Rethinking play in preschool classrooms: The cognitive, affective and contextual roles of constructive play in storytelling and retelling performance

by

CHUNG, Man Chi Sandrine

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Abstract

Whether learning through play is an appropriate and effective way of learning for young children is always on debate. Teachers, parents and scholars from different parts of the world have three distinct perceptions of the concept: play is a separate activity from learning, play is a driver for learning, and play can be highly integrated with learning. Play is highly related to and can be integrated with learning. However, adults still doubt the effectiveness of learning through play. Teachers encounter difficulties in implementing the concept in their teaching because of misunderstanding and limited guidelines and definitions.

This project aims to reveal the close relationship between the three common activities in preschool classrooms: play, storytelling and story retelling. The three separate studies are designed to investigate the effectiveness of three play activities on storytelling and story retelling performance, including the relationship between executive functioning and the storytelling and retelling performance in five- year- old children. Furthermore, it aims to propose a model that reveals contributing factors to high storytelling and retelling performance. Semi-structured and free play help enhance the storytelling and retelling performance of children owing to the cognitive process involved in the specific instructional procedures, positive motivation and affection, and certain contextual characteristics of the activities. The significance of this research project is that it provides empirical evidence of the effectiveness of play on oral language production. This project also extends the definition of free play in a comprehensive manner.

Keywords: constructive play, story retelling, storytelling, executive functions, creativity

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List of Abbreviations

BVSR	blind variation and selective retention
BS	brick set
CLT	cognitive load theory
ECL	extraneous cognitive load
EF	executive functions
FB	free bricks
ICL	intrinsic cognitive load
INC	index of narrative complexity
NAP	narrative assessment protocol
PLK	Cantonese Oral Language Deficiency Early Identification Test for Pre-primary Children (學前兒童粵語表達能力識別測驗)
WS	worksheet Cantonese Oral Language Deficiency

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Chapter 1 Introduction

1.1 Overview of the project

The Center on the Developing Child in Harvard University (2011) stated that 'Having executive function in the brain is like having an air traffic control system at a busy airport to manage the arrivals and departures of dozens of planes on multiple runways'. This interesting metaphor is realistic because the information we receive every day is like the countless aeroplanes arriving at a busy airport. The situation is similar to today's early education. Children as young as one year old are receiving different levels of information overload. Major media in different parts of the world are putting their interest in the appropriate age for schooling. Scholars are studying the impact of starting school too early, and the relationship between starting age of schooling and future success (Dee & Sievertsen, 2015; Marcon, 2002).

An airport cannot function well if the aeroplanes are unable to take off efficiently, much like the brain of young children. The major problem is that young children need the skills to effectively and efficiently elicit the knowledge in their mind. The skills they need to help elicit information within their brain are called executive functioning skills. Children are not born with these skills, but they are born with the potential to develop these capacities through experiences (The Center on the Developing Child, 2011).

What kinds of experiences should children be exposed to in order to develop the capacities for executive functioning and other higher-order thinking skills? Researchers from the psychology field, especially those conducting contemporary work within developmental psychology, have built on the basics of the theories of Lev Vygotsky (1896–1934), a well-known Russian psychiatrist whose key insights into play and learning shed light on the current project. According to Vygotsky, the learning of young children is controlled by the environment until they have a good command

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of mental tools (Bodrova & Leong, 2006). When children have the tools of the mind, their behaviour is more self-regulated than environmentally regulated. They can be independent learners capable of taking charge of their own learning. Play, as a source of development, creates the zone of proximate development and the areas of 'immediate development' (Vygotsky, 1993; in Elkonin, 1980, p.269). Vygotsky's (1987) key insight, the role of play, suggests that play has a crucial role in the unique development of high mental functions in humans. These high mental functions include symbolic representation, self-regulation and development in metacognitive skills.

In modern times, Vygotsky's insights are parallel to contemporary beliefs that play has an important role in early learning. LEGO Play Well Report 2018 (The LEGO Foundation, 2018) mentioned that 'Play is its own reward. We do it because it feels good. The urge to play is nature's way of helping us make sense of the world and our place in it. Through play we learn how our minds and bodies work and discover how others think and feel. Through play we come to know what it means to belong, to be loved and feel happiness'. From ancient to modern times, play has its value in early learning. Play offers a great opportunity for young children to apply their physical and mental skills by testing their own hypotheses, handling peer conflicts, inventing their own game rules and exercising their muscle movements.

The mental tools of humans are comparable to an efficient traffic control system at the airport. With a well-developed traffic control system, all the arrivals and departures of aeroplanes are structurally directed to their destinations. With well-developed mental tools, humans are able to regulate and represent themselves properly. With play apparently the answer to building a set of tools of the mind, the current project explores the following purposes, research problems and questions.

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1.1.1 Statement of purpose

In Hong Kong, the value of play has been diminished by the expectation that young children should focus on academic-style learning in their preschool years. In this research project, I aimed to investigate the effects of three types of play activities on the storytelling and story retelling performance of five-year-old kindergarteners in Hong Kong. I also explored how these two areas of narrative performance are related to the executive functioning skills and other capabilities of the children.

In the following chapters, I present three studies that investigated the effects of play activities on oral language production through different lenses. Study 1 uses group comparison analysis to identify the effect of three types of play activities on story retelling. Study 2 uses correlation analysis to investigate the relationship between oral language production and executive functions (EF). Study 3 employs grounded theory to investigate the different categories of stories that children were able to create under different play settings.

In Study 1 (Chapter 2), 60 five-year-old kindergarteners living in Hong Kong participated in three different play activities before they were asked to retell a story. The study takes a group comparison analytic approach to investigate the differences in story retelling performance between the three groups by analysing the narrative discourse elements. The study investigates the effects of different play activities on story retelling performance of the kindergarteners, with the expectation that semi-structured play—out of the three play activites— provides the greatest help in handling the complexity of story retelling.

Study 2 (Chapter 3) uses data from the same participatnt sample (used in Study 1) of 60 kindergarteners living in Hong Kong. This study investigates the relationship between story retelling performance and four subscales of EF, including self-regulation, planning, short-term

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memory and inhibition. It also discloses the relationship of the four EF subscales with different parts of speech.

Study 3 (Chapter 4) uses data from the same participant sample (used in Studies 1 and 2) of 60 kindergarteners living in Hong Kong. This study has two aims. The first aim is to investigate the frequencies of 14 macrostructural discourse elements that appeared in the stories created by the children from the three activity groups. The second aim is to understand which play setting is favourable for story creation. Stories are categorised into five levels, from non-story to complete story. The characteristics of contextual factors that are favourable for story creation are identified.

The three studies are combined to design a theoretical model of the developmental and external factors that contribute to the storytelling and retelling abilities of five-year-old children.

1.2 What is play?

The modern world is currently focused on play in early childhood education. The United Nations Convention on the Rights of the Child (UNCRC) proposes that choice is one of the main characteristics of play. Article 31 of the UNCRC states, 'Every child has the right to rest and leisure, to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts. That member governments shall respect and promote the right of the child to participate fully in cultural and artistic life and shall encourage the provision of appropriate and equal opportunities for cultural, artistic, recreational and leisure activity'. Research on children's perception of play emphasised that they value the freedom of making their own decisions and having their own time to play (Kapasi & Gleave, 2009). Play is theorised and defined in many different ways. Philosophers and educators like to use a few terms to describe the nature of playful activities: 'spontaneous', 'natural', 'self-directed' and 'inevitable' (Bodrova & Leong,

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2010). Hungarian–American psychologist Mihaly Csikszentmihalyi (1981) defined play as ‘a subset of life..., an arrangement in which one can practice behavior without dreading its consequences’ (p.14). Scales and his colleagues (1991) defined play as the ‘absorbing activity in which healthy young children participate with enthusiasm and abandon’.

Researchers from the early education and special education fields have focused on the assessment and intervention of play. Moreover, educational psychologists have tracked young children’s sequence of development and revealed the developmental changes in children’s knowledge of objects, representation, people and events (Lifter, Mason, & Barton, 2011). These two schools of scholars dominated research on play in the last quarter century. Two perspectives on play, namely behavioural and constructivist, dominate the literature on play.

Researchers also described play as something that children do in multiple forms, depending on their environmental and cultural contexts (Isenberg & Quisenberry, 2002; Elkind, 2007). Fromberg and Bergen (1998) suggested that play is the activities and thinking with a few characteristics, such as symbolic, meaningful, active, pleasurable, voluntary, rule-governed and episodic. Burghardt (2005) stated five characteristics of play in his book: (1) play is purposeless, (2) play is voluntary, (3) play is special and set apart, (4) play is fun and (5) play is focused by rules. In a recently published report by the LEGO Foundation (2018), the Play Well Report, play is defined as a means for young children to learn and socialise. Among all the theorists, Vygotsky is one of those who defined play from different psychological points of view. He stressed that imagination is an important characteristic of play, which involves rule-based nature and positive affection. As imagination, creativity and symbolic representation in early play activities are part of the research focus of this research project, Vygotsky’s theories about play and cognitive development are chosen for an in-depth discussion on the following literature review about play. I

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first review the Vygotskian and neo-Vygotskian perspectives of play. Next, I explain the different classifications of play, including free and structured, constructive and pretend plays. Finally, I address the impacts of play on different aspects of learning and development, including cognitive development, symbolic thinking, literacy development and oral language development.

1.2.1 Overview of the Vygotskian perspective on play

As early as the 1970s, research on play has focused its role in the context of cognitive processes and development. According to Vygotsky (1967), 'In play a children is always beyond his average age, above his daily behavior; in play it is as though he were a head taller than himself'. One metaphor used by Vygotsky in his 1933 lecture is that play is an efficient vehicle used to deliver academic concepts and skills to preschoolers (1967). Vygotsky did not draw a clear definition of play in his lectures and published articles. Indeed, his view on children's play cannot be separated from his broader theoretical constructs. For example, he proposed the cultural-historical theory to stress the importance of complex interaction between biologically determined development and cultural context.

Vygotsky also regarded play as a transitional stage of imagination and symbolic thinking. In his seminal publication *Play and its role in the mental development of the child* (1967), he concluded that play is the 'leading source of development in preschool years'. The central idea in Vygotsky's model of learning is that children construct their own understandings and create their own meanings through their interaction with the social context.

Vygotsky accorded a special place to play in his publication. He mentioned, 'In play the child is always behaving beyond his age, above his usual everyday behavior; in play he is, as it were, a head above himself. Play contains in a concentrated form, as in the focus of a magnifying

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glass, all developmental tendencies; it is as if the child tries to jump above his usual level. The relationship of play to development should be compared to the relationship between instruction and development …' (Vygotsky, 1978, p.74).

Elkonin, a colleague of Vygotsky, continued his work on play and developed a comprehensive theory with various focuses on the cognitive, literacy and emotional aspects of play (2005). Consistent with Vygotsky's cultural-historical theory, Elkonin developed his view on play with a broader consideration of the social-cultural context. Elkonin (1978) stated that play helps children develop general competencies that enable them to overcome future challenges. Through play, children are able to master a set of mental tools that are necessary for them to adapt to modern society. Elkonin suggested four ways that play can help facilitate the mastery of mental tools. Firstly, play enhances children's motivation in terms of coordinating short- and long-term goals. For instance, if children want to play 'supermarket', then they first have to work out the short-term goal of making props and collecting fake food from their toy box. Secondly, play facilitates cognitive decentering, otherwise termed theory of mind. Play creates the opportunity for children to see from the perspectives of others. This skill is essential for their future coordination of multiple roles and socialisation. Thirdly, Elkonin suggested that play advances the representational skills of children, enabling them to separate the physical form of objects from their meaning. For instance, when children are engaged in 'supermarket' play, they need to distinguish between the real and fake food represented by other objects. Representational skill is also practised through speeches and gestures (Bodrova & Leong, 2015). Finally, play helps the development of intentional behaviours, such as planning and monitoring.

Elkonin (1978) and Istomina (1977) tested the Vygotskian statement about the linkage between play and cognitive development by conducting experiments. They found that young

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children's mental skills are at a higher level when the children are engaging in play activities than in other activities. In Istomina's (1977) study, children are able to memorise more vocabularies when they are engaging in a dramatic 'grocery store' play setting than in a typical 'laboratory' setting. These findings support Vygotsky's notion of a magnifying glass, indicating that play has an important role in early development.

1.3 Definition of play in the current project

In this project, a specific type of play activity is proposed, namely the play-narrative integrated activity (PNIA). The purpose of PNIA is to maximise the narrative performance of preschool children through well-designed play activities that match their developmental needs. These developmental needs are investigated in the three studies of the project through different activity conditions: written-based exercises, semi-structured bricks play with instructions and free bricks play without any adult intervention and instruction. The conditions of the three designed activities are different. Hence, a set of definitions of play are applied, with certain definitions distinctively presented in one condition but less in other conditions. The following are seven general definitions of play applied in the PNIAs in this project.

a. Children having their own time to play - Children have their own time to explore the play materials.
b. Children having the freedom of decision making - Children have the freedom to decide what materials to play with and how they use the materials.
c. Pleasurable - Children may not be totally voluntary in play because they are assigned to different activity groups, but they do not have bad feelings in the activities and are all willing to play.

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d. Symbolic - Two of the designed activities involve bricks play, in which children are able to represent what they have in their mind by using the bricks they choose and then giving them symbolic meaning.

e. Purposeless - When children are asked to participate in the play activities, they are simply asked to play instead of being told a goal or further task to accomplish.

f. Focused by rules - Two of the designed activities have clear instructions and suggestions for the children. Children are suggested to follow the rules and instructions, but they can still use their own method to play with the materials.

1.4 Classifications of play

Currently, many descriptions of play exist, such as symbolic, pretend, make-believe, social and free play. Each description means different things and processes in different studies. For instance, the play taxonomy developed by Parten (1932) has been highly influential in social play research. In the taxonomy, play activities are identified as solitary, onlooker, parallel or cooperative. Other than studying play in the social domain, researchers are interested in the process of how young children play with objects. The development of children's mental skills, especially symbolic skills, is manifested by the expressed desire of the players to represent their thoughts with objects. Within this continuum, object, pretend and symbolic play are studied. The value of investigating different play activities individually in one domain provides a measure of play that can be related to other domains (Pierce-Jodan & Lifter, 2005).

Lifter and Bloom (1998) conceptualised play as the 'expression of intentional states- the representations in consciousness constructed from what children know about and are learning from ongoing events… Play may or may not involve caregivers or peers, may or may not involve a

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display of affect, and may or may not involve pretense' (p.164). By definition, play is dynamic and heterogeneous. Different forms of play are further described in the following sections.

1.4.1 Free and structured play

French intellectual Roger Caillois (1961) used the words *ludus* and *paidia* to describe the two types of play. *Ludus* is described as structured, rule-guarded and goal-directed play, whereas *paidia* is free, unstructured play with spontaneous or improvisational activities. Caillois (1961) suggested that the two types of play should not be viewed as distinctive categories but rather as the endpoints of a continuum. In a recent paper, Petersen, Rasmussen and Jakobsen (2015) referred to the definitions of De Valk, Begger and Eggen (2013) of free play and open-ended to clarify that the latter should not be viewed as the same as the former. De Valk et al. (2013) stated that free play is a form of play that can emerge at any time, at any location and with anything. The only required elements are children's imagination, improvisation and initiation. In addition, open-ended is guarded by certain interaction rules that reflect how the design of the game responds to different inputs in terms of feedback. Petersen et al. (2013) clarified that open-ended play does not belong to any side of the play continuum as Caillois suggested. Open-ended play starts with the characteristics of free play. When it evolves, it can remain unchanged within the status of free play or work more like structured play, with rules and regulations developed by the players. Thus, open-ended play tends to shift back and forth between the two ends of the continuum.

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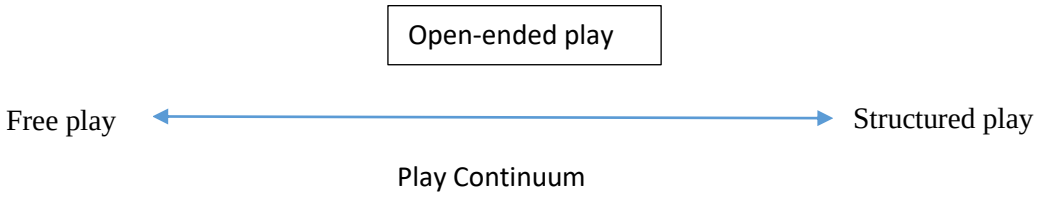

Figure 1 Visualisation of the play continuum by Petersen et al. (2015)

1.4.2 Constructive play

Constructive play, which has gained limited research attention, is defined as an activity wherein children use play materials to construct or build something (Smilansky, 1968). Petersen et al. (2015) defined constructive play as a type of play that is 'centered on a crafting process, where minor components are assembled into a bigger holistic model'. Examples of constructive play materials are Play-Doh, Mindstorms, wooden blocks and Lego bricks, the last being the constructive tool used in the current project. Piaget (2005) suggested that constructive and block play involve skills such as classification, spatial relations, seriation and numerical concepts. For example, children need to do spatial flips and turns with the blocks during block building. They also need to combine different types of blocks to create a new model and figure out how to coordinate small parts into a connected whole. Findings in later research aligned with what Piaget suggested in the way that block play is related to the development of mathematical and spatial development in children, for example, the whole-and-part relationship (Gura, 1992; Kamii et al., 2004). When children play with blocks, they have opportunities to arrange blocks according to different colours, sizes, shapes and orientation. Sorting and classification, as well the concepts of congruence, patterning and equivalence, are also explored during block play (Kersh et al., 2008).

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1.4.2.1 Guided block play

Guided block play, or structured block play, takes place when children engage in block building activities with adult guidance or rules. Ramani and her colleagues (2014) stated that structured block play involves block building activities that are enjoyable for the students but, at the same time, provide opportunities for students to explore and learn.

1.4.2.2 Free block play

In contrast to guided or structured block play, free block play involves block-building activities without adult guidance or rules. Children simply play with the blocks in their own way and preference. Studies show that free block play enhances the visual-spatial skills of preschool children less than guided block play does (Caldera et al., 1999; Casey et al., 2008). However, children engaged in free block play are associated with a higher measure of creativity compared with those engaged in guided block play (Caldera et al., 1999).

1.4.3 Pretend play

Pretend play is a subset of play activities that involve an 'as-if' stance (Garvey, 1990). The 'pretence' in pretend play is layered over reality, including real objects and real life situations (Austin, 1979). Leslie (1987) noted that pretend play involves projecting imaginary objects or pretending that one object is another. Examples of pretend play include young children imagining a close friend to live with and go to school with them or pretending that different colours of blocks are fruits in a supermarket play. Pretend play is sometimes social when a group of children share the same alternative reality. It can also be a solo activity when one child projects his/her own perception on the objects. Three to five years old in early childhood is the 'peak season' of pretend

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play (Singer & Singer, 1992), and it continues to middle childhood and beyond. The current study is designed according to the developmental pattern of symbolic representational skill in early childhood. Given that five years old is suggested to be within the 'peak season' of symbolic play, a part of the current study aims to investigate the symbolic representation pattern of five-year-old children in different classroom activities.

1.5 Play and cognitive development

Piaget was the first scholar who related cognitive development to play. In his stage theory of cognitive development, he suggested that pretend play supports children's development of symbolic representation skills by providing them opportunities to practice the cognitive skills associated with abstract reasoning (Wadsworth, 1996). Pretence, symbolic representational skills and receptive and expressive language skills begin at the same age (approximately between ages one and two years old). Hence, Bergen (2002) hypothesised strong relationships between the development of these skills. Specific cognitive processes involved in play include divergent thinking and symbolism. Strong empirical evidence for the relationship exists between pretend play and creativity in young children (Russ, 2014).

Smith (2010) suggested three possible theoretical relationships between pretend play and developmental outcomes. The first is that pretend play is essential to optimal development. The second is equifinality, in which pretend play is not necessary for development. Equifinality helps some development of young children, but it is only one of the possible routes towards development. The third is that pretend play is an epiphenomenon, which means the by-product of other capabilities. Epiphenomenon makes no contribution to development. The two major Vygotskian theorists, Vygotsky and Piaget, align with the first and third views, respectively. In the current

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study, hypothesis and discussion are based on the first theoretical relationship suggested by Smith that pretend play activity is essential to certain development in early childhood.

1.5.1 Pretend play and symbolic thinking

Vygotsky (1978) noted that pretend play has a critical role in children's development because it provides opportunities for children to learn to separate referent from object. Vygotsky elaborates in his publication that 'Imagination is a new formation that is not present in the consciousness of the very young children, is totally absent in animals… The old adage that children's play is imagination in action can be reserved: we can say that imagination in adolescents and schoolchildren is play without action' (1967, p.8). In his stage theory of cognitive development, Piaget stated that the major achievement of the preoperational stage is the development of symbolic representational skills. The preoperational stage takes place between the second and seventh year of life. Symbolic representation is defined as a form of mental representation of an object or a phenomenon (Veraksa & Veraksa, 2016). The object or phenomenon is learnt and represented by certain other objects or phenomena. For instance, a stick becomes a sword or a banana becomes a mobile phone. Symbolic thought is not limited to objects. As children develop the ability to think symbolically, they 'play pretend', imagining themselves as other people, or animals and fantastical objects. Children's symbolic representation in play activities involves a series of higher-order thinking skills and concept formation.

1.6 Constructive play and early narrative development

Constructive play and early narrative development share a similar nature in the sense that they both involve the construction of knowledge on the basis of existing information. Learning

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materials with a story or narrative context help children produce greater recall of information (Graesser et al., 1980; Mishra, 2003). A school of cognitive scientists also argued that story is the 'most natural package of organized knowledge in the cognitive system for information acquiring and retaining' (Schank & Abelson, 1995; Casey, Erkut, & Young, 2008). Placing constructive play as an intervention focus in the current study aligns with the idea that 'effective teaching interventions are those that make explicit to students the process through which they learn, and engage students in activities that oblige them to think and talk about their learning' (Whitebread, Pino-Pasternak, & Coltman, 2015).

1.7 A roadmap for the three studies and the central theme of the project

The project includes three studies, in which all studies focus on the theme of storytelling and play activities. With the three play activities designed to align with general kindergarten written activity, structured play and free play, a series of 'activity sessions' are offered to the participants within 2 months. In a research perspective, we understand it as a data collection procedure. However, for children, it is more like an activity plan that they look for each week. The data collection procedure was intentionally designed as an activity cluster that happened within two months. There are two reasons for having this design. Firstly, it was easier to establish rapport with the young participants if the reserachers kept seeing them each week for two months. Secondly, researchers needed to make sure that each storytelling or story retelling activity are independent to the participants because different stories are used in the T1 and T2 story retelling activity. In the pilot study, some participants are asked to work with the T1 and T2 story retelling activities in two consecutive days or in a 3- day interval. Those participants tended to mix up the

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two stories that they listened to. We chose to work with the participants in a two- week interval in order to keep the rapport with them at the same time having their mind ‘cleared’ for the next story.

The diagram on the next page (fig. 2) shows the timeline of when, what and how did the ‘activity sessions’ happen.

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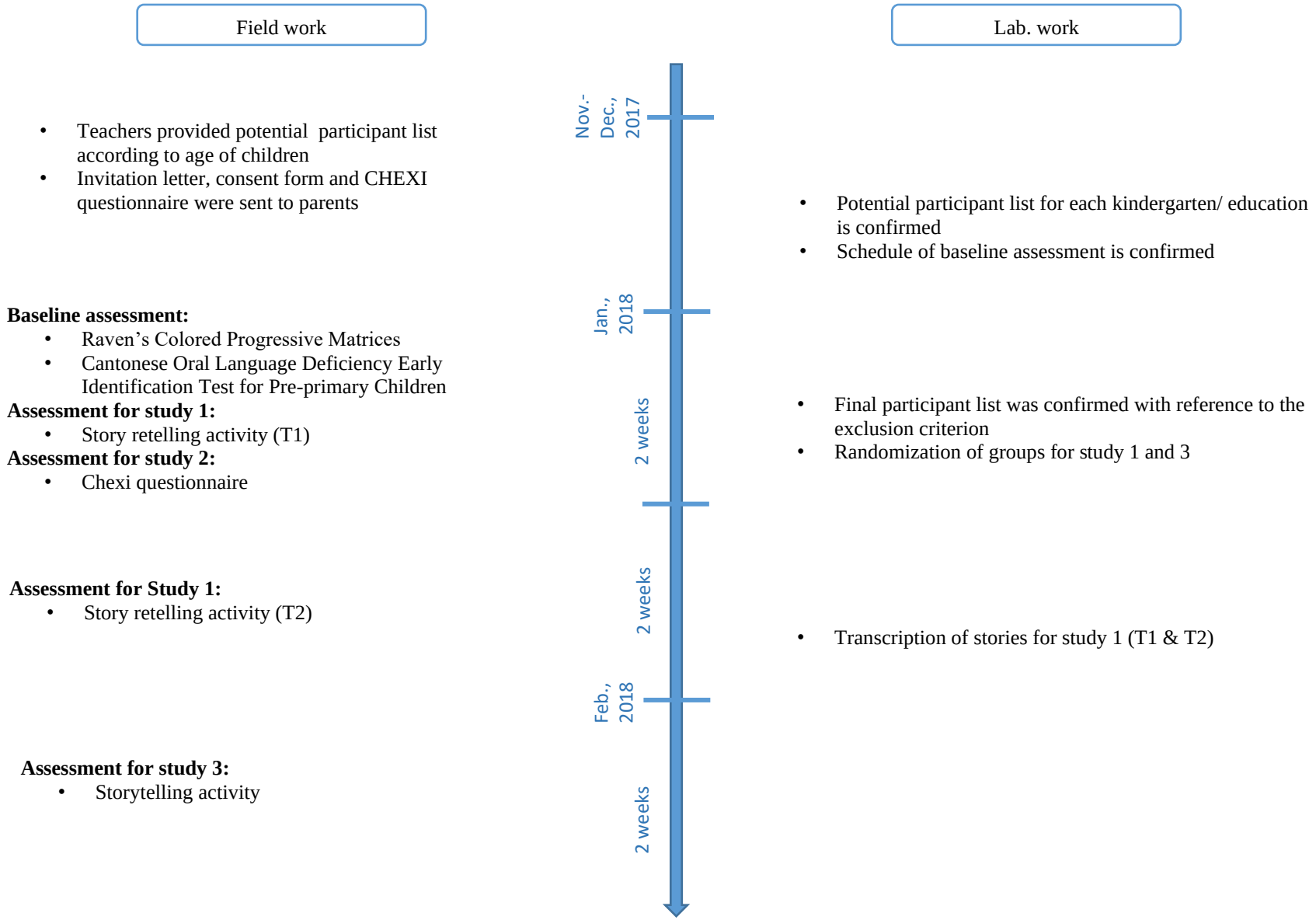

Figure 2 Timeline for the data collection procedure

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Chapter 2 Story retelling and its cognitive processes involved in three classroom activities (Study 1)

2.1 Introduction

Oral language in the first five years of a child's life is of great interest to many teachers and researchers. Through the thousands of vocabularies that children acquire in their early years, they start to build complexity in their oral language and know more than they ought to know through their daily experiences (Snow, Tabors, & Dickinson, 2001). Narrative development as an investigative focus in young children has emerged from the fields of speech-language pathology, developmental psychology and linguistics (To et al., 2010). Oral language is a foundation of emergent literacy (McIntyre & Hellsten, 2004) and a support for writing and reading skills in later learning stages (Curenton & Lucas, 2007; Myhill & Jones, 2009). Storytelling, as one of the most popular activities in preschools, is gaining attention in the field of narrative development. Palmer et al. (2001) described storytelling as a 'constructivist model for developing language and literacy', in which children expand their oral language and develop their literacy abilities through storytelling activities. Narrative not only reflects the pragmatic linguistic knowledge of young children but also their cognitive knowledge, meaning-making abilities and socialisation skills. Bruner (1986) explained that storytelling and narrative production involve a 'narrative mode of thought'. A story is not only made up of information or facts but also tacit knowledge about the specific life experience that the storyteller externalises to the narration.

2.1.1 Early development of oral language

Some scholars aligned with the ideas of Bruner (1986) that narrative production goes further than the organisation of information and facts. They used the term 'emergent literacy' to

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elaborate that narrative development should be considered a developmental continuum which originates from the birth of a child, instead of regarding primary school as the starting point of language acquisition (Teale & Sulzby, 1986; Lonigan et al., 2010; Piasta et al., 2018). Many of the emergent literacy models include a few competencies that are systematically interrelated to one another. These competencies include phonological awareness, writing competence and conventional reading skills, including the present project's focus of investigation, namely oral narrative competence (Scarborough, 2001; National Early Literacy Panel, 2008; Pinto et al., 2009). Oral narrative competence is defined as the ability to present a series of events in a coherent order (Engel, 1995; Hughes, McGillivray, & Schmidek, 1997; Ilgaz & Aksu-Koc, 2005). The coherent order of events is considered a story. From a developmental perspective, children of three to four years are capable of producing basic descriptions and arranging some action sequences (Bamberg, 1987). Children around five years old enrich their stories with a large amount of story grammar elements and constituents and can produce a long story plot (Damico & Ball, 2008).

2.1.2 Cognitive processes involved in storytelling and story retelling

Many children have storybook experiences in early schooling and at home. Two of the most common storybook experiences for children in preschool and kindergarten are storytelling and story retelling. Storytelling reflects the magnitude of linguistic and cognitive skills. Young children around the age of three to four years start to internalise environmental inputs. They combine these inputs with their existing linguistic resources in mind and develop their own narrations through externalisation. A story is considered a tool to help externalise tacit knowledge (Perret, Borges, & Santoro, 2004; Schilcher, 2009).

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Storytelling is a fundamental tool for young children to develop certain literacy and cognitive skills, for example, planning, self-regulating, organising and self-evaluating. Story retelling enhances children's development in four areas: oral comprehensive skills (Grmbrell & Dromsky, 2000; Simon, 2003; Dunst, Shimkus, & Hamby, 2012), expressive vocabulary (Grmbrell & Dromsky, 2000; Philips, 2000; Cain & Oakhill, 2006), creativity and imagination (Ellis, 1997; Isbell, 2002) and cognitive skills (Friedberg, 1994; Collins, 1999; Stadler & Ward, 2005).

Storytelling activity and studies about storytelling focus on language complexity and story comprehension skills. Numerous studies about reading and telling stories to young children have been carried out, but story retelling has received limited research attention. Story retelling goes beyond storytelling in the way that young children have the chance to interact with the original story by creatively adding their own experience and ways of problem-solving. They have a chance to revisit the original story, clarify the ideas and add new details from their own thinking (Isbell, 2002). Story retelling allows children to actualise their imagination and creativity as they transfer the original story plot to a new setting according to their own experience (Isbell, 2002). Beyond literacy skills, storytelling involves a promising amount of executive functioning skills. One has to connect concepts, understand cause-and-effect relationships and utilise the theory of mind to tell or retell a story (Stadler & Ward, 2005). Children have to execute certain mental tasks simultaneously or consecutively when translating a story into their own spoken language (To et al., 2010). Storytelling demands planning and organising of the story information and narrative schema, retrieving appropriate story grammar units and vocabularies to represent ideas, employing syntactic structures of their choice to wrap up the story and self-regulating and evaluating during the presentation process. Existing research focuses on the play–literacy interface (Roskos & Christie, 2001) in terms of language acquisition.

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2.1.3 Oral narrative competence and the discourse structure of narratives

Conceptually, a narrative includes macrostructural and microstructural elements (Justice, Bowles, Pence, & Gosse, 2010; Piasra et al., 2018). Macrostructural elements include the global features of the story, such as the setting, characters, initiating events and emotions that can be analysed via the story grammar approach to determine whether the storyteller is presenting coherent events around recognisable conventions (Griffin, Hemphill, Camp, & Wolf, 2004). By early school age, children already present a basic macrostructure in their narratives (Squires, Lugo-Neris, Pena, Bedore, Bohman, & Gillam, 2014).

Other than the macrostructural elements, assessing the micro-level properties of a narrative is also important for children. The microstructural level of a narrative consists of the measures of verbal productivity, semantic diversity and morphosyntax (Weserveld & Gillon, 2010). Justice et al. (2010) defined the microstructure of narrative as the way that words and sentences are linked through the usage of specific cohesive devices. Narratives produced by typically developing school-age children include several macrostructural elements (Squires et al., 2014), such as the character names, venue and setting as well as the initiating event of the story. Children increase the number of cohesive devices that they use from additive cohesive words to temporal cohesive words, then finally to causal cohesive words (Lahey, 1988).

Children cannot perform full competence in presenting narratives with an episodic structure (McCabe & Peterson, 1991; Berman & Slobin, 1994). Some children who reach the age of five are able to develop narratives with episodic properties. However, the performance across this age group is unstable with a few variables. Those variables include the method of elicitation, contextual differences and their personal experiences. The structure of their narratives fluctuates between pre-

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episodic and episodic categories (Ilgaz & Aksu-Koc, 2005). Until the age of six, children are capable of telling stories with clear causality (Peterson & McCabe, 1983). Their developing temporal-causal cohesion brings a structural complexity to their narratives, a complexity which increases with age as children start to incorporate episodic components to their narratives (Peterson & McCabe, 1983; Hudson & Shapiro, 1991).

Evidence of how children of different ages produce their narratives can be found in a few studies. In Reilly's (1992) study, two groups of children (aged 3–4 years old and 6–8 years old) were asked to retell a story after reading a picture book. Data showed differences in both story structure and story retelling performance. The older group retold the story in a complex way with a longer length than did the younger group. Another interesting finding from the study is that the younger group produced more affective words than the older group. Chang (2004) tracked the narrative competence of 16 Cantonese-speaking preschoolers through the telling of their daily life experience. The author coded the grammatical units that contain a predicate in each story the children told. Results showed that the number of narrative clauses increases between 42 and 48 months of age, peaks at 48 months of age and starts to decrease starting from 48 to 51 months of age. In addition, Sobel and Weisberg (2014) showed that three-year-old children generally have no concept of systematic responses when constructing their own stories. On the contrary, four-year-old children were found to be capable of presenting the stories in a more systematic way and with more internal coherence. The authors suggested that children as young as three years tend to have difficulties in understanding stories. Such difficulties lead to their random responses to the stories and, consequently, their unstructureed retelling of the stories. Children at approximately four years old understand the coherence of a story. When they need to retell a story or construct their own narratives, they present coherent events with the domain of knowledge they choose.

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2.2 Current study

Study 1 aims to identify the type(s) of play activities that are effective for enhancing the story retelling of five-year-old children. The three target classroom activities include written-based activity, semi-structured bricks play and free bricks play. The three target classroom activities are represented respectively by three groups in the study: worksheet (WS) group, brick set (BS) group and free bricks (FB) group. The two main research questions are as follows:

a. What are the effects of three classroom activities, namely written-based worksheets, semi-structured bricks play and free bricks play, on the story retelling performance of five-year-old children?
b. What are the differences of the story grammar structure in terms of microstructural and macrostructural narrative discourse of the retold stories by the three groups?

2.2.1 Effects of three play activities on story retelling performance

The prediction about story retelling performance in these three classroom activities was that children engaged in play activities are more capable of producing complex oral language with complex microstructural and macrostructural narrative discourse elements than those who only work on written-based activities. The prediction of the results is also based on evidence that play provides opportunities for children to develop verbal fluency and complexity by fostering them to connect separate events into structures with new meaning (Johnson, Christie, & Wardle, 2005). Under a play context, children have narrative recall and can elaborate stories with high levels of narrative structures (Kim, 1999; Roskos & Christie, 2001; Kendrick, 2005).

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Therefore, the main hypothesis for research question (a) is that the stories retold after play activities have a more complex narrative discourse structure than those retold immediately after listening to the original plot.

To test this hypothesis, a procedure was devised in which story retelling assessment was arranged at two time points. At time point 1 (T1), participants were asked to retell a story immediately after listening to it. At time point 2 (T2), participants were asked to listen to the story, participate in a classroom activity according to their assigned group and retell the story after the assigned activity. The narrative discourse element scores from T1 and T2 were compared among the three activity groups. Figure 2 shows the work flowchart for this procedure.

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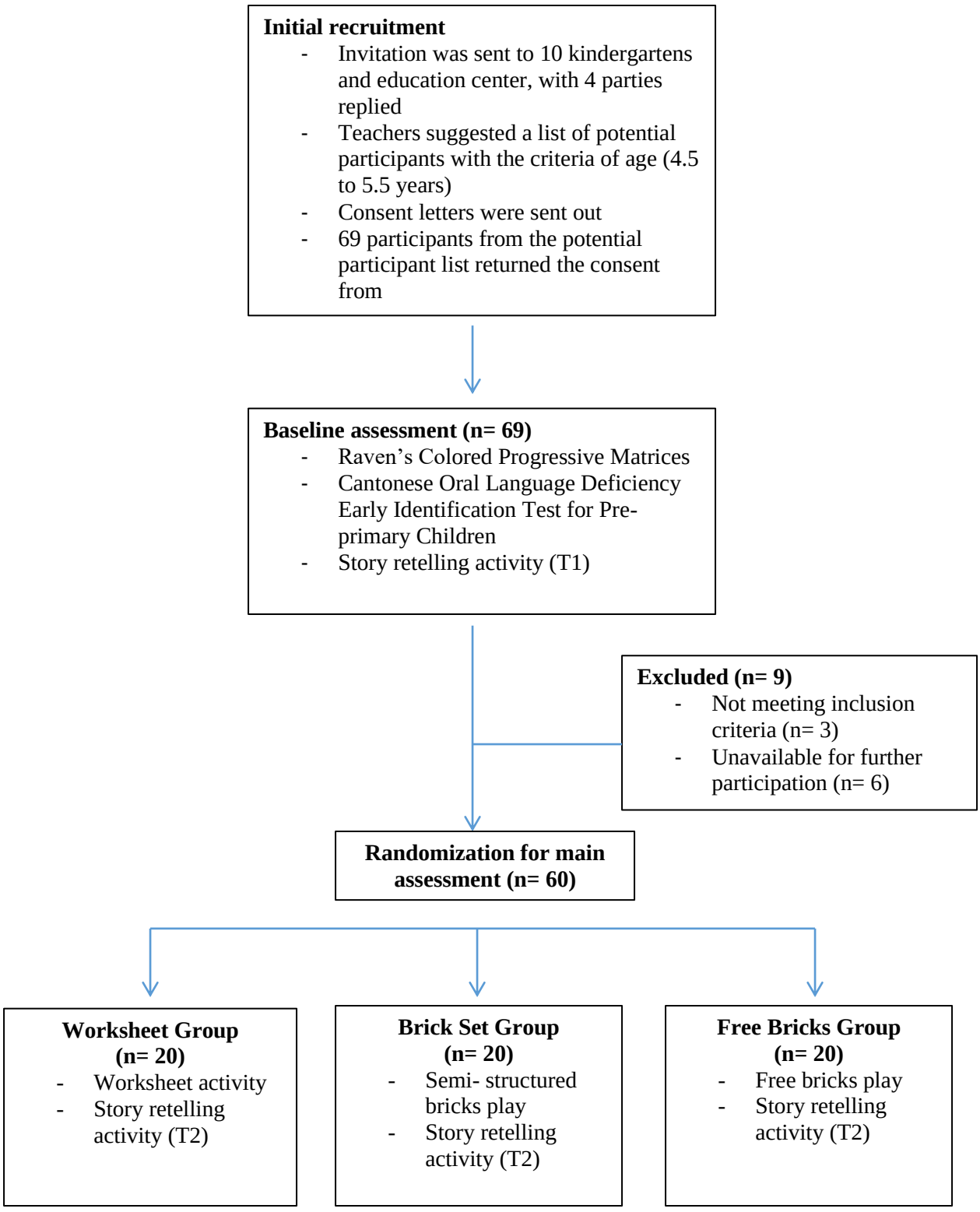

Figure 3 Work flowchart of study 1

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2.2.2 Differences in story grammar structure of the retold stories by the three groups

Stories retold by the FB group may contain more microstructural and macrostructural discourse elements than stories retold by the other two groups. The different nature of play activities may cause the children to retell stories of different complexity levels and matching contents with the original story plot. The two natures of the selected activities are written- and play-based. After engaging in the play-based classroom activities, the children showed a high narrative discourse element score in terms of the complexity and number of narrative discourse elements presented in the story. In activities other than play-based activities, participants exhibited a low narrative discourse element score in terms of the complexity and number of narrative discourse elements presented in the story. The prediction aligned with the test results by Kim (1999) that pretend play is significantly more effective than pictures for the recall of a complex narrative structure. Pretend play and hands-on experiences may have critical effects in facilitating narrative recall. Thereafter, no similar study was done to further justify the effect of different types of play on narrative recall.

Therefore, the main hypothesis for research question (b) is that children who engage in free play activity have the highest microstructural and macrostructural narrative discourse scores, followed by those who engage in semi-structured play activity. Children who engage in written-based activities have the lowest scores among the three groups.

To test this hypothesis, the stories retold at T2 were further analyzed in terms of the discourse element structure and complexity. Three scores were generated from each story: microstructural discourse element score, macrostructural discourse element score and total discourse element score. The scores were compared among the three activity groups to determine which activity had the strongest effect in story retelling performance.

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2.2.3 Method of data collection

2.2.3.1 Site Selection and Recruitment

The selection of data collection sites follows the convenience sampling method. The method relied on data collection from kindergartens and education centres that are conveniently available to participate in the study. Invitation letters were sent to 10 kindergartens and education centres in Kowloon, Hong Kong. These selected kindergartens and education centres have been actively involved in research projects. Three government-funded kindergartens and one private education centre located in the main urban areas replied for the availability of data collection. The three kindergartens are located in Tai Kok Tsui, Cheung Sha Wan and Tseung Kwan O. The private education centre is located in Kowloon City. The three kindergartens serve children from three to six year olds in the neighbourhood on a day-to-day basis. The private education centre serves kindergarten and primary school students on an extracurricular activity basis. Students of the education centre attend classes weekly, twice or three times a week.

2.2.1.2 Ethical Review Procedures

The Faculty Human Research Ethics Committee from the Education University of Hong Kong approved an ethical review application (Ref. no. 2017-2018-0065) before the data collection procedure commenced. The application included two consent letters, one for the kindergarten/education centre principal and another for the guardians of the participants. A hardcopy of the consent letters for the principals was sent to the principals along with an information sheet. The principals approved the data collection at their kindergarten/education centre by returning the signed hardcopy for record-keeping. Hardcopies of the consent letter,

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information sheet and baseline assessment questionnaire were sent out to the guardians of the target participants. Data collection started after the consent letters from the guardians were collected.

2.2.1.3 Data Security

All data, including the signed consent forms, baseline measurement questionnaires, assessment results and video clips of storytelling and retelling activities, could only be accessed by the chief investigator and one research assistant of the study. All softcopy data were saved in a computer with password protection, and hardcopy data were stored in a locked file cabinet. After helping with the transcription, the research assistant deleted all the files on her computer to ensure confidentiality for all participants.

2.3 Method

2.3.1 Participants

The participant selection criteria of the study were age and general cognitive ability as measured by Raven's Colored Progressive Matrices (Raven, Raven, & Court, 2000). Recruited participants with the total assessment score two standard deviations away from the mean score were excluded for data collection. Target participants of the study were kindergarten students aged between 4.5 and 5.5 years old, with Cantonese as their first language. With the help of class teachers, students within the target age range received the consent form, information sheet and questionnaire about executive functioning for their guardian. The main caregivers of the target participants were asked to fill in a questionnaire. The questionnaire included 10 questions about the basic information of the participants and the socioeconomic status (SES) of the participant's

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family. The Chinese version of the Childhood Executive Functioning Inventory (CHEXI) questionnaire was distributed to the target participants along with the questionnaire.

Students with the consent form signed and returned were included in the list of target participants. A total of 69 target participants were recruited for the study and finished the pre-assessment. Six target participants withdrew after the baseline assessment owing to their parents' inability to spare time to participate in another hour of data collection. Three participants could not meet the inclusion criteria of the participant selection. Sixty participants were randomised for the second part of the data collection process. They were given a numeric code from 1 to 60. The 60 codes were randomised by the RAND function in Microsoft Excel into three groups: WS group, BS group and FB group. A total of 20 participants were each allocated to the WS, BS and FB groups. The 60 participants finished the second phase of the data collection procedure, and the data set from the 60 participants were prepared for data analysis.

2.3.1.1 Inclusion criteria of participants

Sixty-three participants finished the pre-assessment, which included Raven's Colored Progressive Matrices and Cantonese Oral Language Deficiency Early Identification Test for Pre-primary Children (學前兒童粵語表達能力識別測驗) (PLK) (Hong Kong Po Leung Kuk District-based Speech Therapy Service Unit, 2012). Recruited participants with a total assessment score two standard deviations away from the mean were excluded for data collection. The raw score of Raven's Colored Progressive Matrices determined the inclusion criterion of participants. Participants with a raw Raven's score that fell in two standard deviations away from the mean score were able to progress to the main assessment. Of the target participants, 3 out of 63 were excluded.

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2.3.1.3 Demographics of participants

Sixty children (35 male, 25 female) participated in the main assessment. Table 1 lists the distribution of gender in each group. The mean age of the participants was 61.2 months, which is equivalent to approximately five years and one month old. The mean age in each of the three groups are evenly distributed at 62.45, 60.65 and 60.40 months in the WS, BS and FB groups, respectively. The mean Raven score of the 60 subjects was 18.33. All subjects were from middle- to low-income families. The range of their parents' education level falls between high school and undergraduate study.

Table 1 Distribution of gender in groups

Group	Male		Female	
	n	%	*n*	%
Worksheet Group	12	34.3	8	32.0
Brick Set Group	13	37.1	7	28.0
Free Bricks Group	10	28.6	10	40.0
Total	35	100.0	25	100.0

*Figures are rounded up to one decimal place.

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Table 2 Demographic characteristics of the sample (n = 60)

Variables	*n*	Percentage (%)	*M* (SD)
Age in months			
54–56	9	15.00	
57–59	10	16.67	
60–62	14	23.33	
63–65	24	40.00	
>65	3	5.00	
Total	60	100.00	61.17 (3.70)
Gender			
Male	35	58.33	
Female	25	41.67	
Total	60	100.00	
Family income range (in HK$)			
<10,000	5	8.33	
10,000–14,999	5	8.33	
15,000–19,999	16	26.67	
20,000–24,999	10	16.67	
25,000–29,999	5	8.33	
30,000–24,999	2	3.33	
25,000–29,999	17	28.33	
30,000–24,999	0	0	
>35,000	0	0	
Total	60	100.00	
No. of family members			
2	2	3.33	
3	16	26.67	
4	27	45.00	
5	14	23.33	
>5	1	1.67	
Total	60	100.00	
Father's education level			
Primary	1	1.67	
Secondary	37	61.67	
Undergraduate	16	26.67	
Postgraduate	6	10.00	
Total	60	100.00	
Mother's education level			
Primary	3	5.00	
Secondary	38	63.33	
Undergraduate	16	26.67	
Postgraduate	3	5.00	
Total	60	100.00	
Raven's score			
0–5	0	0	

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6–11	5	8.33	
12–17	20	33.33	
18–23	25	41.67	
24–29	9	15.00	
30–36	1	1.67	
Total	60	100.00	18.33 (5.19)

*Numbers are rounded up to two decimal places.

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Table 3 Age, gender and Raven's score distribution in groups

Variables	*n*	Percentage (%)	*M* (SD)
Worksheet group			
Age in months			
54–56	2	10	
57–59	1	5	
60–62	4	20	
63–65	12	60	
>65	1	5	
Total	20	100	62.45 (3.49)
Gender			
Male	11	55	
Female	9	45	
Total	20	100	
Raven's score			
0–5	0	0	
6–11	2	10	
12–17	8	40	
18–23	8	40	
24–29	2	10	
30–36	0	0	
Total	20	100	17.25 (5.49)
Brick Set Group			
Age in months			
54–56	4	20	
57–59	3	15	
60–62	5	25	
63–65	8	40	
>65	0	0	
Total	20	100	60.65 (3.53)
Gender			
Male	13	65	
Female	7	35	
Total	20	100	
Raven's score			
0–5	0	0	
6–11	2	10	
12–17	6	30	
18–23	8	40	
24–29	3	15	
30–36	1	5	
Total	20	100	19.25 (5.47)
Free Bricks Group			

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Age in months			
54–56	3	15	
57–59	6	30	
60–62	5	25	
63–65	4	20	
>65	2	10	
Total	20	100	60.4 (3.91)
Gender			
Male	10	50	
Female	10	50	
Total	20	100	
Raven's score			
0–5	0	0	
6–11	1	5	
12–17	6	30	
18–23	9	45	
24–29	4	20	
30–36	0	0	
Total	20	100	18.5 (4.63)

*Numbers are rounded up to two decimal places.

2.3.2 Procedure

Data collection in this study included two parts. The first part was the baseline assessment, the second part was the main assessment. The two parts were administered in two separate data collection sessions with the participants, and the time period between the two assessment sessions was two weeks. The data collection sessions took place in a quiet room in the kindergarten or the education centre to ensure that participants were familiar with their room. The principal researcher of the project and one research assistant were responsible for the data collection. Only one participant at a time was brought to the data collection room to minimise distraction during data collection. When the participant has finished, the researcher assistant would send him/her back to the classroom and another participant would be brought into the room. The data collection sessions

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took place during school hours. All data collection procedures were conducted in Cantonese, including the instructions from the reserachers and the responses from the participants.

2.3.2.1 Baseline Assessment

Two baseline assessment tests and one storytelling activity were included in the first part of data collection. Enrolled participants went through two baseline assessment tests: Raven's Colored Progressive Matrices and PLK (Hong Kong Po Leung Kuk District-based Speech Therapy Service Unit, 2012). Details of the baseline assessment tests are discussed in Section 2.3.3 Instruments and materials for data collection.

After the two baseline assessment tests, the experimenters guided the participant to finish a story retelling activity. The participant watched a 2.5-minute-long short story named 'Finding Mommy' on a tablet computer and was then asked to retell the story to the experimenters immediately. Additional details about the story the participants watched are discussed in Section 2.3.3 Instruments and materials for data collection. The story retelling activity was video recorded with a mini camera hand-held by the experimenters, who gained consent from the parents and the kindergarten principals. The usage of a tripod or an unassisted video camera was avoided as cameras would impose a feeling of surveillance for the participants (Ratcliff, 2007). Participants were given no time limit for the story retelling activity.

The baseline assessment session for each participant took approximately 35 to 45 minutes, depending on the speed of finishing the baseline assessment tests and the length of the retold story.

2.3.2.2 Main Assessment

The second part of data collection took place two weeks after the first part of data collection. Researchers returned to the data collection sites, and the session took place in the same room as in

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the first part of data collection. One story retelling activity and one open-ended storytelling activity were included in the main assessment.

In the story retelling activity, participants were required to watch the story 'Catch That Star' on the tablet computer (the story script can be found in Appendix B). The story was 2 minutes and 30 seconds long, the same length as the story from the baseline assessment. After watching the story, participants were guided to finish an experimental activity according to their grouping. Details of the experimental activities are discussed further in Section 2.3.3.1 Three experimental activities. According to the pilot study, 15 minutes is the most appropriate time period for the participants to work with the activities. Experiemental acitivties with different time period were tested in the pilot study. Three participants in each group (a total of nine) were asked to work on the experimental activities for different time period: 10 minutes, 15 minutes and 20 minutes. Reseracheres observed the participants' responses when they were told to stop working on the activities. When participants from the three groups were asked to stop at 10 minutes, they all showed reluctancy to stop because of not finishing the task; participants involved in the 20- minute time period showed some signs of boredom and lost of concentration in the last 5 minutes. Those signs included not moving anymore, looking at other parts of the room, putting down the materials and stared at them, etc.; on the other hand, participants in the 15- minute group responsed positively when they are told to stop. They tended to be statisfied with their work. They did not ask for more time to finish the activities, and every minute was occupied. Hence in the present study, it was decided that 15 minutes was an appropriate timeslot for each participant to finish the experimental activity before retelling the story to the experimenters.

Similar to what was administered in the baseline assessment session, the retold story was video recorded using a hand-held mini camera.

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The main assessment session for each participant took approximately 25 to 35 minutes, depending on the length of the story each participant told and retold.

2.3.3 Instruments and materials for data collection

2.3.3.1 Three experimental activities

In the main assessment, participants were randomised into three groups: WS, BS and FB groups. Each group represents one type of classroom activity: WS group represents black-and-white preschool classroom activity, BS group represents structured play activity with adult instructions and FB group represents free play activity without adult instructions. The content of each group are discussed in the following.

Worksheet Group. Participants from this group were given a set of worksheets with six pages (Appendix A) and a box of coloured pencils after watching the story from the tablet computer in the main assessment. Activities in the worksheet set have three parts.

(a) Colouring and sequencing activity - Eight pictures from the story 'Catch That Star' were shown in random order. Participants were asked to number the pictures in sequence according to the content of the story. They were also told to colour the pictures.

(b) Finding the character activity - A total of 24 brick characters were shown on the worksheet. Six of the brick characters were identical to the characters in the story. Participants were guided by the researcher to spot the six brick characters and circle them.

(c) Matching activity - Three of the characters in the story have tools. The three characters and their tools were shown on a page of the worksheet. Participants were asked to draw lines to connect the characters with their tools.

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The researcher described each activity in the worksheet set to the participant. The participant was then asked to work on the worksheet set on his/her own for 15 minutes. The worksheet activity in this group represents the written-based activity in the kindergarten classroom.

Brick Set Group. Participants from this group received a set of bricks and a mat after watching the story on the tablet computer. Figure 2 shows the content of the brick set. The researcher described each Lego character and object to the participant. The participant was then given 15 minutes to play with the brick set. The bricks play activity in this group represents semi-structured play because an adult's instructions were involved.

Figure 4 Materials included in the brick set for the Brick Set Group, including all settings and characters mentioned in the story

Free Bricks Group. Participants from this group received a box of free bricks and a mat after watching the story on the tablet computer. Figure 4 shows the content of the free bricks box.

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The researcher did not give any instruction or description to the participants but asked them to play with the set for 15 minutes.

The free bricks activity in this group represents free play because no instruction and introduction were given to the children. The participants make all of the decisions, for example, how to play, what bricks to choose and what models to build.

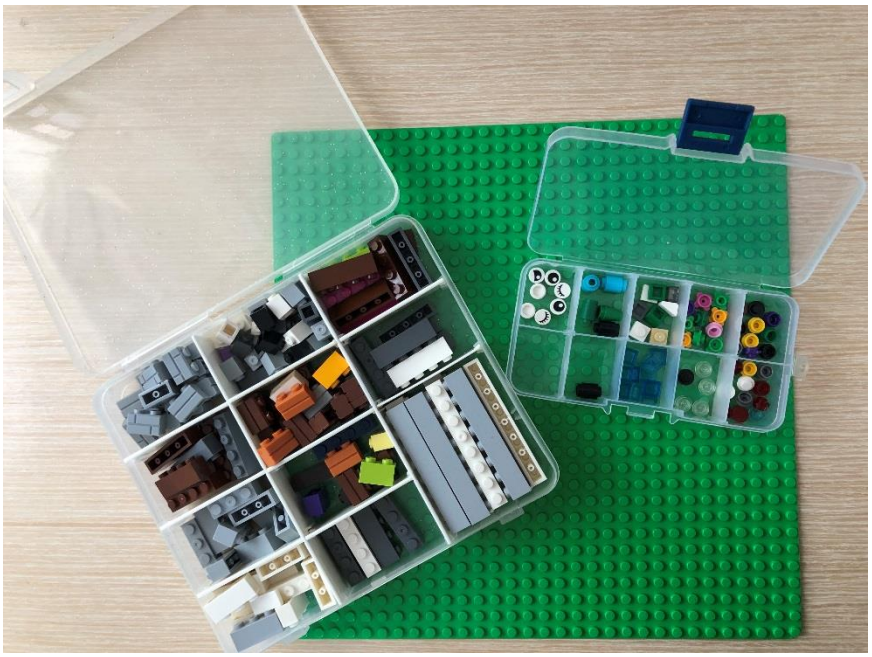

Figure 5 Materials included for the Free Bricks Group, including free bricks of different colours, sizes and orientations

2.3.3.2 Instruments and materials for baseline assessment

Two baseline assessment tests were administered before and during the first part of data collection: PLK and Raven's Colored Progressive Matrices (Raven, Raven, & Court, 2000).

Cantonese Oral Language Deficiency Early Identification Test for Pre-primary Children. The PLK is a test developed by the Hong Kong Po Leung Kuk speech therapist team. The test was selected as part of the pre-assessment owing to its high concurrent validity (compared with the Reynell Development Language Scale II) calculated by the Pearson product-moment coefficient

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($r = .76$, $p < .01$). Furthermore, its high internal consistency reliability with a high score ($r = .935$) was calculated using the Kuder–Richardson 20 (KR-20) coefficient.

The objective of administering the assessment for the PLK was to ensure the ability of enrolled participants in the following:

- Understanding basic classroom instructions
- Understanding and expressing the meaning of receptive vocabularies (at the participants' schooling level)
- Understanding and expressing different basic shapes at the kindergarten level (e.g. circle, triangle, square, star, heart, rectangle, etc.)
- Understanding and expressing different prepositions at the kindergarten level (e.g. on, next to, below, behind, etc.)
- Recognising and expressing basic emotions at the kindergarten level (e.g. sad, happy, excited, disappointed, satisfying, etc.)
- Understanding and expressing basic action words at the kindergarten level (e.g. running, jumping, crying, clapping, watching, etc.)
- Understanding and expressing difference sentence structures (i.e. active voice, passive voice, double-object statement and relative clause)
- Understanding and expressing the sequence and relative clauses of a short story

During the test, participants were required to look at 47 coloured pictures and answer the questions asked by the researcher. The questions were standardised, and correct and incorrect answers were listed on the back of the assessment booklet. Researchers followed the instructions on the back of the assessment booklet during the assessment and scored the answers on a

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dichotomous basis: correct or incorrect. A correct answer was scored one, while an incorrect answer was scored zero. The total raw score of the test of each participant was used for data analysis.

Raven's Colored Progressive Matrices (Raven, J. C., 2011). The second test selected for the pre-assessment is Raven's Colored Progressive Matrices. Participants were required to respond nonverbally to 36 problems. The format was designed to measure the participants' reasoning ability and the meaning-making component of Spearman's g, which is referred to as general intelligence (Raven, 1936). Participants were asked to use their fingers to point out the answer to each problem, and researchers marked their answers on the answer sheet. The total raw score of each participant in the test was used for data analysis.

Both tests were administered on a one-on-one basis, with one researcher administering to one participant. The two baseline assessment tests served to assess the inclusion criteria of the participants.

Other than the two pre-assessment tests, participants were required to finish one story-retelling task during the first part of data collection. The story titled 'Finding Mommy' was designed and hand-drawn by the principal researcher. The story contains six characters and three problem-solving scenes with a complete opening and ending. In addition, it is presented with nine colourful pictures including the cover. The nine pictures were processed into a movie that last for 2.5 minutes and has a voiceover. Each participant was invited to watch the movie on a tablet computer and then retell the story to the researcher.

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2.3.3.3 Instruments and materials for the main assessment

In the second part of the data collection, participants watched another story. The story, titled 'Catch That Star', has the same structure as the story of 'Finding Mommy' from the baseline assessment. The scripts of the stories can be found in Appendix F. The story also contains six characters and three problem-solving scenes with a complete opening and ending. In addition, it is presented to the participants in nine hand-drawn pictures on the tablet computer. The same structure of the two stories ensures the internal reliability of the data collection materials. Participants were asked to work out an open-ended storytelling task immediately after the story retelling task. In the open-ended storytelling task, the researcher introduced the topic 'Birthday Party' to the participants and they told a story. The topic 'Birthday Party' was selected because all of the participants had participated in a birthday party in real life. All the participants may have had a certain experience in a birthday party that will contribute to the open-ended storytelling task. Participants could use the worksheet or the bricks model they built to assist their storytelling, but using any of the previous materials was not required.

2.3.3.4 Training of the research assistant

One research assistant was recruited for the data collection of the project. The selection criteria of the research assistant included the following: (a) able to work well with young children and (b) familiar with experimental research settings. Two female research assistants were recruited based on the above two criteria. One of the assistants holds a master degree in educational speech-language pathology and learning disabilities. She has extensive experience in assessing children's language abilities and using the assessment tools for the current project. Another assistant is a part-time research assistant from the Department of Early Childhood Education at the Education

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University of Hong Kong. She is experienced in data collection with young children. The assistants were briefed and trained by the principal researcher of the project before fieldwork.

Firstly, materials and data collection procedures were introduced to the assistant, including the activities for the three groups, the assessment tools and the flow of data collection. The assistant received the assessment manual and instruction booklets of the two baseline assessment tests: PLK and Raven's Colored Progressive Matrices. The assistant was given one week to familiarise herself with the instructions. After a week, the principal researcher practised the administration of the two baseline assessment tests with the assistant via role-play. The principal researcher pretended to be the participant and the assistant administered the two tests to her. The principal researcher then gave comments on the assistant's performance. In the briefing session, the principal researcher also showed the two story videos to the assistant. The objective was to ensure the assistant was familiar with the story scripts and the operation of the video software before the fieldwork started.

For the three group activities, the research assistant was shown the assessment materials, including the worksheets, brick set, free bricks and settings. The assistant had to be familiar with the instructions on the worksheets to explain the tasks to the participants during data collection. The principal researcher also introduced each Lego character to the assistant and related them to the story script. For the three different group acrivities, researchers followed the verbal instructions protocol (Table 4 and 5) strictly in order to control the verbal input received by the participants. For instance, reserachers read out the verbal instructions that are printed on the worksheet to the participants; in the Brick Set Group, reserachers introduced the bricks elements from the brick set to the participants; for the Free Bricks Group, reserachers just gave short introduction of the activity and were strictly forbidden to give any verbal instructions or words during the acrtivity time. The different conditions and detailed verbal instructions are shown in the protocol.

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Interaction between the researcher and the participants during storytelling and retelling activities was suggested to be minimal. Too many guiding words and sentences from the researcher could affect the story telling/retelling performance and the reliability of the assessment. For example, the research assistant was not supposed to mention any of the storylines and contents as a guide for the participants. A list of guiding words and sentences (Tables 6 and 7) was presented to the research assistant. The aim was to clarify the use of guiding words that could be spoken to the participants during story telling/retelling activities. The list also provided possible questions that the participants may ask during the activities.

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Table 4 Verbal instructions protocol for researchers (Cantonese version)

Group	**Instructions for researchers**	**Examples**
Worksheet Group	- Introduce the worksheet by reading out the instructions printed on each part and tell him/her that he/ she will have 15 minutes to work on the activity - You may ask the participant's preference of the sequence for working on the worksheet. He/ she is allowed to choose which part to work with first - If the participant ask any question about the worksheet, you can answer him/ her, but make sure that you do not help him/ her to do the activity. Try to encourage him/ her to work on himself/ herself, with a gentle tone - Remind the participant 5 minutes before the activity ends	- "你可以順序做工作紙上面嘅活動，或者自己揀做邊個先都得。" - "你可以油顏色先。" - "你可以最後先油顏色都得㗎。" - "你想唔想自己試吓做？" - "你記唔記得故事入面嗰隻熊仔攞住啲乜嘢㗎 ？" - "你可以玩多 5 分鐘，然後我哋就要收拾啦。"
Brick Set Group	- Introduce each bricks element in the brick set to the participant - Tell the participant that he/ she can play around with all the bricks elements in the set in whatever ways for 15 minutes - If the participant ask you question about the bricks during the activity, encourage him/ her to work on himself/ herself with a gentle tone. Do not add any personal opinion on the participant's activity - Remind the participant 5 minutes before the activity ends	- "呢隻係熊仔、呢個係太空人、呢個係獵人張床…" - "你可以用呢啲角色黎玩乜都得㗎。" - "你覺得佢哋做緊乜嘢？你可以將佢哋擺喺任何地方都可以㗎。

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		- “你可以玩多5分鐘，然後我哋就要收拾啦。”
Free Bricks Group	- Tell the participant that he/ she can play around with all of the bricks for 15 minutes - Remind the participants that he/ she has full control over the activity. He/ she can decide everything. Do not add any personal opinion on the participant’s activity - Remind the participant 5 minutes before the activity ends	- “所有積木你都可以玩㗎，你想點玩都得。” - “你可以自己決定架，呢個係你自己嘅積木模型。” -

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Table 5 Verbal instructions protocol for reserachers (English version)

Group	**Instructions for researchers**	**Examples**
Worksheet Group	- Introduce the worksheet by reading out the instructions printed on each part and tell him/her that he/ she will have 15 minutes to work on the activity - You may ask the participant's preference of the sequence for working on the worksheet. He/ she is allowed to choose which part to work with first - If the participant ask any question about the worksheet, you can answer him/ her, but make sure that you do not help him/ her to do the activity. Try to encourage him/ her to work on himself/ herself, with a gentle tone - Remind the participant 5 minutes before the activity ends	- "You can work on the worksheet activities in sequence or according to your preference." - "You can color the pictures first." - "You can leave the coloring at the end and finish the other activities first." - "Do you want to try it again by yourself?" - "Do you remember what the bear holds in the story?" - "You can play for 5 more minutes, then we need to tidy up."
Brick Set Group	- Introduce each bricks element in the brick set to the participant - Tell the participant that he/ she can play around with all the bricks elements in the set in whatever ways for 15 minutes - If the participant ask you question about the bricks during the activity, encourage him/ her to work on himself/ herself with a gentle tone. Do not add any personal opinion on the participant's activity - Remind the participant 5 minutes before the activity ends	- "This is the bear (holding the bear), this is the astronanut (holding the astronanut), this is the hunter's bed (holding the bed), etc. …" - "You can play around with these characters in whatever way you like." - "What do you think they are doing? You can put them anywhere you like." - "You can play for 5 more minutes, then we need to tidy up."

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Free Bricks Group	- Tell the participant that he/ she can play around with all of the bricks for 15 minutes - Whenever the participant asks anything, remind him/ her that he/ she has full control over the activity. He/ she can decide everything. Do not add any personal opinion on the participant's activity - Remind the participant 5 minutes before the activity ends	- "All the bricks belong to you in this 15 minutes. You can play with them in whatever ways you like." - "You can decide everything by yourself. This is your bricks model." - "You can play for 5 more minutes, then we need to tidy up."

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Table 6 List of words/sentences for researchers' guiding use in storytelling and retelling activities (Cantonese version)

Purpose of the guiding words/sentences	**Words/ sentences that CAN be said to participants**	**Words/ sentences that CANNOT be said to participants**
Participant is unable to start the story	• “一開始係點架？” • “記唔記得？” • “你諗多陣” • “記唔記得故事點開始？”	• Any detail of the story, e.g. characters, locations, actions • Example 1 “一開始呢，隻青蛙仔就…” (hint of character) • Example 2”一開始隻青蛙點啊？”(hint of character)
Participant forgets details halfway	• “記唔記得？” • “跟住點？/之後點？” • “你諗多陣”	• Any detail of the story, e.g. characters, locations, actions • Example 1”隻青蛙之後去左搵…” (hint of action) • Example 2”隻青蛙咪去左公園既，之後點？”(hint of location)
Participant asks questions about the story	• “你自己諗下” • “我都唔知啊” • “我俾少少時間你諗”	• They cannot answer the participant’s questions about any detail of the story, e.g. characters, locations, actions

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Table 7 List of words/sentences for researchers' guiding use in storytelling and retelling activities (English version)

Purpose of the guiding words/ sentences	**Words/sentences that CAN be said to participants**	**Words/sentences that CANNOT be said to participants**
Participant is unable to start the story	• "What happened in the beginning?" • "Do you remember?" • "Take your time." • "Do you remember how it started?"	• Any detail of the story, e.g. characters, locations, actions • Example 1: "From the beginning, the frog…" (hint of character) • Example 2: "What happened to the frog at the beginning?" (hint of character)
Participant forgets details halfway	• "Do you remember?" • "Then? / What's next?" • "Take your time to think about it."	• Any detail of the story, e.g. characters, locations, actions • Example 1: "The frog found…" (hint of action) • Example 2: "What happened to the frog when he went to the park?" (hint of location)
Participant asks questions about the story	• "Try to figure it out by yourself." • "I don't know, either." • "I'll give you more time to think about it. "	• They cannot answer the participant's questions about any detail of the story, e.g. characters, locations, actions

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2.3.4 Data analysis instruments and procedures

In the following chapter, the data analysis method, procedures, instruments and results of the study are discussed.

2.3.4.1 Data analysis instruments

The narrative discourse elements of the retold stories were assessed by two selected instruments. The first assessment instrument is the Narrative Assessment Profile (NAP) (Bliss, McCabe, & Miranda, 1998). The NAP is a comprehensive assessment framework for both children and adults, and it enables clinicians and researchers to assess a diverse pattern of narrative discourse in one approach (Biddle, McCabe, & Bliss, 1996; Miranda, 1995). The NAP can be used as a framework for planning intervention. It is flexible for both normally developing children and children with discourse impairment. The six elements in the NAP were fully adopted to assess the microstructural elements of narration. The six elements include topic maintenance, event sequencing, explicitness, referencing, conjunctive cohesion and fluency.

The Index of Narrative Complexity (INC) (Peterson et al., 2008) was adopted for the assessment of macrostructural elements of narration. The INC is proposed to assess the narrative development of children and individuals with language disorders (Harmon, 2015), and the evaluation of the INC assessment tool suggests that the assessment is consistent with the Test of Narrative Language (Gillam & Pearson, 2004). The INC covers a comprehensive scope of 13 discourse elements essential for assessing the story grammar units of narrations. The 13 discourse elements are character, setting, initiating events, internal response, plan, action/attempt, complication, consequence, formulaic markers, temporal markers, causal adverbial clauses, knowledge of dialogue and narrator evaluations.

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A rating rubric (Appendix B) based on the NAP and the INC was drafted for the microstructural and macrostructural discourse elements, and a score sheet was used for rating each story retelling script (Appendix D).

2.3.4.2 Data Analysis

The story retelling tasks were videotaped during data collection and later transcribed by a research assistant. In Study 1, the 60 story transcripts from the main assessment and 60 story transcripts from the baseline assessment were rated on the basis of the narrative discourse element scale. Each story received three scores: microstructural score, macrostructural score and total narrative discourse element score. Each transcript was rated twice by the principal investigator and a trained research assistant to maintain inter-rater reliability.

Statistical analysis was run to understand the effect of the three classroom activities on story retelling performance and the difference of narrative discourse element scores among the three groups measured at T2. Analysis of variance test (ANOVA) and multiple comparison tests were conducted to address the research questions by analysing the group differences of the story retelling performance and the interaction effect.

2.4 Results

2.4.1 Research Question (a) - The effect of experimental activities on story retelling performance

A 3 × 2 mixed-design ANOVA was conducted to compare the effect of the three experimental activities at two time points of the story retelling task, with the total discourse element score of story retelling as the dependent variable, grouping as the independent variable and the time point X grouping as the interaction term.

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At T1, no experimental activity was administered before the story retelling task, whereas at T2, three different experimental activities were conducted according to the grouping of the participants before the story retelling task. The association of the story to be retold and the activity content of the two time points are presented in Table 6.

Table 8 Description of activities at two time points

	Assessment period	Story	Experimental activity
T1	Baseline assessment	Finding Mommy	No
T2	Main assessment	Catch That Star	Yes

The results revealed a significant interaction effect between the experimental activities and time with F (2, 57) = 6.615, $p < .01$, suggesting that the effect of experimental activities was significant for the story retelling performance of participants in time points 1 and 2. In other words, the within-subject difference of story retelling performance during story retelling activity without and with experimental activity is significant.

Figures 3 to 5 present a clear comparison of the total narrative score, microstructural score and macrostructural score of the two time points. Figure 3 shows the mean total score of narrative discourse elements of the three activity groups, and Figs. 4 and 5 show the mean score of microstructural and macrostructural discourse elements of the three activity groups. The three figures follow the same trend: sharp mean score increase for the BS group, slight mean score increase or slight mean score decrease for the FB group and sharp mean score decrease for the WS group. Further statistics of the mean scores are listed in Table 7, and the error bars of the mean scores are shown in Figs. 8 to 10.

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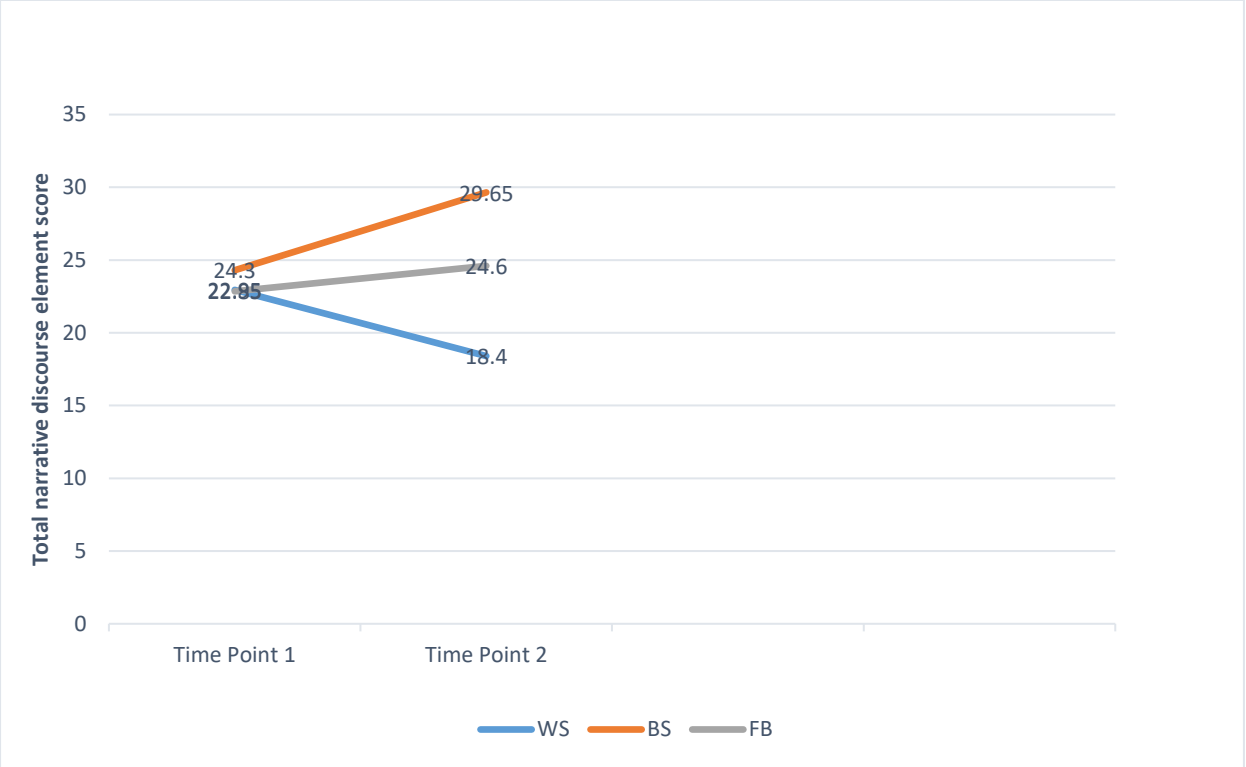

Figure 6 Total narrative discourse element score at two time points

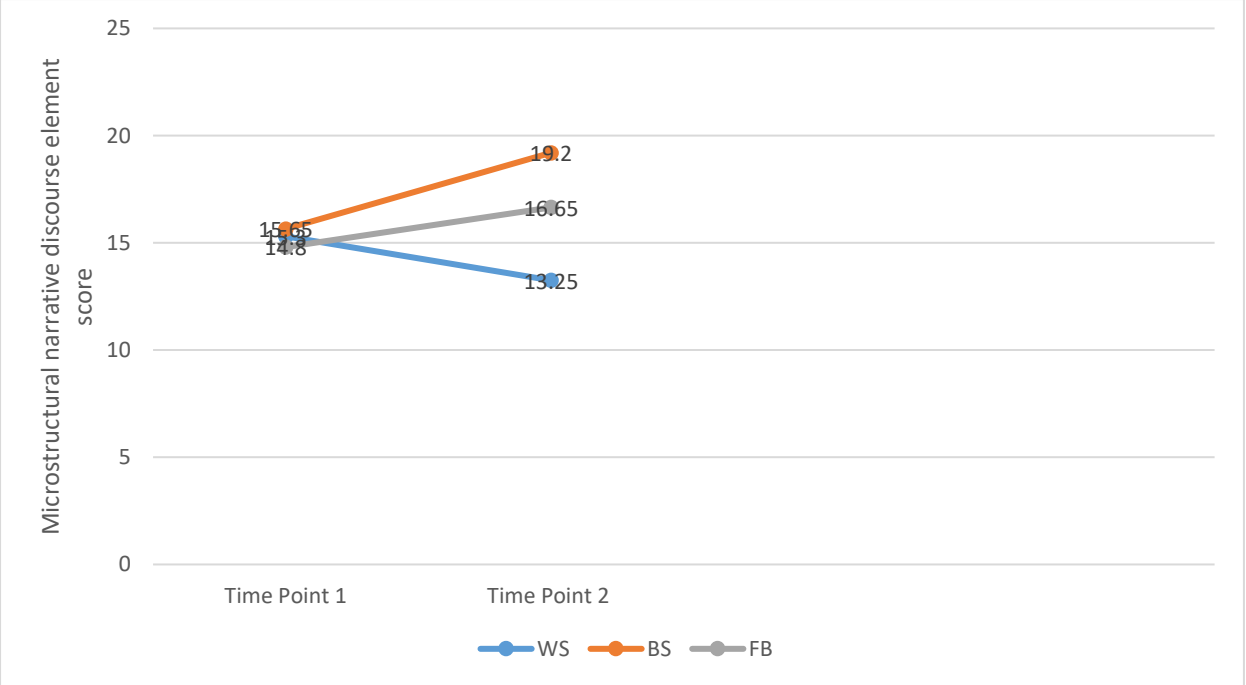

Figure 7 Microstructural narrative discourse element score at two time points

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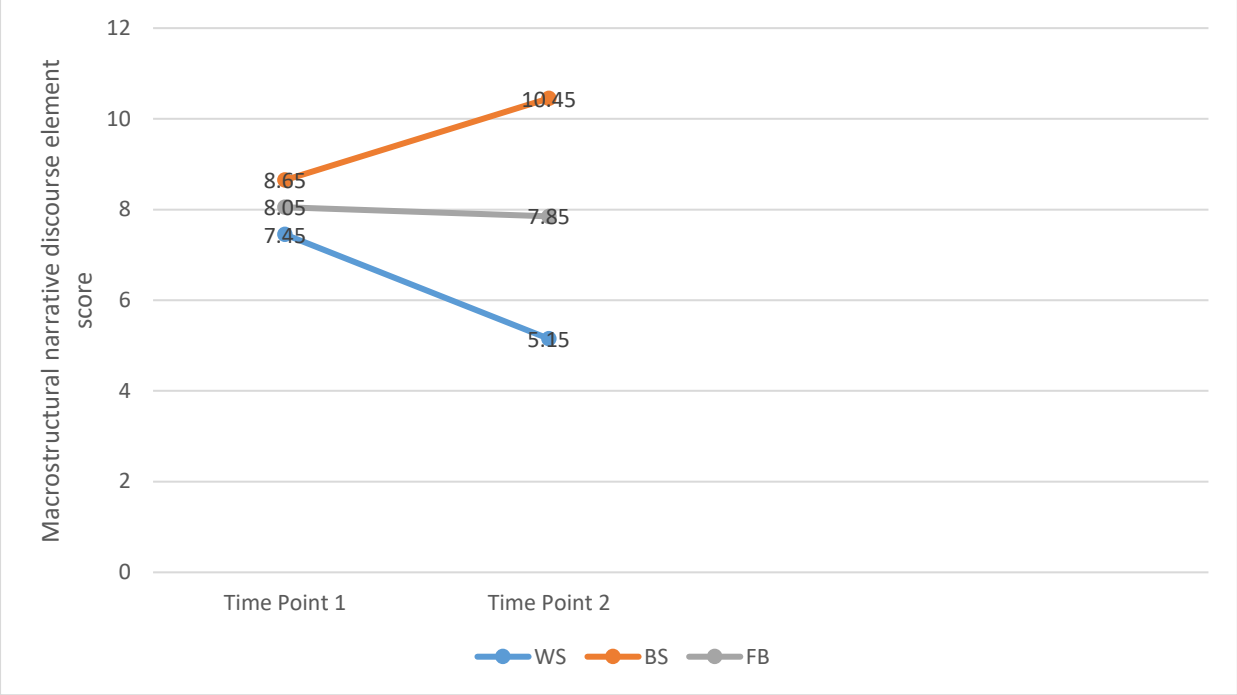

Figure 8 Macrostructural narrative discourse element score at two time points

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Table 9 Study 1- Descriptive statistics of the discourse element scores

Group	Microstructural Discourse Score				Macrostructural Discourse Score				Total Discourse Score			
	T1		T2		T1		T2		T1		T2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Worksheet Group	15.3	4.5	13.3	4.6	7.5	4.8	5.2	3.7	23.0	8.8	18.4	7.8
Brick Set Group	15.7	5.7	19.2	5.1	8.7	5.4	10.5	4.4	24.3	10.8	29.7	9.2
Free Bricks Groups	14.8	6.3	16.7	5.0	8.1	5.2	7.9	4.5	22.9	11.2	24.6	9.3

*Values are rounded up to one decimal place.

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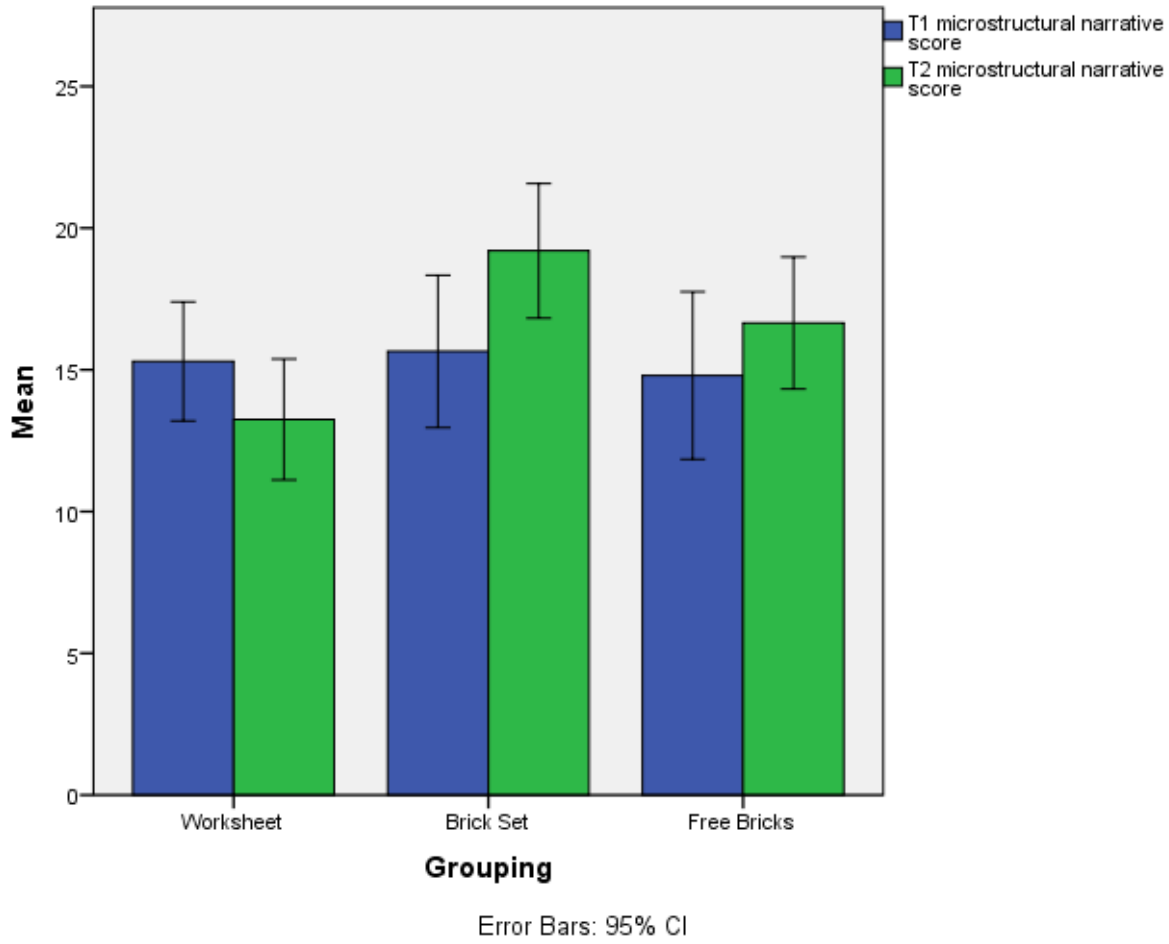

Figure 9 Comparison of the microstructural mean scores at the two time points

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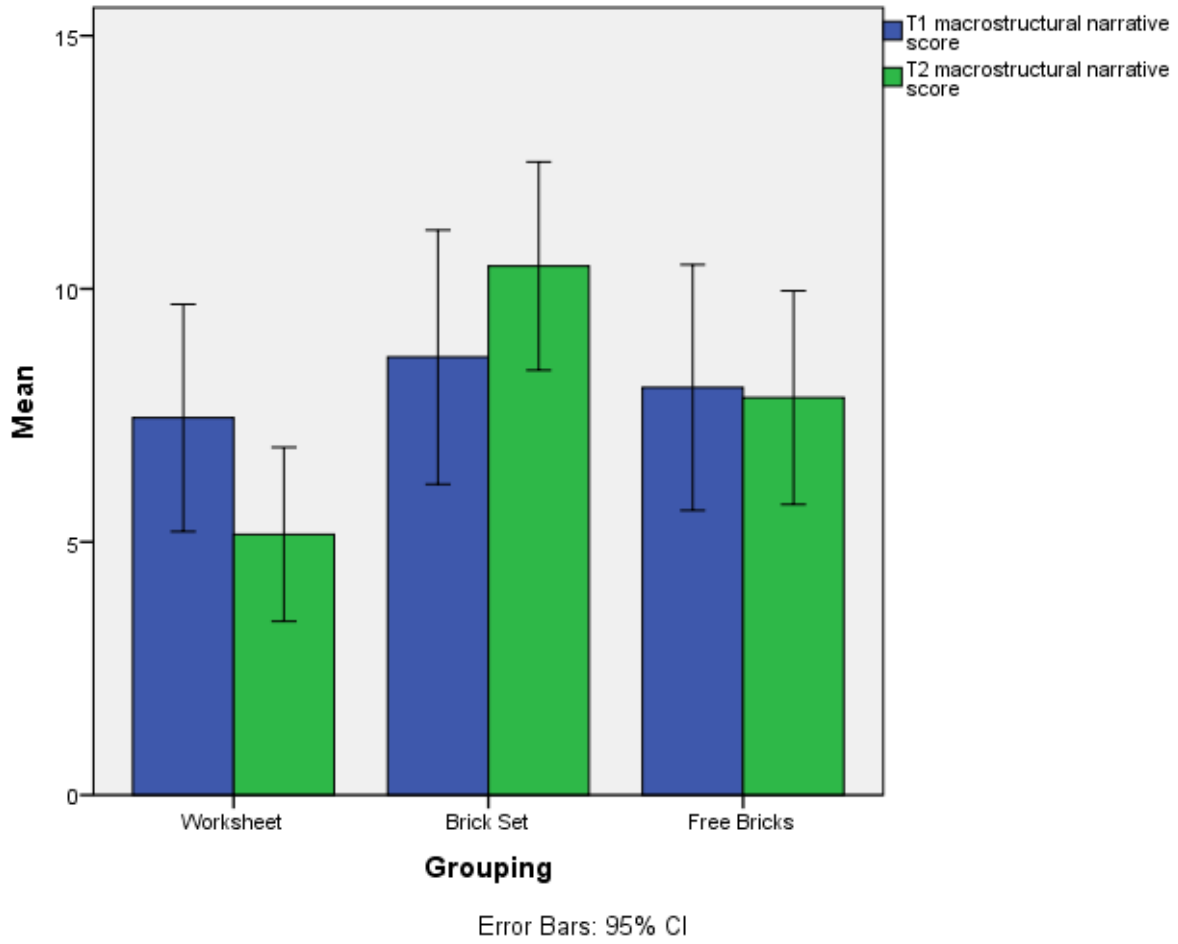

Figure 10 Comparison of macrostructural mean scores at the two time points

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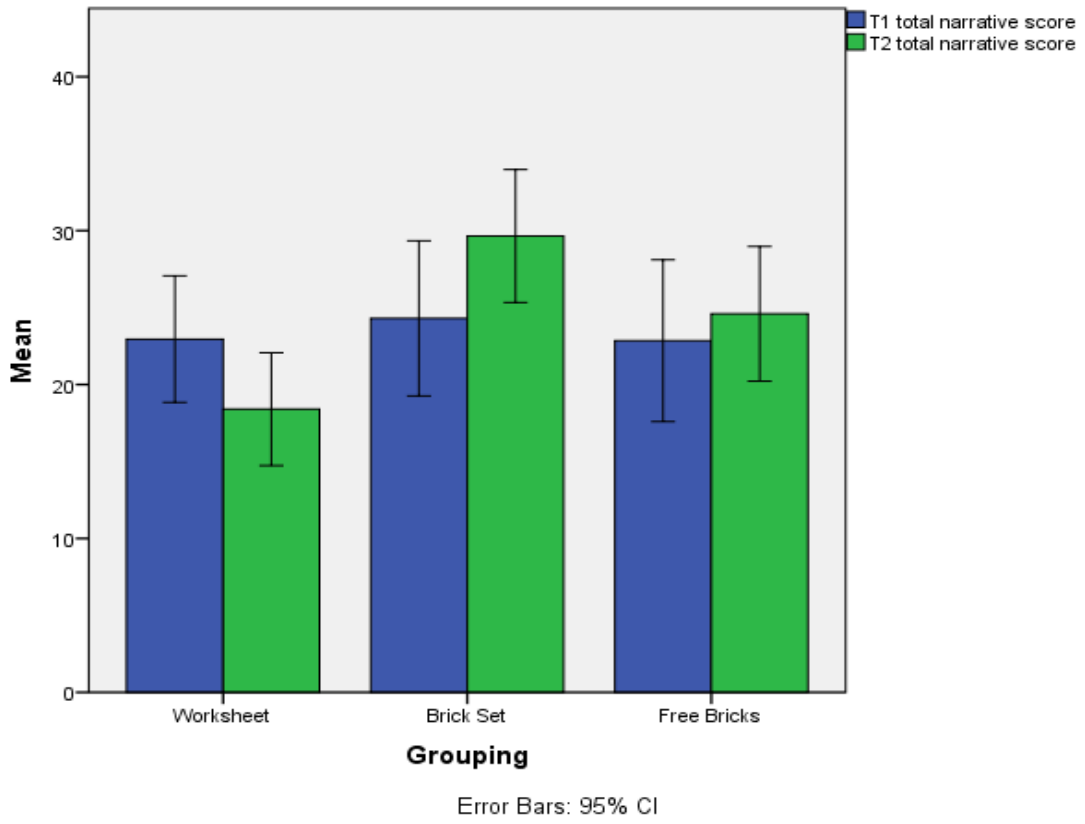

Figure 11 Comparison of the total narrative structure scores at the two time points

2.4.2 Research Question (b) - Difference in narrative discourse element scores among the three groups measured in time point 2

Two assessment frameworks for narrative discourse were combined and modified to answer the research questions. The first assessment framework was the NAP (Bliss, McCabe, & Miranda, 1998). The six elements in the NAP were fully adopted to assess the microstructural elements of narration. The six elements include topic maintenance, event sequencing, explicitness, referencing, conjunctive cohesion and fluency.

The INC (Peterson et al., 2008) was partly adopted and modified for the assessment of macrostructural elements of narration. The INC covers a comprehensive scope of 13 discourse elements, including character, setting, events, internal response, planning, action, complication and

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consequence, all of which are essential in assessing the story grammar units of the narrations. The told stories were rated, and the scores of the microstructural and macrostructural discourse elements of the told stories were generated for analysis.

A one-way between-subject ANOVA was conducted to compare the effectiveness of different experimental activities in story retelling performance with the total discourse element scores as the dependent variable and grouping as the independent variable. The ANOVA result was statistically significant with F (2,57) = 8.137, p = .001.

Post-hoc Tukey's HSD test was used to analyse the pairwise comparison among the means of the three groups. Results showed that the mean score (M = 29.65, SD = 9.23) of the BS group is significantly higher than the mean score (M = 18.40, SD = 7.84) of the WS group (p = .000).

By contrast, the mean score (M = 24.60, SD = 9.35) of the FB group is insignificantly higher than the mean score (M = 18.40, SD = 7.84) of the WS group (p > .001). Furthermore, the mean score (M = 29.65, SD = 9.23) of the BS group is insignificantly higher than the mean score (M = 24.60, SD = 9.35) of the FB group (p > .001).

An initial conclusion we can make is that the brick set is the most effective experimental activity for the story retelling task in this study.

A between-subject one-way ANOVA test was conducted to compare the differences in narrative discourse structure between the three groups. The ANOVA result is significant for the macrostructural discourse element score, F(2,57) = 7.927, p = .001. The result for the microstructural discourse element score is at a lower significant level with F(2,57) = 7.494, p = .001.

Post-hoc Tukey's HSD test was used to analyse the pairwise comparison among the means of the three groups. For the score of macrostructural discourse elements, results showed that the mean score (M = 10.45, SD = 4.395) of the BS group is significantly higher than the mean score

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(M = 5.15, SD = 3.674) of the WS group (p = .001). However, the mean score (M = 7.85, SD = 4.511) of the FB group is insignificantly higher than the mean score (M = 5.15, SD = 3.674) of the WS group (p > .001). The comparison of mean score between the BS group (M = 10.45, SD = 4.40) and the FB group (M = 7.85, SD = 4.511) indicates no significant difference between the two groups (p > .001).

For the score of microstructural discourse elements, the results have a similar trend with those of the macrostructural discourse element score. Results showed that the mean score (M = 19.20, SD = 5.074) of the BS group is significantly higher than the mean score (M = 13.25, SD = 4.564) of the WS group (p = .001). The mean score (M = 16.65, SD = 4.977) of the FB group is insignificantly higher than the mean score (M = 13.25, SD = 4.564) of the WS group (p > .001). The comparison of mean scores between the BS group (M = 19.20, SD = 5.074) and the FB group (M = 16.65, SD = 4.977) shows no significant difference between the two groups (p > .001).

Effect size was calculated by the partial ETA squared, and the value was .222, with the total narrative score with experimental activities as dependent variables and different experimental activities as independent variables.

2.5 Discussion

The aim of this study is to identify the type(s) of kindergarten classroom activities that are effective for enhancing the story retelling performance of five-year-old children. Three activities, namely written-based worksheet activity (represented by the WS group), semi-structured play activity (represented by the BS group) and free play activity (represented by the FB group), were designed to test the hypothesis that play activities enhance the story retelling performance of children.

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As hypothesised, results showed that the mean narrative discourse element score of the BS group increased drastically from T1 to T2 (Fig. 5). We also captured a slight increase in the FB group's mean score from T1 to T2 (Fig. 5). Surprisingly, the worksheet activity did not help enhance the complexity and amount of discourse elements presented in the retold stories. Decreased numbers of the total, microstructural and macrostructural discourse element stories were recorded in the retold stories at T2. In other words, when the same group of children were not engaged in the worksheet activity, their story retelling performance was far better than after they engaged in the activity. This result was beyond our expectations and is worth discussing.

2.5.1 What happened to the little brains when instructions are present? Memory load required for different instructional procedures

Cognitive load theory (CLT) aims at designing instructions for learning activities that do not exceed the learner's cognitive capacities (Chandler & Sweller, 1991; Chandler & Sweller, 1992; Sweller, 1994; Sweller, Van Merrienboer, & Paas, 1998). The two assumptions based on the theory are as follows: 1) long-term memory is unlimited and 2) the capacity of working memory available for data processing is limited. In the following discussion, I took advantage of CLT (Sweller, 1994) to explain the findings from Study 1.

2.5.1.1 Different instructional design of the three experimental activities

Mental processes happened to be different when children from the three groups were asked to participate in the three different activities. The children underwent different pathways of instructional procedures for the activities, although the final goal was to retell the story. To understand the different story retelling performance by each group, we first needed to understand

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the three different instructional designs of the experimental activities and their linkage with the human cognitive architecture, together with the nature of knowledge to which children were exposed.

For the WS group, before the children moved on to the worksheet activity, they listened to long instructions presented by the researchers. Three written-based activities were printed on the worksheets, and each activity carried a specific instruction. After the long instructions for each part of the worksheet were received, pictures and other visual stimuli were introduced, such as pictures of the story and numerous brick characters. For example, in the first written-based activity from the worksheet, eight pictures were presented in the wrong order. Children were asked to reorganise the pictures according to the story they listened to by writing numbers on the corner of each picture. The instructions were considered the verbal inputs, while the printed materials on the worksheets were the visual inputs. Children were required to resemble the verbal and visual inputs mentally to progress towards the goal, which was to retell the story. The pathway of the instructional design is shown in Fig. 11.

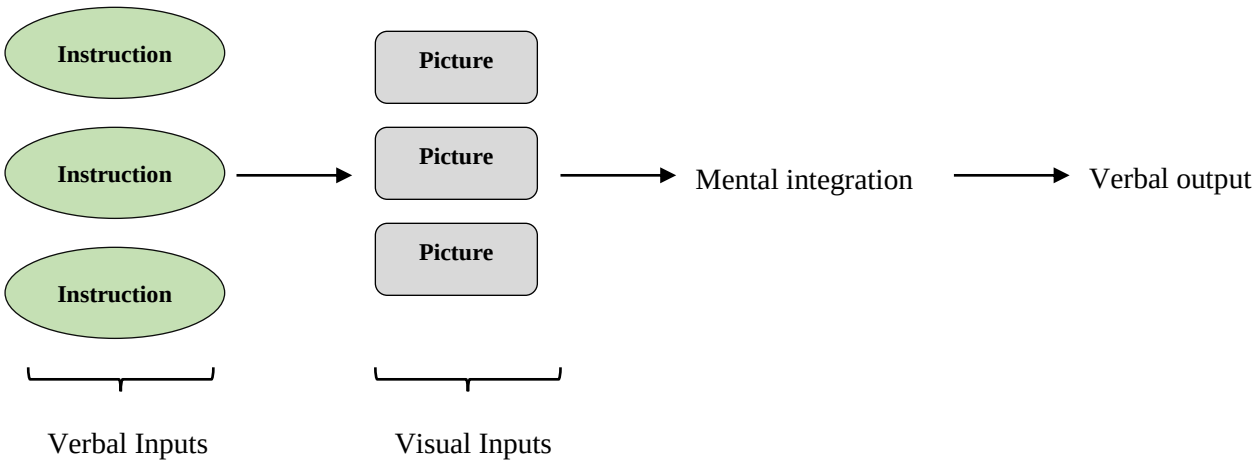

Figure 12 Instructional procedures of the Worksheet Group

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For the BS group, although the researchers introduced the bricks and the characters, children were not required to follow any instructions. The case was similar for the Free Bricks Group. Children from these two groups encountered the visual inputs first instead of the verbal inputs. This order was the main difference in the instructional designs in the WS, BS and FB groups.

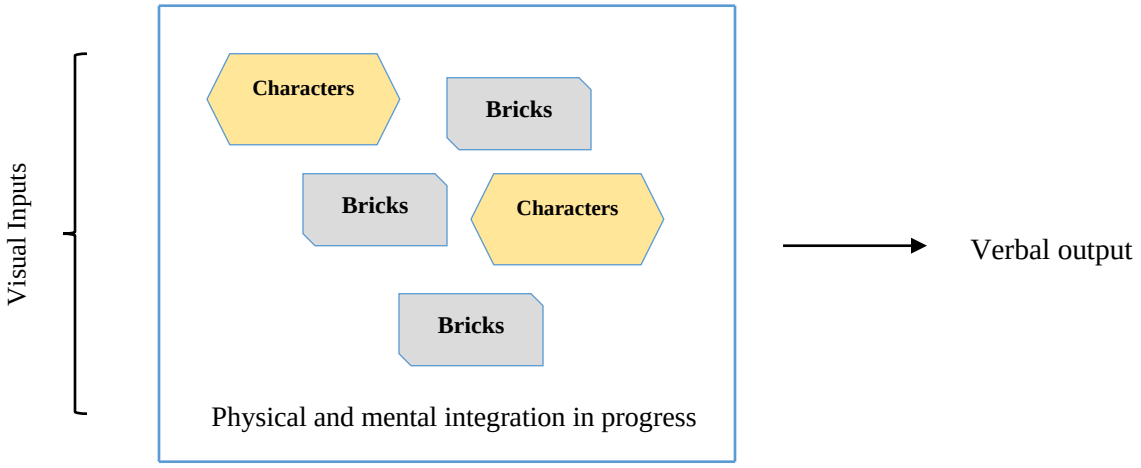

Figure 13 Instructional procedures of the Brick Set Group

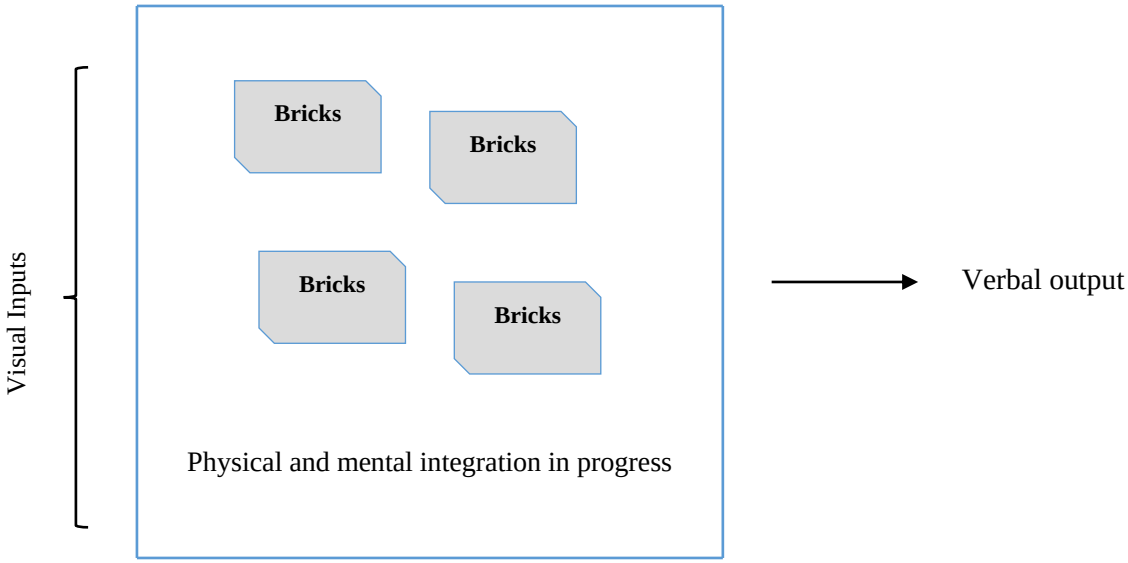

Figure 14 Instructional procedures of the Free Bricks Group

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2.5.1.2 Excessive cognitive load causing adverse performance in story retelling

CLT (Sweller, Ayres, & Kalyuga, 2011; Sweller, 2016) is a theory 'stressing on the human cognitive architecture, including the limits of working memory the organization of information in long- term memory, and the interactions between these memory systems'. According to the theory, the cognitive architecture is used to facilitate learning in an educational setting through the generation of novel instructional procedures (Sweller, Ayres, & Kalyuga, 2011). The two assumptions of CLT are essential to understanding the results in Study 1. Firstly, the amount of new information that the human brain can process at one time is limited. Secondly, the amount of stored information one can process at one time remains unknown. Aligned with the first assumption, the possible reason for the adverse storytelling performance of the WS group is that cognitive overload occurred during the instructional process of the worksheet activity. When the total cognitive load of the entire written-based worksheet activity exceeded the working memory capacity of the children, cognitive overload occurred.

According to CLT, the two basic sources of cognitive load are intrinsic and extraneous cognitive load. Intrinsic cognitive load (ICL) refers to the complexity of the knowledge that one has already obtained. It is related to the difficulty of the subject matter to be learnt and has nothing to do with how the knowledge is obtained (Sweller, 1994; Sweller, 2010; Sweller & Chandler, 1994). ICL can only be changed by changing what is learnt or by changing the knowledge level of the learners. One feature of ICL is that it is fixed and unchangeable. In other words, what is learnt or the levels of expertise of the learners cannot alter the ICL. ICL can be determined by the element interactivity of the task.

Extraneous cognitive load (ECL) refers to how the subject matter is instructed to the learners or how instructions are designed (Sweller, 1994, 2010). This approach is the manner of

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knowledge presentation. Changing the instructional procedures of presenting knowledge can reduce the amount of ECL. Some instructional procedures require learners to unnecessarily process many elements of information simultaneously, which results in a heavy, ECL that interferes with learning (Sweller, 2011).

In the study, the story that children listened to was a variable with strict control to be exactly the same. The ILC amount was supposed to be the same among all the children, regardless of the experimental group they were in. As explained in the previous session, what differed most was the instructional design of the three activities. The extraneous load can be manipulated by different activity instructions. It is about how the instructions are designed and presented to the learners. Through the use of specific terms, the ECL could be different among the three activities. When we know that the ILC in all three groups were being constant and the ECL being different with different activities in the three groups, we can explained the differences of the story retelling performance of the three groups in terms of the difference in ECL. Since the research focus is to understand the effect of the three activities on story retelling performance, we tend to put the focus on ECL rather than ICL, which is a fixed variable that we can not manipulate in the study.

The written-based worksheet activity in the WS group involved complicated instructions, While the other two activities involved limited or no verbal inputs and visual inputs, the worksheet activity involved verbal inputs in double form (written instructions printed on the worksheet and spoken instructions by the researchers) as well as visual inputs. The complicated instructions in the worksheet activity increased the ECL of the participants, causing them to blank out mentally. The instructions required the participants to integrate a number of interdependent sources of information that were difficult to process and understand. For example, they were asked to remember the story they listened to, colour the pictures with different unseen elements from the

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listened story, spot the characters they saw in the story and connect the characters and their tools. The lengthy and unintelligible procedures may exceed the chidren's limited working memory, resulting in a heavy ECL. The split-attention effect occurred and caused the adverse story retelling performance in the WS group.

The split-attention effect assumes that the instructional materials of a task consist of two or more sources of information that split the learner's attention (Sweller, 2016). The diverse sources of instructional materials must be mentally integrated before they can be understood and processed towards the goal of the task. In the worksheet activity, the process of reorganising the pictures, sorting out the story characters or matching the characters with their tools required the mental integration of verbal instructions and visual inputs (the pictures they saw on the worksheet). The act of mental integration requires a large amount of working memory, resulting in an increased amount of ECL. The imposition of excessive ECL could explain why story retelling performance dropped drastically when the children were asked to retell the story after the worksheet activity.

2.5.1.3 Retelling the story better with dynamic and interactive visualisations

The context of play facilitates children's narrative production by decreasing the memory load required in narrative retelling (Ilgaz & Aksu-Koç, 2005). Activities from the BS and FB groups required children to construct the story they listened to by moving around and combining the bricks. By physically moving the bricks, the characters and the essential elements from the story, children were able to conceive the relationship between the characters, objects and settings. The visualised integration of materials also triggered the daily life representations that are associated with the play context. In Figs. 9 and 10, the activities involved physical integration instead of mental integration in the worksheet activity.

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Aligned with the findings of Bodemer et al. (2004), activities with dynamic and interactive visualisations can significantly improve story retelling performance by encouraging children to integrate different elements and actively create symbolic meanings of the elements. Through the physical integration of the information source(s), more working memory is released for learning or working towards the goal (Sweller, 2016). This process results in a reduced ECL. Thus, the story retelling performance of the two play-based activity groups increased when children were engaged in play activities before they were asked to retell the story.

2.6 Conclusions and future directions

Play and storytelling are two inseparable activities in preschool classrooms, in which play is a story in action when children put their story in mind into narrative form (Paley, 1990). The design of the present study focused on these two preschool classroom elements and aimed at examining the effects of three different activities on the story retelling performance of five-year-old children. As predicted, children engaged in semi-structured play and free play performed far better in story retelling than those engaged in written-based activity. The effect of the treatment activities was significant in all three groups. A close look into the results indicated that the application of the written-based activity caused a drop in story retelling performance. The results revealed that the instructional style of the activities is essential to the different performance in story retelling of the groups. Evidence showed that multiple levels of instructions with both verbal and visual inputs increased the ECL of the children and the effort in mental integration. Excessive ECL was the reason story retelling performance declined when children engaged in the written-based activity with complicated instructions.

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The findings need to be interpreted in light of certain limitations. This study included five-year-old Hong Kong kindergarteners across a broad cultural and social spectrum. Age, Raven's score and oral language abilities were the main controlled variables in the sampling procedures. However, SES and cultural background of the participants may also shape the story retelling performance in a broader discipline (Durham, Farkas, Hammer, Tomblin, & Catts, 2007; Pungello, Iruka, Dotterer, Mills-Koonce, & Reznick, 2009). Additional research is needed to compare the story retelling performance across socioeconomic groups. Another possible reason for the Brick Set Group and Free Bricks Group to have significantly higher story retelling performance than the Worksheet Group is that block play may arose the children more than worksheets do. With such heightened arousal, it simply makes the children more alert and thus increases their story retelling performance. Further study focusing on the variables of affection and emotional arousal should be done to investigate their possible relations with story retelling performance.

Finally, past research about the cognitive load during learning activity mainly focused on how the ECL can be reduced, and so did the discussion of this study. Although the findings of this study could be explained by CLT, one type of cognitive load is neglected in the instructional design. Additional efforts can focus on how germane cognitive load can be increased to improve the learning process (Kirschner, 2002; Van Merriënboer, Schuurman, De Croock, & Paas, 2002). Moreover, further research can be conducted on the design of instructions for kindergarteners that can enhance learning by controlling the ECL and maximising the germane cognitive load.

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Chapter 3 Executive functions in early childhood: Interrelations of EF, story retelling performance and oral language skills (Study 2)

3.1 Introduction

When we prepare dinner, we boil vegetables and fry eggs in the pan simultaneously. Everyday, we need to focus on our work and, sometimes, we need to shift our attention to our families when they need us. We struggle to remember the phone number that someone gave us until we find a pen to write it down. As adults, we need skills to help with our capacity to multitask, shifting to different focuses in our daily life, making plans, regulating our impulses, and remembering important information for our success in life and work. Without these skills, we cannot solve complex problems, and most of our goals in our daily life cannot be fulfilled.

Although children do not need to solve adults' problems, they need these skills as well for learning and problem solving. When children are solving arithmetic problems, working on group projects or participating in class discussions, they need a set of skills that help them be flexible in responding and apply the appropriate strategies (Bryce et al., 2014). The set of skills we talk about for adults, teenagers and young children is called executive functioning skills.

3.1.2 What are executive functions?

Executive functioning was brought to light in neuropsychology when a group of patients with prefrontal cortex damage were being investigated. The patients were suffering from short-term memory deficit, namely attentional skills deficit, and showed difficulties in inhibition, planning and problem solving (Diamond, 2013). Recently, researchers have started to investigate the role of executive functions (EF) in the learning process. The term 'executive functions' is always referred to in the plural because it refers to a family of skills, not just one skill. In general,

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EF help individuals adopt to the changing environment and are a complex higher mental process that 'matures in a protracted manner' from early childhood to adolescent (Nelson et al., 2016).

3.1.3 Review of the definitions of executive functions

Pribram (1973) was one of the pioneers in using the term 'executive' to discuss the cognitive functions controlled by the prefrontal cortex. He suggested that 'the frontal cortex is critically involved in implementing executive programs where these are necessary to maintain brain organization in the face of insufficient redundancy in input processing and in the outcomes of behavior'. Throughout the years, researchers and psychologists have been given different definitions of EF.

Since the term 'executive functions' was proposed by Pribram, at least 30 constructs have been discussed and included under the umbrella term of EF (Goldstein et al., 2014). Lezak (1995) hypothesised that each construct of EF involves a distinct set of behaviours.

Different researchers have focused on different executive functioning constructs. After all the years of investigation in EF, they still cannot compromise on a single definition of EF. Lezak (1995) and Mesulam (2002) agree that EF are adaptive and goal-directed behaviours that lead us to success in daily life and learning and that executive functioning skills override automatic and impulse responses. The Center on the Developing Child at Harvard University (2011) emphasises that the three main dimensions of executive functioning skills usually highlighted by researchers include working memory, inhibitory control and cognitive or mental flexibility. Other researchers have worked on additional dimensions of executive functioning skills in young children and adolescents, such as inhibition, attention shifting, working memory, goal-directed behaviours and strategic planning (Miyake et al., 2000; Zelazo & Muller, 2010). A few studies have focused on

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three dimensions of executive functioning: working memory, shifting and inhibition (Lehto et al., 2003; Huizinga et al., 2006; Garon et al, 2009). Some researchers define EF by integrating the skills of reading comprehension and theory of mind (Carlson et al, 2014; Posner & Rothbart, 1998). They consider EF a family of cognitive skills that contribute to the individual differences in developmental changes.

Although no definition of EF has been generally agreed upon, most researchers suggested that EF comprises a variety of skills that help individuals perform certain behaviours to accomplish complex tasks. Naglieri and Goldstein (2013) made a comprehensive conclusion of the nine areas that make up EF: attention, emotion regulation, working memory, planning, self-monitoring, organisation, initiation, flexibility and inhibition control. In the current study, four main constructs of executive functions are investigated, and these are further described below. The four executive functions are selected for investigation in the present study because of their relationship with story comprehending and retelling abilities. Each relationship is discussed in the following parts.

3.1.4 Working memory

One key construct of EF is working memory. When students are working towards a goal, for them to hold previous information and relate them to the information that comes later are critical. Some examples of the utilisation of working memory in learning are holding numerical information when solving mathematical problems in our head, remembering the meaning of the last sentence when doing reading comprehension exercises or retelling a story. Working memory is a process that helps hold information in the mind while updating and manipulating such information (Garon, Bryson, & Smith, 2008). Baddeley (1992) defined working memory as ‘the brain system that provides temporary storage and manipulation of the information necessary for

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such complex cognitive tasks as language comprehension, learning and reasoning'. The ability to hold information develops at very early stages of life. Infants as young as 9 to 12 months old are able to work on the A- not- B task, in which infants were asked to serach for the hidden object after it is shifted from one to another location, with the infant's gaze is broken during the delay period (Diamond, 1985; Bell & Cuevas, 2016). The delayed response task has also shown infants' capacity of working memory. In the task, a toy was hidden at one or two possible locations before the infant entered the room. The locations were randomly determined from one trial to another. The infant then entered the room and searched for the toy. Evidence from the cross-sectional study indicates that six-month-old infants have the ability to hold information in mind over a delay (Johnson, 2005; Reznick et al., 2004). More complex memory-holding abilities, such as updating and manipulating information, gradually develop throughout the preschool period (Alloway et al., 2004). However, relatively little research has been done on the working memory hold capacity of children below three years old and the relationship between work memory capacity and story retelling ability.

Mozeiko et al. (2011) investigated the relationship of EF, working memory and story retelling performance and found moderate correlations between EF and the discourse elicitation performance. Participants were asked to retell a story after looking at a 16-frame picture story. The retold stories were analysed for story completeness (number of critical components) and story grammar (the proportion of T-units in an episodic structure). Results showed a moderate correlation between working memory and story completeness but a weak correlation between working memory and story grammar. As concluded by the authors, working memory appears to vary with the story content but not the story structure. Further regression analysis in the study also showed that working memory is a significant predictor for story grammar and story completeness.

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Although the participants of the study were not young children, the situation is a research direction for the present study.

3.1.5 Inhibition

Together with working memory, inhibition is one of the most investigated EF of early childhood (Cuevas, Hubble, & Bell, 2012) and is considered the foundation of EF (Miyake et al., 2000). Inhibition involves the ability to inhibit the prepotent response and produce another response (Best & Miller, 2010). Diamond (2013) defined inhibition as the ability to control behaviours, thoughts, verbal responses and emotions according to a particular context. The choice or elimination of the inhibited response allows the individual to adjust according to social norms. In practical circumstances, inhibitory behaviours allow a child to resist or inhibit inappropriate responses.

Some researchers have been challenging the assessment of inhibitory control. They argued that many inhibitory tasks do not solely involve inhibition abilities. Instead, working memory is involved in the multitude of response inhibitory tasks (Carlson & Moses, 2001; Diamond, 2001, 2002). The authors also argued for the importance of distinguishing between tasks involving inhibitory control alone and tasks that involve inhibitory control and working memory. Thus, Garon, Bryson and Smith (2008) suggested a differentiation between simple response inhibition tasks and complex response inhibition tasks for the sake of clarity. The authors referred to simple response inhibition tasks as ‘tasks involving minimal working memory demands’ and complex response inhibition tasks as ‘tasks involving moderate working memory demands’. Alternative definitions were provided by Best and Miller (2010) that simple response inhibition tasks refer to

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tasks with pure response inhibition demand, whereas complex inhibition tasks refer to tasks with response inhibition plus alternative response demand.

Inhibition is important in managing extraneous or irrelevant information and activating the current story structures to achieve the goal of constructing or retelling a story (Mozeiko, Le, Coelho, Krueger, & Grafman, 2011). When children are involved in story retelling activities, they need to control their behaviours and thoughts as well as select the verbal responses or even the emotion according to the particular story they heard. For example, the verbal responses of a child retelling a superhero story and another child retelling a fairy tale would be different. The child retelling the fairy tale may need to select gentle words and tones for the narratives, whereas the child retelling the superhero story may need to select more verbs to express the exaggerated actions in the story. As inhibition is an essential skill in retelling a story, the skill is included in the current study for investigation.

3.1.5.1 Simple response inhibition tasks

Inhibition ability begins to develop in the first year of life. Infants as young as 8 months are capable of inhibiting behaviours 40% of the time (Kochanska et al., 1998). Until 33 months old, children are able to inhibit their behaviours most of the time (90%) in their daily life. A typical example of simple response inhibition control behaviour is to quit an enjoyable activity when adults request it. The delay of gratification paradigm developed by Mischel and his colleagues (Mischel, 1974; Mischel & Ebbesen, 1970; Mischel, Ebbesen, & Zeiss, 1972) is one of the most popular paradigms that describe inhibition control behaviours in preschool children. In Moore and Lemmon (2001), preschool children are requested to choose between a smaller reward for now and

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a larger reward for later. Results from the cross-sectional study showed age differences in the number of choices to delay for a larger reward.

3.1.5.2 Complex response inhibition tasks

Gerstadt, Hong and Diamond (1994) investigated the inhibition control ability with the day–night task. Children from three to seven years old were asked to inhibit a prepotent verbal response by saying 'day' when viewing a black card with moon and stars on it or saying 'night' when viewing a white card with a bright sun on it. Inhibition is always investigated with working memory because both simple and complex inhibition tasks require working memory. The day–night task is considered a complex inhibitory task (Garon, Bryson, & Smith, 2008). Complex inhibitory tasks involve holding an arbitrary rule in mind, and the inhibitory responses work on the basis of the rule. In the day–night task, children first have to remember the rules of the twisting day–night responses before they are able to inhibit their response.

3.1.6 Regulation

Regulation, or self-regulation, is one of the key constructs in EF that are well documented with its importance in daily functioning and long-term development in interpersonal skills, academic achievements and professional success (Blair, 2002; Blair & Diamond, 2008; Moffitt et al., 2010). Self-regulation is defined as the 'broad range of automatic and controlled processes through which thoughts, emotions and actions are adjusted' (Lyons & Zelazo, 2011). A comprehensive definition of regulation is the process in which one manipulates his/her thoughts, behaviour and attention in either deliberate or automated use of a set of specific skills towards maintaining goal-directed activities over time and under different contexts (Karoly, 1993).

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Regulation in preschool children is considered one of the core aspects to predict school readiness, social competence, academic success and classroom behaviours in later childhood and adolescence (Blair & Diamond, 2008; McClelland et al., 2007; Morrison et al., 2010; Raver et al., 2012). Research shows that self-regulation skills and expressive vocabulary skills during the preschool period have a bidirectional relationship (Bohlmann, Maier, & Palacios, 2015). Results from the mentioned study confirmed that children with gains in self-regulation skills during the preschool period tend to have larger gains in their expressive vocabulary skills in later time points and vice versa. Given that story retelling tasks require children to produce vocabularies expressively, and expressive vocabulary skills are related empirically to self-regulation skills, self-regulation is included in the present study for further investigation.

3.1.7 Planning

Lezak et al. (2004) defined planning as the 'ability to identify and organize the steps and elements needed to achieve a goal' in their book. During different phrases of regulation, specific mental skills are involved. For example, planning and goal setting are involved in the phase of forethought; while self-monitoring, self-control and attentional focusing skills are involved in the phase of performance (Schunk & Zimmerman, 1998). Planning is an essential skill during the forethought stage when one is achieving a goal.

Young children as young as three can perform a certain degree of planning by verbal representation (Hudson et al., 1995). However, the complexity of planning in three-year-old children is far different from that of children older than seven. Organised and efficient planning is found in children aged seven to eleven (Levin et al., 1991). According to Romine and Reynolds

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(2005), the ability of planning peaks between eight and eleven years old and continues to develop until early adulthood.

3.1.8 Importance of developing executive functioning skills in early childhood

The first five years of life are critical in the development of EF. Executive functioning skills are critical for cognitive, social, academic, psychological and mental health (Diamond, 2016). The development in EF is rapid during early childhood when a high-level increase of mental consciousness is being observed (Zelazo et al., 2007). An intervention study conducted by Bierman et al. (2008) found that executive functioning skills at the beginning of the academic year predicts significant gains in literacy skills and behavioural outcomes at the end of the academic year. In a recent study, EF significantly predicted mathematics and pre-literacy skills in four-year-old Head Start children (Vitiello & Greenfield, 2017). The study also provided evidence that the approaches to learning, also called task orientation, learning-related social skills and self-regulated learning skills, significantly predict a change in school readiness. Studies indicated that preschool children with high executive functioning scores perform significantly better in science, mathematics, vocabulary and pre-literacy tasks in comparison to their peers with low executive functioning scores (Bierman, Torres, & Domitrovich, 2009; Nayfeld, Fuccillo, & Greenfield, 2013). To conclude with results from a systematic review of EF research in the past 20 years, the early development of EF is important in predicting later mental-state awareness (Hughes, 2011).

3.1.9 Challenges and difficulties in researching executive functions in young children

Research has shown that finding a way for young children to express their thoughts is difficult. Early childhood studies that focus on higher mental functions development are limited in the way that many researchers underestimated young children's ability to understand their own

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mental processes (Whitebread & O'Sullivan, 2012). Evidence of early regulation and cognitive control is also found in Slot et al (2015), who show that children as young as three years old can regulate themselves in cognitive and emotional aspects during pretend play activities.

Flavell, Green and Falvell (2000) hold the opposite view that children below seven or eight years of age have very limited abilities for introspection and are less able to be aware of their own thoughts. Scant attention has been placed on the research of EF at young ages in comparison to the research of EF in teenage and adult populations. Other scholars suggested a similar idea to Flavell's that preschoolers are 'dysexecutive' in behaviour for complex tasks (Isquith et al., 2005). Owing to this reason and the methodological difficulties, limited attention has been devoted to the development and assessment of EF in preschool-aged children. One prominent view is that preschool-aged children cannot exert higher mental control over emotional regulation, behavioural impulses and cognitive flexibility (Isquith et al., 2005). They also lack planning strategies and the abilities to inhibit dominating responses.

However, alternative evidence shows that children as young as three can perform a few self-monitoring skills, such as self-commenting, reviewing and rating the level of difficulty (Whitebread et al., 2009). Researchers tend to focus on the tangible and visible variables in looking at the abilities of children to acquire certain knowledge. These tangible variables include verbal communication during play activities and self-report measures. For young children, these attempts have led to the methodological difficulties of underestimating the high mental functions of young children, especially for those with limited verbal skills (Whitebread et al., 2009A). However, revealing what young learners think during the learning process is essential in supporting them to become self-regulated and sustainable learners in the future. Although difficulties exist in capturing the emergent EF of preschoolers, some researchers suggested that an improved

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understanding of the opposite in EF in dysexecutive functioning children will provide potential implications for early intervention in the enhancement of EF (Brophy et al., 2002; Sonuga-Barke et al., 2003).

3.1.10 Measurement and methodological considerations

Researchers have been examining ways by which young children represent their thinking, whereas educators have been finding a suitable pedagogy to help students attain higher mental skills. The assessment of EF tracks the real-time verbal and non-verbal cues of the participants, in which one is performing an ongoing complex task.

One major consideration stated by Hughes and Graham (2002) is that the measurement of EF is in the difficulties in distinguishing between automatic and controlled actions. When a person performs a task, for example, learning to drive a car, the learning process gradually shifts from controlled to automatic. At first, the learner needs to memorise the steps of starting the car engine. When he/she becomes more familiar with controlling the car, the steps become more automatic rather than intentionally controlled.

Hughes and Graham (2002) pointed out another consideration for the assessment of EF. In their opinion, executive functioning comprises numerous complex processes rather than a single one. It involves the coordination of a variety of different cognitive processes (Kimberg & Farah, 1993). Taking the previous driving example, one needs more than one executive functioning skill to control a car. To drive from one location to another, the new driver needs to memorise the steps of starting the car, planning the route to the destination and inhibiting his response for the choice of a wrong route. For the new driver, driving to the destination from home involves simultaneous

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coordination of working memory, planning and inhibition. The assessment of EF must emphasise the complex cognitive system as a whole instead of one or two constructs for assessment.

3.1.10.1 Issues in researching executive functions in children.

The major difficulties of assessing EF in young children are due to their limited verbal skills (Hughes & Graham, 2002; Whitebread et al., 2009A) and the traditional view of young children as 'dysexecutive' in complex tasks (Isquith et al., 2005). Furthermore, most executive functioning tasks designed for adults are complex and multi-componential in nature (Hughes & Graham, 2002). Most assessment methods and tools were first developed for adults and then modified for adolescents and eventually for children in a top-down approach. Most of the research on EF from the last century focused on adults rather than on adolescents or children (Hughes & Graham, 2002). In this specific way, the simplified executive functioning tasks are developmentally appropriate for children. However, Garon, Bryson and Smith (2008) argued that simplifying the EF tasks from assessment schemes designed for adults involves the danger of losing some critical EF components. The EF performance of children in EF tasks may involve non-EF influences on the performance. The non-EF influences on the performance of EF tasks include verbal ability, pragmatic understanding or even compliance. Methodological difficulties have shadowed the possible abilities of young children (Whitebread et al., 2009B).

3.1.10.2 Parent-reported measures of executive functions

Given that children use more than one executive functioning skill in their daily routines, tracking the range of EF of young children in a single experimental setting is impossible (Cuevas, Hubble, & Bell, 2012). Owing to the challenges and methodological considerations mentioned in the previous parts, researchers have been using parent/teacher-reported measures for EF in young

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children. One advantages of using a questionnaire as a rating instrument of EF is that it captures behaviour over an extended period (Thorell & Nyberg, 2008). Questionnaires are also easy to administer, making them valuable for screening children at risk of developing psychiatric disorders.

One of the rating instruments of executive functioning skills in children is the CHEXI (Thorell & Nyberg, 2008). A total of 26 items are included in the questionnaire, and the items are divided into four subscales: working memory, planning, inhibition and regulation. The questions included in the CHEXI are designed on the basis of the hybrid model by Barkley (1997), in which inhibition and working memory were considered the major constructs in EF. To date, most of the behavioural measures of EF are limited to English-speaking countries. The CHEXI and the Behaviour Rating Inventory of Executive Function (BRIEF) are the only two measurements with validation studies conducted in multiple languages, including traditional and simplified Chinese (Catale et al., 2015). The CHEXI was selected to be the assessment tool of EF in the current study.

Given the methodological design of commonly used EF tasks, the limited verbal ability of young children, the language used in the assessment and the objectivity of the assessment results, a parent-reported measure, namely CHEXI, was chosen in combination with the story retelling task to assess the relationship between EF skills and story retelling performance in the present study.

3.2 Current study

The aim of Study 2 is to identify the relationship between EF, oral language skills and story retelling performance in five-year-old children. This study tends to fill the research gap that a few studies missed by focusing on the relationship between EF and oral language skills or story retelling. Two main research questions were addressed:

a. Does a positive relationship exist between EF and story retelling performance?

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b. Does a positive relationship exist between EF and the oral language skills of five-year-old children?

3.2.1 Relationship between executive functioning skills and story retelling performance

The relationship of executive functioning skills and story retelling performance was predicted to be positively related because preschool children with high EF scores perform significantly better in vocabulary and pre-literacy tasks than their peers with low EF scores (Bierman, Torres, & Domitrovich, 2009; Nayfeld, Fuccillo, & Greenfield, 2013). Researchers did find positive correlations between play and literacy development, but the possibility of the third variable, which is cognitive maturity, remains. Authors clearly pointed out that a cognitive connection exists between play and literacy (Roskos & Christie, 2001, p.62).

The main hypothesis for research question (c) is that executive functioning skills are required for story retelling tasks. These skills include working memory to hold the information, sequencing skills plus planning and organising skills to present the story plot, inhibitory control and regulatory skills to receive the narrative (receptive language skills) and self-monitoring and impulse control skills to deliver the narrative (expressive and pragmatic language skills). The four mentioned executive functioning skills are hypothesised to be positively correlated with story retelling performance.

To test the hypothesis, a story retelling task was administered to 60 participants. The main caregivers of the participants were also invited to fill in a standardised questionnaire that measures four executive functioning skills, namely CHEXI, to report the daily behaviours of the participants. Correlation analysis was run to investigate the relations between the story retelling performance and the four executive functioning skills.

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3.2.2 Relationship between executive functioning skills and oral language skills of five-year-old children

The relationship between executive functioning skills and oral language skills of five-year-old children was predicted to be positively related. A recent correlational study showed a strong concurrent relationship between language and EF skills during preschool years (Gooch, Thompson, Nash, Snowling, & Hulme, 2016). Another recent study also confirmed that inhibition and verbal fluency measures are significantly correlated in middle childhood (Berninger, Abbott, Cook, & Nagy, 2017). Thus, the hypothesis for research question (d) is that at least one EF sub-score, most probably the inhibition sub-score, is positively correlated with the general oral language skills of five-year-old children.

To test the hypothesis, correlational analysis was run to investigate the relations between the four executive function subscales (inhibition, working memory, regulation and planning) and the 10 parts of speech assessed by the PLK.

3.3 Method

3.3.1 Participants

The sample of Study 1 in the project was used for the current study. A total of 60 kindergarteners with a mean age of 5.1- year- old (61.17 months) participated in Study 3. The demographic details of the participants can be found in Table 2 in Chapter 2.

3.3.2 Assessing instruments and procedures

Two main assessments were used for the measurement of EF and oral language skills in this study. For the measurement of EF, the CHEXI (Thorell & Nyberg, 2008) was used to assess

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the executive functioning skills manifested in the daily life of the participants. The main caregiver of the participants filled in the questionnaire. The CHEXI is a questionnaire to filled out by parents or teachers. It has 24 statements and takes about 5 to 10 minutes to complete. Four subscales measure working memory, inhibition, working memory and planning, respectively. Each statement was rated on a scale from 1 (definitely not true) to 5 (definitely true). The CHEXI is appropriate for the age range of the study because it was originally invented for use solely in the 4- to 12-year-old age range (Thorell & Nyberg, 2014). It has a high test–retest reliability with r = .81 (range: .76–.85) and good internal consistency, with the Cronbach α coefficient ranging from .80 to .98 for parents and teachers from clinical and normative settings (Thorell & Nyberg, 2008). The test- retest reliability was found to be adequate (r = .89, p >.001). The test- retest reliability of the four subscales are as follows: .86 for the inhibition subscale; .84 for the regulation subscale; .74 for the working memory subscale; and .94 for the planning subscale (Thorell & Nyberg, 2008). The psychometric properties of the CHEXI confirm it as a good tool for clinical assessment (Catale, Meulemans, & Thorell, 2015).

The CHEXI was selected to be the instrument of the project among a few well-developed assessment tools for EF for three reasons. First, other measurement tools, such as the BRIEF (Gioia, Andrwes, & Isquith, 1996), has a potential problem of being too lengthy, and they mainly capture the profile of EF that differs across normally developing individuals and individuals with disorders, including ADHD, ASD and other reading disorders (Isquith et al., 2005). Some items in the BRIEF questionnaire consist of the measurement of ADHD symptoms, which will help in the early identification of ADHD at-risk children. For the current project, participants are normally-developing five-year-old children. The CHEXI, which only contains items for assessing everyday behaviours without directly measuring ADHD symptoms, is selected for this reason.

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Another reason for the choice is the age appropriateness of the tool. The BRIEF and the other EF measurement tools, for example, the Barkley Deficits in Executive Functioning Scales (Barkley, 2012), are more suitable for older children and teenagers. The CHEXI is solely developed for children aged from 4 to 12 years, which is perfectly appropriate for the current project.

The PLK was selected as the instrument to assess the expressive oral abilities of the participants. It was also selected for measuring the inclusion criteria of the participants in Study 1. More information about the instrument can be found in Chapter 2 (Section 2.3.3.2, p. 51).

The assessment comprises 11 parts, with 10 parts assessing an individual part of speech in Cantonese and the final part including a short storytelling task, in which six pictures were shown and the participants were asked to tell the story. The corresponding parts of speech are as follows:

- Noun
- Verb
- Adjective
- Hypernym
- Quantifier
- Active voice
- Comparative clause
- Passive voice
- Double object verbs
- Relative clause

During the assessment, participants were required to look at 47 coloured pictures and answer the questions asked by the researcher. The questions were standardised, and correct and incorrect answers were listed on the back of the assessment booklet. Researchers followed the

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instructions on the back of the assessment booklet during the assessment and scored the answers on a dichotomous basis: correct or incorrect. A correct answer was scored one, while an incorrect answer was scored zero. The total raw score of each participant in the test was used for data analysis.

The data on story retelling performance from T1 were adopted from Study 1 for analysis in this study.

3.4 Data analysis and results

Results from the CHEXI were entered into the SPSS24 with raw scores. Four subscales were provided by the inventory, namely inhibition, short-term memory, planning and self-regulation. The raw score of each subscale was also calculated using SPSS24 and Microsoft Excel. For the CHEXI, each participant received a total score and four subscores of the subscales for further statistical analysis. For the PLK test, each participant received a total score and 10 sub-scores representing each of the parts of speech. Five separate correlation analyses were conducted in SPSS24 (IBM Corp., 2014) to address the two research questions in the current study by analysing the relationship between (a) story retelling performance at T1 and the four subscales of executive functioning skills, (b) the inter-relations between the four EF subscales in total and (c) the usage of the 10 parts of speech and the 4 subscales of executive functioning skills.

3.4.1 Relations between executive functions and story retelling performance

Correlation analysis was conducted to examine the relations between different EF skills and story retelling performance at T1 (Tables 8). The four subscales of EF used for analysis included working memory, planning, regulation and inhibition.

From the correlation analysis, no significant correlation between EF and the story retelling performance at T1 was found.

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Table 10 Matrix of correlation between variables of executive functions

Variable	1	2	3	4	5	6	7	8
1. Working memory	-							
2. Planning	.87**	-						
3. Regulation	.49**	.49**	-					
4. Inhibition	.45**	.49**	.37**	-				
5. PLK total	.03	–.09	.23	.18	-			
6. T1 Microstructural narrative score	–.02	–.01	–.08	.14	.28*	-		
7. T1 Macrostructural narrative score	.04	.07	.01	.14	.31*	.49**	-	
8. T1 Total narrative score	.01	.03	.05	.15	.30*	.51**	.96**	-

Note: Figures rounded up to two decimal places
** Correlation is significant at the .01 level (two-tailed)
* Correlation is significant at the .05 level (two-tailed)

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3.4.2 Relations between executive functions and the usage of parts of speech in five-year-old children

Correlation analysis was conducted to examine the relations between EF skills and the usage of free morphemes. The intercorrelations among the four EF skills were also examined. Table 9 shows the correlations among the four subscales of EF measured by the CHEXI and the 10 parts of speech measured by the PLK.

3.4.2.1 Relations between executive functions and the usage of free morphemes

Table 9 shows significant correlations between the regulation subscale and two of the parts of speech, namely verb and double object verbs (.337 and .257, respectively). No significant correlation was found between any other EF subscale and part of speech. This finding implies that children might have needed to exert a certain level of regulation when they used verbs and double object verbs in the PLK test.

3.4.2.2 Inter-relations among the subscales of executive functions

The four subscales of EF, namely working memory, planning, regulation and inhibition, were found to be significantly intercorrelated (Table 9). Of the four subscales, working memory and planning were highly correlated (.87).

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Table 11 Matrix of correlations between executive functions and oral language variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Working memory	-														
2. Planning	.87**	-													
3. Regulation	.49**	.48**	-												
4. Inhibition	.45**	.49**	.37**	-											
5. PLK total	.03	–.09	.23	.18	-										
6. PLK noun	.16	.10	.21	.19	.54**	-									
7. PLK verb	.08	.06	.38**	.14	.38**	.31*	-								
8. PLK adjective	–.14	–.11	.04	–.04	.44**	.23	.36**	-							
9. PLK hypernym	.06	.11	.21	.15	.53**	.38**	.11	.24	-						
10. PLK quantifier	.05	–.12	.14	.12	.57**	.28*	.20	.29*	.11	-					
11. PLK active voice	.06	–.07	.16	.09	.49**	–.04	.19	.09	.38**	.28*	-				
12. PLK comparative clause	.11	–.09	.11	.13	.59**	.37**	.20	.26*	.33*	.30*	.34**	-			
13. PLK passive voice	–.05	–.06	.09	.01	.61**	.21	.11	.04	.30*	.04	.38**	.21	-		
14. PLK double object verbs	.00	–.03	.26*	.12	.50**	–.01	.04	.03	.36**	.18	.45**	.22	.33*	-	
15. PLK relative clause	–.10	–.14	.01	.14	.65**	.32*	.04	.04	.25	.22	.00	.11	.43**	.34**	-

Notes: Figures rounded up to two decimal places
** Correlation is significant at the .01 level (two-tailed)
* Correlation is significant at the .05 level (two-tailed)

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3.4.3 Discussion

This study examined the relationship between the four subscales of EF (working memory, planning, regulation and inhibition), story retelling performance and oral language usage in 60 five-year-old children. In the first part of the analysis, one of the highlights is that no EF subscale is correlated with story retelling performance. In the second part of the analysis, all four EF subscales are inter-correlated. Furthermore, the inhibition subscale is significantly correlated with the PLK verb and PLK double object verbs. The results imply the following relation: when the individual is rated with a high inhibition score, he/she is more capable of handling the use of verb and double object verbs in oral language.

3.4.3.1 Maturation level

The findings of this study help to clarify the relationships between EF, story retelling performance and oral language usage. First, the results indicate that storytelling is not correlated to EF. A possible reason is that oral language is developing rapidly in the course of preschool, but EF indicates a slower development during the preschool period. This interpretation aligns with the results of the correlation study by Pazeto, Seabra and Dias (2014), who found a minimal relationship between EF and oral language, except for a moderate correlation between attention and oral vocabulary. Another correlation study also suggested that EF and linguistic abilities in preschool children are independent (Stievano & Valeri, 2013). The development of different executive functioning skills peaks at different periods in one's lifespan. For inhibition, evidence shows that older children aged nine to twelve years old have better inhibitory control skills than do younger children aged six to eight years old (Williams, Ponesse, Schachar, Logan, & Tannock, 1999). A similar case occurs in working memory. Evidence also shows that working memory

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begins to increase from age four to early adolescence (Gathercole, Pickering, Ambridge, & Wearing, 2004). The mismatch developmental period of EF skills and oral language skills can be why no significant correlation is found between the four EF skills and story retelling performance in the current study.

3.4.3.2 Linking regulation and two parts of speech: verbs and double object verbs

Findings from the study show that significant correlations exist between the regulation subscale and two parts of speech, namely verbs and double object verbs. From a linguistic perspective, a significant debate has arisen on whether young children produce verbs before nouns or vice versa. Most studies provided evidence that English-speaking children learn and use nouns earlier than when they can manage verbs (Goldsfield & Reznick, 1990; Imai, Li, Haryu, Okada, Hirsh-Pasek, Golinkoff, & Shigematsu, 2008). By contrast, some researchers suggested that verbs predominate in the vocabulary production of Mandarin- and Korean-speaking children (Tardif, 1996; Choi, 2000, Tse, Chan, & Li, 2005). Results of the current study show that one of the EF subscales, regulation, is significantly correlated with the expressive production of verbs and double object verbs. This result is inspiring because language can be a child attribute that affects the development of self-regulation, and the form of the expressive language of children may be an important factor for researchers to understand self-regulation development in early childhood (Montroy, Bowles, Skibbe, McClelland, & Morrison, F. J., 2016). Vallotton and Ayoub (2011) evaluated expressive language as helpful to children's ability to self-regulate. The issue was later investigated by Bohlmann et al. (2015), who found that early expressive language skills are associated with high levels of self-regulation. Their results also indicated the bidirectionality between children's self-regulating skills and expressive vocabulary. The greater the language skills

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one gains during the preschool period, the greater the self-regulating skills he/she gains when he/she transits to higher grades and vice versa. Researchers claimed that expressive vocabulary serves as an indicator of self-regulating skills in preschool children. In addition, self-regulating skills play a crucial role in vocabulary development during the preschool period.

Examining the present correlational study did not confirm whether the high ability to produce expressive verbs is a factor of self-regulation or a result of such skill. Although the current study is correlational and does not indicate any cause-and-effect relationship between self-regulation and the expressive production of verbs, the findings may be an indicator that the two variables contribute to each other's development.

3.5 Limitations and future directions

One limitation of the current study was that EF ratings were collected only from one main caregiver of the children who may have bias or blind spots on the children's behaviour. The reason to ask the main caregiver, instead of the parents to provide relevant information is that for some families in Hong Kong, the main person who provide care to a child may not be his/ her parent. Some of the children are taken care by their grandparents, or even a domestic helper instead of the parents. The term 'caregiver' serves to remind and ensure that the EF ratings are provided by the closest relative who takes care of the participant, thus we can reveive more valid data for analysis. For future studies that consider using the same or similar questionnaires for the collection of EF data, we suggest collecting data from more than one caregiver and from the teachers to obtain a more subjective mean score for each participant.

In general, larger samples will lead to better inferences about correlations than smaller samples (Anderson, Doherty, Berg, & Friedrich, 2005). However, VanVoorhis and Morgan (2007)

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indicated that the general rule of thumb is to include no less than 50 participants in a correlation or regression study. Green (1991) suggested that $N > 50 + 8m$ (m is the number of independent variables) is required for conducting a multiple correlation analysis. According to the above suggestions, the sample size of $n = 60$ in the present study is not considered a big sample size for correlation analysis. Nonetheless, it reaches the general rule of thumb suggested by VanVoorhis and Morgan (2007). This case suggests that a larger sample size should be used for future correlation studies on EF-related variables.

To gain an improved understanding of the causal relationship of oral language skills and EF, additional training studies are needed. The findings from the current study show that EF and oral language skills do not correlate at the same time point. The majority of research on cognition and discourse examined how a specific EF measure relates to a particular narrative task (Mozeiko, Le, Coelho, Krueger, & Grafman, 2011). However, few studies have addressed the predictive power of specific EF substrates on story retelling performance. Story retelling performance or other discourse elicitation performance should be recorded at different time points for the regression analysis of the EF substrates' predictive power on story retelling performance at different time points.

The current study only analysed the correlational relationship between four EF substrates and story retelling performance at a single time point, and no strong correlation was found. In the study, age, oral language abilities and non-verbal intellectual ability were controlled. However, other confounding variables may contribute to the story retelling performance of the children. One way to solve this problem is to introduce additional control variables to control for the confounding variables. For example, the SES background of the children can be strictly controlled, or children can be recruited only from one kindergarten class.

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Chapter 4 Enriching the context for storytelling by promoting creativity: What are the secrets? (Study 3)

4.1 Introduction

Teachers frequently use the words ‘Be creative!’ to encourage students to think out of the box. Some teachers attempt to evaluate creativity by assessing students’ work and determining whether it is ‘colourful’ or even ‘going above and beyond’ (Randi & Jarvin, 2006). Sternberg, who wrote an introduction for the special issue ‘Creativity and Education’, stated that ‘There are hundreds of books and thousands of articles on how to teach children to think creatively. If one walks into a classroom, however, one is not likely to see a lot of teaching for creative thinking’ (2015, p.115). Thus, why are teachers emphasising creativity? Can creativity be trained and taught?

Before answering the above two questions, we need to understand that creativity can be hard to define or clearly assessed. One of the reasons is that creativity may be difficult to test in a standardised format unlike most psychometrics, which allow for cross-group comparison (Baer, 2016). Csikszentmihhalyi (2013) also stated that ‘If one turns to the literature of creativity research and asks the simple question: What is being measured? What is creativity? One soon realizes that the entire research enterprise moves on a very thin ice’ (p.143). The influential report of the National Advisory Committee on Creative and Cultural Education (1999) defined creativity as ‘imaginative activity fashioned so as to produce outcomes that are both original and of value’ and identified four characteristics of the creative process. Firstly, using imagination in the creative process is essential. During the process, individuals try the possibilities of a given situation. Secondly, creativity carries purpose and action. Individuals work towards a goal. Thirdly, originality is necessary for the creative process. Finally, the creative process consists of a generative mode of thought, in which individuals try possibilities with failures and modify the

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ideas that they generate. Another creativity researcher, Amabile (1996), provided a three-dimensional (3-D) definition of creativity in a direction similar to what the National Advisory Committee on Creative and Cultural Education suggested. She suggested that creativity should be novel, creating appropriate and useful responses to the task in hand, and heuristic rather than algorithmic (p.35).

The creativity expert Sir Ken Robinson defined creativity as ‘a process of having original ideas that have value’ (Azzam, 2009) and regarded creativity as a tool for human beings to face everyday challenges, including those from the biological, social, cultural or economic aspects. Guided by the definitions and characteristics presented above, we attempted to reconceptualise the relationship between creativity, play and storytelling in early childhood settings.

In the following literature review, I clearly describe two connections: (1) the relationship between play and creativity and (2) the past research focus on play and storytelling. After the literature review, I then describe the current study, titled ‘Enriching the context for storytelling by promoting creativity: What are the secrets?’

4.1.1 Relationship between play and creativity

Following the discipline of developmental psychology, the construction of mental representation begins as early as two years old during the symbolic function substage of the preoperational stage (Singer & Singer, 2009; Smith & Franklin, 1979; Harris, 2000). By the age of three or four, children can distinguish between reality and appearance and understand pretence as a subjective state (Harris, 2006). Some scholars discussed the importance of symbolic functions and the representational system that allow young children to play with pretence (Bialystok, 2000; Bretherton & Beeghly (1989). However, Smith and Carlsson (1990) claimed that young preschool

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children are unable to be creative because of their difficulty in distinguishing between their inner representation and external reality. Vygotsky (1995, 2004) emphasised that imagination and creativity begin with pretence in play and further develop into higher mental functions in the form of inner speech. As suggested, the symbolic representation of children in play is not only a simple reproduction of what they experienced but also a creative work that requires high-order thinking, concept formation and verbal communication skills. Children's creative process in play works towards the reconstruction of a reality that conforms to their own goals and needs (Vygotsky, 2004, pp.11–12).

4.1.2 Creativity and its contributing factors in early childhood

Creativity is how individuals see the surrounding world in a flexible and transformable way (Hoof & Carlsson, 2002). According to Guilford (1950), creativity is a set of personality traits of creative people. Although more definitions transcend the two mentioned, creativity researchers have agreed on a two-criterion definition of creativity: (1) original or novel and (2) adaptive or useful (Simonton & Damian, 2013). Hoff (2013) stated that two main theoretical perspectives provide evidence on the contributing factors of creativity in early childhood: cognitive and affective. These two perspectives are discussed in the following sections.

4.1.2.1 Cognitive perspective

The cognitive perspective of creativity focuses on problem-solving procedures and their cognitive processes (Hoff, 2013). Piaget, one of the representing cognitive theorists, suggested that the imagination and creativity of preschool children are precursors of mature thought that emerges at approximately six to seven years old (1952). The creative process is also seen as a combination

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of primary process thinking and secondary process thinking with blind variation and selective retention (BVSR) (Campbell, 1960). In the BVSR model, blind variation refers to the ability to generate different ideas with imagination. The greater the variety of ideas generated, the more that new and useful ones will be discovered. By contrast, selective retention refers to the evaluation of ideas according to the goals or given criteria, for example, appropriateness and novelty. When one has the intention to be creative, he/she discards common or useless ideas. Novel and valuable ideas are retained and further evaluated to reach the individual's goal. Yuan and Zhou (2008) classified the above two cognitive processes of creativity as heuristic and algorithmic, respectively. In heuristic tasks of creativity, the path to the solution is not clear and the goal is usually vague. By contrast, in algorithmic tasks, the path to the solution is clear and straightforward and the goal is clearly defined. Amabile (2018) suggested that pretend play or imaginary play is perceived as a problem-solving tool that is heuristic at the beginning. After some modification and selection of ideas, the algorithmic properties can also arise when children have decided the ways they will work through the problems towards the goal.

4.1.2.2 Affective perspective

Scholars agree that affection is an essential factor of both play and creativity (Amabile, Barsade, Mueller, & Staw, 2005; Lieberman, 1977; Russ, 2013). Russ (1993) also proposed a few factors of affection that contribute to the creative process of children at play. These factors include the affect themes in fantasy, pleasure and joy when working on a task, emotional status, and the ability to integrate and regulate affect. The above four affection status facilitate creativity. Children who express affect themes and emotions in play are more likely to develop creativity in play activities (Kaugars & Russ, 2009). Mood induction study also confirmed that positive affect

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enhances creativity (Isen, Daubman, & Nowicki, 1987). Play activities and creativity are believed to share common traits that require positive affect for intrinsic motivation (Amabile, 1996; Lieberman, 1977). When children find an activity fun and enjoyable, they find it easier to reach creative solutions.

4.1.3 Interplay of storytelling and play context

As storytelling consists of certain literacy cognitive skills, these mental operations are too difficult if young children have to think and discuss without any visualisation. Vygotsky (1978) suggested that play provides a medium for children to easily remember, recreate ideas and imagine from their previous experiences, thereby facilitating the creation of narratives. The inseparable relationship between storytelling and play was formulated by Paley (1990), who suggested that 'play is story in action, just as storytelling is play put into narrative form' (p.4). Paley also considered play and storytelling as two activities that are never far apart in early childhood. Storytelling is the oral verbal form of communication.

4.2 Current study

Studies 1 and 2 emphasised the linguistics issues of story retelling performance, whereas the current study (Study 3) focused on the contextual factors that contribute to the storytelling abilities of five-year-old children. Study 3 sought to examine the discourse structure of the stories created by five-year-old children and the circumstance(s) in which children can tell stories of different categories. The circumstances investigated aligned with the three designed activity groups in Study 1, namely 1) writing and colouring, 2) semi-structured play and 3) free play. Participants were placed in the three different circumstances above and asked to create a story.

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The overall aim of the study was to discover the contextual factors that might contribute to the storytelling and creation ability of children and develop a new model that explains the interaction of different contextual factors and storytelling properties in an early childhood education setting.

Part of the grounded theory methodology was recruited in the current study. The data were collected and analysed following the Strauss and Corbin (1998) approach to grounded theory, which consists of coding, concept development and the formulation of a theoretical model. The central focus of this study was to understand the behaviour process of children when asked to tell a story under different contexts, and the theoretical model emerged to suggest a framework of contextual factors that affect the storytelling behaviours (including verbal and non-verbal behaviours). The data collection of the study was consistent with many grounded theory studies. Face-to-face interview data were collected and used for further coding. An inductive approach was initially used to generate substantive codes from the data. Initial data collection was guided by the following questions:

a. Which macrostructural discourse elements are the most and least presented in stories created by five-year-old children?
b. Do children from different groups place different emphases on the discourse elements? Is there any clue of the affective process from the discourse element pattern?
c. Which activity provides a more favourable circumstance for children to create complete stories?

The prediction about the circumstance(s) of storytelling is that children who participate in the two play activities with bricks are more capable of creating plotted narratives than those who participate in the worksheet activity. Although illustrations play an important role in storytelling and retelling, the pictures prevent children from elaborating and imagining a story in the sense that

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children are applying the illustrator's mental images instead of their own (Spinillo, 1991; Berkowitz, 2011; Epstein & Phillips, 2009). Conversely,the emerging competence of five-year-old children in creating stories with episodic structures is suggested to be evident in play contexts owing to the use of action and visualised objects, namely movable bricks, as the tools for scaffolding (Ilgaz & Aksu-Koç, 2005). With dynamic and interactive visualisations of the bricks as tools for the imagination, brick-building activities can encourage children to actively integrate symbolic versions of pictorial representations (Bodemer, Ploetzner, Feuerlein, & Spada, 2004).

4.3 Method

4.3.1 Participants

The samples of Studies 1 and 2 in the project were used for the current study. Sixty kindergarteners with a mean age 61.17 months participated in Study 3. Table 2 in Chapter 2 presents the demographic details of the participants.

4.3.2 Procedures

We used the same method applied in Study 1 to randomise the participants in this study into three groups: WS, BS and FB groups. The researcher and the participants worked on a one-on-one basis. Participants were asked to create a story based on the topic 'Birthday Party' after engaging in the prescribed activity. The story was audio-recorded with an iPhone. The iPhone was held by the researcher, who pretended it was a time-checking device to avoid disturbing the participants. All participants were told that they could choose a gift (a pencil) after finishing the task.

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Worksheet Group. For the WS group, participants were given the same set of two colouring pages and coloured pencils. The two colouring pages selected for the task are shown in Appendix G. Participants were asked to work on the colouring pages independently for 10 minutes. During the process, the researcher provided suggestions to the participants or tried to ask them questions about a birthday party. After 10 minutes, the researcher asked them to create a story on the topic. Participants were allowed to look at the colouring pages when telling the story.

Brick Set Group. For the BS group, participants were given the same set of bricks, including some characters, trees, animals and furniture, such as chairs, tables, doors and windows. The content of the brick set was fixed, and the researcher ensured that all participants received the same number of materials. Figure 14 presents the content of the brick set. The researcher then introduced the brick components and instructed the participants that they must use the bricks given to construct a model of a birthday party. Participants were given 10 minutes for their playtime. During the process, the researcher did not communicate or give instructions to the participants. After 10 minutes, participants were asked to create a story on the topic 'Birthday Party'. They were allowed to move the brick components when telling the story.

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Figure 15 Study 3- Brick Set Group play materials

Free Bricks Group. For the FB group, participants were given two boxes of free bricks. Figure 15 displays the content of the boxes. Participants were told to play with the bricks in whatever way they like. No time limit was given. They were asked to create a story on a 'Birthday Party' after they finished playing with the bricks. Participants were allowed to move the bricks when telling the story.

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Figure 16 Study 3- Free Bricks Group play materials

Table 10 below shows the contextual differences of the three activities.

Table 12 Contextual differences among the three groups

	Worksheet Group	Brick Set Group	Free Bricks Group
Instructions/ introductions before activity	Yes	Yes	No
Instructions and communication during activity	Yes	No	No
Fixed materials	Yes	Yes	No
Time limit for activity	Yes	Yes	No
Dynamic movement of materials during storytelling	No	Yes	Yes
Extrinsic reward	Yes	Yes	Yes

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4.3.3 Data analysis method and instrument

The same assessment scale for microstructural discourse elements used in Study 1, namely the INC (Peterson et al., 2008), was employed for analysing the frequency of discourse elements in the stories. The INC covers a comprehensive scope of 13 discourse elements which are essential in assessing the story grammar units of the narrations. The 13 discourse elements include character, setting, initiating events, internal response, plan, action/attempt, complication, consequence, formulaic markers, temporal markers, causal adverbial clauses, knowledge of dialogue and narrator evaluations.

The Strauss and Corbin (1998) approach to grounded theory suggested some coding categories for the development of a theoretical model. These categories include the components of open, axial and selective coding. Selective coding was employed in the data analysis process of the current study. Researchers first familiarised themselves with the core discourse elements from the INC (Peterson et al., 2008) in the storytelling scripts. Then, they reread each transcript 13 times, selectively coding one single discourse element each time.

The analysis revealed that most of the stories consisted of a high frequency of nouns. Children tended to predominantly discuss objects. As the INC does not include the discourse element of ‘object’ or ‘noun’, an extra discourse element was added to the assessment scale.

The model of categorisation of stories (Spinillo, A. G., 1991; Spinillo, A. G. & Pinto, G., 1994; Pinto, Tarchi, & Bigozzi, 2016) was adopted for the data analysis of Study 3. The stories told by the children were classified into five categories according to the model. The five categories reflect different levels of story schema and are described in Table 8. This qualitative instrument was selected for data analysis because it involves both story structure and conventional expressions, and the criteria for each category match the macrostructural discourse elements rated by the INC

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in Study 1. For example, the setting, characters, central event (initiating event in INC), changes in the characters' environment (complications in INC) and resolutions (consequences in INC) were the criteria for different levels of categorised stories. Conventional expressions mentioned by Spinillo and colleagues include the conventional openings and endings of a story. Conventional expressions involve the 'traditional' way of starting a story. Defining the term 'conventional' in terms of story openings and endings is difficult. Spinillo and Cain (2013) suggested that a conventional story opening involves wordings like 'once upon a time' or 'one day', and a conventional story ending involves wordings like 'at the end', 'it is the end' or 'lived happily ever after'.

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Table 13 Five categories of stories told by children

Category of narrative structure	Properties
Category 0: No response	No utterance is produced
Category I: Non-stories	Simple description of actions without any characteristics of narrative style (conventionalised story openings or closing). The production is very short and sentences have few grammatical variations. • Simple actions without characteristics
Category II: Sketch stories	Introduction of the setting and the main character. Conventionalised story openings are found. • Setting • Main character • Opening
Category III: Incomplete stories	Setting and characters are present with conventional story openings, including the initiating events with information that mark some change in the characters' environment. • Setting • Character • Opening • Central event • Complication
Category IV: Essential stories	Introduces the setting and the characters with conventional story openings. The central event is presented with or without resolution. A conventional story closing is also found. • Setting • Character • Opening • Central event • Closing

(To be continued on next page)

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Category V: Complete stories	Complete narrative structure with an introduction of setting and characters and an explicitly stated event and resolution. Conventional openings and closings are observed. • Setting • Character • Central event • Complication • Resolution • Opening • Closing

4.3.4 Data analysis procedures and examples

The participant's stories were audio-recorded during the main assessment and then transcribed. The 60 transcripts were read carefully by the principal researcher and one research assistant. The frequency of each of the macrostructural discourse elements was counted, and Table 12 was formed for comparison and analysis. Investigator triangulation was employed to enhance the creditability of the study. In studies using qualitative method, especially when the coding of data is required, two or more investigators are involved in the data analysis procedures (Turner & Turner, 2009). The frequency of discourse elements was evaluated by the principal researcher and two research assistants to ensure reliability. Reserachers read and evaluated the transcripts individually and compared the coding of the discourse elements. Over 85% of the discourse elements coded by the principal researcher matched those coded by the research assistants.

Wordings and sentences were marked according to the microstructural discourse elements mentioned in Appendix C. In the following phase, one story from each of the three activity groups was randomly selected for each category as an example. The examples were translated from Cantonese to English. The original Cantonese version can be found in Appendix F.

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Category I: Non-stories. The narratives are non-stories that consist of simple descriptions of actions without a conventional opening and closing. The narrative production is very short and the sentences have few grammatical variations. Below are three examples of this category from the three activity groups.

1) Eat the cake. Having party. Finished. (WS group, participant 32)
2) This birthday. They…celebrate…celebrate…sing the birthday song, and the gift for him. (BS group, participant 5)
3) They celebrate…umm… they keep on celebrate. Celebrate the birthday. Nothing else. (FB group, participant 36)

Narrative elements were usually omitted from the stories of Category I. In some productions, such as in (1), the character was omitted and only the verbs 'eat' and 'having' were in the narrative. In (3), utterances were longer. An ambiguous pronoun 'they' was used but no reference was made to the character of the story. In non-stories, repetitions [e.g. 'They…celebrate…celebrate…' from sxample (2)] were frequently used for the coherence of the sentence because of the lack of temporal markers.

Category II: Sketch stories. The narratives consist of an introduction of the setting and the main characters. Conventional story openings (e.g. 'Once upon a time', 'one day' and 'today') are also presented.

1) Today is the birthday of the teddy bear. He is so happy. There is a cake as tall as the sky…very tall, very tall like one million. He said: 'so many games to play with!' Then he

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said there is a gift worth one million. Many magic sticks. Finished. (WS group, participant 14)

2) The birthday party, they bring their clothes but not the arrows and go together. The hunter holds him. Mommy is going, too. They are now sitting at the table, eating pizza. And they eat the breakfast at the table, too. They go to the birthday party at the school when they finished eating. Done! (BS group, participant 44)
3) There is the birthday party, and there is the slide, and the swing. We play at the park. We can bring the Lego to play at the park. We have also brought some toys from the store. We can play at home, too. If the toys are broken, we throw them into the bin, and buy some new toys. (FB group, participant 7)

Stories in Category II are often longer than those in Category I but are still unsuitable to be classified as stories. Conventional openings were found in the Category II stories, such as 'today' and 'there is the birthday party' from scripts (1) and (3). Other than the pronouns 'he', 'they' or 'we', the storytellers tried to identify the main characters in the story and linked the characters with the events. For example, in script (1), 'teddy bear' appeared as the main character, and the whole narrative centred on the birthday of the teddy bear. Although the main events were more concrete in the stories, the description was still shallow and had no complications and consequences. Temporal markers were also limited.

Category III: Incomplete stories. This category consists of an elementary narrative structure with the introduction of settings, characters and conventional story openings. The stories also contained an initiating event with some changes in the characters' environment.

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1) They are playing with the swing, umm, the sisters. She hurts herself here, and she sits on the swing. She hurts her head! So she goes home and asks mommy to rub her head. Then they play at home, play with the sister. Then she said, 'My sister hits me!' Then she tells 'Mommy!', and mommy scolds her sister. (WS group, participant 4)
2) They are ready to go to the birthday party. When they light up the candle, it catches fire! Then they call the firefighters. The firefighters come to save them. They can continue the birthday party. (FB group, participant 34)
3) The mom… because it's his birthday, mom bought him a cake. There are candles, too, and some candies. Mom said, 'Let's have the cake!' Then, he said, 'What cake is it?' 'It's a candy cake'. He said, 'Oh I like candy cake!' Then he came to the cake, and blew the candles. (WS group, participant 45)

A remarkable characteristic of the stories in Category III that distinguish them from the previous two categories is that at least one change in the characters' environment was presented. For example, in script (1), the setting of the story shifted from the swing (at the park) to the home. In script (2), the focus situation changed from a birthday party to an accident.

Category IV: Essential stories. As in Category III, narratives from this category consist of the introduction of settings and characters with conventional story openings. Moreover, the narratives focus on an initiating event and have a sudden complication of the plot as the main event. However, no resolution is presented for the complication. Conventional story closings are also found.

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1) They are going to the birthday party by bus. They need to ride on bus no. 2 to Cheung Sha Wan, and go very high up there. But they have to wait for long time for the bus to the beach where they have the birthday party. Hello Kitty needs to wait for bus no. 10 to Cheung Sha Wan. She needs to go to school. Then after school she needs to take the double decker to the shopping mall, and take the aeroplane back to her home. The story is done! (WS group, participant 47)
2) One day, when it is the birthday party, I'm 6! We sit down at the birthday party, and they eat the birthday cake. We give him the birthday gifts after eating the cake. He is very happy. Then he unwraps the gifts. One of the gift is a star! He gives it to mom, then he goes to bed. When he wakes up, he goes to school. Finished! (BS group, participant 31)
3) It's Jason's birthday. Then he tells his mom, 'Today is my birthday!' He wants to have a birthday party, but the mom says, 'It's too early Jason. Let's sleep for a bit longer'. Then Jason wakes up: 'Wake up! Let's go to the birthday party!' Mom says, 'OK, let's go to brush your teeth'. After brushing his teeth he eats the cornflakes. Then he…then he… goes to the party. After the party, Jason wants to have a gift card, but mom says, 'Wait for a while, Jason. Let me finish chatting first and make a phone call'. He answers, 'OK'. Then they go home. It's night time already. Bye bye! (FB group, participant 12)

Conventional story closings were presented in the stories from Category IV, thus differentiating the stories from those in previous categories. In the above three scripts, the ending of the story / main event was marked by terms like 'the story is done', 'finished' and 'bye'. Changes in settings and complications were presented, such as the 'birthday party to bed, then to

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school' setting in script (2) and the 'home to birthday party' setting in script (3). No consequence or resolve of the plot was presented though.

Category V: Complete stories. Complete stories consist of an introduction of settings, characters, initiating events, complication of the major event and resolution to the complication. Conventional story openings and endings are also found.

1) At that time, it was in August, and it was someone's birthday. Somebody lighted the candles, and the fire went onto the floor. It caught fire! Then they left the school. The firefighters came, and there was no fire suddenly because there are fire extinguishers at school and they fought the fire off. Then they built the school again. They lighted the candles again and no catching fire this time. Finished! (WS group, participant 37)
2) At the birthday party, he wants to light the candles with bullets. He lights the whole house up, and the house explodes! Then the firefighters come and save him. Then he goes to school. He shots the bullets at the cake and blow it… the whole school…. Explodes! He cannot blow it because there is too much fire. His mouth is not powerful enough. He cannot use the fan, because the fan is broken. All furniture are broken. Then at the end, everything explodes. Boom! The cake is cooked, but not exploded. Only the candles and the room explode. Finished. (FB group, participant 38)
3) 'Wow mommy, I want to have the birthday party at the peak today. It's my birthday!' 'OK!'

   Then she goes to the peak by car. She sits down on the peak, but there is nobody around.

   'Hi! I'm your friend'.

   'Are you going to have a party with me?'

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‘Yes! We are having a party on the peak. My party is the best!’

‘Let’s go!’

‘Wow! We have chocolate sticks, chocolate marshmallow and the chocolate fountain here. And also siu mai, and all the delicious food in the world!’

Then, ‘You come to my place. I’m full now’.

‘Wow! You have so many food at your party’.

‘Yes. We have all the toys here too!’

‘Wow, it’s fun!’

Then they play till late. They need to go home.

When they go home, they see a weird big head.

‘I saw that weird big head too! That person is really weird. He looks like a monster’.

‘Let’s go quickly now!’

Then they run away and go home.

(FB group, participant 49)

In the above three narratives, conventional openings and closings were presented (e.g. by using the word ‘finished’ in scripts 1 and 2). All three narratives consisted of a complication with a resolved solution. For example, in script (1), the firefighters fought the fire on the birthday cake, and in script (2), the children ran away to escape from the monster. The narratives were presented clearly with one central event. Although characters were not given concrete names, references were readily made in relation to their actions/speech, and the storylines were easy to follow.

After the stories were categorised, the percentage of each story category from each activity group was calculated and presented in a table for comparison and analysis.

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4.4 Results

4.4.1 Total discourse elements presented by different groups

Regarding the frequency of all 13 discourse elements, children who participated in free play produced the most macrostructural discourse elements, whereas those who participated in the worksheet activity produced the least. Table 12 indicates that 369 discourse elements, the highest number of total discourse elements presented among the three activity groups, were contributed by the participants from the FB group. Participants from the BS group presented nearly two-thirds the number of discourse elements (247) provided by the FB group, and the least number of discourse elements (143) came from the WS group.

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Table 14 Frequency of discourse elements by activities

Discourse elements*	Activity			
	Worksheet *n* = 20	Brick Set *n* = 20	Free Bricks *n* = 20	Total *n* = 60
1. Character	17	61	46	124
2. Setting	10	5	19	34
3. Initiating event	5	5	5	15
4. Initiating response / emotion	4	6	4	14
5. Plan	0	0	0	0
6. Action words / verbs	38	64	122	224
7. Complication	2	0	5	7
8. Consequence	2	0	4	6
9. Formulaic markers	1	4	2	7
10. Temporal markers	25	41	64	130
11. Causal adverbial clauses	1	1	1	3
12. Dialogue	4	13	18	35
13. Narrator evaluation	0	0	0	0
14. Object/noun**	34	47	79	160
15. Total discourse elements presented in stories	143	247	369	759

* Discourse elements 1–13 are adopted from INC.
** Discourse element 14 is an extra element developed for the current study and is not included in the assessment instrument INC.

4.4.2 Macrostructural differences of the stories created by the three groups

Exploring the characteristics of stories created by children from the BS group revealed that the children from this group had a greater ability to present more utterances about characters than did children from the other two groups. The dominant macrostructural discourse elements presented by the BS group included characters, action verbs, temporal markers and nouns.

Action verbs, temporal markers and nouns were also the dominant elements presented by the FB group. Notably, the FB group generated an outstanding amount of action verbs.

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To further explore the two outstanding numbers of verbs and nouns produced in the stories, we calculated the ratio of nouns to verbs using the equation suggested by Tardif, Gelman and Xu (1999). The equation is as follows:

Nouns/(nouns + verbs), with the simplified form of N/(N+V).

The ratio helps clarify whether a statistically significant predominance of nouns or verbs is found in the stories created by the children in the study, and the ratios are displayed in the following table.

Table 15 Comparisons of the nouns and verb types and the ratios among the three activity groups

	Nouns	Verbs	Nouns + verbs	Noun–verb Ratio	Summary
WS group	34	38	72	.47	V > N
BS group	47	64	111	.42	V > N
FB group	79	122	201	.39	V > N
Total	160	224	384	.42	V > N

Note. Figures are rounded up to two decimal places for the ratios

In the above table, a ratio above 0.50 means that nouns outnumbered the verbs. A ratio below 0.50 means that more verbs than nouns were produced. As presented in Table 13, all the noun–verb ratios were below 0.50. Thus, all participants produced more verbs than nouns in the stories they created. A closer look at the group difference shows that the FB group had the lowest ratio among the three groups, suggesting that children from this group showed the clearest predominance of verbs than nouns in their stories.

4.4.3 The absence of specific discourse elements

Just a small number of the 60 participants were able to present cognitive verb reference, which is the intention to act on or solve an initiating event. For example, in example number 2 and

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3 on p.106, the cognitive verb ‘want’ are presented. Some of the examples of the cognitive verbs suggested by the INC include ‘thought that’, ‘wanted to’ and ‘decided to’. Furthermore, none of the 60 participants presented a narrator evaluation during the storytelling activity. According to the INC (Peterson et al., 2008), narrator evaluations refer to any explanation provided by the storyteller to justify why an action or event took place.

Also, limited presentation of the initiating event, initiating response/emotion, complication, consequence and causal adverbial clauses were found in the 60 stories, regardless of which group produced the stories.

Regarding the frequency of all 14 macrostructural discourse elements, children from the FB group presented the most macrostructural discourse elements, whereas those from the WS group presented the least.

4.4.4 Categories of stories

Each of the 60 stories was categorised. Table 10 presents the percentage and number of each category. The statistical results segregated by groups are also presented in three pie charts (Figs. 17- 19).

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Table 16 Distribution of categories of stories from the storytelling activity

Category	WS *n* = 20		BS *n* = 20		FB *n* = 20		Total *n* = 60	
0	35%	(7)	25%	(5)	15%	(3)	25%	(15)
1	40%	(8)	35%	(7)	35%	(7)	36.6%	(22)
2	5%	(1)	15%	(3)	10%	(2)	10%	(6)
3	10%	(2)	0%	(0)	5%	(1)	5%	(3)
4	5%	(1)	25%	(5)	15%	(3)	15%	(9)
5	5%	(1)	0%	(0)	20%	(4)	8.3%	(5)

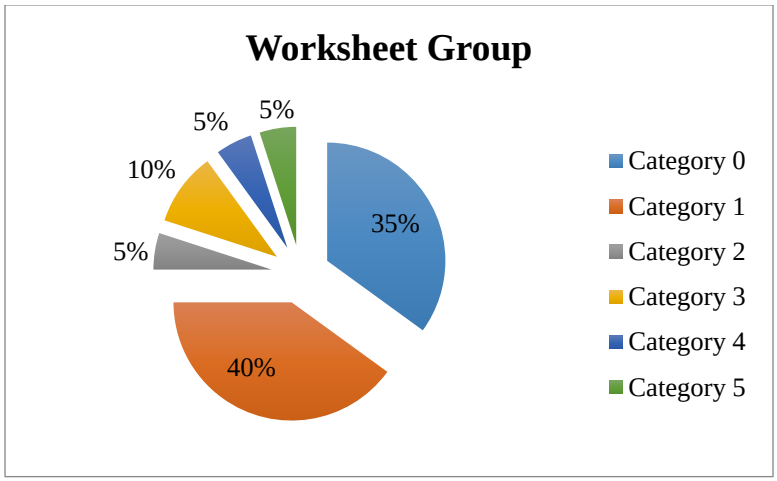

Figure 17 Distribution of story categories in the Worksheet Group

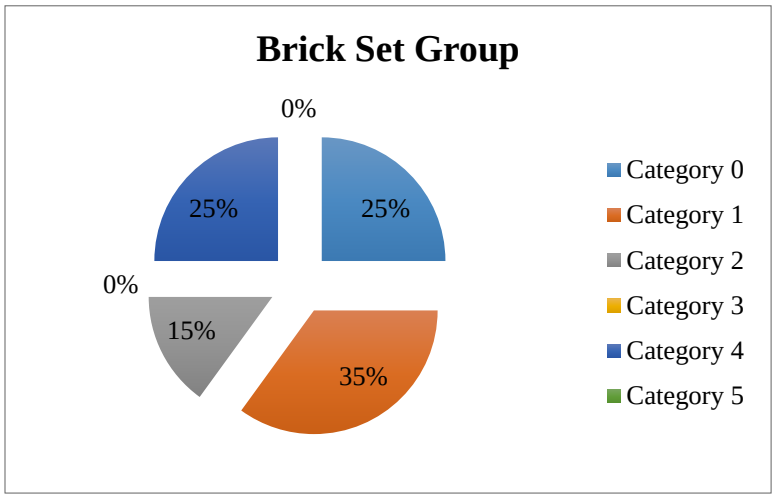

Figure 18 Distribution of story categories in the Brick Set Group

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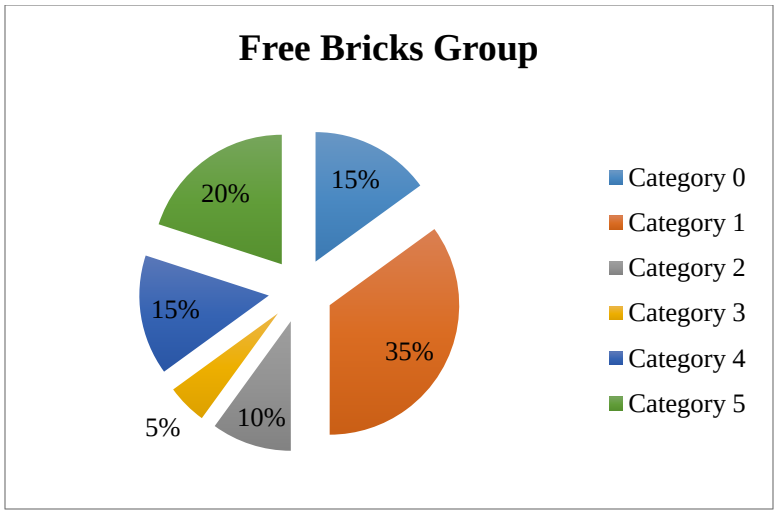

Figure 19 Distribution of story categories in the Free Bricks Group

In going further from the five categories of stories proposed by Spinillo and colleagues (Spinillo, A. G., 1991; Spinillo, A. G. & Pinto, G., 1994; Pinto, Tarchi, & Bigozzi, 2016), the five categories, including Category 0, are finely reclassified in the current study into the following three categories for detailed analysis: (1) shallow stories, which consist of Category 0 and 1 stories; (2) middle-level stories, which consist of Category 2 and 3 stories; and (3) nearly complete and complete stories, which consist of Category 4 and 5 stories, respectively. Table 15 lists the distribution of the three categories of stories.

Table 17 Proportion of the three categories of stories in each group

	Worksheet Group *n* = 20	Brick Set Group *n* = 20	Free Bricks Group *n* = 20
Shallow stories	75%	60%	50%
Middle-level stories	15%	15%	15%
Nearly complete or complete stories	10%	25%	35%

*The percentages are calculated by adding the numbers of stories in the category and dividing the sum by 20.

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4.4.4.1 Capability of creating a complete story

Only one participant from the WS group was able to create a complete story. None of the participants from the BS group were able to create a complete story and only 4 out of 20 participants (20%) in the FB group were able to tell a complete story. Thus, in response to research question (g), children are most able to create complete stories under the free play circumstance.

4.4.4.2 Inability to produce an utterance when asked to create a story

Non-stories that consisted of 'simple descriptions of actions without and characteristic of narrative style' (Spinillo, A. G., 1991; Spinillo, A. G. & Pinto, G., 1994; Pinto, Tarchi, & Bigozzi, 2016) were classified as Category 1 in the analysis. When the participant produced no utterance during the storytelling activity, the result was assigned under Category 0. A large proportion (35% of the group) of the participants from the WS group was unable to produce any utterance when they were asked to do so. By contrast, 25% of the participants from the BS group and 15% of participants from the FB group could not produce any utterance. A similar trend was found for the Category 1 non-stories. A total of 40% of participants from the WS group and 35% from the other two groups produced random utterances that were not adequate to form a story. Conventionalised story openings and closings were missing. The sentences were very short and simple with few grammatical variations. No coherence or conjunction was observed between the short sentences. Note that 25% of participants from the BS group were able to tell a Category 4 story, but some elements for a complete story were missing. According to the examples cited in section 4.3.4 of this chapter, the main element missing was the consequence or resolution of the story plot.

4.5 Discussion

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4.5.1 Required cognitive process in play and creative storytelling hinted by the BVSR model

Hoff (2013) suggested that two main theoretical perspectives provide evidence for the contributing factors of creativity in early childhood. One such perspective is the cognitive perspective. According to the BVSR model of the creative process (Campbell, 1960), children go through the cognitive processes of BVSR during creative activities.

Children from the BS and FB groups had very strong intentions to construct and re-construct with the bricks. Examples of the brick models were randomly selected from each group for the following discussion. According to the field notes and photographs of the bricks models, each group had a special pattern in presenting their ideas for a story. For instance, most children from the BS group liked to put the characters in different locations and try out the best location to place the characters. Children from the FB group had even more freedom to combine their bricks. Figures 19 and 20 indicate that a participant from the FB group tried out different ways that she could form a human-like character with the free bricks. However, she discovered that arranging the bricks as shown in Fig. 19 was ineffective. She could not easily move the character around on the mat. Finally, she came up with a way wherein the bricks could stick together and easily move around. Figure 20 shows the final form of the character.

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Figure 20 Trial combination of bricks by participant 21, free bricks group

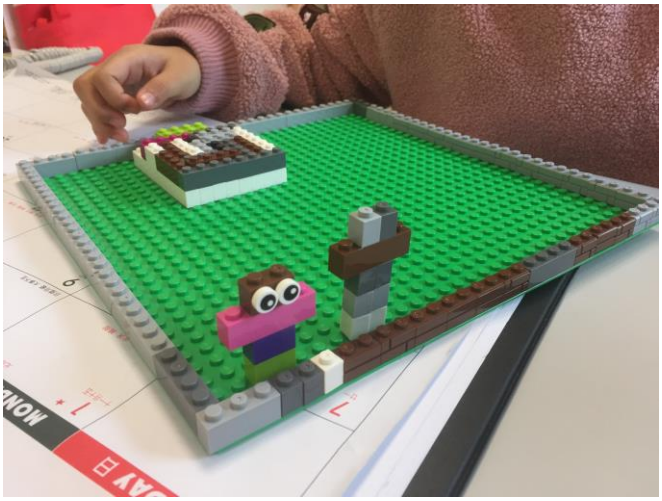

Figure 21 Final form of character presented by participant 21, Free Bricks Group

In another example from the BS group, the participant first placed the bird on the treetop (Fig. 21). After some time, he moved the bird from the treetop to the top of the door. When telling the story, he explained that the bird was too far away from the other characters, and it was too difficult for the bird to join the activities. Note from Fig. 22 that the final positioning of the characters and other elements (such as bed, table and door) differed from their initial positions. The participant explained that characters must stay close in a birthday party, and this was why he

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moved the characters to a position closer to the ‘cake’ on the table (as demonstrated by the arrow on Fig. 22).

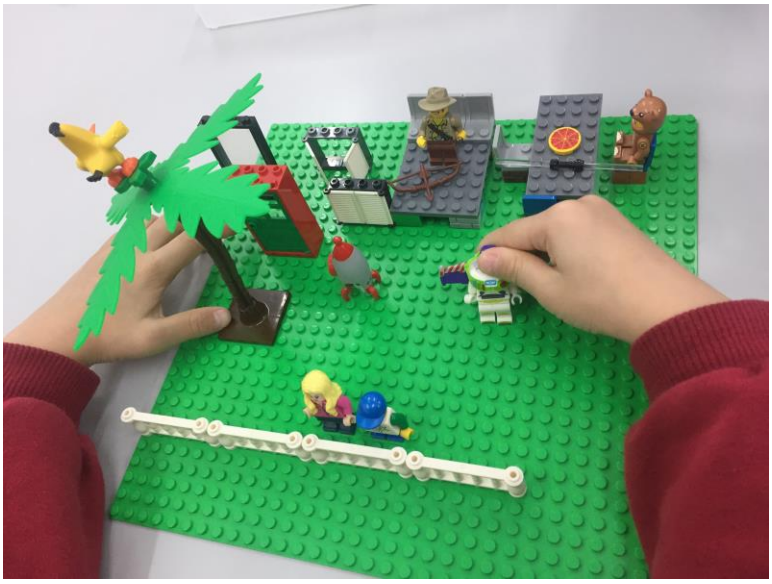

Figure 22 Initial presentation of story by participant 56, Brick Set Group

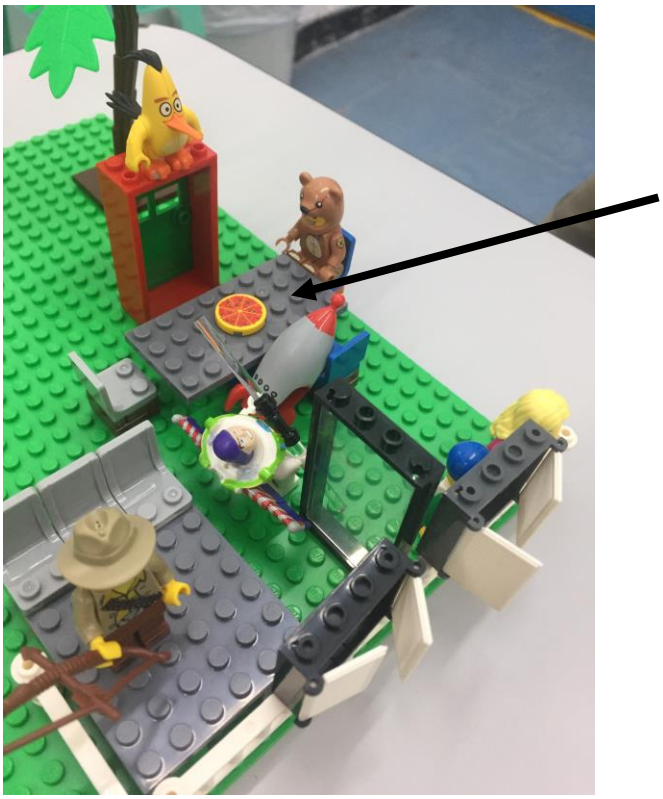

Figure 23 Final positioning of the character by participant 56, brick set group

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According to the above analysed behaviours and with reference to the findings of Yuan and Zhou (2008), both participants were undergoing the heuristic process of blind variation in play. They were going through the process of blind variation by changing the positions of the characters and trying out different combinations of the bricks. These acts provided them the opportunities to generate various ideas based on the task requirement of creating a story about a birthday party. Through the heuristic process of blind variation, imagination was used to identify the combinations of ideas and knowledge from their memories and experiences. As Hoff (2013) suggested, imagination is a trial-and-error process that help children generate appropriate ideas for a task. The more variations the children generated, the more useful the ideas they could use for the storytelling task. Given the above evidence, the assertion can be made that one of the possible reasons for the creation of more nearly complete and complete stories in the FB and BS groups is that the dynamic movement of visualised materials during storytelling facilitated the heuristic process of blind variation. This process, in turn, provided the children more ideas for working towards the storytelling goal.

Conversely, participants from the WS group did not have the opportunity to experience the blind variation process with dynamic visualisation of playing materials. The dynamic movement of materials was only present in the BS and FB groups. Therefore, with the absence of visualised and dynamic playing materials, the heuristic process of blind variation could not be completed for five-year-old children because they have difficulty in processing blind variation mentally.

A possible reason for the higher percentage of shallow stories found in the WS group (Table 12) was that the colouring pages showed too much information about a ‘Birthday Party’. According to Simonton and his team (2012, 2013), an inverse relationship convincingly exists between creativity and sightedness. Highly creative ideas can be found in a blind situation rather

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than a sighted situation (Simonton, 2013). The Monte Carlo simulation of the plot of creativity as a function of sightedness by Simonton (2012) is shown in Fig. 23. The scatter plot shows the inverse relationship between creativity and sightedness for Monte Carlo generated ideational combinations. The most creative combinations of ideas are found when sightedness is low, whereas the least creative combinations of ideas are found when sightedness is high. The results of the current study further confirmed the Monte Carlo ideational combinations of the inverse relationship between creativity and sightedness in the way that the most complete and highly creative stories were found in the FB Group.

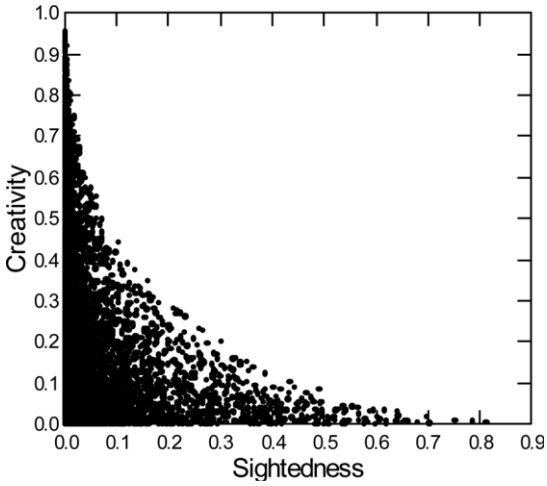

Figure 24 Monte Carlo simulation of the plot of creativity as a function of sightedness by Simonton (2012). The graph is adapted from Figure 4 in 'Combinatorial creativity and sightedness: Monte Carlo simulations using three-criterion definitions' by Simonton (2012), The International Journal of Creativity and Problem Solving, 22, pp. 5–17.

Children from the WS group were expected to be able to tell a complete story about a 'Birthday Party' after working on the colouring pages, because elements of a birthday party are shown on the page. However, a surprising result was that most children (75%) from the WS group

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were only able to create shallow stories about a ‘Birthday Party’. This outcome is in line with the suggestion of Simonton and his team about the inverse relationship between creativity and sightedness. When children were shown the colouring pages of a birthday party, the knowledge was sighted and embedded in their minds. However, the highly sighted knowledge of a ‘Birthday Party’ caused a negative effect in how they created a story with the given topic.

4.5.2 Affection as a contributing factor of creative storytelling

One of the surprising results in this study is that most completed stories were found in the FB group, where the children engaged in free play without adult intervention and no provided instructions. By contrast, none and only a small number (5%) of completed stories were found in the BS and WS groups, respectively. One possible reason for the above results is that the participants in the two brick play activities showed more interest and more positive affection than those who participated in the worksheet activity, especially for the children from the FB group.

According to Lieberman (2014) and Russ (1999, 2013), affection processes are decisive in play and creativity. Positive affect enhances creativity (Isen, Daubman, & Nowicki, 1987). When children are doing something for fun, an intrinsic value exists in attaining the creative solution for the goal, which is to create a story after playing with the bricks. As children from the BS and FB groups were more interested in the brick play activity and children from the WS group did not exhibit a notable interest in the colouring activity, the explanation can be made that the positive affect and motivation in the BS and FB groups is one reason they can create more complete stories than the WS group.

According to Table 10, one of the factors that distinguishes the FB group from the other two groups is the absence of time limit for the activity. With the aid of field notes and comments

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made by the researchers, the BS and FB groups showed the following two characteristics when they were engaging in the free play activity: (1) they were more excited than the children from the WS group when told to play with the bricks, and (2) they were unrestricted in terms of time when playing with the bricks. Children from the FB group were not given any time limit for the playtime. As marked in the field notes, none of the participants in the FB group asked when the activity would end. BS group participants were told to have 10 minutes of playtime before the storytelling. The field notes reveal that 12 out of 20 of the children asked for extra time when the researchers announced that time was up. The rest of the children (n = 8) did not respond to the researcher's request to finish the playtime and continued playing until the researchers requested a second time.

According to the Hungarian psychologist Csikszentmihalyi and his team (2014), flow is defined as 'a subjective state that people report when they are completely involved in something to the point of forgetting time, fatigue, and everything else but the activity itself'. Children from the BS and FB groups were observed to experience some timeless behaviours as described.

Amabile and her colleagues (1996, 1999) suggested that extrinsic rewards, such as gifts, competition and evaluation, will thwart the creative process. As all participants were told that they could choose a gift after finishing the storytelling task, we can conclude that an extrinsic reward is not the main contributing factor to the difference in the storytelling in this threshold.

To conclude, intrinsic motivation and positive affection were the key drivers for the children to work creatively towards their goal.

4.5.3 Verb-bias tendency of Cantonese-speaking children in oral expressive language

How young children learn verbs and nouns is crucial for our understanding of early lexical development, and thus research focus has been directed towards the noun and verb learning of

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children. Gentner (1982) tested whether young children learn nouns or verbs early in their early childhood. She concluded that the noun bias in young children is universal and described the underlying cognitive processes that explain the findings. She also proposed that nouns are easier for children to learn than verbs, independent of the distributional and structural properties of oral language.

Some evidence suggested that verbs predominate in Chinese-speaking children (Choi, 2000; Tardif, 1996), while some studies revealed that nouns and verbs appear in equal proportion in children's narratives (Choi & Gopnik, 1995). However, samples in the aforementioned studies involved Mandarin-speaking children instead of Cantonese-speaking ones. Cantonese is a dialect of Chinese, and its phonological, pragmatic system and vocabulary slightly differ from Mandarin (Zheng, 1995). Thus, conducting an independent study on the Cantonese expressive vocabulary structure of Cantonese-speaking children in Hong Kong is crucial. A local study revealed that Cantonese-speaking children aged 36–60 months seem to use more verbs than nouns in their daily utterances (Tse, Chan, & Li, 2005). The study also confirmed that Cantonese-speaking and Mandarin-speaking children display similar expressive vocabulary patterns, wherein they place more focus on verbs in the preschool toy play context. The findings of this study on whether Cantonese-speaking children at five years old have noun bias or verb bias when producing their self-created narratives are interesting. We also considered the contextual factors in positing that different classroom activities may contribute to the noun–verb ratio of narratives.

Table 9 shows that the verb is the dominating discourse element produced by the children. In total, 224 verbs were coded in the stories, accounting for approximately 30% of the total discourse elements coded. The total number of nouns coded was 160. The verbs produced by the

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children far outnumbered the nouns. The total noun–verb ratio and the ratios of each group suggested that our samples produced more verbs than nouns in their expressive oral language.

4.5.3.1 Verb-bias of oral language due to the unique linguistic properties of Chinese

In studies about the noun and verb bias, the verb bias in Mandarin- or Cantonese-speaking children can be explained by the unique linguistic properties of the Chinese language. Tardif (1996) and Gentner (1982) pointed out clearly that Chinese is a language with a simple morphological structure. This linguistic property contributes to fostering verb learning and usage of the Chinese language. Owing to the morphological characteristic of the Chinese language, a verb may be the single word in a sentence. Children do not necessarily need the ability to map and further extend verbs compared to English-speaking children (Imai, Haryu, Okada, Hirsh-Pasek, Golinkoff, & Shigematsu, 2008). For example, when a child falls to the ground and his/her friend wants to tell the teacher about it, he/she is likely to say 'fall' ('跌倒'/ '跌親'). The object and subject of the sentence are both omitted. This case seldom happens in English. Furthermore, nouns and verbs are not morphologically distinguished in the Chinese language (Erbaugh, 1992). When a word is produced on its own, distinguishing whether it is a noun or a verb is difficult (Li, Jin, & Tan, 2004). In this way, the usage of verbs is restricted with less grammatical boundaries than those found in English. Suggestions from Tardif and her team (1997) also provided insight for the current study's results. The team suggested that Cantonese is a pro-drop language, such that verbs are difficult to be omitted from a sentence. The unique linguistic properties of the Cantonese language and the special usage of verbs can explain why children use much more verbs than nouns in their stories.

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4.5.3.2 Contextual difference as an influencing factor of verb usage

Despite the linguistic properties of Cantonese, a single verb may generate an understandable sentence. The findings reveal that the free play context with the least restrictions and regulations imposed foster the most oral production of verbs instead of nouns. This context is followed by the semi-structured play context with limited restrictions and regulations, and the written-based context fostered the least oral production of verbs. It is reasonable to posit that the presentation of visualised and dynamic objects (the bricks in this case) allowed the children to omit the nouns when they were creating their own stories. The play materials acted as the tool for the symbolisation and visualisation of objects. Thus, what remained in the speech were the verbs used to describe the actions.

4.6 Limitations and future directions

The aim of this study was to investigate the contextual factors that facilitate creative storytelling in children. We sought to capture snapshots of how children engaged in the three different activities and considered a few factors in children's story creating abilities. We aimed at sampling children from a similar socioeconomic background because SES was not one of the independent variables we took into account in this project. As SES and home backgrounds, including parental influences, can be factors that affect the oral language abilities and lexical structure of young children (Durham, Farkas, Hammer, Storch, & Whitehurst, 2001; Tardif, 1996; Tomblin, & Catts, 2007; Hoff, 2013), it would be interesting to examine the role of SES and parental influence on the storytelling ability and creativity of children and their influence on lexical differences in early childhood.

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4.7 Conclusion

In this study, children's ability to create a complete story in three different contexts was assessed. According to Amabile's (1996) 3-D definition of creativity, any creative activity should carry the following characteristics: novel, with a useful and appropriate response and heuristic rather than algorithmic. In this work, we examined the process of how children engage in three different activities and analysed how much work they did towards the goal. Along the process, we also discovered contextual factors that positively or negatively affect children's ability to complete the goal. 'To create a story with the given topic' was the goal we issued to the 60 children who participated in the study. By assessing how complete the stories created were, we understood how well the children managed to complete the goal we gave them with appropriate responses. During playtime, we tracked how the children played with the bricks and observed how they went through the heuristic process of creativity. This research combined process analysis and outcome analysis to understand the factors that enrich the context for children's creative storytelling.

A particular key finding of this study is that most of the complete and nearly complete stories were from the BS and FB groups. Possible reasons for the results were discussed according to two perspectives: cognitive and affection. In the BS and FB groups, children went through a more heuristic process by moving the bricks around and generating different ideas before they created the stories. In the WS group, children were only able to colour and draw on their materials. The lack of interactive visualisation hindered them from the blind variation process, in which they did not have the opportunity to turn their imagination into various goal-reaching ideas. A possible reason why the least complete stories were found in the WS Group is that the children were exposed to numerous materials that were related to their goal. Owing to the inverse relationship between creativity and sightedness, children from the WS group who have seen the related

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materials were only able to create shallow stories. Intrinsic motivation and the state of flow were also two factors that affected the ability of children to create stories.

This study confirmed that Cantonese-speaking children express more verbs than nouns in their expressive oral language, regardless of the play activities they were engaging in. The free play context triggered the largest number of verbs produced by the children in their self- created stories.

In response to the title of this study, 'Enriching the context for storytelling by promoting creativity: What are the secrets?', we can sum up a few 'secrets' of the contextual factors that are favourable for five-year-old children to create stories. Firstly, the presence of dynamic and interactive visualisation does help activate the blind variation process in creativity, thereby leading to the generation of more ideas. Secondly, limiting the sightedness of materials that are related to the creativity domain could help with a more effective generation of ideas. Thirdly, positive affection during play activity leads to a rise in intrinsic motivation, resulting in more creative ideas generated for storytelling. Finally, the absence of time limitations enhance creativity in storytelling by allowing participants to experience 'flow' status.

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Chapter 5 General discussion

5.1 Revisited issue - learning through play in doubt

The quality and effects of learning through play have been investigated in the past decades, and the doubt has no borders. In both Western and Eastern countries, the learning outcomes of play have represented a concern (Cheng, P. W. D., 2010). Ailwood (2003) claimed that play activities in preschool settings are repetitive and more recreational than educational. In a comparative study conducted in five countries (France, Germany, Japan, the United Kingdom and the United States), parents seemed confused about the role of play in learning (LEGO Institute, 2002). Many parents disagreed with the contention that children can learn when they play and through play. Thus, most children are motivated to work towards academic success with the intensive training of basic skills in school (Golinkoff, Hirsh-Pasek, & Singer, 2006).

The overall aim of this work was to understand the underlying factors of different discourse structures of retold and created stories and the circumstances in which children may tell more complex stories. In this project, we examined the effects of three different activities on children's storytelling and story retelling performance. We called these activities 'play-narrative integrated activities'. Three studies examined play activities in the early childhood context to comprehend the psychological mechanism of how different designs and instructions of the activities affect the storytelling and retelling performance of kindergarteners. These studies also examined the individual differences in executive functioning skills that may affect story retelling performance, including inhibition, planning, regulation and working memory. Apart from assessing the storytelling/retelling performance from a psycholinguistic perspective, the three studies also considered contextual factors. Participants were placed in different contexts: written-based activity, semi-structured play and free play.

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The three studies presented in the project examined three different activities in an early childhood context from different angles: (1) a group comparison analysis to identify the effect of three different play activities on story retelling, (2) a correlation analysis to examine the relationship between oral language production and executive functions and (3) a grounded theory to examine the different categories of stories that children were able to create under different play settings. Table 16 summarises the characteristics and key findings of each of study.

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Table 18 Summary of study characteristics and findings

	Study 1	Study 2	Study 3
Sample(s)	60 children with a mean age of 61 months	60 children with a mean age of 61 months and their main caregivers	60 children with a mean age of 61 months
Statistical/research approach	Group comparison analysis by analysis of variance	Correlation analysis	Grounded theory
Data sources	- 60 story retelling scripts	- 60 story retelling scripts - Executive functioning scores of participants	- 60 storytelling scripts - Field notes - Field photos
Primary aim	- To assess the story retelling performance by analysing the narrative discourse element scores (microstructural and macrostructural) - To compare the scores among the three groups	- To examine the relationship between story retelling performance and executive functioning skills (inhibition, planning, regulation and working memory) - To compare the relationship among the three groups	- To code the stories and compare the microstructural discourse elements of stories from the three groups - To explore which play circumstance is favourable for the creation of complete stories
Primary outcomes	- Stories retold at two time points were rated and three narrative discourse element scores were recorded	- Executive functioning skills with four subscales (inhibition, planning, regulation and working memory) were rated by the main caregivers of the children - EF scores were correlated with the story retelling performance and the oral presentation of parts of speech	- Stories were coded and frequencies of the microstructural discourse elements were recorded - Stories were coded and categorised into five complexity levels - Noun–verb ratios were calculated for the three groups
Key findings	- The BS group had the highest narrative	- No significant correlation of EF	- Discovering the dominant

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	discourse element scores - Participants performed significantly better in story retelling with play activities (at T2)	and story retelling performance - Strong inter-relatedness of the EF subscales - Regulation is positively correlated with verbs and double object verbs	microstructural discourse elements in the created stories - More completed stories were found in the FB group - All stories created were verb-biased

From the findings of the three studies, we summarised the factors that affect the effectiveness of these PNIAs on narrative production in three levels: personal, instructional and contextual. Taken together, the three studies show that different PNIAs have specific roles in either enhancing the story retelling or storytelling performance of five-year-old children. These studies specify the characteristics of the triggered mental process of the three activities and identify the factors in different levels that contribute to the storytelling/retelling performance of young children.

The key findings from this research project are summarised below. These findings provide initial empirical evidence for the key insights that are applicable to instructional and curriculum design in early childhood education (Fig. 24). The model combines the findings from the three studies and illustrates factors from the instructional, personal and contextual levels that would enhance the effectiveness of PNIAs in preschool settings.

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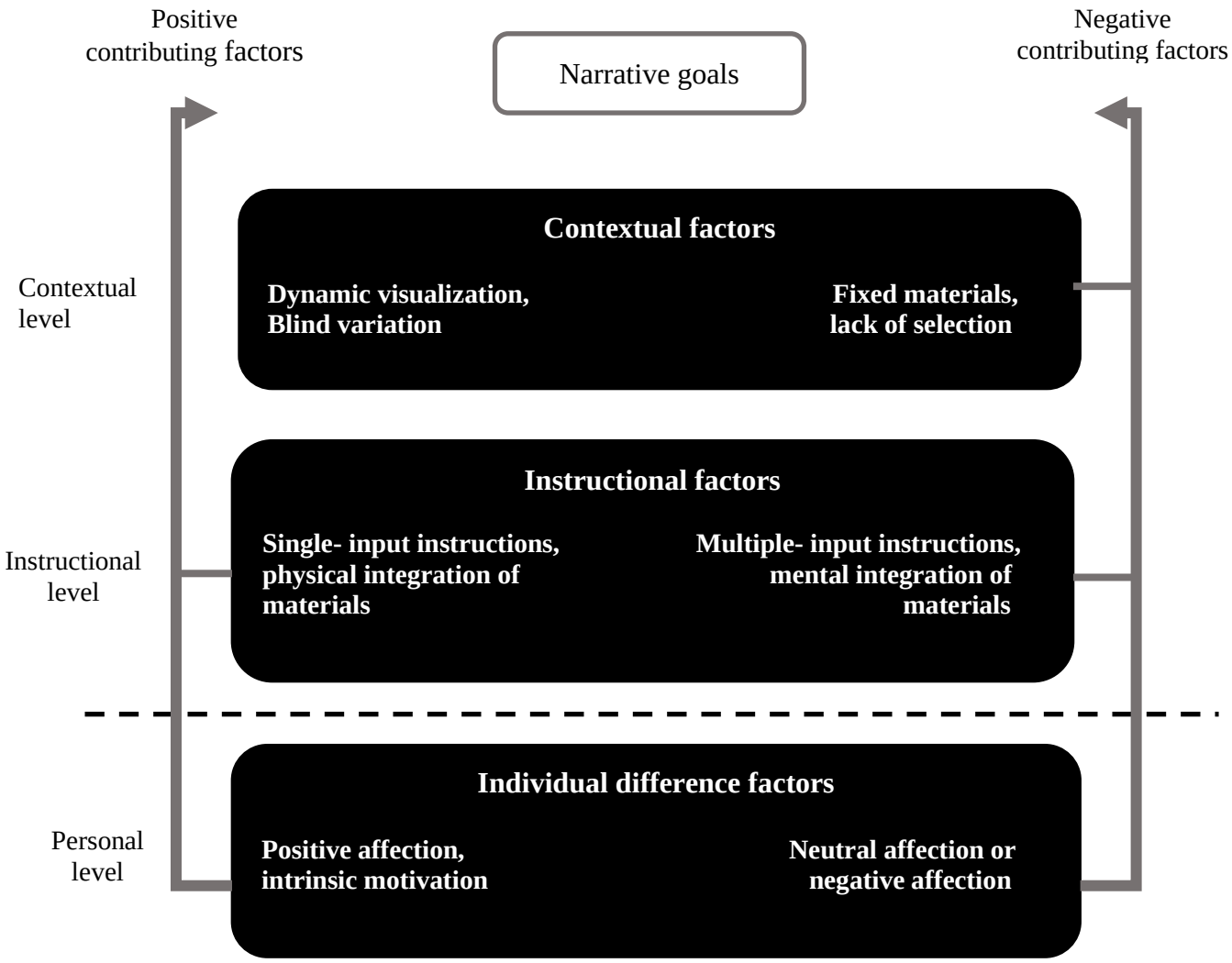

Figure 25 Three-level model of play-narrative integrated activity in the preschool setting (Chung, 2019)

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5.2 Proposed play-narrative integrated activity (PNIA) in preschool settings: its value and goals

This project links play and story retelling/storytelling with the premise that activities that systematically integrate symbolic play and narrative are valuable in the development of emergent literacy in young children. The experience of narratives, including storytelling and story retelling, helps bring 'the symbolic power of language' for the children to create imaginary worlds through the use of words. As Nicolopoulou, McDowell and Brockmeyer (2006) suggested, stories and symbolic play provide children with the decontextualised cluster of oral language skills that serve a critical role in helping their literacy achievement and overall school success. Young children's storytelling and retelling are voluntary and self-initiated. By integrating with play, these narrative activities provide strong indications that they help promote oral language skills that serve as a foundation of emergent language skills and promote the literacy awareness of children (Nicolopoulou, 1996; Nicolopoulou, McDowell, & Brockmeyer, 2006).

From all of the literature, we learnt that play and literacy are two inseparable issues in early childhood. With the findings of this research project and the interpretations made for each study, a three-level model was developed to explain the factors that contribute to the effectiveness of the three activities, namely PNIA.

The PNIA put forward in this project is defined as a type of preschool activity that integrates personal, instructional and contextual factors in the play process. The goal of the play process is to maximise the narrative performance of preschool children. Simply put, play is the process and narrative performance maximisation is the goal of PNIA. The PNIA seeks to maximise the measurable narrative performance of children with the dynamic interaction of the factors in the play process. The factors are stated in the three-level model of PNIA in the preschool setting (Fig. 24). With the positive factors in the play process, the narrative goal(s) can be maximised. By

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contrast, the narrative goal is minimised given negative factors in the play process. In the following section, the positive and negative factors at the three levels are discussed.

5.3 Personal level - an extended definition of free play with an emphasis on positive affection and intrinsic motivation in the play process

The findings of Study 2 revealed that EF skill is not a significant factor that affects the story retelling performance of children at the age of five. The contributing factor at the personal level is the individual difference in affection and motivation when working with the PNIA. Play is considered a good source of intrinsic motivation because it is internally rewarding, and the play process itself motivates children to work towards their goals (Hakkarainen, 1999). According to Rubin, Fein and Vandenberg (1983), play is also an intrinsically motivational activity. Participants place more concern on the process of the activity than the goals. Most literature consider play as a source of motivation for learning, and the findings from Study 3 aligns with the assertion that play serves to motivate children in learning.

At the personal level, the positive contributing factors include the positive affection and intrinsic motivation of the participants. It is suggested that during PNIA, the narrative goals are best brought out with a positive affection during play. Conversely, the negative factors that might cause a minimum narrative goal attainment level involve the neutral or negative affect that the participants exhibit during play. When participants are not interested in or not enjoying the play process, a minimised narrative goal attainment level may ensue. As the UNCRC suggested, choice is a characteristic of play. From the children's perspective, they consistently value the freedom of making their own decisions and choices during the process of play (Kapasi & Gleave, 2009).

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5.3.1 Extended definition of freedom in play

For more practical implications, the freedom of choice is provided to the children so they can choose the play activity they are truly interested in. Most definitions of free play emphasise minimal direction from adults and the exercise of control towards their own learning (Wood, 2014). In this research project, children were more affectionate with semi-structured play and free play with bricks. They enjoyed selecting their own materials and combining these in the way they desired. They never tired of moving the bricks around and trying out different compositions. The 'free choice of play' is about selecting what to play and being free from adult intervention. With the evidence from this research project, we aim to extend the definition to include the free choice of materials and the free ways to utilise the materials. For a more comprehensive definition of 'freedom in play', we proposed the following criteria:

- Freedom to select what to play
- Freedom to decide the form of play
- Freedom to decide the play materials
- Freedom to decide how to utilise the materials

Corresponding examples are given for the four suggested criteria of play. The 'what' in the first criteria, 'freedom to select what to play', implies the subject matter that children decide to be involved with. For example, they can decide to play 'supermarket', 'police and robber' or 'hospital'.

When the subject matter 'supermarket' is used for further illustration of the remaining three suggested criteria, the choice of the form of play can be understood as the particular way that children want to manifest the subject matter. For example, pretending to be supermarket customers by walking round and selecting products can be a form of supermarket play. Pretending to be the

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cashier and counting money can be another form of play. Narrative creation can be considered one of the play forms when children decide to represent their thoughts about ‘supermarket’ through oral language. Some can choose to manifest their ideas of ‘supermarket’ by using drawings.

The third suggested criterion is the freedom to decide the play materials. One obvious example is to use the supermarket play sets for the play. Some children without the supermarket play set would also use other materials, such as blocks and stones, to represent supermarket products. The decision on play materials is simultaneously made with the decision on the play form. For instance, if children choose to manifest their form of play with drawings, they may need to choose some drawing tools, such as crayons, as their play materials.

For the final suggested criterion of the freedom to decide how to utilise the materials, two levels explain this standard. The primary level of material utilisation involves ready-to-use materials or materials that they can play with without any extra construction. We can say that children who play with the supermarket play set are engaged in the primary utilisation of materials. Children who are involved in the secondary utilisation of materials are employing materials that they created themselves. For example, if the children discovered that no fake money is present in the supermarket play set and they decide to draw some by themselves, the play materials involved include the play set and the crayons they used to draw the bank notes. The play set is considered their choice of primary utilisation of materials, while the crayons and paper are considered their choice of secondary utilisation of materials.

The four suggested criteria of free play could be understood as a hierarchy as shown in Fig. 25 below.

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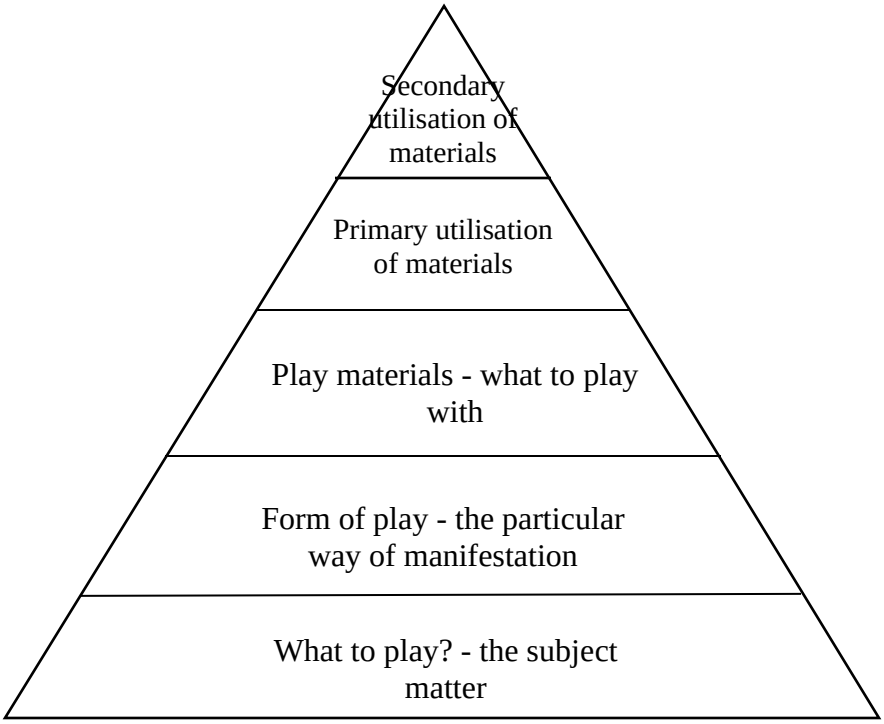

Figure 26 Hierarchy of free play criteria (Chung, 2019)

5.4 Instructional level - awareness of the instructional design of play-narrative integrated activity

When children are placed in different play activities, including written-based activity, semi-structured play and free play, the effects on their story retelling performance vary. As expected, semi-structured play significantly enhanced the story retelling performance of the five-year-old children, and evidence suggests that it also promoted the narrative complexity in terms of microstructural and macrostructural discourse elements. Note that the difference in instructional design of the activities is key to the story retelling performance in the way that an appropriate instructional style reduces complicated and redundant inputs that would definitely increase the ECL of the children. Such added load results in the ineffectiveness of PNIAs as manifested by the poor story retelling performance.

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At each level of the model, one or more contradicting factors positively or negatively contribute to the effectiveness of the PNIAs in the preschool setting. For the instructional level, two sets of contradicting factors were identified from Study 1: (1) positive factors: single-input instructions and physical integration, and (2) negative factors: multiple-input instructions and mental integration. According to the findings, the written-based activity with both verbal instructions and visual inputs triggerred the story retelling performance of children. By contrast, enhanced performance was recorded in semi-structured play and free play with only visual inputs. The effectiveness of PNIA can be boosted with the positive factors. To reach the goal of PNIA in the preschool setting, simple instructions in a single form, either verbal or visual, are better in helping with the story retelling performance of children.

5.5 Contextual level - providing dynamic and visualised learning materials

Results from Study 3 reveal that blind variation is an essential factor for storytelling and creativity. In response to the title and the main theme of Study 3, we concluded the ‘secrets’ for enriching the context for storytelling. The free choice of materials acted as the tool for children to visualise and manipulate their ideas in mind, thereby resulting in a workable story plot before they could maximise their narrative outputs. Empirical studies have found that children who are given choices in terms of materials for creating a collage are more creative than those who are given a fixed set without choice (Amabile & Gitomer, 1984). Another study by Greenberg (1992) also provided evidence that when participants are given choices in the selection of tasks to work on, they can reach more creative outputs. Researchers studying the psychological mechanism of creativity suggested that self-determination and intrinsic motivation are both products of choice and are the key factors of creative performance (Amabile, 1983, 1988, 1990; Deci, 1981). Results

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from a recent study (Chua & Iyengar, 2008) confirmed the importance of choice, with the addition of two given conditions; specifically, that individuals have high prior knowledge of the subject matter and are given instructions to be creative.

For the effective work out of the blind variation process and selective retention process during idea generation, it is suggested that various resources be provided to young children. This suggestion also facilitates the extended definition of freedom in play proposed by this research project, in which free play is also subjected to the freedom to select what to play, decide the play materials, and choose how to utilise the materials. By contast, limited or fixed materials hinder the possibility of idea generation.

5.5.1 Reconceptualising play in early childhood education

The contextual level is placed on the highest portion of the model. Although we sought out the positive contextual factors that help with the effectiveness of PNIA, many factors in the context still hinder the implementation of play in the preschool setting, especially in the local Hong Kong context. Many Western educators do not suggest highly structured activities with a structured choice of play materials, but these activities are common in local preschool settings as well as those in the Asian region where high academic performance is always encouraged (Cheng, 2001). Play and learning are usually viewed as separate in Hong Kong, with play as the opposite of learning (Wu & Rao, 2011). A similar belief about play and learning also prevails among parents. Euro-American parents treat play as an important vehicle to drive early learning, whereas Asian parents think that early academic training is more important than play.

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As reported by Cheng (2001), most kindergarten teachers have difficulties grasping the concept of play and applying it to their teaching. Teachers must also understand the children's embedded interests to help them attain the play-learning state and the related narrative goals.

Understandably, learning through play is a hard-to-define concept among teachers and parents. Knowing the boundary between children-centred and adult-centred approaches, as well as that between free play and structured play along the play continuum, is always difficult. In overcoming the misinterpretation of the learning through play concept, this research project provides an evidence-based protocol for teachers and parents and suggests detailed and practical definitions of play freedom and the three-level factors that help promote the maximisation of play-related narrative goals.

5.6 Understanding the balance of freedom and structure in early childhood

Research on children's perspective on play emphasised that they value the freedom of decision making and having their own time to play (Kapasi & Gleave, 2009). The UNCRC proposed that choice is the main characteristic of play in early childhood. Free play is proudly promoted in many countries for children's right and policymaking, but an opposing view has been growing in the early childhood research field. Scholars have been questioning the significant power of child-centred discourses in early childhood education (Bodrova, 2008; Broadhead, Howard, & Wood, 2010; File, Mueller, & Wisneski, 2012; Welsh et al., 2011). They doubted the challenges that practitioners face in combining freedom and structure in the early childhood curriculum. Other researchers believed that free play and free choice for children are controlled with educational settings and teachers' beliefs (Millei, 2012; Sherwood & Reifel, 2010; Wood,

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2010). Hedges (2010) pointed out that teachers might underestimate children's interests with their 'shallow interpretations' and their different values and beliefs in free play.

Clearly, the misunderstanding and difficulties in the practice of play-based education reduces the power of a child-centred play curriculum. Apart from the three levels of factors we suggested in the model, numerous contextual considerations must be considered for the effective implementation of play-based education. This project serves to provide clear definitions and suggests concrete ways that teachers and parents can consider when they are trying to implement play activities for enhancing story retelling/storytelling performance.

This research project responds to the concern from scholars about the problematic integration of freedom and structure in early childhood settings. The evidence from this work clearly indicates that semi-structured play and free play work in different but similar ways to foster story retelling and storytelling performance in five-year-old Hong Kong children. That is, semi-structured play is effective in enhancing the story retelling performance, and free play is effective in facilitating the creativity process and enhancing storytelling performance. It is suggested that the two forms of play work together best when teachers have the skills and guidelines to maximise the values of the activities. To conclude, the tactfulness in instructional design of semi-structured play activities and the adequate provision of choices and play materials are essential in implementing play-based learning. Moreover, regardless of whether semi-structured play or free play is applied, teachers should have a prioritised vision to provide children with freedom in play instead of focusing on the 'to play or not to play' issue.

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5.7 Limitations and future directions

5.7.1 Other approaches to determine the contributing factors of story retelling/storytelling performance

The present project prioritised the cognitive, instructional and contextual factors of story retelling/storytelling performance. Future studies may employ a research design other than using the three conditions to test their effects on story retelling and storytelling for determining the other contributing factors. For example, interviews can be conducted with the children after the activities to track their immediate perspectives on different types of play. Questions can also be asked to further understand the motivation and affection issue.

In this project, only three activities were designed to test their effects on children's story retelling and storytelling performance. However, in real life situations, more possibilities and combinations of play activities are present. When play is integrated with narrative to form PNIA, even more possibilities exist for children and adults to create their form of play, such as the effects of pretend play on writing skills or the effects of sociodramatic play on comprehensive skills. Therefore, future studies can focus on the different combinations of play and narrative activities.

Future research should also build upon the longitudinal measure of EF and oral language skills. As indicated in Study 2, the development of these two variables might peak at different periods of early childhood, thereby causing difficulties in correlating them at the same period. A regression model can be used to investigate whether certain EF skills predict the production of specific morphemes, or vice versa.

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5.7.2 Participant sample limitations and generalisability

The participant samples were limited in size for practical reasons. Thus, the power to detect individual differences and correlation was low. Participants also came from convenient samples, such that the same group of participants were involved in all three studies. All participants have a similar family background, including their parents' education level and family income level, and most of them are from the Kowloon East District in Hong Kong. These variables, especially the sociocultural background, were well-controlled in the studies, but the results from the present samples cannot be generalised to children from a more diverse background. It would be important to examine whether the findings of the current study can be generalised to other settings, for example, when comparing children from a high SES with those from a low SES. The difference in SES and sociocultural background may shape the correlation between EF and story retelling performance; for instance, the difference in maternal education background may cause the different usage of verbs and nouns in early oral language (Tardif, 1996; Tardif, Gelman, & Xu, 1999; Salemi, Assanelli, D'Odorico, & Rossi, 2007).

5.8 Conclusion

The values of semi-structured play and free play in different areas are clear according to the evidence from this research. When selecting free play or semi-structured play, the former seems to be a better choice for boosting creativity but not for story retelling. By contrast, semi-structured play is a better choice for helping with story retelling but not for creativity. When semi-structured play and free play are combined in PNIAs, a higher level of measurable narrative goal can be attained. The main contribution of this research is in showing the influencing role of semi-structured play and free play activities in both story retelling and storytelling performance of five-

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year-old children. When local educators and parents have a relatively low sensitivity in the concept of learning through play, this research program serves as an evidence-based protocol to suggest practical ways in which adults can be involved to provide a more 'playful' environment for the children and enabling them to maximise the complexity of oral expressive language production. By integrating the findings of the three studies, this research identified the contributing factors that teachers and parents must work on to enhance the story retelling and storytelling performance of children. Conversely, the negative factors acted as a reminder for the adults to avoid situations that may hinder children's performance. The key advantage of the model suggested in this project is that adults can easily use the factors as a checklist for confirming whether or not they are facilitating children's learning through play

This research program also contributes to the play literature by developing extended definitions of the freedom of play. Previous studies on play mainly focused on the ideology by reflecting the stakeholders' perspectives on play (e.g. Fleer, 2009; Samuelsson & Fleer, (Eds.), 2008). The current study serves to fill the research gap by using experimental settings to obtain empirical evidence for supporting the value of semi-structured and free play. This work also extends the insights into the contributing factors of expressive oral language production by representing the factors in three levels. Although factors from the personal, instructional and contextual levels were introduced in the project, the model provides insights into additional factors that could be influencing the expressive oral language production of young children and which are awaiting investigation in future projects.

Play is about more than happiness and having enjoyable experience. However, play alone and with surface understanding cannot be linked to learning. By fulfilling the positive factors and avoiding the negative factors suggested by this research project, PNIAs can easily reach their goal

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to balance fun and learning in preschool settings. This work provides initial evidence of the integrated power of play and narrative and identifies the contributing factors that may help maximise such relationship, thereby providing a starting point for future work on the controversial issue of learning through play.

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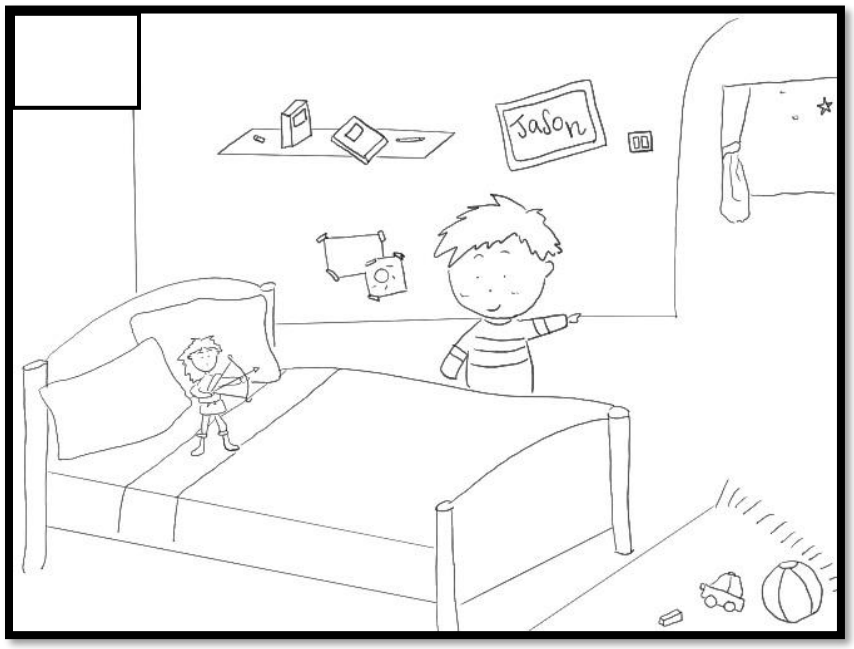
Appendices

Appendix A1. Study 1 Worksheets for the worksheet group (Cantonese version)

《給媽媽摘星星》
遊戲工作紙

第一部分：填色遊戲

以下是故事的內容，請你於圖畫左上角空格填上數字，排列故事的順序，並把圖畫填色。



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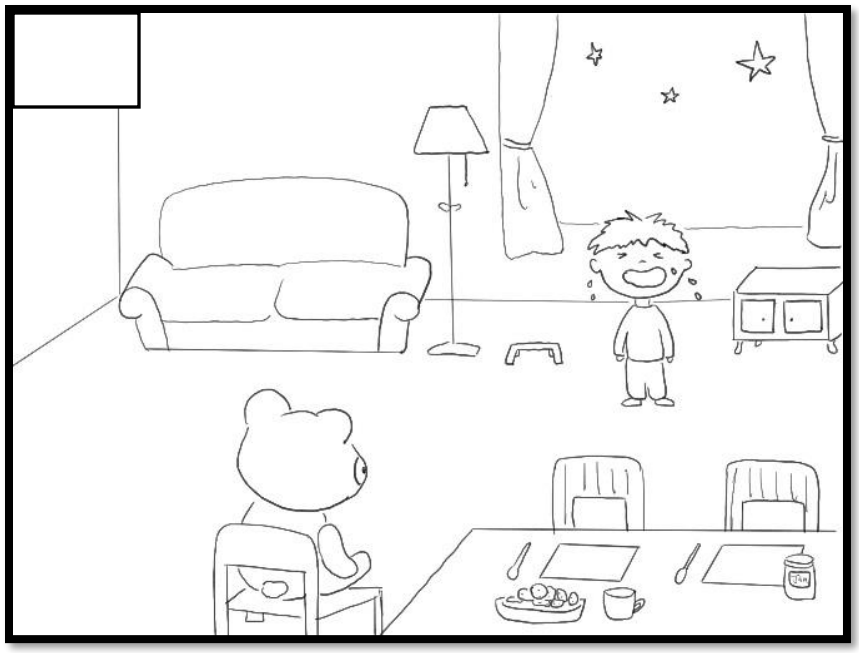

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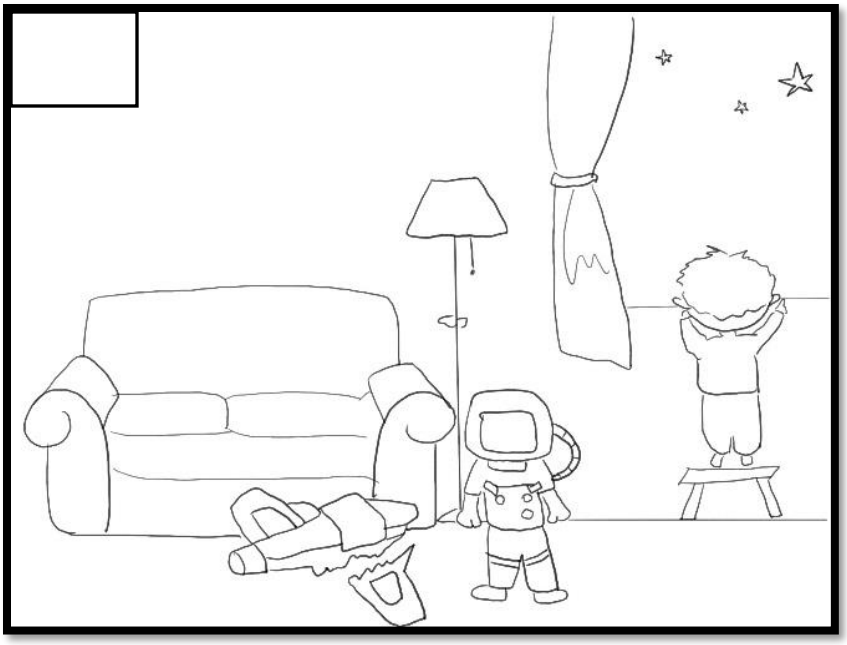

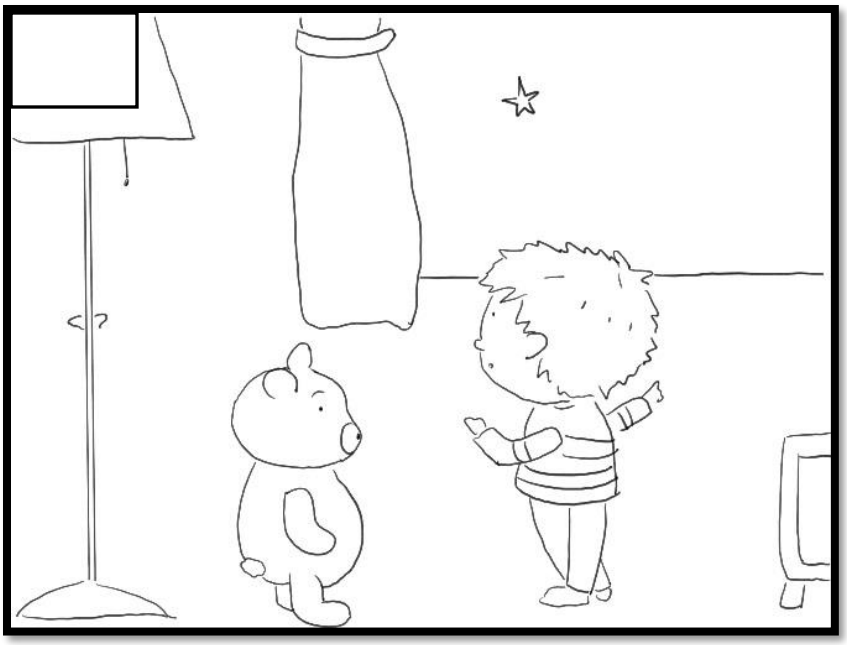

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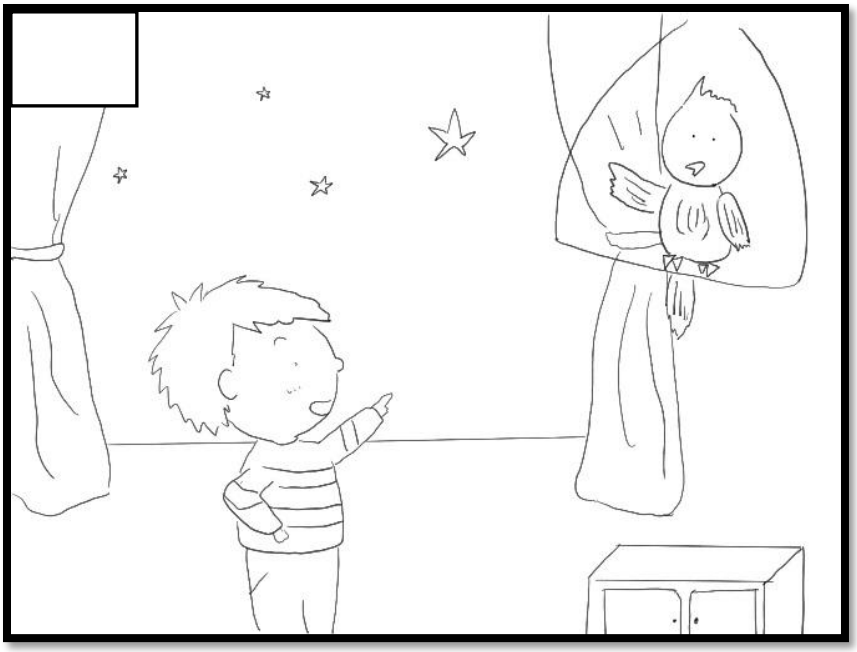

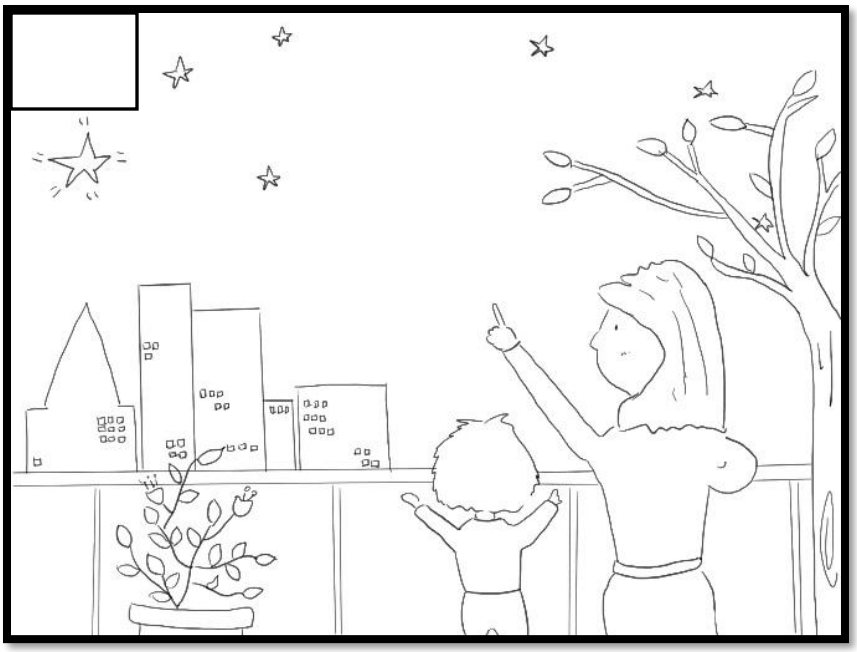

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第二部分：尋寶遊戲

你還記故事中出現過什麼人物嗎？請你把在故事中出現過什麼人物圈起來。

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第三部分：配對遊戲

你還記得故事裡的人物擁有什麼工具嗎？請你連線把人物和屬於他的工具配對起來。

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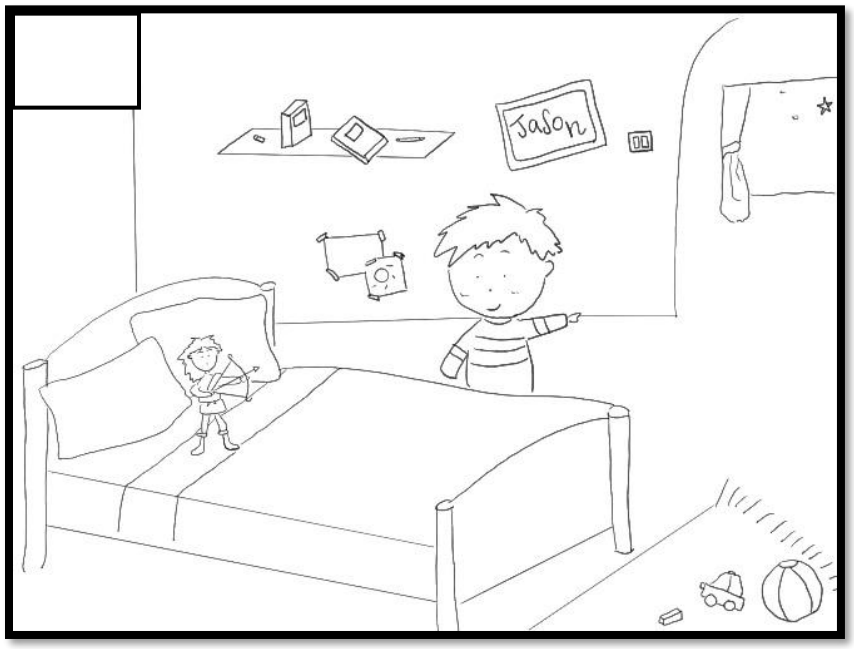
Appendix A2. Study 1 Worksheets for the worksheet group (English version)

Catch That Star
Worksheet

Part 1: Colouring game
Below is the content of the story. Please fill in the numbers in the top-left boxes according to the sequence of the story and colour the pictures.



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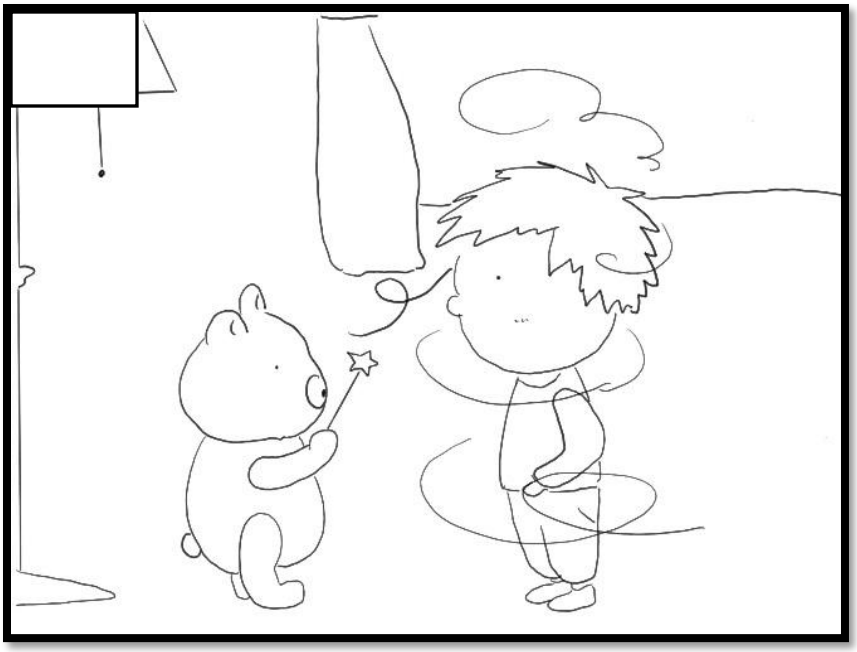

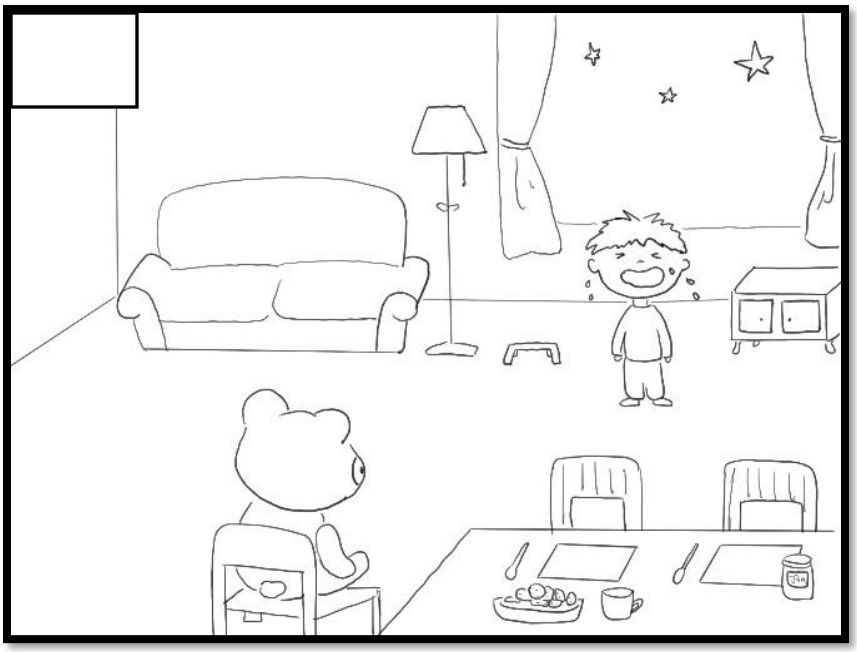

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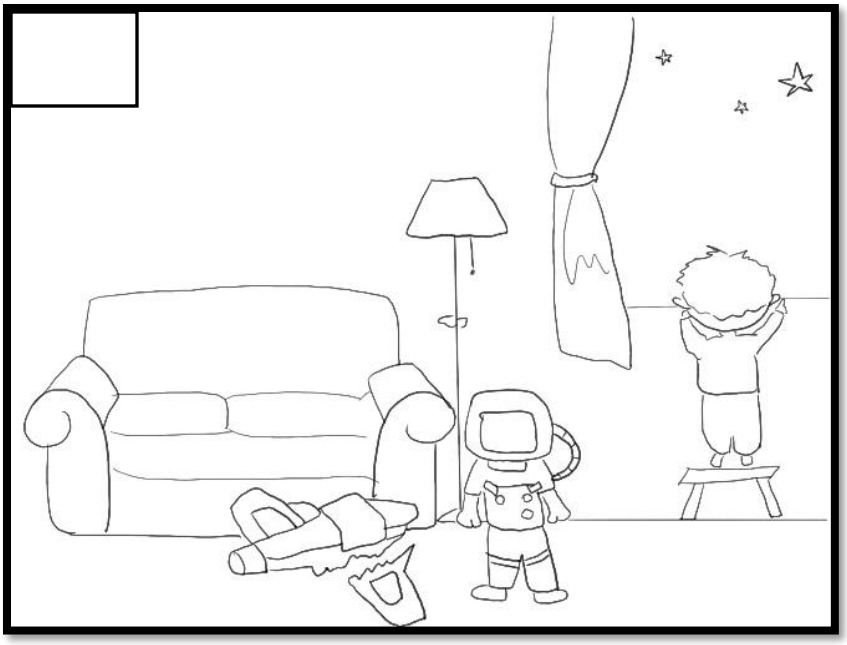

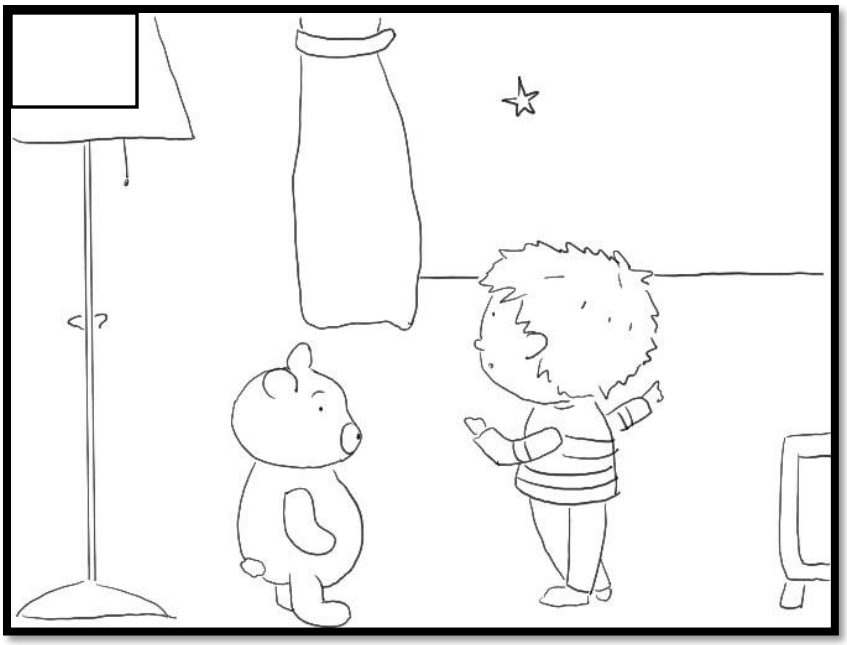

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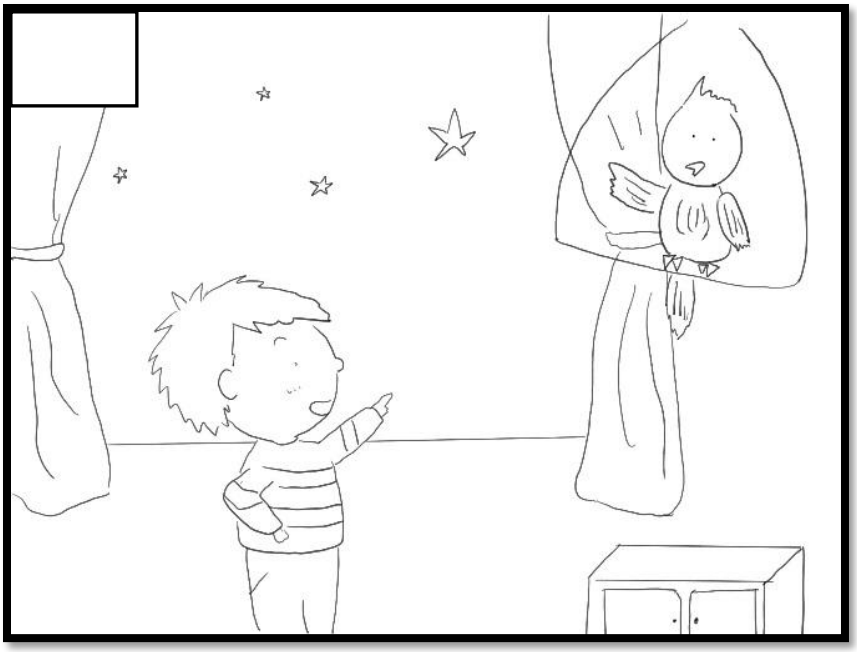

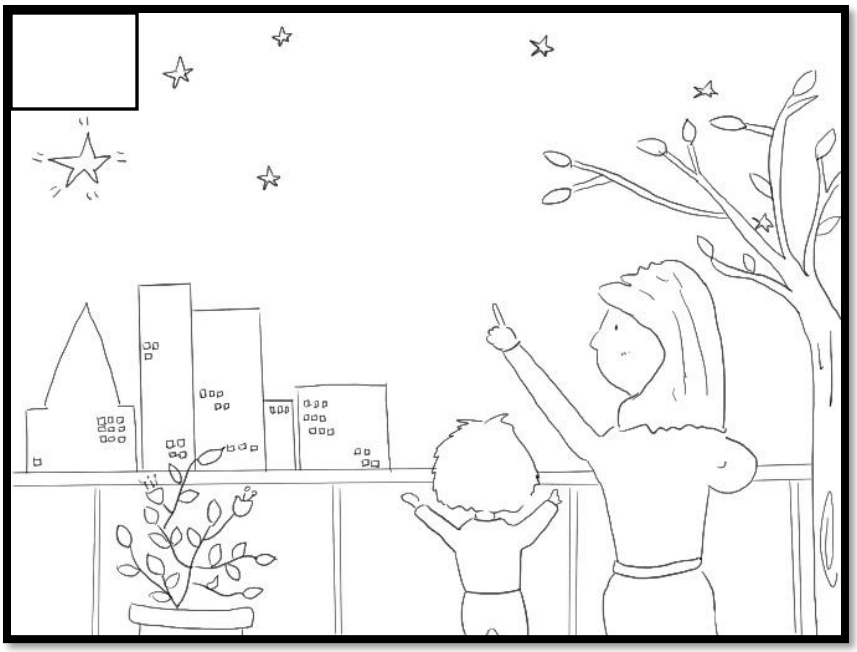

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Part 2: Treasure hunting game

Do you still remember the characters in the story? Please circle the characters that you saw in the story.

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Part 3: Matching game

Do you still remember what the tools of the characters were? Please draw a line to match the character and his/ her tool.

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Appendix B. Study 1 Story scripts for the story retelling activity

Story 1 for Story Retelling at Time Point 1- 青蛙比比找媽媽 (Original Version)

Picture no.	Narration
0	今日我地會聽一個故事，呢個故事叫《青蛙比比找媽媽》。
1	有一日，小青蛙比比同媽媽去公園玩， 比比係池塘入面游水游得好開心，
2	但係比比游完水一抬頭，媽媽就唔見左啦！
3	於是，比比就去搵幫手，幫佢搵媽媽啦。 比比係滑梯前面見到小狗德德，就問德德：‘你可唔可以幫我搵媽媽呀？’ 德德就話：‘我依家趕住去學琴呀！ByeBye!’
4	比比又見到小貓妙妙坐係櫈上面，於是就過去搵佢幫手。 ‘妙妙，我唔見左媽媽呀，你可唔可以幫我搵媽媽呀？’ 妙妙就話，‘喵，我依家要食埋我條魚先，唔得閒幫你！’
5	比比好唔開心，不過佢都無放棄， 佢見到小烏龜樂樂係草叢入面，就請樂樂幫佢手搵媽媽， 樂樂就話：‘我諗我幫唔到你啦，你睇！我行得咁慢，有排都幫唔到你搵媽媽啦！’
6	比比好心急，於是就大喊起黎。 Jason 見到比比喊，就問佢咩事， 比比就話俾 Jason 知原來佢唔見左媽媽呀！仲無人幫佢搵媽媽添！
7	於是 Jason 就叫比比跳上佢膊頭：‘唔洗驚！等我帶你去搵媽媽啦！’
8	最後，Jason 同比比係雪糕車前面搵到青蛙媽媽， 比比好開心，佢好感謝 Jason, 青蛙媽媽仲請 Jason 食雪糕添！

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Story 1 for Story Retelling at Time Point 1: Finding Mommy (Translated Version)

Picture no.	Narration
0	We are going to listen to a story today. The title of the story is ‘Finding Mommy’.
1	One day, Babe the little frog went to the park with mommy. Babe was playing happily in the pond.
2	When Babe raised his head, mommy was not there.
3	Then, Babe went to find some helpers to help him find mommy. Babe saw Ted the dog in front of the slide. He asked Ted, ‘Can you help me to find mommy?’ Ted said, ‘I’m now rushing to piano lesson! Bye!’
4	Babe saw MiuMiu the cat sitting on the bench. He then went ahead. ‘MiuMiu, mommy is lost. Can you help me to find mommy?’ MiuMiu said, ‘Meow, I am going to eat my fish first. I can't help you’.
5	Babe was upset but he didn't give up. He saw Lok Lok the turtle in the grass. He asked Lok Lok to help him. Lok Lok said, ‘I think I can’t help you. You see! I walk very slowly. It will take ages for me to help you’.
6	Babe is nervous, so he cried loudly. Jason saw Babe’s crying and asked him what happened. Babe told Jason that mommy is lost and no one help him to find mommy!
7	Then, Jason asked Babe to jump onto his shoulder, ‘Don’t worry! I will help you to find mommy!’
8	At last, Jason and Babe found mommy in front of the ice-cream van. Babe was happy. He thanked Jason. Mommy bought an ice- cream cone for Jason too!

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Story 2 for Story Retelling at Time Point 2- 給媽媽摘星星 (Original Version)

Picture no.	Narration
0	今日我地會聽一個故事，呢個故事叫《給媽媽摘星星》。
1	有一晚，Jason 同媽媽係露台睇星星， 媽媽見到一粒好大好光既星星，就話啦： ‘呢粒星星又大又光，我好中意呢粒星星呀！’
Transit	於是，Jason 就想摘呢粒星星俾媽媽啦。
2	Jason 去客廳搵小鳥嘉比： ‘嘉比嘉比，你可唔可以飛上天空，幫我摘果粒星星落黎呀？’ 嘉比就話：‘唔得呀，我飛唔到咁高啊！我幫你唔到啦’.
3	於是，Jason 就去搵坐係床上既獵人懷恩啦。 ‘懷恩懷恩，你有一把弓箭，，你可唔可以幫我射粒星星落黎呀？’ 懷恩就話：‘唔得架，我把弓箭只係用黎打獵，係射唔到星星架！’
4	Jason 無放棄，佢去搵太空人巴斯。 ‘巴斯巴斯，你有太空船，你可唔可以幫我飛上天空，摘粒星星落黎呀？’ 巴斯就話：‘唔好意思啊，我隻太空船爛左啊，幫唔到你啦’.
5	無人幫到 Jason 摘星星，於是 Jason 就好唔開心，仲大喊起添！ 坐係飯廳既小熊迪迪聽到 Jason 係度大聲喊。
6	迪迪走過去問 Jason 發生咩事， Jason 就話俾迪迪知佢想摘粒星星送俾媽媽，不過無人幫到佢啊。
7	於是迪迪就攞左一枝魔法棒出黎，係 Jason 個頭上面點左一下。 Jason 就識得發光啦！而且仲閃令令好靚添！
8	迪迪就話俾 Jason 知：‘Jason，你睇下！你都識發光啊！ 其實你係媽媽既小寶貝，媽媽中意你多過中意粒星星啦！’ Jason 最後好開心好滿意，就話啦：‘原來我就係媽媽既閃星星啦！’

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Story 2 for Story Retelling at Time Point 2- Catch That Star (Translated Version)

Picture no.	Narration
0	We are going to listen to a story today. The title of the story is ‘Catch That Star’.
1	One evening, Jason was watching stars with mommy on the balcony. Mommy saw a big bright star and said, ‘This star is big and bright. I like it!’
Transit	Then, Jason wanted to catch that star for mommy.
2	Jason found Gabi the bird in the sitting room. ‘Gabi, can you fly to the sky and help me to catch that star?’ Gabi said, ‘No I can't. I can’t fly that high! I can’t help you’.
3	Then, Jason found Ryan the hunter who was sitting on the bed. ‘Ryan, you have the anchor and the arrows. Can you help me to shoot that star?’ Ryan said, ‘No I can't. My anchor and arrows are only for hunting. I can’t use them for shooting the star!’
4	Jason didn't give up. He found Buzz the astronaut. ‘Buzz, you have a spaceship. Can you help me fly to the sky and catch that star?’ Buzz said, ‘Sorry, my spaceship is broken. I can’t help you’.
5	No one could help Jason to catch the star. Jason was upset and cried loud. Teddy the bear who was sitting at the table heard Jason’s cry.
6	Teddy went to Jason and asked what happened. Jason told Teddy that he wanted to catch the star for mommy, but no one could help him.
7	Then Teddy took out a magic stick and tap on Jason’s head. Jason was sparkling!
8	Teddy told Jason, ‘Jason, you see! You are sparkling!’ ‘You are mommy’s precious boy. Mommy likes you more than the bright star’. Jason was satisfied and happy at the end, ‘I’m mommy’s precious bright star!’

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Appendix C. Study 1 Narrative assessment checklist and rating rubrics

Microstructure (Adopted from the Narrative Assessment Profile, Bliss et al., 1998)

Narrative element	Interpretation	Rating (1–5)
Topic maintenance	How well all utterances in a narrative relate to a central topic	
Event sequencing	The presentation of events in chronological or logical order	
Explicitness	The sense-making process of discourse coherence - Informativeness - Elaboration - Basic narrative ingredients Description: attributions of people and objects Actions: events and scenes Evaluation: the significance of an event for a speaker	
Referencing	Providing adequate identification of individuals, features and events	
Conjunctive cohesion	Words or phrases that link utterances and events together	
Fluency	Lexical or phrasal interruptions in utterances	
Total score of microstructure	(6 to 30)	

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Rating rubrics for microstructure

	Rating				
Discourse item	1	2	3	4	5
Topic maintenance					
Event sequencing					
Explicitness					
Referencing					
Conjunctive cohesion					
Fluency					

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Macrostructure (Adopted from the Index of Narrative Complexity Story Coding Form, 2008)

Narrative element	Interpretation	Rating (1-4)
Character	Reference to the subject of a clause in the story	
Setting	Reference to a place or time in the story	
Initiating event	Reference to an event or problem that elicits a response from the characters in the story	
Internal response	Reference to information about a character's psychological state, including emotions, desires, feelings or thoughts	
Plan	Reference that is intended to act on or solve an initiating event	
Action/Attempt	Actions taken by the main character(s) but are not directly related to the internal response	
Complication	An event that prohibits the execution of a plan or action taken in response to an initiating event	
Consequence	A consequence that resolves or does not resolve the problem	
Formulaic markers	Standard utterance used to mark the beginning or ending of the story, e.g. 'the end', 'once upon a time' and 'at last'	
Temporary markers	Standard utterance used to mark the transition of events in the story, e.g. 'then', 'next', 'when' and 'while'	
Causal adverbial clauses	Standard utterance used to mark the cause-and-effect relationship of events in the story, e.g. 'because', 'since' and 'therefore'	
Knowledge of dialogue	Realising who issued the dialogue and to whom the dialogue is for in the story	
Narrator evaluations	Any explanation provided in the story to justify why an action or event took place	
Total score of microstructure	(13 to 52)	
Total narrative score	(Micro + Macro scores, 19 to 82)	

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Rating rubrics for macrostructural discourse elements (Petersen, Gillam, & Gillam, 2008)

Narrative element	0 point	1 point	2 points	3 points
Character A character is any reference to the subject of a clause in a narrative	No main character is included or only ambiguous pronouns are used Examples: a. They were walking. b. He was walking.	Includes at least one main character with nonspecific labels only Note: Only code each character one time Examples: a. Once there was a boy. b. The boy was walking.	Includes one main character with a specific name for the character Example: Once there was a boy named Charles.	Includes more than one main character with specific names Example: Once there was a boy named Charles and a girl named Mary.
Setting A setting is any reference to a place or time in a narrative	No reference to a specific or general place Example: The boy and the girl were walking.	Includes reference to a general place or time Examples: a. The boy and the girl were outside. b. It was daytime. c. One day, they went to the park.	One or more references to specific places or times Examples: a. Once there was a boy and a girl walking in Central Park. b. They were walking at night.	
Initiating event An initiating event is any reference to an event or problem that elicits a response from the character(s) in a narrative	An event or problem likely to elicit a response from the character is not stated Example: The girl looked at the boy. The boy and girl were walking in the park.	Includes at least one stated event of problem that is likely to elicit a response from the character, but no response is directly related to that event. Example: The girl was walking in a park and saw a spaceship land (event/ problem) and she saw some aliens, and she	Includes at least one stated event or problem that elicit a response from the character(s) Example: The girl was walking in a park and saw a spaceship land and she saw some aliens (IE). The girl started to run away (action).	Two or more distinct stated events or problems that elicit a response from the character(s) Example: The girl was walking in a park and saw a spaceship land and she saw some aliens (IE-1). The girl started to run away (action). But while she was running, her

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		saw a dog, and a table and…		shoe got stuck in a hole (IE-2). She quickly knelt down and took off her shoe to get unstuck (action).

Narrative element	0 point	1 point	2 points	3 points
Internal response An internal response is any reference to information about a character's psychological state, including emotions, desires, feelings or thoughts	No overt statement about a character's psychological state	One overt statement about a character's psychological state not causally related to an event or problem Examples: a. The dog was sad. b. The girl was happy.	One or more overt statements about a character's psychological state causally related to an event or problem Example: The alien's landed. Sara saw the ship and was terrified.	
Plan A plan is any cognitive verb reference that is intended to act on or solve an initiating event. It must include a 'cognitive verb' that indicates a plan. Note: The plan and the action/ attempt can share the same clause (see 2 points example b)	No overt statement is provided about the character's plan to act on or solve the event or problem. Example: The girl was very excited, and she ran out to meet the aliens.	One overt statement about how the character might solve the complication or problem. Example: The girl thought that it would be neat to go and meet the aliens.	Two overt statements about how the character might act on or solve the event(s) or problem(s) Examples: a. The girl was very excited, and she told the boy that she wanted to go meet the aliens. b. The boy was very scared so he decided to sneak away quietly.	Three or more overt statements about how the character might act on or solve the event(s) or problem(s)

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Action/ attempt Actions are taken by the main characters but are not directly related to the IE. Attempts are taken by the main character(s) that are directly related to the IE	No actions are taken by the main character(s). Example: There is a girl. There is a boy. It is sunny.	Actions by main character are not directly related to the IE Examples: a. The boy and the girl were walking in a park. b. They saw a boy alien waving.	Attempts by the main character are directly related to the IE. Example: The girl thought that it would be neat to go and meet the aliens so she got away from the boy and walked out on the grass.	

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Narrative element	0 point	1 point	2 points	3 points
Complication A complication is an event that prohibits the execution of a plan or action taken in response to an initiating event Note: A complication can also be a second initiating event. In this case, code both a complication and initiating event	No complications.	One complication that prohibits a plan or action from being accomplished. Example: The spaceship landed. The girl decided to get away from the aliens and started running from the spaceship. While she was running, her shoe got stuck in a hole. She could not get away from the aliens.	Two distinct complications that prohibit plans or actions from being accomplished. Example: The girl was walking in a park and saw a spaceship land and she saw some aliens (IE-1). The girl stated to run away (action-1). But while she was running, her shoe got stuck in a hole (complication-1 / IE-2). She quickly knelt down and took off her shoe to get unstuck (action-2) but she was shaking too much to get her shoe off (complication- 2).	
Consequence A consequence resolves the problem or does not resolve the problem. It must be related to the IE and be explicitly stated. Note: A consequence for one episode can	No consequence to the action/ attempt is explicitly stated. Examples: a. She got away from the boy and walked out onto the grass. b. The alien girl had a dress on.	One consequence Example: The spaceship landed. The girl went out to see them. The aliens were scared of her. They ran back to the ship and flew off.	Two consequences. Examples: a. They told their parents the spaceship was in the park. But their parents didn't believe them. When they took their parents to the park,	Three or more consequences

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often be the IE for another.			the spaceship was gone. b. The boy wanted a frog. He went to the woods to find one. He couldn't find a frog. He decided, he really wanted a dog.	

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Narrative element	0 point	1 point	2 points	3 points
Formulaic markers A formulaic markers is any standard utterance used to mark the beginning or ending of a narrative	No formulaic marker	One formulaic marker Example: Once upon a time	Two or more formulaic markers Example: Once upon a time…the end	
Temporal markers For example, when, next, then, immediately, instantly, after, again, already, always, before, lately, now, once, presently, rarely, today, weekly and while	No temporal marker	One temporal marker Examples: a. The girl walked over to the aliens, 'Then' they all ate some lunch. b. 'After' the aliens landed, the girl screamed.	Two or more temporal markers Example: 'When' the girl saw the aliens, she ran out to meet them. She 'already' knew they would be nice.	
Causal adverbial clauses For example, because, since, so that, therefore, as a result, consequently, thus and hence	No causal adverbial clause	One causal adverbial clause Example: The aliens were not nice to the girl 'because' they were scared.	Two or more causal adverbial clauses Example: The aliens were not nice to the girl 'because' they were scared. 'Since' they were mean, she ran away.	
Knowledge of dialogue Knowledge of dialogue is registered by a comment or statement made by a character or by characters engaging in conversation	No dialogue	One character makes a comment or statement Examples: a. He said, 'Out'. b. He said, 'Don't come over here'.	Two or more characters engage in conversation Example: He said, 'Oh look, there is an alien', and she said, 'Oh, lets go see them'.	

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Narrator evaluations Narrator evaluations are any explanation provided in the story to justify why an action or event took place	No narrator evaluations	One narrator evaluation Example: She ran up to say 'Hello' to the alien. She always wanted to meet one.	Two or more narrator evaluations Examples: a. She knew that it was an alien spaceship. Everyone knows about UFOs. b. He wanted to run from the aliens. They were his worst nightmare.	

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Appendix D. Study 1 Score sheet for narration discourse elements

Name of participant:

Date of assessment:

Group:

Rating rubrics for macrostructure (0–30)

Discourse item	0 point	1 point	2 points	3 points
Character				
Setting				*N/A*
Initiating Event (IE)				
Internal Response (IR)				*N/A*
Plan				
Action/attempt				*N/A*
Complication				*N/A*
Consequence				
Formulaic markers				*N/A*
Temporal markers				*N/A*
Causal adverbial clauses				*N/A*
Knowledge of dialogue				*N/A*
Narrator evaluations				*N/A*

Macro: /30

Rating rubrics for microstructure (6–30)

Discourse item	1 point		2 points	3 points	4 points	5 points
Topic maintenance						
Event sequence						
Explicitness						
Referencing						
Conjunctive cohesion						
Fluency						

Micro: /30

Total: /60

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Appendix E. Study 2- The CHEXI Questionnaire (Thorell & Nyberg, 2008), English version

CHILDHOOD EXECUTIVE FUNCTIONING INVENTORY (CHEXI) FOR PARENTS AND TEACHERS

Below you will find a number of statements. Please read each statement carefully and thereafter indicate how well that statement is true for the child. Indicate your response by circling one of the numbers (from 1 to 5) after each statement.

Definitely not true	Not true	Partially true	True	Definitely true
1	2	3	4	5

1. Has difficulty remembering lengthy instructions	1	2	3	4	5
2. Seldom seems to be able to motivate himself-/herself to do something that he/she does not want to do	1	2	3	4	5
3. Has difficulty remembering what he/she is doing in the middle of an activity	1	2	3	4	5
4. Has difficulty following through on less appealing tasks unless he/she is promised some type of reward for doing so	1	2	3	4	5
5. Has a tendency to do things without first thinking about what could happen	1	2	3	4	5
6. When asked to do several things, he/she only remembers the first or last	1	2	3	4	5
7. Has difficulty coming up with a different way of solving a problem when he/she gets stuck	1	2	3	4	5
8. When something needs to be done, he/she is often distracted by something more appealing	1	2	3	4	5
9. Easily forgets what he/she is asked to fetch	1	2	3	4	5
10. Gets overly excited when something special is going to happen (e.g. going on a field trip or going to a party)	1	2	3	4	5
11. Has clear difficulties doing things he/she finds boring	1	2	3	4	5
12. Has difficulty planning for an activity (e.g. remembering to bring everything necessary for a field trip or things needed for school)	1	2	3	4	5
13. Has difficulty holding back his/her activity despite being told to do so	1	2	3	4	5
14. Has difficulty carrying out activities that require several steps (e.g. for younger children, getting completely dressed without reminders; for older children, doing all homework independently)	1	2	3	4	5

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Definitely not true	Not true	Partially true	True	Definitely true
1	2	3	4	5

15. In order to be able to concentrate, he/she must find the task appealing	1	2	3	4	5
16. Has difficulty refraining from smiling or laughing in situations where it is inappropriate	1	2	3	4	5
17. Has difficulty telling a story about something that has happened so that others may easily understand	1	2	3	4	5
18. Has difficulty stopping an activity immediately upon being told to do so. For example, he/she needs to jump a couple of extra times or play on the computer a little bit longer after being asked to stop	1	2	3	4	5
19. Has difficulty understanding verbal instructions unless he/she is also shown *how* to do something	1	2	3	4	5
20. Has difficulty with tasks or activities that involve several steps	1	2	3	4	5
21. Has difficulty thinking ahead or learning from experience	1	2	3	4	5
22. Acts in a wilder way compared to other children in a group (e.g. at a birthday party or during a group activity)	1	2	3	4	5
23. Has difficulty doing things that require mental effort, such as counting backwards	1	2	3	4	5
24. Has difficulty keeping things in mind while he/she is doing something else	1	2	3	4	5

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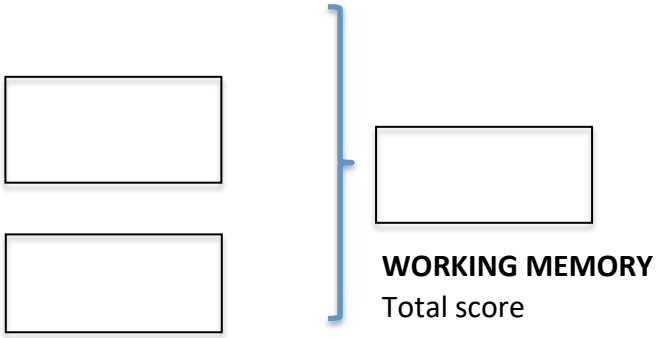
SCORING

Fill in the total score for the respective subscales in the boxes below, and the total score for the two factors WORKING MEMORY and INHIBITION. For an example of ADHD and control group means and SDs, as well as cut off scores, see Catale, Meulemans and Thorell (in press)[1].

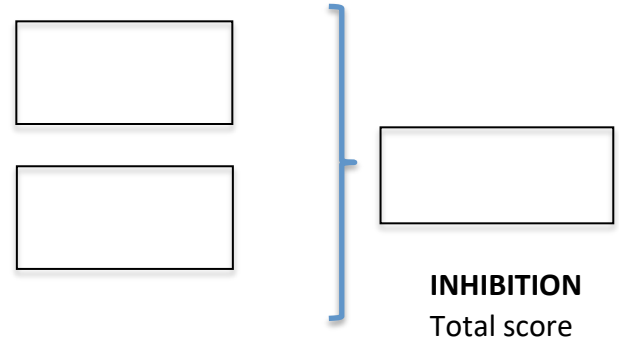
Subscale 1: Working memory
Total score for items: 1, 3, 6, 7, 9, 19, 21, 23, 24

Subscale 2: Planning
Total score for items: 12, 14, 17, 20



Subscale 3: Regulation
Total score for items: 2, 4, 8, 11, 15

Subscale 4: Inhibition
Total score for items: 5, 10, 13, 16, 18, 22



The CHEXI includes four different subscales tapping working memory, planning, regulation and inhibition. However, factor analysis in children in kindergarten was only able to identify two factors, referred to as WORKING MEMORY (working memory and planning subscales) and INHIBITION (regulation and inhibition subscales).

[1] Catale, C., Meulemans, T., & Thorell, L. B. (in press). The Childhood Executive Function Inventory (CHEXI): Confirmatory Factorial analyses and cross-cultural clinical validity in a sample of 8—11 years old

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Children. Journal of Attention Disorders, doi: 10.1177/1087054712470971

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Appendix F. Study 2- The CHEXI Questionnaire (Thorell & Nyberg, 2008), Chinese version

兒童執行功能量表 (CHEXI 中文版**:繁體)**

(家長及教師適用)

以下是一系列的陳述句。請細閱每一句句子，圈出每項陳述後面的一個數字（從 1 到 5）
代表用作形容目標兒童的情況。

完全不正確	不正確	部分正確	正確	完全正確
1	**2**	**3**	**4**	**5**

1	難以記住一些冗長的指示。	1	2	3	4	5
2	他(她)似乎很少能自我激勵去做一些自己不喜歡做的事。	1	2	3	4	5
3	難以記得自己在活動中途做過甚麼。	1	2	3	4	5
4	難以對一些欠缺吸引力的任務堅持到底，除非有人承諾會給與獎勵。	1	2	3	4	5
5	有傾向在做事之前沒先想一想後果。	1	2	3	4	5
6	當有數件事情要他(她)去做，他(她)只會記得第一件或最後一件事情。	1	2	3	4	5
7	當他(她)被問題困擾著時，難以想出另一個方法來解答。	1	2	3	4	5
8	當有些事必須要完成的時候，他(她)常常會被其他更吸引的事分了心。	1	2	3	4	5
9	很容易忘記別人要他/她拿甚麼東西回來。	1	2	3	4	5
10	當一些特別事情即將發生時 (例如：出外參觀、參加派對) 會異常興奮。	1	2	3	4	5
11	顯然難以去做一些他(她)認為沉悶的事。	1	2	3	4	5

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12	難以計劃好一項活動 (例如：記得帶齊實地考察的裝備或上學所需要 的東 西) 。	1	2	3	4	5
13	難以抑制他(她)的活躍，儘管早已作出吩咐亦如 是。	1	2	3	4	5
14	難以進行一些需要多個步驟的活動 (例如： 年紀較幼的小孩在沒有提 示下穿好衣服鞋襪；年紀較長的小孩獨自做完所 有功課)。	1	2	3	4	5
15	他(她)一定要覺得任務有吸引力才能全神貫注。	1	2	3	4	5
16	難以在不適宜笑的場合忍 笑。	1	2	3	4	5
17	難以把一些已發生的事情述說得令其他人容易明 白。	1	2	3	4	5
18	即使被喝令停止亦難以在活動中立即停下來。例如：他(她) 在被喝停 後總要多跳幾下或是多玩電腦一會兒。	1	2	3	4	5

19	難以理解用言語表達的指示，除非同時向他(她)示範怎樣做。	1	2	3	4	5
20	難以應付一些包含多個步驟的任務或活 動。	1	2	3	4	5
21	難以預先想好未來的事或從經驗中學習。	1	2	3	4	5
22	在一班小朋友當中會表現得比其他人更瘋狂 (例如：生日派對上或群 體活動中)。	1	2	3	4	5
23	難以做一些需要動腦筋的事，例如：倒 數。	1	2	3	4	5
24	難以在做著其他事情時仍不忘之前要牢記 的東西。	1	2	3	4	5

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Thorell, L.B. & Nyberg, L. (2008) The Childhood Executive Functioning Inventory (CHEXI): A new rating instrument for parents and teachers. *Developmental Neuropsychology, 33*, 536-552.

Thorell, L.B., Veleiro, A., **Siu, A.F.Y.**[#], & Mohammadi, H (2013). Examining the relation between ratings of executive functioning and academic achievement: Findings from a cross-cultural study. *Child Neuropsychology, 19*, 630-638.

[#]Translator for the Chinese version of CHEXI

計分

在下面的空格填上每個副量表的分數，然後計算出兩個因素「工作記憶」及「抑制力」的得
分。如需要一個過度活躍組、控制組的平均分、標準差，以及分界數值的例子，可以參考 Catale,
Meulemans, & Thorell （印刷中）[1]。

＝**副量表 1：工作記憶**

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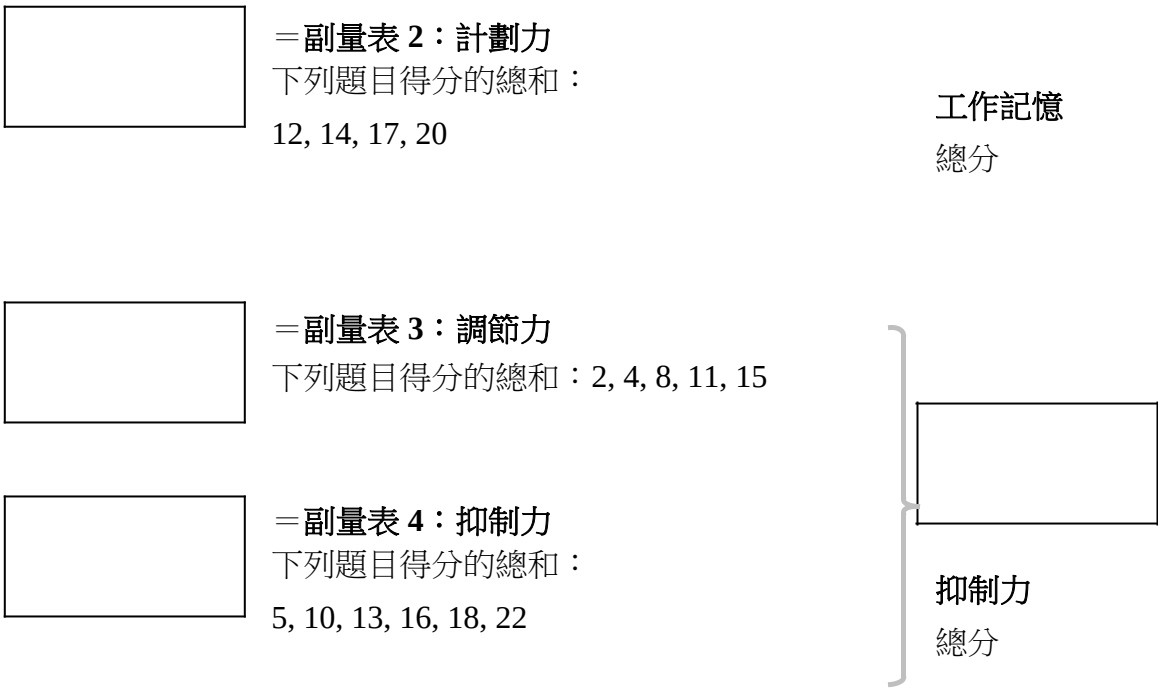
下列題目得分的總和：

1, 3, 6, 7, 9, 19, 21, 23, 24



CHEXI 量表包括四個不同的副量表，名為：工作記憶、計劃力、調節力、抑制力。不過因素

分析在幼稚園學生及小學生樣本中只能確定兩個因素，分別是 **工作記憶**（「工作記憶」及「計

劃力」副量表）和 **抑制力**（「調節力」及「抑制力」副量表）。

[1] Catale, C., Meulemans, T., & Thorell, L.B. (in press). The Childhood Executive Function Inventory (CHEXI): Confirmatory factorial analysis and cross-cultural clinical validity in a sample of 8-11 years old children. *Journal of Attention Disorders*, doi: 10.1177/1087054712470971

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Appendix G. Study 3 Original storytelling transcript samples (in Cantonese) selected for category analysis

Category I: Non-stories

1) 食蛋糕, 開 party, 無啦 (Worksheet group, participant 32)
2) 呢個生日, 佢地…慶祝…慶祝佢, 唱生日歌, 送禮物俾佢 (Brick set group, participant 5)
3) 係做 d 慶祝, er…佢地係就咁慶祝, 無啦, 係要做 d 慶祝生日 (Free bricks group, participant 36)

Category II: Sketch stories

1) 今日係果個熊 bear bear 生日, 跟住佢好開心, 有個去到天既大蛋糕, 好高好高一千萬, 佢話: '好多野玩 wor!', 跟住佢話送一千萬既生日禮物, 好多魔法棒, 完成! (Worksheet group, participant 14)
2) 個生日會, 佢地就帶埋衣服, 佢地唔攞呢 d 對箭野, 一齊去, 佢就行啦, 獵人抱住佢, 媽媽都去,

   依家係柏度食 pizza, 依家早餐係柏度食, Er…呢度坐左，食左就去生日會學校果度, 完成左 (Brick set group, participant 44)
3) 有…生日會有生日 sir 滑梯玩架, 仲有盪千秋, 仲有…仲有得係公園有得玩，公園都有得帶 Lego 去玩, 係戶外城買左 d 玩具, 仲可以帶返屋企玩, 如果 d 玩具爛左，就可以掉落垃圾筒, 再買新既玩具 (Free bricks group, participant 7)

Category III: Incomplete stories

1) 佢呢係度跌親，就訓千秋

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跟住 hum 到個頭，跟住叫媽媽返屋企搽搽個頭，跟住就去屋企玩，同家姐玩

跟住佢就: '家姐，佢 meet 我呀'

跟住就講俾媽咪知，跟住佢話家姐

佢呢係度周圍玩千秋, 佢呢係度跌親, 就訓千秋, 跟住 hum 到個頭, 跟住叫媽媽返屋企搽搽個頭, 跟住就去屋企玩, 同家姐玩

跟住佢就: '家姐，佢 meet 我呀'

跟住就講俾媽咪知，跟住佢話家姐 (Worksheet group, participant 4)

2) 之後…果個小朋友，佢生日呀, 佢開生日會, 佢 5 歲

之後有一個小朋友送左一份禮物俾佢, 之後佢就拆左份禮物

之後呢，佢就見到一個星星，佢就俾媽咪 (Free bricks group, participant 34)

3) 個媽咪…因為佢生日, 媽咪就買左個蛋糕俾佢, 仲有蠟燭, 仲有糖果 d 野

跟住有個蛋糕攞攞攞, 媽咪話：'有蛋糕食啦！'

跟住呢，佢話：'咩蛋糕啊？'

係糖糖蛋糕, 跟住佢就話：'哇我中意糖糖蛋糕啊！'

跟住就過黎啦, 跟住就點蠟燭, 跟住就吹 (Worksheet group, participant 45)

Category IV: Essential stories

1) 佢地去左生日會, 去答巴士, 跟住答 2 號巴士去東沙道長沙灣, 跟住去好高果度, 跟住要等好耐先去沙灘果度開 party, 跟住 hello kitty 要等 10 號 287 巴士去東沙道長沙灣, 佢要去返學, 跟住佢返完學放學要答果個雙層巴士去商場答飛機去返去佢自已屋企, 完左啦 (Worksheet group, participant 47)

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2) 有一日, 生日會時候, 我已經 6 歲啦, 佢 6 歲, 生日會係坐係度架, 跟住佢生日會係度食蛋糕, 食完蛋糕之後送禮物俾佢, 佢就好開心, 小朋友, 跟住就拆禮物拆禮物拆禮物, 跟住就果個禮物係星星禮物啊, 跟住佢就送俾媽咪, 送俾媽咪就訓覺, 訓完覺之後就返學, 完左啦 (Brick set group, participant 31)
3) 係 Jason 生日, 跟住佢又…佢同媽媽講：‘今日我生日今日我生日!’, 跟住佢就好想參加佢生日, 跟住佢媽媽話：太早啦 Jason，訓一陣覺啦, 媽媽話, 跟住 Jason: ‘起身啦！我想參加！’, 跟住媽媽話：好啦, 去刷牙啦, 跟住刷完牙之後食粟米片早餐, 跟住佢就 errr… 跟住佢就…開始參加啦, 跟住參完加之後 Jason 仲想要禮物卡, 不過媽媽佢話：‘等陣先啦 Jason, 第我傾完計先啦，打完電話先啦’, ‘好啦’, 佢就答好, 跟住呢佢呢就…就返左入屋度, 夜晚啦, Bye bye! (Free bricks group, participant 12)

Category V. Complete stories

1) 果時候呢，8 月份有人生日既時候, 有人點蠟燭果時候呢, 然之後點左落地下度, 然之後著火, 然之後呢佢就離開個學校, 然之後消防員就黎左, 然之後無端端無哂 d 火, 因為學校有 d 噴水器噴走哂 d 火, 然之後呢重新黎過起過一間學校然之後再點多一次, 就無點左落地下啦, 完啦 (Worksheet group, participant 37)
2) 佢想用個子彈點蠟燭, 跟住點左成間屋, 跟住間屋爆炸, 跟住消防員去救佢, 跟住就返到學校, 射落去個蛋糕度，個蛋糕就著左, 跟住唱生日歌，跟住吹, 成間學校都係，就爆炸, 吹唔到，因為太多，佢地個口無力，用風扇機又唔得，因為風扇壞左, 乜野傢俬都壞左, 跟住最後就全個…成個氣就爆炸, Boom! 個蛋糕煮左，但係就無爆炸, 得個蠟燭同間房爆炸, 無 Lu (Free bricks group, participant 38)

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3) ‘哇，媽咪，我今日想到山頂開生日 party 呀’

‘好呀’, 之後佢就坐車到山頂, 之後佢到左山頂果度坐低, 但係無其它人

‘你好呀，我係你既朋友’

‘你係唔係同我一齊開 party 啊？’

‘好呀，我都係係山度開 party, 我個 party 係最好玩架！’

‘好呀好呀，我地走’

‘哇呢度有朱古力棒，朱古力棉花糖，同埋朱古力噴泉啦，同埋燒賣啦，同埋世界上所有既野食都係係呢度呀’

之後 ‘你去我果度啦，我都食飽啦’

‘哇你個 party 咁多野食既’

‘我呢度呀全部都係玩架’

‘哇好玩呀！’

之後玩到夜晚啦，要返屋企啦

‘之前我係呢度見到一個頭，個人有 d 奇怪，好似一個怪獸’

‘快 d 走啦’, 之後佢地就返屋企啦 (Free bricks group, participant 49)

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Appendix G. Study 3 Colouring pages for the worksheet group

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Source from http://coloringhome.com/coloring-page/1728907

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