g., Dynia, et al., 2014; Lucas & Norbury, 2017). Specifically, home literacy environment was significantly associated with literacy development such as alphabet knowledge and reading development among children with ASD. For instance, Dynia et al. (2014) identified that the frequency of home literacy practices was a significant predictor of alphabet knowledge among children with ASD after controlling language performance and autism severity. Another study by Lucas and Norbury (2017) reported that the frequency and duration of independent reading at home was positively associated with reading development among children with ASD. Prior research has

shown that children with ASD tend to be less motivated to participate in literacy practices at home in comparison with typically-developing children. Nonetheless, the present study revealed that the home literacy environment contributed to literacy development among children with ASD.

As one specific aspect of the home literacy environment, the use of technology for literacy-related practices was found to be significant in predicting oral vocabulary performance among children with ASD. Existing research on the application of technology to children with ASD has identified its effective on literacy development such spelling, alphabet knowledge, word recognition, reading fluency, and reading comprehension (e.g., Alison, Browder, & Wood, 2017; Bailey, Arciuli, Stancliffe, 2017; Eutsler, Mitchell, Stamm & Kogut, 2020; Mandak, Light, & McNaughton, 2019). However, the computer-assisted instruction and digital/mobile devices were utilized by teachers in the classroom settings. Although evidence of technology use at home for literacy practices among children with ASD was lacking, findings on literacy development among both typically-developing children and children with ASD in education settings provided insights of the contribution of technology use to developing literacy skills (e.g., Burnett, 2010; Kennedy, & Deshler, 2010). The digital practices such as electronic reading might be effective: a) to deliver literacy-related knowledge and skills (e.g., Eshet-Alkalai & Chajut, 2007; Silverman & Hines, 2009); b) to provide the digital platform of interaction with texts (e.g., Chung & Walsh, 2006); and c) to facilitate the process of making meanings (e.g., Tancock & Segedy, 2004; Teale & Gambrell, 2007). Given that children with ASD faced challenges in language

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development and social interaction, children with ASD might benefit from the digital practices for literacy development which promoted their engagement of literacy-related practices and understanding of written or oral input with the assistance of audial and visual materials. As a very first research on the use of technology at home among children with ASD, the contribution of the home literacy environment should be further investigated with more empirical and clinical evidence. The variable of using technology in the present research was defined as using digital devices (e.g., iPad, laptops and TV) for literacy-related purposes such as character recognition, vocabulary learning and shared reading. It should be noteworthy that parents might use the technology for either interactive (e.g., shared reading) or passive activities (e.g., read to their children). The finding indicated that the use of technology for literacy practices might facilitate the literacy learning process and motivate the engagement in home literacy practices among children with ASD. Because the present research is the very first research which examined the home technology use for literacy practices as one component of home literacy environment among children with ASD, the benefits of using technology for literacy practices at home should be further examined. Future research should explore the possible impacts of different types of activities with technology (e.g., interactive vs passive) on the development of literacy knowledge and skills among children with ASD.

Although limited evidence of technology use at home for literacy practices among children with ASD was investigated, findings on literacy development in education settings provided insights of the contribution of technology use to developing

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literacy skills (e.g., Burnett, 2010; Kennedy, & Deshler, 2010). The digital practices such as electronic reading might be effective: a) to deliver literacy-related knowledge and skills (e.g., Eshet-Alkalai & Chajut, 2007; Silverman & Hines, 2009); b) to provide the digital platform of interaction with texts (e.g., Chung & Walsh, 2006; Siegel M, Kontorourki S, Schmier S et al., 2008); and c) to facilitate the process of making meanings (e.g., Tancock & Segedy, 2004; Teale & Gambrell, 2007). In this case, we hypothesized that children with ASD might also benefit from the digital practices for literacy development at home and, as one potentially significant component, the contribution of the home literacy environment should be further investigated with more empirical and clinical evidence.

In terms of the contribution of the home literacy environment among typically-developing children, the present research identified that emergent literacy skills, *not* home literacy environment, statistically significantly predicted the oral vocabulary performance among typically-developing children. Evidence from existing research demonstrated that both emergent literacy skill knowledge (e.g., Oakhill & Cain 2012; Westerveld, Gillon, van Bysterveldt, & Boyd, 2015; Whitehurst & Lonigan, 1998) and a supportive home literacy environment (e.g., Farver, Xu, Lonigan, & Eppe, 2013; Niklas, & Schneider, 2013; Sawyer et al., 2014; Yeung & King, 2016) were significant for literacy development for typically-developing children. Nevertheless, considering the shared effect between emergent literacy skills and home literacy environment, the contribution of home literacy environment might be mediated by the effect of the knowledge regarding emergent literacy skills.

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4.5. Conclusion

The present study expands the current scope of the contribution of the home literacy environment to literacy development among children with ASD in China. However, there are several limitations that should be addressed for future research. First, the design of the present study is correlational. Hence, the causal relation between home literacy environment and oral vocabulary development cannot be inferred (Dynia et al., 2014; Westerveld, et al., 2017). In this case, longitudinal-design research is needed to further investigate the effect of the home literacy environment among children with ASD. Second, the home literacy environment was measured by a self-reported survey. However, the survey used to measure home literacy environment may not be specific enough to provide sufficient evidence on home literacy practices between caregivers and children with ASD (Dynia et al., 2014). The scale for measuring home literacy environment should be further expanded with more specific items on literacy-related practices such as the strategies of interaction and the types of input during the shared reading, (Lucas & Norbury, 2017). In addition, the future home literacy environment survey could include more detailed items on the technology use for literacy practices such as the types of activities with technology and the purposes of using technology as a supportive tool. Moreover, a known problem with self-report surveys is subjective bias (Rasmussen & Byrd, 2016; Shaw, Thomas, & Zubrick, 2015). In this study, findings on the home literacy environment might be biased by parents and other family members. Therefore, qualitative and mixed-design research with interviews and observations will be helpful for further examining the home literacy environment among children with

ASD. Fourth, although the significant contribution of home literacy environment to oral vocabulary among children with ASD was identified, the possible joint and mediating effect between the knowledge of emergent literacy skill and home literacy environment was not considered in the present research. Therefore, further research should further explore two mentioned effects to examine the contribution of home literacy environment on literacy development among children with ASD.

In conclusion, the present study aimed to investigate the role of the home literacy environment on oral vocabulary among children with ASD. As one of the very first studies, findings from the present study identified that there was no statistically significant difference in home literacy environment between children with ASD and their typically-developing peers. The literacy environment was identified to play a significant role on oral receptive and expressive vocabulary among children with ASD. In addition, the use of technology for literacy practices at home was a significant predictor for oral vocabulary among children with ASD. Despite the limitations outlined above, the present study extends the scope of current research by showing the contribution of home literacy environment to the development of oral vocabulary among children with ASD in China and is the first to demonstrate the effectiveness of using technology on the development of literacy knowledge and skills at home among children with ASD.

4.6. References

Alison, C., Root, J. R., Browder, D. M., & Wood, L. (2017). Technology-based shared
story reading for students with autism who are English-language learners.
Journal of Special Education Technology, *32*(2), 91-101.

ASDEU Consortium. (2018). Autism Spectrum Disorders in the European Union
(ASDEU): final report: main results of the ASDEU project-28/08/2018.

Australian Bureau of Statistics (Producer). (2014). *Autism in Australia, 2012*. Retrieved
from
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4428.0Main%20Fe
atures12012?opendocument&tabname=Summary&prodno=4428.0&issue=2012
&num=&view=.

Bailey, B., Arciuli, J., & Stancliffe, R. J. (2017). Effects of ABRACADABRA literacy
instruction on children with autism spectrum disorder. *Journal of Educational
Psychology*, *109*(2), 257.

Bracken, S. S., & Fischel, J. E. (2008). Family reading behavior and early literacy skills
in preschool children from low-income backgrounds. *Early Education and
Development*, *19*(1), 45-67.

Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy
environment (HLE) to the development of reading-related abilities: A one-year
longitudinal study. *Reading Research Quarterly*, *37*(4), 408-426.

Burnett, C. (2010). Technology and literacy in early childhood educational settings: A
review of research. *Journal of early childhood literacy*, *10*(3), 247-270.

Bus, A. G., Van Ijzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of educational research*, *65*(1), 1-21.

Centers for Disease Control and Prevention (2020). Data & Statistics on Autism Spectrum Disorder. Retrieved from https://www.cdc.gov/ncbddd/autism/data.html

Chen, X., Hao, M., Geva, E., Zhu, J., & Shu, H. (2009). The role of compound awareness in Chinese children's vocabulary acquisition and character reading. *Reading and Writing*, *22*(5), 615.

Chen, Z., & Kuo, L. J. (2017). Language and literacy development among children with autism spectrum disorder. *Journal of Childhood and Developmental Disorders*, *3*(3), 1-3.

China Autism Education Rehabilitation Industry Development Report (2015). Beijing Normal University Press.

Chung, Y. H., & Walsh, D. J. (2006). Constructing a joint story-writing space: The dynamics of young children's collaboration at computers. *Early Education and Development*, *17*(3), 373-420.

Constantino, J. N., & Gruber, C. P. (2002). The Social Responsiveness Scale. Los Angeles: Western Psychological Services.

Denckla, M. B., & Rudel, R. G. (1976). Rapid 'automatized' naming (RAN): Dyslexia differentiated from other learning disabilities. *Neuropsychologia*, *14*(4), 471-479.

Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics:

    Morphosyntactic development in autism. *Journal of autism and developmental*

    disorders, *37*(6), 1007-1023.

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language

    acquisition in autism spectrum disorders: A developmental review. *Research in*

    Autism Spectrum Disorders, *5*(2), 681-691.

Eshet-Alkalai, Y., & Chajut, E. (2010). You can teach old dogs new tricks: The factors

    that affect changes over time in digital literacy. *Journal of Information*

    Technology Education: Research, *9*(1), 173-181.

Eutsler, L., Mitchell, C., Stamm, B., & Kogut, A. (2020). The influence of mobile

    technologies on preschool and elementary children's literacy achievement: a

    systematic review spanning 2007–2019. *Educational Technology Research and*

    Development, *68*(4), 1739-1768.

Delli, C. K. S., Polychronopoulou, S. A., Kolaitis, G. A., & Antoniou, A. S. G. (2018).

    Review of interventions for the management of anxiety symptoms in children

    with ASD. *Neuroscience & Biobehavioral Reviews*, *95*, 449-463.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody picture vocabulary test-revised*. American

    guidance service, Incorporated.

Dynia, J. M., Brock, M. E., Logan, J. A., Justice, L. M., & Kaderavek, J. N. (2016).

    Comparing children with ASD and their peers' growth in print knowledge.

    Journal of autism and developmental disorders, *46*(7), 2490-2500.

Dynia, J. M., Lawton, K., Logan, J. A., & Justice, L. M. (2014). Comparing emergent-literacy skills and home-literacy environment of children with autism and their peers. *Topics in Early Childhood Special Education*, *34*(3), 142-153.

Farver, J. A. M., Xu, Y., Lonigan, C. J., & Eppe, S. (2013). The home literacy environment and Latino head start children's emergent literacy skills. *Developmental Psychology*, *49*(4), 775.

Hamilton, L. G., Hayiou-Thomas, M. E., Hulme, C., & Snowling, M. J. (2016). The home literacy environment as a predictor of the early literacy development of children at family-risk of dyslexia. *Scientific Studies of Reading*, *20*(5), 401-419.

Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger syndrome. *Journal of autism and developmental disorders*, *33*(1), 3-13.

Kennedy, M. J., & Deshler, D. D. (2010). Literacy instruction, technology, and students with learning disabilities: Research we have, research we need. *Learning Disability Quarterly*, *33*(4), 289-298.

Kimhi, Y., Achtarzad, M., & Tubul-Lavy, G. (2018). Emergent literacy skills for five kindergartners with autism spectrum disorder: a pilot study. *Journal of Research in Special Educational Needs*, *18*(3), 211-221.

Lanter, E., Watson, L. R., Erickson, K. A., & Freeman, D. (2012). Emergent literacy in children with autism: An exploration of developmental and contextual dynamic processes. *Language, speech, and hearing services in schools*.

Lanter, E., Freeman, D., & Dove, S. (2013). Procedural and conceptual print-related

    achievements in young children with autism spectrum disorders. *Focus on*

    Autism and Other Developmental Disabilities, *28*(1), 14-25.

Li, L., & Tan, C. L. (2016). Home literacy environment and its influence on Singaporean

    children's Chinese oral and written language abilities. *Early Childhood*

    Education Journal, *44*(4), 381-387.

Lucas, R., Thomas, L., & Norbury, C. F. (2017). Can children with autism spectrum

    disorders learn new vocabulary from linguistic context?. *Journal of Autism and*

    Developmental Disorders, *47*(7), 2205-2216.

Mandak, K., Light, J., & McNaughton, D. (2019). Digital books with dynamic text and

    speech output: Effects on sight word reading for preschoolers with autism

    spectrum disorder. *Journal of autism and developmental disorders*, *49*(3), 1193-

    1204.

Maye, M. P., Kiss, I., & Carter, A. S. (2017). Definitions and classification of autism

    spectrum disorders. *Autism spectrum disorders: Identification, education, and*

    treatment, 1-23.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and

    its relationship to language in school-aged children with high-functioning autism.

    International Journal of Language & Communication Disorders, *42*(6), 682-702.

Niklas, F., & Schneider, W. (2013). Home literacy environment and the beginning of

    reading and spelling. *Contemporary educational psychology*, *38*(1), 40-50.

Oakhill, J. V., & Cain, K. (2012). The precursors of reading ability in young readers: Evidence from a four-year longitudinal study. *Scientific studies of reading*, *16*(2), 91-121.

Pan, J., McBride-Chang, C., Shu, H., Liu, H., Zhang, Y., & Li, H. (2011). What is in the naming? A 5-year longitudinal study of early rapid naming and phonological sensitivity in relation to subsequent reading skills in both native Chinese and English as a second language. *Journal of educational psychology*, *103*(4), 897.

Payne, A. C., Whitehurst, G. J., & Angell, A. L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, *9*(3-4), 427-440.

Rasmussen, C. L., & Byrd, D. R. (2016). Evaluating continued use of an online teacher professional development program with a sustained implementation scale. *Journal of Online Learning Research*, *2*(2), 145-167.

Raven, J. C., JH Court, & Raven, J. (1996). *Raven Manual: Section 3 Standard ProgressiveMatrices With Adult US Norms by JC Raven, JH Court AndJ. Raven*. Oxford Psychologist Press.

Sang, B., & Miao, X. (1990). The revision of trail norm of Peabody picture vocabulary test revised (PPVT-R) In Shanghai proper. *Psychological Science*, *5*, 20-25.

Sawyer, B. E., Justice, L. M., Guo, Y., Logan, J. A., Petrill, S. A., Glenn-Applegate, K., ... & Pentimonti, J. M. (2014). Relations among home literacy environment, child characteristics and print knowledge for preschool children with language impairment. *Journal of Research in Reading*, *37*(1), 65-83.

Shaw, T., Cross, D., Thomas, L. T., & Zubrick, S. R. (2015). Bias in student survey findings from active parental consent procedures. *British Educational Research Journal*, *41*(2), 229-243.

Silverman, R., & Hines, S. (2009). The effects of multimedia-enhanced instruction on the vocabulary of English-language learners and non-English-language learners in pre-kindergarten through second grade. *Journal of educational psychology*, *101*(2), 305.

Shu, H., Peng, H., & McBride-Chang, C. (2008). Phonological awareness in young Chinese children. *Developmental science*, *11*(1), 171-181.

Sun, Z., Zou, L., Zhang, J., Mo, S., Shao, S., Zhong, R., ... & Song, R. (2013). Prevalence and associated risk factors of dyslexic children in a middle-sized city of China: a cross-sectional study. *PloS one*, *8*(2), e56688.

Tancock, S. M., & Segedy, J. (2004). A comparison of young children's technology-enhanced and traditional responses to texts: An action research project. *Journal of research in childhood education*, *19*(1), 58-65.

Teale, W. H., & Gambrell, L. B. (2007). Raising urban students' literacy achievement by engaging in authentic, challenging work. *The Reading Teacher*, *60*(8), 728-739.

Travers, J. C., Higgins, K., Pierce, T., Boone, R., Miller, S., & Tandy, R. (2011). Emergent literacy skills of preschool students with autism: A comparison of teacher-led and computer-assisted instruction. *Education and Training in Autism and Developmental Disabilities*, 326-338.

Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of autism and developmental disorders*, *40*(10), 1259-1273.

Westerveld, M. F., Gillon, G. T., van Bysterveldt, A. K., & Boyd, L. (2015). The emergent literacy skills of four-year-old children receiving free kindergarten early childhood education in New Zealand. *International Journal of Early Years Education*, *23*(4), 339-351.

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts, J. (2017). The emergent literacy skills of preschool children with autism spectrum disorder. *Journal of autism and developmental disorders*, *47*(2), 424-438.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child development*, *69*(3), 848-872.

Yeung, S. S., & King, R. B. (2016). Home literacy environment and English language and literacy skills among Chinese young children who learn English as a second language. *Reading Psychology*, *37*(1), 92-120.

Yuet-Han Lau, J., & McBride-Chang, C. (2005). Home literacy and Chinese reading in Hong Kong children. *Early education and development*, *16*(1), 5-22.

5. CONCLUSION

5.1. Conclusion

The dissertation research aims to investigate the emergent literacy development and home literacy environment among children with ASD in China. The present study not only provided insights on the differences in emergent literacy development and home literacy environment between children with ASD and typically-developing children, and the contribution of emergent literacy skills and home literacy environment to oral vocabulary development among children with ASD, but also discussed the impact of linguistic and sociocultural contexts on emergent literacy development and home literacy environment. The dissertation research involves three studies. Study one was a systematic literature review, which aims to synthesize findings from existing literature and to provide theoretical basis on following research. Study 2 explored the emergent literacy development among children with ASD, including the comparison of emergent literacy skills between children with ASD and typically developing children, and discussion of the role of emergent literacy skills in developing oral vocabulary. Study 3 further investigated the contribution of home literacy environment to oral vocabulary development among children with ASD.

Findings from the first study, the systematic literature review, identified current research trends and findings on emergent literacy development and home literacy environment among children with ASD. Specifically, over the past decade, increasing emphasis was given on the exploration of emergent literacy development and home

literacy environment among children with ASD. Additionally, the systematic literature review provided directions and suggestions for future research through summarizing the substantive and methodological features of selected studies. In terms of emergent literacy development, findings revealed that children with ASD had fewer struggles in developing alphabet knowledge and phoneme segmentation (e.g., Dynia et al., 2014; Westerveld et al., 2017; 2020). However, they faced particular challenges in advancing print concept, phoneme manipulation and meaning-related skills (e.g., Davidson & Ellis Weismer, 2014; Westerveld et al., 2017). Moreover, emergent literacy skills were found to be significantly associated with literacy development among children with ASD (e.g., Westerveld et al., 2017; Zhao et al., 2019). In terms of home literacy environment, existing research identified that children with ASD tended to be less engaged in home literacy practices (e.g., Dynia, et al., 2014; Lanter et al., 2013). However, specific home literacy components such as the frequency and the duration of home literacy practices were significant predictors for literacy development among children with ASD (e.g. Dynia et al., 2014; Lucas & Norbury, 2017).

Study two explored the emergent literacy development among children with ASD in China. Research evidence, on the one hand, further confirmed findings from existing studies. On the other hand, it also expanded the current scope by investigating children with ASD from a non-English-speaking context. Specifically, findings indicated that children with ASD also lagged behind their typically developing peers in code- and meaning-related skills. What is more significant is that the present study considered the possible impact of linguistic context. Given the disparities in linguistic features and

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structure, different languages may address different literacy skills in language and literacy development. Considering that Chinese is a logographic language in which a given character represents a syllable and morpheme, syllable awareness but not phonemic awareness is considered as the significant phonological skill in Chinese (e.g., Li et al., 2012; McBride-Chang et al., 2008). Because of the inconsistency between phonological units and written symbols, processing and manipulating phonological units in Chinese tends to be more challenging. In addition, the prevalence of homophones and compounding convention makes morphological awareness significantly associated with literacy development among children in China. As one significant facet of morphological awareness, compounding awareness was a significant predictor for vocabulary acquisition among children in China (e.g., Cheng et al., 2017; Liu et al., 2013; Liu & McBride-Chang, 2010). In this case, it was significant to address specific emergent literacy skills for children in different linguistic contexts. In the present research, phonological awareness and morphological awareness were not significantly associated with oral vocabulary among children with ASD. Results indicated the possible impact of autism severity and nonverbal reasoning in affecting literacy development among children with ASD in China.

Evidence from study three demonstrated the contribution of home literacy environment among children with ASD in China. Although there was no significant difference in home literacy environment between children with ASD and typically developing children, results indicated that children with ASD in China were less likely to participate in home literacy practices. In addition, results also revealed differences in

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the preference of home literacy practices between parents in China and those in the US (read to children but not shared reading with interactions). Home literacy environment was found to be significantly associated with oral vocabulary development among children with ASD. Specifically, findings expanded the existing research through identifying the significance of using technology for literacy-related practices. The effectiveness of technology use in classroom settings to promote literacy development among children with ASD has been investigated by several studies (e.g., Alison, Browder, & Wood, 2017; Bailey, Arciuli, Stancliffe, 2017; Eutsler, Mitchell, Stamm & Kogut, 2020; Mandak, Light, & McNaughton, 2019). Digital practices might be effective through providing visual and audio support and creating an environment for interactions. Findings on the effectiveness of technology use at home from the present research should be further investigated.

Based on the findings, the dissertation research provided several suggestions and directions for future research. First of all, the participant sample is considered as one of the common limitations across research on emergent literacy skills and home literacy environment among children with ASD. Findings may be influenced by the limited sample size and selection bias. For instance, the small sample size may give rise to the attenuation of statistically significant results. Also, participants from different centers, schools and districts with various autism identification instruments may also influence the interpretation of findings. Therefore, future research should recruit more participants and consider the issue of the participant variety. Most existing studies were correlational and quantitative. Hence, the causal relationship cannot be inferred. Thus, future research

needs to employ more types of research designs such as longitudinal studies, qualitative studies and case studies to provide more detailed and supportive evidence. Another common limitation in research on children with ASD is the measure used. On the one hand, some existing measures for emergent literacy skills were designed for typically developing children and might be challenging for children with ASD. On the other hand, the home literacy environment survey may be not sufficient enough to collect and cover information on home literacy environment. Therefore, future research should focus on the design and accommodation of measures which are appropriate for children with ASD (e.g., measures with audio and visual supports). Moreover, the possible impact of the learning/school site (i.e. inclusive and exclusive) should be investigated. Thus, children with ASD received different types of practices and training in different environments (i.e., inclusive and exclusive sites). Therefore, the different experiences may contribute to the disparities in developmental trajectories of language acquisition, literacy learning and social communication development among children with ASD.

In conclusion, the dissertation research aims to investigate the emergent literacy development and home literacy environment among children with ASD in China. Findings provided insights on differences in emergent literacy development and home literacy environment between children with ASD and typically developing children, and the contribution of these mentioned components to literacy development among children with ASD. In addition, as one of the very first studies, the present research also investigated children with ASD from a non-English-speaking context. Findings from the

research not only confirmed evidence from existing studies, but also extended the scope

of current research with more directions.

5.2. References

Alison, C., Root, J. R., Browder, D. M., & Wood, L. (2017). Technology-based shared
story reading for students with autism who are English-language learners.
Journal of Special Education Technology, *32*(2), 91-101.

Bailey, B., Arciuli, J., & Stancliffe, R. J. (2017). Effects of ABRACADABRA literacy
instruction on children with autism spectrum disorder. *Journal of Educational
Psychology*, *109*(2), 257.

Cheng, Y., Zhang, J., Li, H., Wu, X., Liu, H., Dong, Q., ... & Sun, P. (2017). Growth of
compounding awareness predicts reading comprehension in young Chinese
students: A longitudinal study from grade 1 to grade 2. *Reading Research
Quarterly*, *52*(1), 91-104.

Davidson, M. M., & Weismer, S. E. (2014). Characterization and prediction of early
reading abilities in children on the autism spectrum. *Journal of autism and
developmental disorders*, *44*(4), 828-845.

Dynia, J. M., Lawton, K., Logan, J. A., & Justice, L. M. (2014). Comparing emergent-
literacy skills and home-literacy environment of children with autism and their
peers. *Topics in Early Childhood Special Education*, *34*(3), 142-153.

Eutsler, L., Mitchell, C., Stamm, B., & Kogut, A. (2020). The influence of mobile
technologies on preschool and elementary children's literacy achievement: a
systematic review spanning 2007–2019. *Educational Technology Research and
Development*, *68*(4), 1739-1768.

Lanter, E., Freeman, D., & Dove, S. (2013). Procedural and conceptual print-related

    achievements in young children with autism spectrum disorders. *Focus on*

    Autism and Other Developmental Disabilities, *28*(1), 14-25.

Li, H., Shu, H., McBride-Chang, C., Liu, H., & Peng, H. (2012). Chinese children's

    character recognition: Visuo-orthographic, phonological processing and

    morphological skills. *Journal of Research in Reading*, *35*(3), 287-307.

Liu, P. D., & McBride-Chang, C. (2010). What is morphological awareness? Tapping

    lexical compounding awareness in Chinese third graders. *Journal of Educational*

    Psychology, *102*(1), 62.

Liu, P. D., McBride-Chang, C., Wong, T. T. Y., Shu, H., & Wong, A. M. Y. (2013).

    Morphological awareness in Chinese: Unique associations of homophone

    awareness and lexical compounding to word reading and vocabulary knowledge

    in Chinese children. *Applied Psycholinguistics*, *34*(4), 755-775.

Lucas, R., Thomas, L., & Norbury, C. F. (2017). Can children with autism spectrum

    disorders learn new vocabulary from linguistic context?. *Journal of Autism and*

    Developmental Disorders, *47*(7), 2205-2216.

Mandak, K., Light, J., & McNaughton, D. (2019). Digital books with dynamic text and

    speech output: Effects on sight word reading for preschoolers with autism

    spectrum disorder. *Journal of autism and developmental disorders*, *49*(3), 1193-

    1204.

McCann, J., Peppé, S., Gibbon, F. E., O'Hare, A., & Rutherford, M. (2007). Prosody and
its relationship to language in school-aged children with high-functioning autism.
International Journal of Language & Communication Disorders, *42*(6), 682-702.

Westerveld, M. F., Paynter, J., Brignell, A., & Reilly, S. (2020). No Differences in
Code-Related Emergent Literacy Skills in Well-Matched 4-Year-Old Children
With and Without ASD. *Journal of Autism and Developmental Disorders*, 1-6.

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts,
J. (2017). The emergent literacy skills of preschool children with autism
spectrum disorder. *Journal of autism and developmental disorders*, *47*(2), 424-
438.

Zhao, J., Chen, S., Tong, X., & Yi, L. (2019). Advantage in Character Recognition
Among Chinese Preschool Children with Autism Spectrum Disorder. *Journal of
autism and developmental disorders*, *49*(12), 4929-4940.

APPENDIX A

HOME LITERACY ENVIRONMENT SURVEY

Child's Name _____   Child's Gender _____

Demographic Information

1. Your family is:

   (1) two-parent family (2) single-parent family (3) Other (e.g., reconstituted family)

2. How many members in your family?

   _____ (No. of adults)   _____ (No. of child/children)

3. How much is your monthly family income? _____ (monthly income)

4. Mother's highest level of education:

   _____ No formal education   _____ Middle School

   _____ Primary school but not finish   _____ Four-year college but not finish

   _____ Primary school   _____ Four-year college

   _____ Middle school but not finish   _____ Master or PhD degree

   _____ Other _____

5. Mother's job:

   _____ Full-time   _____ Part-time

   _____ Unemployed   _____ Full-time mother

   _____ Other _____

6. Father's highest level of education:

   _____ No formal education   _____ Middle School

   _____ Primary school but not finish   _____ Four-year college but not finish

   _____ Primary school   _____ Four-year college

   _____ Middle school but not finish   _____ Master or PhD degree

   _____ Other _____

7. Father's job:

_____ Full-time   _____ Part-time

_____ Unemployed   _____ Full-time mother

_____ Other _____

Home Literacy Environment

Note: 1. Never; 2. Seldom; 3. Sometime; 4 Often; 5. Very Often

8. How many children's books are in your family?

(1)   0   (2)   less than 10   (3)   11-20   (4)   21-50   (5)   51-100

(6)   more than 100

9. How often do you read books to your child?

(1)   (2)   (3)   (4)   (5)

10. How often do you tell stories to your child?

(1)   (2)   (3)   (4)   (5)

11. How often do your family members read books to your child?

(1)   (2)   (3)   (4)   (5)

12. How often do you and your family members interact with your child during reading?

Interaction: ask questions, discussions or answer questions

(1)   (2)   (3)   (4)   (5)

13. How often does your child interact with you and your family members during reading?

Interaction: ask questions, discussions or answer questions

(1)   (2)   (3)   (4)   (5)

14. How often does your child ask you or family members to read?

(1)   (2)   (3)   (4)   (5)

15. How often does your child read independently?

(1)   (2)   (3)   (4)   (5)

16. How often do you take your child to the library/bookstore?

(1)   (2)   (3)   (4)   (5)

17. How long is it for child to watch TV, videos, movies, or DVDs per day?

_____ Hours per day (If no, please fill 0)

18. How long for a child to use iPad, cellphone, or computer for literacy practices per day?

_____ Hours per day (If no, please fill 0)

Literacy Development (1-5: Disagree - Agree)

19. Reading with your child is fun.

(1)   (2)   (3)   (4)   (5)

20. Reading with your child can develop their reading ability

(1)   (2)   (3)   (4)   (5)

21. Reading with your child can develop their character recognition

(1)   (2)   (3)   (4)   (5)

22. Reading with your child can develop their language ability

(1)   (2)   (3)   (4)   (5)