Learning to Play and Playing to Learn: The Role of Symbolic Play in Language Acquisition

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Declaration

I declare that this thesis reports my original work, no part of this thesis has been accepted previously and presented for the award of any degree or diploma from any university, and to the best of my knowledge no material published or written by another individual is included in this thesis, except where due acknowledgement is given.

............................................................

Sara Jane Quinn
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Abstract

Theory in developmental psychology has long recognised commonalities between symbolic play and language, yet approaches differ in the importance they assign to the role of symbolic play in language acquisition (e.g., constructivist theory, Piaget, 1962; socio-cultural theory, Vygotsky, 1978). This thesis examines the nature of the relationship between the two domains in early childhood, with a focus on whether the context of symbolic play provides a fertile context for language development (Bruner, 1983; Vygotsky, 1962, 1978). Study 1 presents a quantitative review of the accumulated empirical evidence in the field. A meta-analysis of correlational symbolic play-language studies was conducted, with thirty-one studies meeting the criteria for inclusion (N = 6,561). The results revealed a direct relationship between the two domains: growth in symbolic play ability was associated with growth in language, a relationship that was evident concurrently and longitudinally. The results established beyond doubt that there is a significant association between symbolic play and language in development, addressing recent queries to the contrary that have been made on the basis of qualitative reviews (Lillard et al., 2013). A longitudinal study of 54 parent-infant dyads is then reported. Parents and their infants were observed engaging in different types of play contexts (functional, symbolic). Using these data Studies 2 and 3 investigated the influence of play contexts on verbal and socio-cognitive communicative acts used in parent-infant interaction when infants were 18 months old. Study 2 found play context influenced child-directed speech: in functional play parents were more likely to comment on (declaratives) and direct their infant's behaviour (imperatives), whereas in symbolic play parents presented infants with more opportunities to participate in conversation through the use of wh- and yes/no-questions. This lead to a greater number of conversational turns in the symbolic play condition. Study 3 revealed differences in socio-cognitive communicative acts across play
contexts: the frequency and duration of joint attention was greater and encouraged gesture use in symbolic play compared to functional play. Overall Studies 2 and 3 suggest symbolic play is an environment that encourages the use of specific verbal and socio-cognitive communicative acts, which provides infants with opportunities to participate and engage in interactions. Study 4 examined whether the verbal and socio-cognitive communicative acts characteristic of functional and symbolic play, as identified in Studies 2 and 3, predicted infant language growth over the following 6 months. Conversational turns and imperatives were consistently correlated with infant language knowledge at 18, 21 and 24 months.

When controlling for infant age and language proficiency at 18 months, conversational turns positively predicted vocabulary production at 18 and 24 months, whereas imperatives negatively predicted infant language growth and syntactic complexity at 24 months. Therefore, two features which distinguish functional and symbolic play, the use of imperatives and conversational turns, had differential longitudinal effects on infant language development, with the greater interactional complexity characteristic of symbolic play positively predicting development. It is concluded that the socio-cognitive ecology of symbolic play has a positive effect on language development via its tendency to engage interlocutors in the shared exchange and negotiation of meaning.
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Chapter 1

Overview

“Play is the highest form of research.” (Scarf, 1962, p. 120)

Play is a hallmark of early childhood. The ubiquitous nature of play in childhood has naturally led to its inclusion as a central concept in developmental theory and research. The work of two major theorists, Piaget (1962) and Vygotsky (1962, 1978), has significantly influenced the literature on the topic, but the two differed in the importance they assigned to play in early language development. Very broadly, Piaget (1962) viewed the role of play in development as a pleasurable but not particularly useful activity for children. Conversely, Vygotsky (1962, 1978) viewed play as crucial to the healthy development of a child.

Research that has investigated the relationship between play and language has identified a relationship between the two domains. However, there is ambiguity and division in the literature about the strength of the play-language relationship. Symbolic play, commonly defined as the nonliteral use of objects, actions or persons (e.g., object substitution, imagining absent objects, assigning absent attributes, as in sociodramatic play), has received considerable attention in the literature, and is the main focus of this thesis. Symbolic play and language share many conceptual similarities, being both symbolic and communicative (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Werner & Kaplan, 1963). These conceptual similarities have led to the assumption that the two domains are developmentally coupled. That is, that there is something particularly special about the relationship between symbolic play and language acquisition.

The symbolic play-language relationship has recently gained fresh prominence with the publication of two qualitative reviews that came to two very different
conclusions. The first review proposed that symbolic play is crucial to a child’s language acquisition (e.g., see Hirsh-Pasek, Golinkoff, Berk, & Singer, 2009). In contrast, Lillard et al. (2013) concluded that the current empirical evidence for a symbolic play-language relationship was equivocal. Methodological issues have stunted any hope of a resolution of this debate and have renewed academic interest in the field to conduct well-designed, methodologically-sound studies. There is a dearth of research examining the symbolic play-language relationship in a large longitudinal sample in a naturalistic setting. Additionally, while most studies have treated play as an individual capacity, few have examined how play contexts may condition different behaviours, which may in turn be related to language development. Accordingly, the research reported in this thesis aimed to answer four broad questions:

- What can existing literature tell us about the quantitative relationship between symbolic play and language?
- How do verbal communicative acts differ when a parent and their infant interact during symbolic play compared to functional play?
- How do joint attention and gesture use differ during parent-infant interaction when they are engaged in symbolic play compared to when they are engaged in functional play?
- Are there differences in the parent-infant interaction across play contexts that are related to infant language development?

This thesis comprises nine chapters, including four empirical studies designed to investigate the research questions. Chapter 2 is a theoretical review and describes the difficulties of defining play and the multiple definitions of the concept of symbolic play that exist in the literature. It also details the two main theoretical models that differ in their treatment of symbolic play in development: Piaget (1962), who viewed symbolic play as an epiphenomenon of development, and Vygotsky’s (1962, 1978) socio-cultural
approach, which views symbolic play as a leading factor in development. Chapter 3 is a qualitative review of studies that have examined the relationship between play and language.

The first empirical study is reported in Chapter 4. It is a quantitative meta-analysis of the literature, designed to examine the cumulative qualitative relationship between play and language and answer the first research question. This is the first quantitative meta-analytic review of the symbolic play-language literature.

Chapters 6, 7 and 8 address the second, third, and fourth research questions, respectively. Chapter 5 describes the methodology of the longitudinal study that informs the empirical studies reported in Chapters 6, 7 and 8. Data was collected from 54 parent-infant dyads at three times points over a 6-month period. Testing began when children were approximately 18 months old. Parents and their infants were observed engaging in different types of play (functional, symbolic) in their own home. Specific aspects of this interaction (e.g., language use, joint attention, and gesture) were analysed for their ability to predict the infant’s language development.

Using these data, Chapter 6 explores the influence of play contexts on the language used in parent-infant interaction when infants were 18 months old. Differences in parent and infant spoken language (mean length of utterance, type-token ratio), interactional complexity (conversational turns) and the use of specific parental speech acts (declaratives, imperatives, exclamatives, interrogatives, naming and mimetics) were compared across play contexts.

Chapter 7 examines differences in joint attention and gesture when parent-infant dyads are engaged in symbolic play compared to functional play. The frequency and duration of joint attention episodes were coded and compared across play conditions. Parent-infant interactions were also coded for the presence of gestures such as points
(declarative, imperative) and iconic gestures (in-hand, out-of-hand) and whether or not these communicative acts were accompanied by speech.

Chapter 8 investigated whether the differences in the linguistic and socio-cognitive variables across play contexts identified in Chapters 6 and 7 significantly influenced the infant’s subsequent language development. For instance, it explored whether conversational turns (among other variables), which are significantly more likely to occur in symbolic play, longitudinally predict language growth. As such, the analyses presented in this chapter aimed to identify those specific linguistic and socio-cognitive features of symbolic and functional play that significantly influence language development.

Chapter 9 provides a concise overview of the findings of each empirical chapter and how these findings may be understood in terms of current developmental theories. It also sketches potential avenues for further clinical interventions and research designed to promote language development in typically and atypically developing children.

Overall, this thesis examines the nature of the relationship between symbolic play and language acquisition in early childhood. It proposes that the ambiguous nature of symbolic play elicits specific patterns of linguistic and socio-cognitive behaviours to create a unique social ecology that fosters language and interaction in development.
Chapter 2

Play and Language: A Theoretical Review

Symbolic play provides a child with a “means for self-expression…a system of signifiers constructed by him and capable of being bent to his wishes” (Piaget & Inhelder, 1977, p. 58).

“In play a child always behaves beyond his average age, above his daily behavior. In play it is as though he were a head taller than himself.” (Vygotsky, 1978, p. 102).

This chapter is a qualitative review of studies that have examined the relationship between play and language. It describes the difficulties of defining play, and the multiple definitions of the concept of symbolic play that exist in the literature. Two main theoretical models of play are outlined in detail: Piaget’s (1962) constructivist approach, which views play as an epiphenomenon of development, and Vygotsky’s (1962, 1978) socio-cultural approach, which views play as a leading factor in development. It then explores the possible relationships between the social context of symbolic play and language development.

2.1 The Definition of Play

While we inherently know what play is when we witness it, precise scientific definitions of the concept are difficult to formulate. Weisberg, Zosh, Hirsh-Pasek, and Golinkoff (2013) describe this problem, commenting that “play can refer to just about any activity children do that meets a number of criteria” (2013, p. 41). Herein lies the problem with operationalising play. Repeated attempts have been made to capture the essence of play within a single definition and with a range of different criteria, yet to date there is not one definition that has been consistently adopted in developmental literature (Barton & Wolery, 2008).
Smith (2010) reviewed the multiple ways in which play has been defined and operationalised. For instance, the work of animal ethnologist, Robert Fagen (1974) describes two main approaches to defining play: the functional approach and the structural approach. The functional approach focuses on why a child engages in play (e.g., for enjoyment, not for a specific external purpose per se), whereas the structural approach focuses on the specific behaviours of play and the way a child performs these behaviours. These two approaches present an initial issue with defining play: some aspects of play can be observed (e.g., affect, play with objects, language) while other aspects cannot (e.g., goals, internal mind state, enjoyment, benefit). Therefore, often play may only be inferred from behaviours (e.g., he’s smiling means he’s happy) and the sequence of these behaviours (e.g., she piles the blocks, knocks them down, then piles them up and knocks them down again). The functional and structural approaches to defining play provide basic boundaries to allow a child's activity to be categorised as play. However, these definitions are primarily from the point of view of the child and rely on knowing why a child is engaging in play and what they are thinking while engaged in play behaviours. From an observer’s perspective, defining play according to these approaches is subjective and ambiguous, especially in a fluid play environment. Furthermore, the observer has additional difficulty defining what might constitute play, as a child's behaviours during play are not isolated to play contexts (e.g., manipulating objects such as cuddling teddy may happen during play for fun and at bedtime for comfort).

A third approach reviewed by Smith is criteria-based, where play is defined according to the presence or absence of specific features. Krasnor and Pepler (1980) provide a simple yet comprehensive definition that captures the essence of play within a criteria-based approach. They specify that four main elements are required for an interaction to be defined as “play”. These include (i) positive affect: a child is observed
to enjoy the activity as evinced by overt facial expressions (e.g., smiling) or behaviours (e.g., laughing), (ii) flexibility: the activity and behaviours within play fluctuate both in form and in content (e.g., a child may move from object to object as frequently or infrequently as they wish), (iii) non-literality: behaviours frequently fluctuate between nonliteral and literal meanings (e.g., a banana in one moment might be in a fruit bowl and in the following moments the child might pretend “as-if” this same banana is a boomerang and then “as-if” it is a telephone), and (iv) intrinsic motivation: play is not constrained by external rules or social demands, and is engaged in for its own sake (akin to the functional approach). Smith and Vollstedt (1985) added to this definition the necessity to consider “means/end” (p. 1043). That is, a child's interest in play is the performance of play itself and not the outcome of play, which is congruent with the structural approach to defining play. The criteria-based approach provides a more objective method for researchers to assess the presence of play. It recognises that play cannot be neatly captured in a single definition, and instead requires multiple criteria to be satisfied for researchers to determine the presence of play with greater precision and accuracy.

Adopting a broad approach to the definition of play, Singer, Golinkoff, and Hirsh-Pasek (2006) equate play to learning. They also recognise the difficulty in defining play (see also Weisberg, Zosh, et al., 2013). Initially, they align with the functional approach and build their definition to demarcate play from other activities by suggesting that play has no specific purpose and is not linked to survival. Their second point aligns with the structural approach, that playful activities are frequently exaggerated (i.e., are longer in duration or involve a greater range of motion) compared with non-playful activities. In line with the criteria-based approach, they further specify that play is child-led, and this is a crucial and distinctive aspect of play that researchers use to decide if an activity is play or not. This multi-factorial approach leads to greater
agreement in assessing the presence of play (Krasnor & Pepler, 1980; Smith, Cowie, & Blades, 2003).

**2.1.1 Defining symbolic play.**

As a subtype of play, symbolic play is also very difficult to define. Lillard (1993) provides a specific definition, operationalising symbolic (i.e., pretend) play as “the projecting of a supposed situation onto an actual one, in the spirit of fun rather than for survival” (Lillard, 1993, p. 349). She identified five features that are both “necessary and sufficient for play to be considered pretend”. These include: (i) a pretender, (ii) a reality (a pervasive and obvious essential component), (iii) a mental representation that is different from reality, (iv) a layering of representation over the reality, such that they exist within the same space and time (also see Bretherton, 1984), and (v) an awareness on the part of the pretender of the components of play described in (ii) – (iv). Lillard also adds that pretence frequently requires bodily movement (activity), although clarifies that this is not essential (e.g., one can pretend to be at the beach while one is sitting in their office writing their thesis). In this definition Lillard (1993) accords with Singer et al. (2006), addressing the function and structure of play to develop specific criteria to differentiate between play and non-play episodes.

Particularly evident when defining symbolic play is the difficulty for an observer to identify the type of play in which a child is engaged. This difficulty derives from the fact that play is often determined by the internal state of the individual. That is, the quality of non-literality is not necessarily observable. For instance, we may observe in reality a child jumping off a dirt pile without being privy to their internal and ‘fantasy’ mindstate in which they are imagining being a knight jumping off the castle wall into the crocodile-infested waters below. Furthermore, the “as-if” quality changes rapidly and unexpectantly.
Observing how a child plays with objects is one way to distinguish between symbolic play and other subtypes of play. In typical development, play with objects becomes more prevalent and more social with age (Rubin & Howe, 1985). A great deal of theoretical and empirical attention has been directed to the many ways that children use objects as they age, particularly during play (e.g., Pellegrini, 2013; Piaget, 1962; Tomasello & Farrar, 1986; Tomasello, Striano, & Rochat, 1999; Vygotsky, 1978). Play with objects has been classified in three developmental stages: non-exploratory, non-symbolic, and symbolic, with symbolic play considered the most sophisticated level of play with objects due to the cognitive competence it requires (Piaget & Inhelder, 1977; Sigman & Sena, 1993).

For the purposes of this thesis, a distinction is made between two particular types of play: functional and symbolic. In functional play, objects are used by children in a manner which is appropriate to their given purpose. For example, a wooden hammer may be used to bang pegs into a block and a castanet is used to make music. By contrast, in symbolic play, a child may pretend an object, action or idea represents another object, action or idea and they may then convey this new meaning to their playmate (e.g., see Fekonja, Umek, & Kranjc, 2005). For example, a saucepan lid may be used as a steering wheel, or a red cloth as teddy’s cape or a blanket. In this sense, pretend play is symbolic because the child is treating objects in a manner that contravenes reality, and in doing so projects a symbolic mental image onto an object.

Object substitution has been described as one aspect of symbolic play that differentiates it from other types of play (e.g., Bruner, 1983; Fein, 1981; Ungerer & Sigman, 1984). Object substitution is the transformational quality of having a real object symbolise another object, and, according to McCune-Nicolich (1981), is the most salient and important feature of symbolic play. Werner and Kaplan (1963) suggested that when a child engages in object substitution they are demonstrating an awareness...
that the symbol (e.g., wooden spoon) is separate from what is symbolised (e.g. a microphone). Leslie (1987) describes this ability as “decoupling” (pp. 416-418).

McCune (2008) argued that object substitution as a sophisticated form of play within a developmental hierarchy of pretend play behaviours. She suggested that this sophistication is demonstrated as a child’s actions are initially and primarily driven by an internal mind state rather than external cues (e.g., the properties of an object in the external world). Adding to this, McCune (2008) noted that object substitution assumes that a child deliberately keeps in mind that one thing “stands for another”. This occurs via an intentional on-going representational state that equates what the child knows in reality (e.g., this is a wooden spoon) to be different in form and function from what they are pretending it is (e.g., a microphone). This is taken as evidence that children quarantine the events that occur within episodes of pretence from their surrounding reality (Leslie, 1987). Recent findings suggest children can distinguish reality from pretence (Bourchier & Davis, 2002), and they rarely confuse the two (Lillard, Pinkham, & Smith, 2010; Weisberg, Zosh, et al., 2013). This capacity for symbolic representation is argued to reflect the child's emerging cognitive competence, a view that has framed the majority of the theory and research into the relationships between play and language (McCune, 1995).

2.2 Play and Language: Theoretical considerations

The works of two major theorists, Jean Piaget (1896-1980) and Lev Vygotsky (1896-1934), has informed the current understanding of the developmental relationship between play and language acquisition. In this section it is argued that, while both theorists acknowledge associations between play and language, they differ in the importance they assign to the context of play in early language development.
2.2.1 Piaget and the constructivist approach.

Piaget is arguably one of the most influential theorists in developmental psychology (see Zigler & Finn-Stevenson, 2007). The father of the ‘constructivist’ approach to development, Piaget based much of his initial theory on extensive observations of his own children and later conducted experiments to examine these theories. The Piagetian constructivist approach views symbolic play as evidence for the child’s emerging capacity for symbolic representation (Belsky & Most, 1981; McCune, 1995; McCune-Nicolich, 1981; Nicolich, 1977).

Piaget conceptualised cognitive development as progressing through a series of distinct developmental stages. He observed similarities between language and play across development and argued that both require the ability to use symbols (i.e., language, numbers, pictures, signs, and/or gestures) to represent actions, objects or ideas. He referred to this capacity for mental representation as the *semiotic ability* (Piaget, 1951). Specifically, Piaget argued that both symbolic play and language require the capacity for symbolic understanding of events and objects, yet language acquisition is only possible once a child has acquired this cognitive ability (Bornstein, Haynes, O’Reilly, & Painter, 1996). During the sensorimotor period (birth to two years of age), infants interact with their world using sensorimotor actions and reflexes and use these interactions to construct their knowledge about the world. Piaget suggested that the semiotic ability develops towards the end of the sensorimotor period (approximately 18 – 24 months). During this period, children consolidate their knowledge of reality and symbol through representational rehearsal. This representational rehearsal occurs during play, with children projecting symbolic schemas onto objects and others.

Piaget proposed that the development of mental representation across play and language domains is facilitated by the processes of assimilation, accommodation, and equilibration (Piaget, 1962). Assimilation is viewed as a consolidation of knowledge as
it involves fitting new information into an infant’s existing thoughts and action
schemata (Siegler, 1996). For example, an infant may have learned the word “spoon”,
and for a while all items of cutlery are called “spoon” as they are assimilated into a
schema related to the infant's understanding of “spoon”. This process is then balanced
by accommodation, which leads to growth and change through the adjustment of
schemata to fit with new experiences (i.e., as a child perceives that a spoon can be
distinguished from a fork they develop different schema for these two types of cutlery)
(Siegler, 1996). When these two processes reach equilibrium, infants reach a stable
level of knowledge and there is a domain general shift in cognition.

Although Piaget recognised that the processes of assimilation and
accommodation are conducted through an infant’s interaction with the world, he argued
that symbolic development is largely a solitary process rather than a social process. He
stated that symbolic play is “primarily self-assertion for the pleasure of exercising his
powers and recapturing fleeting experience” (1962, p. 131), a matter of “correcting
reality” (1962, p. 131), or “doing in play what one would not dare do in reality” (1962,
p. 132). For instance, a child engages in symbolic play and pretends to be the daddy,
bathe, and feed his teddy child (i.e., assimilate reality to the self) without changing their
established schemata (accommodation). Piaget assumed that the egocentric assimilation
that occurs during play, when children incorporate new information into their current
understanding, is both reinforcing and satisfying (Piaget & Inhelder, 1977, pp. 58-59).
Therefore, the function of symbolic play, according to Piaget, is to consolidate the
child's knowledge of mental representation and a child engages in this process with a
sense of pleasure and mastery.

Piaget therefore viewed development occurring largely independently of social
interaction, and thus that the symbolic play context is a venue for demonstrating
mastery rather than a context in which mastery is achieved. However, in other places
Piaget does acknowledge that social interaction is important for the semiotic function (in particular, the use of linguistic signs and the use of language during object substitution; Piaget, 1962, p. 99, 1995), but that this social rehearsal does not “modify pre-verbal intelligence” (Müller & Carpendale, 2000; Piaget, 1962, p. 68; Piaget & Inhelder, 1977, p. 84). Additionally, Piaget does not account for how infants acquire the ability to grasp what another person is communicating about (i.e., their referential intent), a level of social understanding required for learning and using both language and symbolic play behaviours such as object substitution. Such downplaying of social processes in development has been questioned by research that emphasises the triadic nature of signs (e.g., Buhler, 1990; the sender, receiver, objects and the state of affairs), proponents of which argue that signs are inherently social.

2.2.2 Vygotsky and the socio-cultural approach.

While Piagetian theory has been criticised for ignoring the importance of social and cultural factors in cognitive development (e.g., see Müller & Carpendale, 2000; Nicolopoulou, 1993), Vygotsky’s (1962, 1978) socio-cultural approach explicitly focuses on these factors as drivers of development. Vygotsky argued that language both originates from and develops towards supporting social contexts such as symbolic play. While both Piaget and Vygotsky viewed the symbolic play environment as a venue within which a child may navigate and rehearse symbolic relationships, Vygotsky viewed play as “a leading factor in development” (1978, p. 101), and stressed the importance of learning through the social environment, particularly within the context of play. He argued that a child develops as they participate in social interaction and that tools (e.g., objects) and signs (e.g., language, pretend play) are instrumental to this social interaction. Vygotsky emphasised that a child is motivated to engage in play and this motivation is not purely from a cognitive basis (as Piaget suggested occurs through egocentric assimilation), but from a socio-cultural basis. He argued that “human
learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them” (Vygotsky, 1978, p. 88). Symbolic play is an inherently social activity and development in this domain relies heavily on the support of the social context (Striano, Tomasello, & Rochat, 2001). Thus it follows that symbolic play should be understood within the social context in which it develops (e.g., Rakoczy, Tomasello, & Striano, 2004; Tomasello, 1999).

A key aspect used to explain the link between play and cognitive development in Vygotsky’s theory is the concept of the zone of proximal development. This has been defined as “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). Therefore, the zone of proximal development describes the difference between a child's actual development and the child's level of potential development. In early childhood, the zone of proximal development is frequently established with “more intelligent” social partners, such as parents and more competent peers (Van der Veer & Valsiner, 1991, p. 337). Vygotsky stated that “all the higher functions originate as actual relations between human individuals” (Vygotsky, 1978, p. 57). This statement has been interpreted to apply to the learning that occurs through social contexts such as play, whereby social partners facilitate a child’s learning by using a range of strategies such as guiding them through tasks, and providing or modelling problem-solving techniques (Nicolopoulou, 1993). Support for this view comes from evidence that children can copy and perform more pretend actions and do so with greater complexity after witnessing their social partner perform them first (Bretherton, O’Connell, Shore, & Bates, 1984; Lyytinen, 1989, Ungerer, Zelazo, Kearsley, & O'Leary, 1981).
Vygotsky argued that symbolic play itself is crucial in the development and understanding of symbolic thinking. Symbolic play provides a child with the opportunity to navigate symbolic relations, through which a child develops the ability to separate referent from object (e.g., see Bornstein et al., 1996; Weisberg et al., 2015). When a child engages in pretence, children develop an understanding that objects (e.g., a large white container with holes) and their referents (e.g., washing basket, laundry basket) can be interchangeable and that these can be separated from reality in a number of ways in the context of a play situation (e.g., the cat's bed, a pirate ship). Through learning that objects and their referents are interchangeable, children learn to differentiate between meaning and vision (i.e., what objects and actions mean and what they look like; Lillard et al., 2013). As the social structure serves as a primary source of learning for young children, it is argued that the interactional nature of pretence provides a fertile context for the development of symbolic understanding (Bruner, 1983).

2.2.3 The Role of Social Interaction in Language Development

Both Vygotsky and Piaget viewed the capacity for symbolic representation as emerging towards the end of the second year, which coincides with the emergence of both symbolic play and language (e.g., Le Normand, 1986). Both saw the emergence of language as evidence of a developmental shift in a child's cognitive competence. Piaget stated that this abrupt domain change coincides with the emergence of language and that symbolic play does not continue beyond the second year, captured by the quote: “the symbolic game...only appears during the second year of the child's development” (Piaget, 1962, p. 112). An underlying premise of Piaget's work is that cognitive development such as the ability for mental representation, develops prior to, and is the basis upon which language develops (Miller, 2002). According to Vygotsky, language plays a fundamental role in the development of mental representation and is not
dependent on achieving this cognitive shift. In fact, Vygotsky viewed language as the basis upon which other symbolic systems develop (e.g., see Nelson, 2007). However, Vygotsky posited that the capacity for mental representation does not emerge entirely from cognition but from the integration of early speech and non-verbal systems. He argued that thought and language are two separate entities which unite: “At a certain point these lines [abilities] meet, whereupon thought becomes verbal and speech rational” (Vygotsky, 1978, p. 128). As such, external language is internalised to become internal psychological knowledge, and subsequently social and cognitive processes become linguistically mediated across developmental time.

Therefore, both theorists acknowledge the importance of mental representation in cognitive development; however, Piaget viewed language as stemming from this cognitive ability, whereas Vygotsky viewed language as an important aspect of the development of mental representation and that it is socially constructed. Piaget’s approach to cognitive development was broad and applied to many developmental domains, although exactly how the process of equilibrium contributed to cognitive development is unclear. By contrast, the transactional socio-cultural perspective of learning refers to developmental progression as occurring within a child’s engagement with their social environment (Vygotsky, 1978).

Overall, the socio-cultural perspective (e.g., Vygotsky, 1962, 1978; Wood, Bruner, & Ross, 1976) emphasises the role of supportive environmental factors in an infant’s learning and development. Language is argued to emerge from interactions which typically move from dyadic (e.g., between an adult and infant) to triadic (between an adult, infant and an object). These interactions typically include attentional behaviours which become increasingly more complex over time (e.g., from eye gaze following, to imitation, to pointing and declarative gestures).
A recent approach to incorporate Vygotsky’s socio-cultural approach to infant development is the Cultural Learning approach proposed by Tomasello and colleagues (Tomasello, 1999, 2003; Tomasello et al., 1999; Striano et al., 2001). Collectively, they discuss the important role of social interaction in the construction of language, in particular the way in which it is used between social partners to manipulate attention. The importance of environmental factors in infant development is particularly salient when an infant engages in activity with an adult partner and an object (e.g., Tomasello, Carpenter, Call, Behne, & Moll, 2005). The triangular interaction between adult, infant and an object provides a unique sharing situation for an infant that promotes infant learning. This learning occurs within Vygotsky’s (1967) zone of proximal development, where an adult both matches and then extends the activity to promote an infant’s learning. The process by which parents support and scaffold infant’s language development has been described as multidirectional and transactional (Razfar & Gutiérrez, 2003). That is, parents react to things their infants say and do and vice-versa. These interactions also provide infants with exposure to the role of social partners, which allows infants to establish an understanding of communicative intent and the eventual production of intersubjective linguistic constructions (Tomasello, 2003). Abstract mental representation is thought to be facilitated when an infant considers others’ perspectives and this allows them to consider their own thought from multiple perspectives (Tomasello, 1999). Accordingly, socio-cultural approaches acknowledge that the environment that surrounds an infant, particularly during play, is rich and diverse (e.g., includes a range of verbal and socio-cognitive behaviours) and provides the infant with opportunities to interact with and understand how their play partner thinks and acts.
2.3 Summary and Overview

The present chapter has considered the two main theoretical positions of infant development focusing on the achievement of mental representation, the role of the social context, and its relationship with language development. Until recently, research investigating cognitive development, particularly the relationship between play and language, has placed a larger emphasis on Piagetian theory. It is clear that Vygotsky and Piaget attribute varying importance to the social context in cognitive development. For instance, when a child is presented with a play context, Piaget suggests that a child’s action and learning is governed by their own autonomy (not individuality as many researchers suggest, see Tappan, 1997). That is, development occurs independent of social interaction. In contrast, Vygotskian theory argues that the social context itself will influence the child’s action and learning; development occurs within social interaction (e.g., action influenced by an external force; the Kantian concept of heteronomy; Sensen, 2013; Stetsenko & Arievitch, 2004).

The current research was informed not by which theory or orientation is preferable to the other, but is led by the fact that the role of the social context has been investigated to a lesser extent. While a Piagetian view of the play-language relationship has dominated the empirical literature (as will be evident in Chapters 3 and 4), the work of Vygotsky provides an alternative perspective upon which we can understand associations between play and language in early childhood. To this end, the empirical work in this thesis investigates the socio-cognitive ecology of play, investigating how language and communicative interaction differ across symbolic and functional play contexts. The play-language relationship, the empirical literature bearing upon this relationship, and the research focus of this thesis is discussed in Chapter 3.
Chapter 3
Language and Symbolic Play: A Literature Review

3.1 The Empirical Play-Language Relationship Across Development

Developmental relationships between symbolic play and spoken language have been consistently documented over decades of research on child language acquisition. Across disciplines (e.g., psychology, education), this body of research has also generated a general, although not uncontroversial, assumption that symbolic play has an important role in cognitive development.

It has been widely noted that symbolic play and language are interrelated (McCune, 2008; Orr & Geva, 2015; Smith & Jones, 2011), with many demonstrations of coupled development between the two domains (Bates et al., 1979; Fein, 1981; Morelock, Brown, & Morrissey, 2003; McCune-Nicolich, 1981; McCune, 1995; Nicolich, 1977; Ogura, 1991; Shore, O’Connell, & Bates, 1984). Symbolic play and language share two important similarities: both rely on the capacity for symbolic representation (i.e., in play objects, ideas, and, actions contravene reality; in language, the sounds of words typically have no relationship to their meaning), and both follow a developmental trajectory from a basic to more advanced expression (see Gillespie & Zittoun, 2010; McCune, 1995).

The skills necessary for symbolic play are acquired early in development (for reviews see Fein, 1981; Nicolich, 1977; Rubin & Howe, 1985). Children’s early play is characterised by functional and “pre-symbolic” sensorimotor manipulations of objects, when infants recognise the relationship between objects and actions (e.g., banging a block, squeezing a ball, flicking a tag, eating from a spoon; Brown, Rickards, & Bortoli, 2001; Fein, 1981; McCune, 1995; Tamis Le-Monda, et al., 1992). This pre-symbolic stage is evident between 8 and 11 months of age (Fein, 1981; McCall, 1974; McCune, 1995). Symbolic behaviours typically emerge at around 12 months of age and increase
dramatically between 15 and 18 months (Rubin & Howe, 1985). These behaviours
typically advance to incorporate representational thinking and symbolic acts, including
object substitution (e.g., pretending a wooden spoon is a person), gestures (e.g., using a
hand as a telephone), sound effects or exaggerated movements (e.g., “slurp” and
throwing head back when drinking from an empty teacup), and the combination of
representative acts into sequences and hierarchical orders (e.g., feed teddy, wipe his
mouth, put him to bed in the pot) (Fein, 1981; McCune, 1995, 2008). By 24 months
pretence is well established (Bates et al., 1979; Bretherton, 1984; Fein, 1981; Nicolich,
1977; Tamis Le-Monda & Bornstein, 1991), with infants spending approximately 5 –
20% of their play time pretending (Haight & Miller, 1993). At 24 months infants also
demonstrate the ability to interpret and respond to some forms of pretence performed by
other play partners (Harris, Kavanaugh, Wellman, & Hickling, 1993). Contrary to
Piaget's (1962) proposal that symbolic play does not continue beyond the second year of
life, empirical evidence suggests that children continue to engage in symbolic play
beyond this point. Sociodramatic play also emerges around 4 years of age, particularly
with a proficient play partner (e.g., Haight & Miller, 1993; Howes & Matheson, 1992;
Shore, O'Connell & Bretherton, 1984). Although there is an argument that pretending
continues throughout adulthood, the average age at which children report no longer
engaging in pretence is 12 years (Lillard, Pinkham, & Smith, 2010; Smith & Lillard,
2012). In contrast to the development of language, a child's ability to produce pretence
acts develops prior to their ability to comprehend pretence acts (Bigham & Bourchier-
Sutton, 2007; Tomasello et al., 1999). Pretence comprehension varies according to the
similarity between the pretence act and the object or action represented, such that
children find it easier to comprehend a pretence action or object if the action or object is
similar to the referent it represents (Bigham & Bourchier-Sutton, 2007).

Infant language development follows a similar, hierarchical developmental
pathway to symbolic play. Infants typically comprehend their first words at 9 months of age and spontaneous word production begins at around 12 months of age. In typical development, the 50-word milestone for comprehension and production is attained at an average age of 13 months and 18 months, respectively (e.g., Benedict, 1979; Lyytinen, Laakso, Poikkeus, & Rita, 1999). At this point in development it is likely that children understand the symbolic nature of language; that is, that words have symbolic importance. There is consensus between many researchers that this is the same age at which children begin to unambiguously engage in symbolic play behaviours (Bates, 1993; Bornstein & Hendricks, 2011; Lyytinen, Poikkeus, & Laasko, 1997; McCune, 1995).

The second year of life represents a significant period of change and growth in play and language development (e.g., Bates, Dale, & Thal, 1995). At the same time that infants are starting to combine words, they are also beginning to combine and sequence symbolic play behaviours (e.g., Bates, 1993; Bornstein & Hendricks, 2011; McCune, 1995). For example, McCune-Nicolich (1981) and McCune (1995) showed that complexity in play is associated with parallel development in language production. McCune (1995) conducted a large cross-sectional ($n = 102$) and smaller longitudinal study ($n = 10$) to examine the relationship between play and language in children between the ages of 8 and 24 months. The findings of these studies replicated earlier studies that revealed that the development of play either coincided with or was closely followed by developments in spoken language abilities (e.g., Bates et al., 1979; Shore et al., 1984; Tamis-LeMonda & Bornstein, 1990). These findings were attested in both concurrent and longitudinal analyses of these data. Overall, children’s play developed from pre-symbolic play schemes to more advanced levels. McCune found that these developments in play complexity were closely associated with early milestones of language development (i.e., from the production of first words to the development of
multi-word speech). That is, the onset of pretend play behaviours coincided with the beginning of vocabulary production, and the onset of combinatorial pretence and multi-word utterances. The conclusion of this study was that play and language development is integrated as a function of the underlying capacity for metarepresentation. That is, following Piaget, both skills emerge in the context of a system of related skills.

In support of Piaget’s claim that development in play and language are dependent upon an underlying capacity for symbolic representation, correlational research has found concurrent and longitudinal play-language associations for symbolic but not functional play (e.g., Lewis, Boucher, Lupton, & Watson, 2000; Lyytinen et al., 1999). Lyytinen et al. (1999) examined concurrent and longitudinal associations between language and functional (i.e., functional/relational play behaviours) and symbolic (i.e., self-directed, other-directed, and substitution pretence behaviours) play in a longitudinal sample of 171 infants at 14, 18 and 24 months. They reported significant concurrent correlations between symbolic play and language comprehension and production at 14 and 18 months of age, and significant longitudinal correlations between symbolic play measured at 14 and 18 months of age and vocabulary production at 24 months. Symbolic play measured at 14 months was predictive of infant vocabulary production at 24 months (as measured by the Bayley expressive scores). By contrast, there were no significant associations between functional play and any measure of infant language. These results were similar to those reported by Ungerer and Sigman (1984) and Tamis-LeMonda and Bornstein (1994). In an earlier study, Lyytinen et al. (1997) found significant associations between measures of language and symbolic play at 18 months. However, they found that this relationship differed according to the language measure used: stronger associations were observed between symbolic play and language comprehension than between symbolic play and language production.

Similarly, Tamis-LeMonda and Bornstein (1994) found that the strength of the
play-language association also differed by language measurement and infant age. At 13 months, language comprehension (hypothesised to be an index of linguistic representation) but not production was related to symbolic play. At 20 months only a child’s ability to express meaning (i.e., semantic diversity as measured by language used to indicate possession, agency, and location) was related to symbolic play. The authors suggested that as specific aspects of language are related to symbolic play, language-play relationships may be specific rather than reflective of global abilities. When examining play-language associations across a larger age range in early childhood, Lewis et al. (2000) found significant associations between a child’s functional play ability (as measured by the Lowe and Costello Symbolic Play Test, 1988) and language production, but no association with language comprehension. By contrast, significant associations between a child’s symbolic play ability (as measured by the Test of Pretend Play, Lewis & Boucher, 1997) and language production and comprehension (as measured by the Preschool Language Scale, Zimmerman, Steiner, & Pond, 1992) were reported. This suggests that different types of play may be more strongly associated with different aspects of language development.

Similarly, Casby and Della Corte (1987) observed the frequency and nature of object substitutions used during play episodes and how these changes influenced language development over a 12-month time frame in children aged between 19 and 32 months ($N = 15$). They found that children who produced multi-word utterances were more proficient at decontextualising objects and more likely to decontextualise dissimilar objects (e.g., using a block as a cup) than children who only produced single-word utterances, over and above the influence of age. The authors interpreted these findings according to a Piagetian cognitive–developmental approach and viewed play complexity as associated with language complexity due to the child’s level of symbolic understanding. Examining bimodal expressions of symbolic understanding (i.e., via
speech and/or gesture), Unhjem, Eklund, and Nergård-Nilssen (2014) examined play behaviours produced by mothers and their children in a lab-based study which examined play, gesture, and language in a typically developing sample of 32 children with and without familial risk of dyslexia. Children were followed longitudinally and tested at 12, 15, 18, and 24 months. Child play-based behaviours were coded according to two basic categories based on meaningful combinations of objects: functional play combinations were defined as having “little sense of symbolic activity”, such as putting a spoon in a cup, whereas symbolic play combinations were defined as meaningful use of objects in combination with self- or other-directed symbolic activity, such as feeding the doll (Unhjem et al., 2014, p. 328). Functional and symbolic play scores were based on the frequency of play episodes observed during the play session. The duration of each play session was unclear. Overall, relationships between symbolic play and gesture and language development were evident for both groups. Early gestures at 12, 15, and 18 months (as measured by the MB-CDI, Fenson, Marchman, Thal, Dale, Reznick, & Bates, 2007) were positively associated with language production at 24 months (as measured by scores on the MB-CDI and Bayley Scales of Infant Development - 3rd edition; BSID) in the group at familial risk for dyslexia (similar to typically developing samples, see Caselli, Rinaldi, Stefanini, & Volterra, 2012; Iverson & Goldin-Meadow, 2005). Unlike Caselli et al. (2012) and Rowe and Goldin-Meadow (2009), early gesture did not predict language comprehension (as measured by receptive communication scores on the BSID). Additionally, the authors found that symbolic but not functional play at 12 months correlated with later language production. The symbolic play-language relationship was weaker when symbolic play was measured at 15 and 18 months and only related to language production at 24 months (as measured by expressive communication scores on the BSID). Differences in the strength of associations between play, gesture, and language between groups were attributed to
small sample sizes and the variance that exists within samples of typically developing children. Therefore, based on these data, the play-language relationship appears to be stronger when symbolic play is measured earlier in development and may differ depending on how language is measured.

Few studies have interpreted the symbolic play-language association according to a socio-cultural Vygotskian understanding of language development. Similar to research interpreted according to a Piagetian perspective, these studies have been primarily based on correlational data. Ungerer and Sigman (1984) reported that children who engaged in more doll-directed and other-directed play acts at 13.5 months also reported higher language scores concurrently at 13.5 months and longitudinally at 22 months. At 22 months of age language proficiency was concurrently associated with symbolic play acts but not relational play (i.e., stacking or nesting objects). Ungerer and Sigman suggested that their findings add to the literature that describes the benefit of the social and communicative functions of play in the development of play-language associations. Hall, Rumney, Holler, and Kidd (2013) examined how play, language and gesture use are related in children aged 18 to 30 months. They found that when accounting for differences in age, representational play was significantly associated with a child’s language development and gesture use. The authors interpreted these findings in terms of the overall influence of the social context on learning. They proposed that the symbolic aspect of representational play leads to the emergence of some gesture use, in addition to providing a context that fosters communicative development. In other words, the Piagetian approach may usefully describe relationships between play and language that stem from a child’s ability to understanding symbolic representation, but it is the social context itself that is crucial to the exchange of meaning which influences language acquisition.
In order to better understand the developmental pathway of the relationship between symbolic play and language, Orr and Geva (2015) conducted a micro-analytic study of symbolic play behaviours in a sample of 14 infants aged between 6 and 18 months. They analysed 288 vignettes to provide an in-depth analysis of how an infants' symbolic play behaviours (e.g., novel use of objects) are associated with their vocalisations and one-word utterances. These vignettes described solo play: infants engaged in object play while their mothers sat nearby so that the researchers could investigate the internal and independent expression of symbolic play in infancy. Mothers were permitted to hand objects to their infants, but were not allowed to participate in any other aspect of their infant's symbolic play. Infant utterances and gaze directed towards their mother or an object were coded as requests for a maternal response and mothers' subsequent responses (verbal, smile, touching the infant, keeping eye contact, pretence behaviours including exaggerated gesture and speech) were also coded. They found that infants who produced a greater number of symbolic acts were more likely to request maternal responses during their solitary play. Overall, maternal responses were positively correlated with the complexity and sequencing of their infants' symbolic play. However, maternal verbal responses were coded as “vocal responses from distant places” (e.g., “yes, good, right”, p. 153) and these were not significantly associated with any measure of infant symbolic play. The authors acknowledged that the study was designed to observe solitary symbolic play in infancy, yet despite this suggested that the results revealed that, even when kept to a minimum, maternal interaction augments symbolic play activity in infancy and that infants play an active role in this process (also see Venuti, de Falco, Esposito, & Bornstein, 2009). These findings demonstrate associations between symbolic play and conversational transaction in early infancy, although the extent to which the relationship is a property of symbolic play or simply play in general is unknown since there was no control
condition (i.e., a non-symbolic play condition). Regardless, it appears that infants who display more complex levels of symbolic play are also more likely to respond to and request input from their mothers. This may be interpreted as support for symbolic play fostering co-operative action and negotiation to establish a shared understanding about the pretence situation (Rakoczy, 2008; also see Brown, Donelan-McCall, & Dunn, 1996). However, these results could equally mean that children who are more cognitively sophisticated are more likely to request interaction from their mothers.

3.2 The Social Context of Play

3.2.1 The social context of play: Social scaffolding.

Vygotsky emphasised the presence of two inextricably linked components of play (i) an “as-if” situation and (ii) the presence of underlying rules. This observation highlights the difference between symbolic and functional play contexts. Based on Vygotsky’s quote “What passes unnoticed by the child in real life becomes a rule of behavior in play” (Vygotsky, 1967, p. 9), Nicolopoulou, Cortina, Ilgaz, Cates, and de Sá (2015) describe functional and symbolic play contexts on a continuum: an explicit imaginary situation with implicit rules (symbolic play) to an implicit imaginary situation with explicit rules (functional play). For example, when a child pretends to put teddy to bed, she acts according to her perception and understanding of the implicit rules of parental behaviour. Within this perspective, the symbolic play context is viewed as an enjoyable activity for a child (and adult), which is entered into voluntarily, yet is maintained by a combination of potentially incongruent factors: imagination and flexibility plus self-imposed (and shared), rule-governed action. Research informed by Vygotskian theory therefore argues that symbolic play both requires and supports the development of social competence (Bodrova & Leong, 2003; Hirsh-Pasek et al., 2009).

Differences and similarities between play contexts have been detailed in the literature (e.g., Pellegrini; 2013; Smilansky, 1968). Smilansky (1968) differentiated play
categories according to how behaviours differ when children play with objects. That is, an infant engaged in functional play explores objects simply (e.g., banging, dropping) in functional play (akin to Piaget’s definition of sensorimotor play) and then play with objects becomes more constructive (similar to Piaget’s definition of symbolic play) with infants manipulating objects more purposefully. Thus, developmental research has differentiated between functional and symbolic play by the way objects are used during these different contexts. For example, in functional play an object is used according to its function despite the size of the object, whereas in symbolic play the object is treated “as-if” it were something else (e.g., Leslie, 1987; Lewis, Boucher, & Astell, 1992; Ungerer & Sigman, 1984).

Until recently, the importance of social interaction around object use in early cognitive development has been largely ignored. Piaget (1962) recognised the importance of object use in play and proposed that solitary object play was sufficient for cognitive development. However, Tomasello (1999), Pellegrini (2013), and Pellegrini and Hou (2011) recognised that infants observe others playing with objects and spend much of their time interacting with objects in social contexts. Rakoczy (2007) argued for a rich, social interpretation of play. Through the concept of collective intentionality, Rakoczy proposes that symbolic play requires the joint creation of a series of ideas and behaviours which are transient, but act to establish and organise the pretence situation. For example, Ash’s mother holds the wooden spoon upright, moves it around, and says, “Look, he’s dancing to the music.” Ash moves the small red spoon in the same manner and says “dance spoons”. Ash and his mother both smile. The pretence episode closes when Ash says, “Tired now, bedtime”, and he places the spoons in the pot. Rakoczy argues that this type of social interaction requires and provides a child with opportunities to rehearse specific skills such as: joint attention (Ash shares his mother’s attention on the spoon and develops an understanding that “the spoon is dancing”),
shared action (Ash and his mother “dance their spoons”), and imitative cultural learning (Ash performs an appropriate inferential pretence act whereby “after dancing, the spoons should be tired and need to go to bed”). The suggestion is that within these types of playful interaction children come to understand the symbolic nature of the world. That is, in Ash’s case, he learns that X (the spoon) stands for Y (a dancer) in context C (playtime with mum), and understands that this representational mapping is shared with his interlocutor.

3.2.2 The social context of play: The role of language.

From the earliest stages of language learning, children vary greatly in their rate of language development (Bates, 1979; Fenson et al., 1994). It has been argued that the human potential for language is based in biology and that the social environment converts the potential for language into a reality (Hoff, 2006). Accordingly, the past literature has focused either on the biological mechanisms of language acquisition (e.g., see Chomsky, 2000) or the quantitative and qualitative variation of language acquisition as a function of the social environment in which it develops (e.g., Bates et al., 1995). Developmental studies have largely examined how the course and outcome of normal language acquisition are influenced by environmental and individual factors. One important environmental factor that contributes to individual differences in early vocabulary development is the linguistic input to which children are exposed (Hoff, 2006; Hoff-Ginsberg & Shatz, 1982; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Marjanović-Umek, Sočan, Tašner, & Fekonja-Peklaj, 2015; Pan, Rowe, Spier, & Tamis-LeMonda, 2004; Roskos & Christie, 2001). During symbolic play, the ambiguous nature of objects and situation encourages language use as a parent and child express themselves and clarify these symbolic transformations (e.g., Fekonja et al., 2005; McCune-Nicolich, 1981; Pellegrini, 2009). It has also been argued that the planning, development and maintenance of this symbolic transformation requires the
use of language and that this facilitates the organisation and maintenance of play situations.

Accordingly, language use within play may be more complex than in other social contexts. Fekonja et al. (2005) examined the spontaneous speech of 60, 4 to 5 year-old children across three different contexts: eating breakfast, free play, and guided storybook reading with a teacher. They found that different contexts elicited different types of child utterances. Compared with guided and mealtime contexts, children's speech during free play was more frequent, more complex (i.e., multi-word utterances), involved a greater range of speech types (e.g., interrogatives, mimetics), and was predominantly directed towards peers. Therefore, there is evidence to suggest that from infancy through to preschool years, children's language use is encouraged by both the context of play itself and the presence of a play partner.

If variation in language input leads to differences in later language proficiency (e.g., Huttenlocher et al., 2010), examining how the quantity and quality of parental speech changes across play contexts is an important priority for research. Elements of child-directed speech (CDS) found to influence language development in English-speaking children include the use of interrogative such as wh-questions (e.g., what, where, when, who, why, which, and how) and language complexity. Wh-questions are proposed as more challenging than yes/no-questions or imperatives (i.e., instructions such as put your coat on) for a child as they require a response from the child in the form of recalling, organising, and/or expressing specific information (Cristofaro & Tamis-LeMonda, 2011; Tamis-LeMonda, Bornstein, & Baumwell, 2001). Wh-questions also function to sequence events during play and establish common understanding between play partners, in addition to facilitating the conversational exchange. In fact, children of mothers who pose more wh-questions display more advanced language skills (Rowe, Coker, & Pan, 2004; Rowland, Pine, Lieven, & Theakston, 2003; Tamis-
LeMonda et al., 2001); and can produce and comprehend these types of questions more readily (e.g., Valian & Casey, 2003). Studies that examine parental speech complexity, often measured by calculating the number of morphemes per utterance (MLU), typically find that parents adapt the sophistication of their CDS based on the age of the child (Rondal, 1980; Fernald et al., 1989).

Very little past research has investigated how CDS differs across play contexts. O'Brien and Nagle (1987) examined how CDS differed between three types of play interactions (manipulated by the use of three types of toys: shape sorter, dolls, and vehicles). Differences were observed both between parents and across play conditions. Overall, parents spoke more and were more likely to encourage conversation from their children when interacting with dolls. Specifically, parents spoke more and used longer utterances, named objects more frequently and used more questions compared to when they were playing with shape sorters or vehicles. A greater number of directives were used with shape sorters and yes/no-questions were more prevalent when parent-child dyads were playing with dolls than with shape sorters and vehicles. The use of wh-questions did not differ as a function of play context, which is surprising due to the proposal that more complex negotiations are required in symbolic play (Fekonja et al., 2005; McCune-Nicolich, 1981; Pellegrini, 2009). The authors specified that the influence of gendered toys and small sample size ($n = 20$) may have minimised any potential differences between language use in play contexts. They concluded that children are exposed to different types of parental language when they are interacting with different types of toys because the parents focus on different types of goals. For instance, as shape sorters have a clear goal (e.g., put a specific shape in a specific hole), parents were more likely to focus on achieving this goal and manipulating shapes rather than the focusing on the social context of the interaction (e.g., establishing shared understanding), which was more evident when interacting with dolls. This study
suggests that differences in parental language between play contexts manifest when the goal of play is concrete and “achievable” (e.g., building a block tower) versus when the goal is primarily social (e.g., playing with teddy bears). Collectively, the results of Fekonja et al. (2005) and O’Brien and Nagle (1987) suggest that particular aspects of free play (e.g., symbolic transformation) encourage greater language complexity in both parents and children and that symbolic play also encourages differences in the pragmatic function of CDS.

Recently, research has emphasised the role of the quality of parent-child interactions in shaping early language development. Hirsh-Pasek et al. (2015) reported that the quality of interaction between a parent and their 24-month-old preverbal child during free play (i.e., 3 sets of toys: picture book, cooking set, dollhouse) is a stronger predictor of language growth than the quantity of parental language input (mothers words per minute) at 36 months. They noted that although infants were unable to engage in verbal conversations due to limited productive vocabularies, parents’ use of conversation to scaffold their child’s engagement with objects, share familiar routines, and mutually negotiate play situations provided a rich platform for children to learn and rehearse new words and their meanings (also see Adamson, Bakeman, Deckner, & Nelson, 2014; Bruner, 1983). The fluency and connectedness (i.e., the balance of conversational contributions from each partner, the negotiation of turn-taking, and how smoothly the interaction progresses, as assessed by ratings on items of the parent-child interaction ratings battery; Adamson, Bakeman, Deckner, & Nelson, 2012) of parent-infant interactions was the strongest predictor of later infant vocabulary and grammatical growth.

These data are consistent with the general argument that social contexts support and shape childhood language development (also see Gallaway & Richards, 1994; Golinkoff, Can, Soderstrom, & Hirsh-Pasek, 2015; Hirsh-Pasek, et al., 2015; Hoff-
Within social environments meaning is primarily exchanged through language. It follows that if language acquisition depends on access to communicative opportunities, then a child’s language development will differ when they are exposed to play contexts that differ in the provision of different social supports. However, language is only one aspect of the parent-infant interaction that occurs during play that acts to shape infant development (Hoff, 2006). The contribution of socio-cognitive communicative acts (e.g., joint attention, gesture) during play and how these might influence infant language development are considered below.

3.2.3 The social context of play: The role of joint attention.

Infants have been described as “sophisticated customers of information” (Baldwin, 1993, p. 842). A forum for transmitting this information is within joint attention (JA). The ability to engage in JA has been described as a major socio-cognitive milestone in infant development (Tomasello, 1995, 1999), and has been identified as one of the specific aspects of social interactions most commonly associated with language development. JA was first discussed by Werner and Kaplan (1963) as a sharing situation. JA has since been conceptualised in various ways. At a broad level, the concept refers to a range of behaviours used by infants and young children to follow, share and direct the attentional focus of others. More specifically, JA has been defined as a situation in which: (i) two individuals share a common point of reference (Mundy & Newell, 2007); (ii) social partners share their attention with an external object or event (Bakeman & Adamson, 1984; Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998); (iii) a dyad shares a mutual and intersubjective focus on the same object during an interaction (Saxon & Reilly, 1998; Tomasello, 1995); and (iv) two individuals monitor each other’s attention to the same object/event. Tomasello (1999) refers to this triadic co-ordination of person-person-object awareness as a *reference triangle*. 
The growing awareness of other people as intentional agents, whose attention to objects and events can be directed and shared, is the key social-cognitive skill underlying the ability to engage in JA behaviours (Legerstee & Barillas, 2003; Tomasello, 1995). Moore and Dunham (1995) distinguish between collaborative (coordinated/active) and non-collaborative (passive) JA. Collaborative JA is the active involvement of both conversational partners and involves turn-taking, mutual participation, and flexibility, whereas non-collaborative JA is a parallel interaction (i.e., engaging independently in the same activity or one partner observing the other engaged in an activity). According to Tomasello (1995), collaborative JA encompasses true intentionality and is the most tangible expression of the construct of JA relative to non-collaborative JA (Saxon & Reilly, 1998).

In typical development, a child first develops the ability to interact primarily with their social partner and ignores the events occurring in their surroundings. In this didactic situation the child develops a sense of shared experience or intersubjectivity (Schaffer, Hepburn, & Collis, 1983; Trevarthen, 1979). These dyadic interactions become triadic in nature when infants start to incorporate external objects and ideas into their interactions with others through the ability to alternate gaze between an object and/or event and a social partner’s face (Moore & Dunham, 1995). This ability develops between 9 and 12 months of age (Bakeman & Adamson, 1984; Carpenter, Nagell et al., 1998; Moore & Dunham, 1995; Tomasello, 1995). In response to this shift of gaze, a parent typically reciprocates in a conventionalised manner (e.g., touching or talking about the object/event) that maintains this attentional focus (Moore & Dunham, 1995). Around 12 months of age, infants use eye gaze to engage others in extended episodes of joint attentional focus (for a review see Moore & Dunham, 1995). By 12-18 months an infant can begin to follow the gestures (e.g., show or point) to an object and demonstrate an ability to initiate this type of interaction using gesture by pointing to and
showing objects to others (Behne, Liszkowski, Carpenter, & Tomasello, 2012). Studies of the developmental trajectory of JA have found that point following and gestural production are well established by the age of 18 months (e.g., Bakeman & Adamson, 1984; Carpenter, Nagell et al., 1998; Saxon & Reilly, 1998). In a series of studies examining JA and free play, Butterworth and Cochran (1980) found that infants had the capacity to respond to their mother’s bids for attention inside their visual field by 6 months, and to bids outside of their visual field by 18 months, in addition to being able to direct their mother’s attention through the use of gaze and pointing. During interactions, infants pick up subtle cues that facilitate word learning (Striano & Stahl, 2005) and children who spend more time in JA also report more advanced language comprehension and production skills than children who spend less time in JA (Butterworth & Cochran, 1980). JA is also functionally significant in the development of social referencing; that is, during JA episodes infants monitor an interlocutor’s emotional expression to guide action in ambiguous contexts (Walden & Ogan, 1988).

The concept of collective intentionality is an important component of what motivates a child to share social experiences with others and how verbal and socio-cognitive behaviours perform a role in the exchange of meaning. Specific types of toys promote specific types of play and this is influenced by object form (e.g., size, shape, material, complexity) and the child’s knowledge of the function of objects (e.g., saucepans are stirred by big wooden spoons) (e.g., see Nielsen, 2012; Pellegrini, 2013; Rubin & Howe, 1985). Searle (1995) and Rakoczy (2007) discuss the use of objects in terms of ‘causal usage functions’, whereby the naturally occurring properties of an object lend it to be used by an individual in a specific manner and with other objects in a specific way. By contrast, the assignment of a ‘status function’ to an object is conventionally understood (e.g., this carrot is a pencil) as the object (carrot) cannot fulfil the function (to draw) due to its intrinsic properties. Rackoczy states that “the
status function is brought into existence, constituted merely by collective intentionality” (p. 55, 2007). Both causal usage functions and status functions are evident in play; however, the status function is particularly apparent in symbolic play when an infant and parent understand and agree via verbal and socio-cognitive communicative acts on what objects and actions represent. This collective intentionality is inherently social and is consistent with the proposal that symbolic play is an explicit imaginary situation with implicit rules (Nicolopoulou et al., 2015). The infant and parent negotiate and (implicitly) agree on the meaning of an explicit imaginary situation (the status function, the carrot is a pencil) and both treat the objects and actions accordingly (the parent “sharpens” the “pencil”, before handing it to the infant who pretends to draw with it). To exchange meaning within pretence, prelinguistic infants share their experiences using manual gestures such as pointing (i.e., deictic gestures) and pantomime (i.e., iconic gestures) (e.g., see Bates et al., 1979). For instance, the infant pretends to draw with an empty hand or a carrot in-hand (iconic gesture) and answers the question “where’s the pencil?” by pointing to the carrot. Collective intentionality requires JA and allows a preverbal child to derive rich meaning from social interaction prior to the emergence of their spoken language. In turn, gesture use predicts a child’s later language development (Bates et al., 1979; Hall et al., 2013; Tomasello, 2008).

3.2.4 The social context of play: The role of gesture.

Gesture use constitutes the child’s earliest form of intentional communication (Tomasello, 2008). Gesture both precedes and facilitates early verbal language development (Capirci, Iverson, Pizzuto, & Volterra, 2005; Iverson & Goldin-Meadow, 2005; Özcalışkan & Goldin-Meadow, 2009). Both forms of communication are expressions of a child’s knowledge of symbols and have been interpreted as evidence of their capacity for symbolic representation (McCune, 2008; Unhjem et al., 2014). Play may constitute one important learning environment within which infants learn and use
symbols, first through gesture and then through spoken language (Capirci, Contaldo, Caselli, & Volterra, 2007; McCune, 2008).

Infants communicate via gesture before they have spoken their first words (Bates, 1979). *Deictic gestures* such as index finger pointing, gain their referential meaning from the context in which they are used rather than the specific form of the gesture. A child is capable of and begins to use communicative pointing at 12 months, and does so by pointing at objects (Carpenter, Akhtar, & Tomasello, 1998; Liszkowski, Carpenter, & Tomasello, 2008). For example, a child may point to their bottle to communicate that it is a *bottle* or indicate that they are *hungry*. This example highlights two main motives for this type of communicative gesture: (i) a declarative point communicates a wish to divert and/or engage the attention of the social partner (Franco, 1997), and (ii) an imperative point expresses a desire or request for an object. Infants use this form of communication for up to 3 months to refer to objects before they are able to produce the word label for the object (Özçalişkan, Gentner, & Goldin-Meadow, 2014). Declarative gestures, such as points, function to share knowledge about objects and events with others and are commonly associated with definitions of JA (Bates et al., 1975; Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004; for a review see Tomasello, Carpenter & Liszkowski, 2007). For instance, Tomasello and Farrar (1986) found that maternal directives expressed via speech and gesture which re-directed an infant's attention to a new object were positively correlated with infants’ concurrent vocabulary at 15 months. In contrast, imperative gestures are not typically associated with JA behaviours, although have been frequently measured within research examining children’s use of communicative gestures within parent-child interaction (Bates, 1979; Desrochers, Morisette, & Ricard, 1995; Tomasello & Camaioni, 1997).

Associations have been identified between play, gesture, and spoken language, suggesting these three systems are interrelated in development (e.g. Acredolo &
Goodwyn, 1988; Bates et al., 1979; Hall et al., 2013; Namy, Acredolo, & Goodwyn, 2000; Namy, Vallas, & Knight-Schwarz, 2008). In a seminal developmental experiment examining the play-language relationship, Bates et al. (1979) tracked 25 children longitudinally between 9 and 13 months of age. To examine associations between play, deictic gesture, and language development, children were assessed using a range of tasks that measured the three skills, in addition to other measures of general abilities such as imitation and motor development. Both play and gesture predicted language development. However, play, particularly symbolic and combinatorial play, predicted gesture better than it predicted spoken language. Gesture also predicted spoken language. In particular, communicative pointing (and other gesture types such as giving, reporting and ritual requests) best predicted language development. The association between communicative pointing and language was argued to reflect the fact that communicative pointing is a gestural, sensorimotor form of naming, which functions to share reference with an interlocutor. Overall, these findings suggest that infant play predicts their gesture use, which subsequently predicts early language development. These associations were interpreted as evidence for a common underlying mechanism supporting the development of these three domains. However, an alternative interpretation for this play-gesture-language relationship has been suggested. Hall et al. (2013) examined the tripartite relationship between play, gesture (deictic and iconic), and spoken language in a cross-sectional sample of children aged 18–31 months. They found that symbolic play is positively associated with children’s gesture use, which in turn is positively associated with spoken language knowledge over and above the influence of age. Based on observations that each skill develops out of interaction with a competent other, Hall et al. suggested that that all three skills are emergent developments from the uniquely human skills of cooperation and collective intentionality, consistent with the Cultural Learning approach to development.
Gesture plays an important role in the construction and expression of meaning (Gullberg, de Bot, & Volterra, 2008). Liszkowski et al. (2008) argued that a human infant’s communicative pointing reflects species-specific predisposition for prosocial behaviour. In early interactions involving pointing, parents are likely to “translate” the meaning intended by the point produced by their preverbal child and look for cues from the child’s behaviour to ascertain if their transcription is accurate (Goldin-Meadow & Alibali, 2013; Olsen & Masur, 2011). Meaning is frequently easier to express in gesture than in speech (e.g., the act of pointing to a water bottle is simpler to express than the speech “I want water”), and the gesture-word combinations (e.g., ‘want’ + POINT) are less cognitively demanding and as such precede the onset of two-word utterances (Wagner, Nusbaum, & Goldin-Meadow, 2004). Used in conjunction with speech, gestures supplement information conveyed verbally by clarifying and/or enriching the verbal content for both the user and recipient (McNeill, 2005). For example, research into early pointing gestures and the acquisition of nouns suggests that if an infant points at a particular object (e.g., a hat) the likelihood that they will learn the word for that particular object (“hat”) increases (Iverson & Goldin-Meadow, 2005), particularly within JA episodes (e.g., Akhtar, Dunham, & Dunham, 1991).

It has been proposed that young children initially treat words and gestures as equivalent forms of symbolic reference to extract information about the world (Namy & Waxman, 1998; Puccini & Liszkowski, 2012). Namy et al. (2000) found that, during JA episodes, parents produced both verbal and gestural labels for objects, and 17-18-month-old infants learned novel words and gestures with equal proficiency (also see Namy, Campbell, & Tomasello, 2004; Namy & Waxman, 1998). Spoken language eventually takes over as the dominant mode of communicative exchange; however, children (and adults) continue to express meaning through gesture (Bates et al., 1979).

(Tomasello et al., 2005; Tomasello et al., 2007; Tomasello & Rakoczy, 2003).
Typically gesture-speech combinations first appear with deictic gestures and then with iconic gestures (Özçalişkan & Goldin-Meadow, 2005, although cultural variation in gesture production exists; Iverson, Capirci, Volterra, & Goldin-Meadow, 2008). These gesture-speech combinations reliably predict the onset of two-word combinations (Iverson et al., 2008).

Deictic gestures (such as communicative pointing) offer a powerful and flexible means of early communication for infants as they allow interlocutors in the shared exchange and negotiation of meaning. By contrast, iconic gestures convey semantic or representational information about the identity, function and/or characteristics about the object/idea being labelled (Acredolo & Goodwyn, 1988; Namy et al., 2000; Özçalişkan & Goldin-Meadow, 2009). Iconic gestures are often characterised as occurring with or without an object in hand. Out-of-hand (“empty handed”) gestures have been defined as the concrete representation of an object’s characteristics or meaning to denote the presence of specific objects (e.g., holding hand to ear with little finger and thumb extended “as-if” it is a phone, swinging arm up and down “as-if” it is an elephant's trunk, panting gesture for “dog”; Acredolo & Goodwyn, 1988; Hall et al., 2013). In-hand iconic gestures are representational gestures completed with an object held in hand (e.g., stirring imaginary food with a wooden spoon in a pot, talking on a toy telephone; moving a toy car, drinking tea from an empty teacup; Namy et al., 2000). As the ability to adopt an interlocutor’s perspective for the purpose of effective referential communication develops, children are more likely to use iconic gestures rather than deictic gestures to express and construct meaning during social interactions (Kidd & Holler, 2009).

General findings from gesture-language empirical studies suggest that maternal gesture is a predictor of concurrent infant gesture use, which in turn predicts infants’ language development (Liszkowski, Brown, Callahgan, Takada, & de Vos, 2012;
Liszkowski & Tomasello, 2011; Rowe & Goldin-Meadow, 2009). Further, infants’ production of iconic gestures predicts the acquisition of spoken words and multi-word speech (e.g. Acredolo & Goodwyn, 1988; Capirci et al., 1996, 2005; Iverson & Goldin-Meadow, 2005; Özçalişkan, Gentner, & Goldin-Meadow, 2014).

It appears that gestural input differs between contexts in which parent-infant interactions occur. To date, only one study has specifically examined gesture within play contexts. Namy et al. (2000) studied parents engaged in free play with their 12-15 month-old infants and found that parents produced more in-hand iconic gestures than empty-handed iconic gestures, particularly during JA. During symbolic play specifically, parents’ in-hand gestures predicted infant gesture vocabulary when measured by parental report and only parents’ out-of-hand gestures predicted infant gesture production as observed during free play (Namy et al., 2008). Therefore, it appears that play contexts promote the use of specific parental gestures, which in turn may predict language acquisition. These findings also suggest the development of infant gesture production differs by exposure to different forms of gesture within social contexts.

It has been hypothesised that iconic gestures emerge from play-based action schemas (Volterra & Erting, 2004). Infants may learn and rehearse gestural meaning from observing gestures performed by their play partner. Acredolo and Goodwyn (1988) reported that infants could generate gestures without an object in hand after they had observed in-hand iconic gestures produced by an interlocutor. This suggests that infants are able to grasp the representational nature of an iconic in-hand gesture and express this meaning without an object in hand. This ability is particularly evident for action-based iconic gestures. For example, the iconic gesture of lifting an empty cup to the mouth is followed by lifting an empty hand to the mouth, which in turn is followed by the word “drinking”. Infants initially produce action-gestures prior to their verbal
equivalents until the number of words and action-gestures in their communicative repertoire become similar. For instance, Fenson et al. (1994) reported that words comprehended and action-gestures produced are significantly correlated. These findings suggest a strong link between real actions, actions represented via gesture, and infants' verbal representational abilities (Gullberg et al., 2008).

From a socio-pragmatic perspective, Nelson (1973, 1996) suggested that play and gesture allow the child to externalise mental representations shared between a child and their caregiver in joint activity, which helps to develop symbolic understanding, a crucial prerequisite for successful language acquisition. In this sense, gesture may also provide a way for children to rehearse and express different meanings before they have fully developed oral-facial motor abilities that enable them to verbalise these meanings in speech. Thus, gestures have been found to be closely linked to internal linguistic processes, which supports the Vygotskian concept that social processes become linguistically mediated over time (Gullberg et al., 2008).

3.3 The Socio-Cognitive Ecology of Symbolic Play: Empirical Evidence

Consistent with the socio-cultural approach to language development, JA and gesture are socio-cognitive acts closely linked with language and may be influenced by contextual factors such as play (Gullberg et al., 2008; Iverson et al., 2008). However, few studies have examined how parent-infant interactions differ across play contexts. Lillard and Witherington (2004) examined 18-month-old infant’s capacity to distinguish between reality and pretence and how infants use social cues to navigate this distinction. Mother-infant dyads were randomly assigned to one of two experimental conditions and asked to either eat a real (reality condition) or pretend (pretence condition) snack. Maternal behaviours were coded for verbal, non-verbal behaviours, and facial expressions (e.g., smiles, looking patterns). In the pretence condition, mothers spoke more, looked at, and smiled at their infants more frequently than in the reality condition.
Smiles were both more frequent and for longer in duration in the pretence condition than in the reality condition. These results indicate a difference in the way mothers behave in pretence contexts. Lillard et al. (2007) extended this study using a different paradigm (personal grooming) and explored maternal language variables (total utterances, unique words, pronouns) in a sample of 15 to 24 month old infants. Their results replicated the Lillard and Witherington (2004) results, although surprisingly, while infants became more proficient at symbolic representation, they reported few differences in maternal non-verbal behaviours as infants aged. Maternal verbal behaviours did change across conditions, with fewer unique words, and greater verbal repetition and use of pronouns during pretence. The authors suggested that mothers' increased looking during pretence and changes in verbal behaviours function to establish and maintain JA by scaffolding their infant’s engagement during pretence. They concluded that these JA behaviours create a context in which mothers can communicate meaning and infants can interpret the situation as pretence.

Nishida and Lillard (2007) recoded the Lillard and Witherington (2004) data to investigate if specific patterns of mother-infant behaviour were present during pretence. They examined three sequences of behaviours across conditions: social referencing (mother acts, mother looks at infant, mother smiles, infant smiles and/or acts), imitation (mother acts, infant acts), and affecting mirroring (mother smiles, infant smiles). Their analysis revealed that social referencing occurred more frequently within pretence compared to the reality condition, and that within pretence, social referencing occurred more frequently than imitation and affect mirroring. Collectively these authors concluded that social referencing is a marker of mother-infant interactions during pretence and this sequence of non-verbal behaviours facilitates an infant’s understanding that a situation may either be real or not real. They argued that the social
cues that occur within pretence contexts help infants maintain an accurate representation of the world; that is, to quarantine pretence from reality.

Young children appear to understand pretence is not reality and can learn new information during pretence episodes, which they can apply to real-life situations (e.g., see Hopkins, Dore, & Lillard, 2015). The body of research conducted by Lillard and colleagues describes pretend situations as a rich scene for language rehearsal and language learning. This argument accords well with Vygotskian theory and the concept of the zone of proximal development, whereby parents' non-verbal and verbal behaviours scaffold their infants' use of words and gestures in social contexts such as play. However, the relative importance of the predictive ability of these differences in social referencing behaviours between social contexts and language development in early childhood has not yet been explored.

### 3.4 The Current Research

The importance of symbolic play in early language acquisition has been subject to considerable discussion in the literature. However, few studies have investigated the specific verbal and socio-cognitive communicative acts elicited by the symbolic play context with a comparable play context. Although studies conducted by Lillard and colleagues go some way towards describing parent-infant interactions within pretence and how these contexts may influence language learning, further research is needed to explore the nature of these differences across play contexts in an ecologically valid setting.

The research reported in this thesis aims to explore the ‘socio-cognitive ecology’ of symbolic play and how the properties of the context itself may be related to later language acquisition. The next chapter examines the strength and direction of the play-language relationship in the existing literature using meta-analytic techniques without the influence of theoretical interpretation. Subsequent chapters examine how parent-
infant interactions differ between functional and symbolic play contexts, with a focus on whether the context of symbolic play provides a fertile context for language development (Bruner, 1983; Vygotsky, 1978). Concurrent and longitudinal relationships between parental verbal and socio-cognitive behaviours characteristic of symbolic play and infant language acquisition are then examined.
Chapter 4


Chapters 2 and 3 provided qualitative reviews of the developmental literature investigating the relationship between symbolic play and language. A recent paper by Lillard et al. (2013) questioned the role of symbolic play in numerous areas of cognitive development, including language development. The paper sparked an intense debate on the role of symbolic play in cognitive development (see Bergen, 2013; Walker & Gopnik, 2013; Weisberg, Hirsh-Pasek, & Golinkoff, 2013). Somewhat problematically, this debate has been conducted on the basis of narrative (i.e., qualitative) reviews of the literature, and thus has not made use of important statistical techniques (e.g., meta-analysis) which can establish the presence or absence of an association between symbolic play and other domains of development using empirical evidence accumulated over decades of research. No systematic, quantitative review of the symbolic play-language literature exists. This chapter uses meta-analytic techniques to re-evaluate the evidence concerning the association between symbolic play and language acquisition.

To frame their review Lillard et al. (2013) used Smith’s (2010) taxonomy of three potential theoretical relationships between symbolic play and other domains in development: (i) causal – symbolic play precedes and is responsible for development in other domains, (ii) equifinality – symbolic play is one behaviour which may aid development in other domains, but not the only, and (iii) epiphenomenal – any relationship between symbolic play and other domains is due to a third underlying variable, and as such symbolic play makes no true contribution to development. Their conclusion concerning language acquisition was that any of these potential explanations was possible.
A completely faithful application of Smith’s (2010) taxonomy may not be the best way to consider the symbolic play-language relationship. Language acquisition is a complex process dependent upon and influenced by a range of endogenous (e.g., memory, statistical learning; Gathercole, 2006; Kidd, 2012; Romberg & Saffran, 2010) and exogenous variables (e.g., input quality and quantity; e.g., Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002). As such, it is unlikely that symbolic play could be causally related to language acquisition. Rather, the question is perhaps better framed as what is the strength of the relationship between symbolic play and language acquisition? Only a quantitative analysis of past research in the form of a meta-analysis can provide a reliable answer to this question.

4.1 The Current Study

The current study employed meta-analytic techniques to provide a cumulative statistical assessment of the symbolic play-language literature. Thirty-one (N = 31) correlational studies that examined the play-language relationship were included in the analysis, for a combined sample of 6,561 children. Two potential moderator variables were considered: (i) study design (e.g., concurrent or longitudinal) and (ii) the modality of language assessment within the studies (e.g., comprehension or production). The first moderator, study design, was included to assess concurrent and longitudinal symbolic play-language associations. The second moderating variable, modality of language assessment, aims to resolve inconsistent results in the literature. Whereas symbolic play is always measured via production, language has been measured using tests that measure either comprehension or production, or both. For instance, Lyytinen et al. (1999) reported that symbolic play was more strongly associated with language comprehension than production in children aged 18-months. In contrast, in a sample of 3-4-year-olds, Kirkham, Stewart and Kidd (2013) reported stronger associations between symbolic play and language production. Therefore it is unclear as to whether
any symbolic play-language relationship is more strongly observed when language is measured through comprehension or production. The use of meta-analysis allows for a more reliable assessment of whether any symbolic-play-language relationship differs according to how language is measured.

Age-related changes were also examined. This was because, as noted in Chapter 2, Piagetian theory predicts no concurrent symbolic play-language association beyond 36 months, whereas Vygotskian theory predicts a significant association beyond this age. Vygotsky (1962) argued that the play-language relationship changed across development. Specifically, early symbolic play provides a context in which language is acquired, but language structures cognitive processes once it is internalised and children have access to internal speech (around 5 years). Predictive analyses of the symbolic play-language relationship (with play predicting language and language in turn predicting play), would provide insight into how language originates and then acts to support social contexts such as symbolic play. Unfortunately, this hypothesis was could not be tested, since there are not enough studies that measured both symbolic play and language longitudinally in children aged 3 – 5-years.

4.2 Method

4.2.1 Selection of articles.

Digital databases (Proquest Psychology Journals, PsycINFO, PsycARTICLES, PsycBOOKS and Linguistics and Language Behavior Abstracts) were searched for English-language articles (peer-reviewed journals, books, and book chapters) using various combinations of the following keywords: symbolic play, preten* (i.e., wildcard for pretend, pretence, and pretense), fantasy, sociodramatic, language (spoken, comprehension, production, receptive, expressive), object substitution, typical, development, children. Additional studies were identified using the ancestral method (i.e., from reference lists). Finally, unpublished sources (e.g., dissertations,
presentations, unpublished studies) were searched for using Google Scholar, contacting researchers in the field via personal email, the Info-CHILDES listserv, and digital databases of dissertations (e.g., ProQuest Dissertations and Theses, and Educational Resources Information Centre).

There were several criteria for study inclusion. Firstly, each study required an independent measure of symbolic play. To date, there is little consensus in the way that symbolic play ought best be operationalised (e.g., Lillard, 2013; Weisberg, Hirsh-Pasek, et al., 2013), and this analysis was bound to past operationalised definitions of the concept. The following definition of symbolic play was used to select the sample of studies:

*the nonliteral use of objects, actions or persons (e.g., object substitution, imagining absent objects, assigning absent attributes, as in sociodramatic play).*

This definition encompasses the major ways in which symbolic play has been operationalised in past studies (e.g., Bates et al., 1979; McCune, 1995; Tamis-LeMonda, Bornstein, Cyphers, Toda, & Ogino, 1992), in addition to being consistent with current standardized measures of pretence (e.g., the *Test of Pretend Play*, Lewis & Boucher, 1997). Differences in the measures of play used across different studies were accounted for in the statistical analyses using random-effects models (Field & Gillett, 2010; Rosenthal & DiMatteo, 2001). The remaining criteria for inclusion were: (ii) an independent measure of language comprehension or production (measuring vocabulary or grammatical knowledge, or both); and (iii) report of a correlational relationship, or data that would allow a correlation to be calculated between play and language measures. Only correlational studies were included, for the following reasons. Firstly, this is the most frequent type of study in the literature, enabling the most reliable estimate of the symbolic play-language relationship. Secondly, numerous problems have been raised with intervention studies, most notably the lack of adequate control.
More recent studies have corrected many of these problems (e.g., Hirsh-Pasek et al., 2015; Morrissey, 2014; Nicolopoulou et al., 2015; Weisberg et al., 2015); however, the evidence base for these studies is still small. Using correlational studies is also the best way to mitigate one other major problem identified in the literature on symbolic play, namely, the fact that few studies use blind experimenters. Since correlational studies collect independent measures of both symbolic play and language, the likelihood that experimenters can subtly influence the outcome of a study is diminished.

Exclusion criteria were: (a) participants with mental or developmental disorders; (b) children older than 73 months; and (c) studies in which play was constructed as a context rather than a variable. Studies that did not include sufficient data to calculate effect sizes were excluded (e.g., Corrigan, 1982; Lifter & Bloom, 1989; Ogura, 1991). Two studies (Rutherford, Young, Hepburn, & Rogers, 2007; Youngblade & Dunn, 1995) did not directly report a relation between play and language. The authors of these studies were contacted to obtain this information, but the data were unavailable.

Following these search criteria a list of candidate studies were finalised for inclusion, which were then independently verified by a senior researcher (blind to study authorship). Any disagreements were resolved through discussion. A final list of 31 studies (N = 6561) conducted between 1978 and 2012 were identified as eligible for inclusion in the meta-analysis. A detailed summary of how play and language were operationalised and participant characteristics in this final candidate list of studies is provided in Tables A2 and A3. Seventeen of the 31 studies did not directly report the native spoken language by participants. One study conducted in Canada reported that ten of the 30 participants in their study spoke English as their second language (Astington & Jenkins, 1995). Two American studies reported a mixed sample; one comprised of 12 Italian and 13 English children (Bates et al., 1979) and the other
comprised 38 American and 40 Japanese speaking children (Tamis-LeMonda et al., 1992). Finnish was the native language spoken by all participants in the two studies conducted in Finland (Lyytinen, 1983; Lyytinen et al., 1999). The children in the studies were drawn from the full range of socio-economic backgrounds. The number of participants in the studies ranged from 12 to 5,070, and ranged in age from 8 to 73 months ($M_{age} = 30.19, SD = 15.96$).

4.2.2 Coding the studies.

The following study characteristics were coded: (i) study design (concurrent or longitudinal), (ii) age at play and language measurement, (iii) the difference between these ages in the longitudinal studies (time span), (iv) measurement of play and the way that symbolic play was operationalised (e.g., Symbolic Play Test, object substitution, sociodramatic play), (v) language measurement (i.e., type of test used and whether the test measured comprehension and/or production), (vi) the method of measurement (e.g., naturalistic or elicited), and (vii) year of publication and publication status (e.g., peer review journal article, book chapters, unpublished data). Overall, 18 studies first determined the level of play and subsequently measured language in a longitudinal design, whereas 16 studies measured play and language concurrently. Four studies reported both concurrent and longitudinal data. In these cases, effect sizes were computed for both design types. It is important to emphasise that, since the focus is the predictive association between symbolic play and language, the effect sizes from the longitudinal studies represent symbolic play predicting language. Table A1 reports sample characteristics and effect sizes of the studies included in the meta-analysis.

4.2.3 Statistical integration of the findings.

Calculation of effect sizes.

When study designs differ, the calculated effect sizes are likely to describe different population parameters (Morris & DeShon, 2002). For example, in a between-
groups design (e.g., language compared across high pretence vs low pretence groups), the effect size is a description of the difference in the outcome variable between the two groups relative to the variability within the groups. In contrast, in a single-group longitudinal design (e.g., correlational analysis of data from the same individual measured at two different times) the effect size describes the change in the outcome variable (e.g., measure of language) relative to the variability of change scores (e.g., measure of symbolic play), and the effect size is derived from standard deviations of the change score. As such, effect sizes are heterogeneous when derived from studies using different designs. Therefore, in this analysis, effect sizes were transformed to the same metric (Pearson’s $r$). Effect sizes were calculated performing as few transformations as possible to ensure that metrics and meaning remained as close to original data as possible. For example:

- Acredolo and Goodwyn (1988) interpreted a strong negative effect size to mean “the larger the number of object gestures a child developed, the younger the child was when the 10-word milestone was reached” (p. 461). For the purpose of the meta-analysis, this effect size was converted to a positive value to indicate that children demonstrating greater proficiency in symbolic play also showed greater proficiency in spoken language.

- Shore et al. (1984) reported the mean and maximum sequence lengths in language and (symbolic play) gesture and completed multiple regression analyses, but did not report correlations or corresponding effect sizes (p. 876). As multiple regression does not isolate the contribution of a single variable to the outcome of another variable, for the purpose of running the meta-analysis, Pearson’s $r$ was calculated for the mean length of utterance and the mean length of gestural sequence at both 20 and 28 months. These measures, as described by
the authors, were determined to be the most reliable indicators of the child’s proficiency in both play and language.

- In a cross-sectional design, Jurkovic (1978) compared the linguistic maturity of children aged between 52 and 66 months of age who exhibited high or low levels of free play, and found that children in the ‘high play group’ also had higher verbal production scores (as measured by the verbal expression subscale of the Illinois Test of Psycholinguistic abilities). A significant $F$ test was reported with this finding, with 1 degree of freedom (e.g., $F(1, 44) = 17.88, p < .001$). Using the equation, $r = \sqrt{\frac{F}{F + df_{error}}}$, $r$ was calculated to equal .54.

Positive effect sizes indicated that children demonstrating greater proficiency in symbolic play also showed greater proficiency in spoken language. Negative effect sizes indicated that children with greater proficiency in symbolic play exhibited comparatively lower proficiency in language.

**Satisfying the need for independence.**

If studies are based on the same data set they are not statistically independent. The following are examples of the considerations that were made to ensure statistical independence:

- The following articles included samples from 200 Finnish children who participated in the Jyvaskyla Longitudinal Study of Dyslexia: Lyytinen et al. (1997), Lyytinen et al. (1999), Lyytinen, Poikkeus, Laakso, Eklund, and Lyytinen (2001), and Laakso, Poikkeus, Katajamäki, and Lyytinen, (1999). While the samples for each study may have varied, at least a few of the children may have participated in several of the above studies reported from their different age stages (Lyytinen, 23 August 2012, personal communication). Therefore, the decision to include or exclude these studies in the meta-analysis
was made according to Wood’s (2007, p. 81) detection of duplication heuristic; a method of detecting overt and covert duplication of publication.

- Acredolo and Goodwyn (1988) used separate samples for their concurrent and longitudinal studies and therefore their data appears as two separate studies within the analysis (e.g., 1998a, 1998b).

### 4.2.4 Method of meta-analysis.

Meta-analysis statistically combines effect sizes from empirical data in order to obtain an objective estimate of the true size of the effect in the population (Field, 2005). Two main statistical models have been designed for meta-analysis: fixed-effects and random-effects. Debate exists regarding the use, assumptions and the inferences that can be made when either of these models is employed (see Camilli, 1990; Field, 2001, 2003, 2005; Hedges & Vevea, 1998; Hunter & Schmidt, 2004; Overton, 1998). Inferences based on fixed-effects models are limited to the studies included in the meta-analysis, whereas inferences based on random-effects models can be extended to the general population (Hedges & Vevea, 1998). For this reason, random-effects models are the more desirable statistical technique (Field, 2005). In the current meta-analysis both fixed-effects and two commonly-used random-effects models: Hedges and Vevea (1998) and Hunter and Schmidt (2004) are reported, as recommended by Field and Gillett (2010). Reporting both fixed and random-effects enabled us to elucidate whether any play-language associations are observable in the general population or are emergent properties of the particular samples used in past studies.

All rs were transformed prior to Fisher conversions with \( r - \frac{(r(1-r^2))/2(n - 3)} \) to account for the positive bias evident in Fisher-transformed correlation coefficients (Overton, 1998, p. 358). The roles of several moderators were examined: (i) study design (concurrent, longitudinal); (ii) language modality – that is, comprehension or production, and (iii) the age at which play was measured. To allow for meaningful
interpretation of the moderator variables, $F$ and Chi-square are both reported for each moderator. All analyses were conducted in SPSS (version 17) using syntax written by Field (2009; see Field & Gillett, 2010).

4.3 Results

Figure 4.1 presents an overview of the main analyses. Each step is briefly described here, before discussing each analysis in more detail below. In Step 1 all effect sizes (including multiple effect sizes from single studies, if reported) were included in an overall analysis of the play-language relationship. In Step 2, the influence of study design and language modality on the play-language relationship were analysed separately to identify whether either variable significantly influenced the relationship. Step 3 analysed whether these two variables moderate the play-language relationship. In Step 4 four separate meta-analyses that analysed the combined influence of study design and language modality on the play-language relationship were conducted. Step 5 statistically compared the effect sizes from the Step 4 analyses. In Step 6 another overall analysis (as in Step 1) was conducted, but this time only one effect size per study was included, thereby satisfying the assumption of statistical independence. Although not detailed in Figure 4.1, age-related differences were explored following Step 6. To preface the results, in all but one case (Step 5 meta-analysis of longitudinal play-language studies where language was measured through comprehension), medium positive relationships between symbolic play and language were found.
Figure 4.1. Overview of main analyses.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Overall</th>
<th>Study Design</th>
<th>Language Modality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$r = 0.337, 95% \text{ CI } [0.305, 0.369], z = 19.05, p &lt; 0.001 (k = 164)$ (Independence Not Assumed)</td>
<td>$r = 0.357, 95% \text{ CI } [0.305, 0.406], p &lt; 0.001$</td>
<td>$r = 0.363, 95% \text{ CI } [0.300, 0.405], p &lt; 0.001$</td>
</tr>
<tr>
<td>2.</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
</tr>
<tr>
<td>3.</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
<td>$\chi^2 (1) = 1.51, p = 0.283$</td>
</tr>
<tr>
<td>4.</td>
<td>Concurrent Comprehension ($k = 14$)</td>
<td>Concurrent Production ($k = 21$)</td>
<td>Longitudinal Comprehension ($k = 3$)</td>
</tr>
<tr>
<td></td>
<td>$r = 0.368, p &lt; 0.001$, 95% CI [0.300, 0.432]</td>
<td>$r = 0.380, p &lt; 0.001$, 95% CI [0.289, 0.464]</td>
<td>$r = 0.245, p = \text{non sig}$, 95% CI [0.006, 0.467]</td>
</tr>
<tr>
<td>5.</td>
<td>Concurrent Comprehension vs Concurrent Production $p = 0.417$</td>
<td>Concurrent Comprehension vs Longitudinal Comprehension $p = 0.423$</td>
<td>Concurrent Comprehension vs Longitudinal Production $p = 0.432$</td>
</tr>
<tr>
<td>6.</td>
<td>Overall</td>
<td>$r = 0.362, 95% \text{ CI } [0.300, 0.422], z = 10.54, p &lt; 0.001 (k = 30)$ (Independence Assumed)</td>
<td>$r = 0.362, 95% \text{ CI } [0.300, 0.422], z = 10.54, p &lt; 0.001 (k = 30)$ (Independence Assumed)</td>
</tr>
</tbody>
</table>
4.3.1 Analysis of all effect sizes.

All extracted and calculated effect sizes from each study were included in the initial analysis ($k = 161$). Following Rosenthal’s (1995) recommendation, the computed and extracted effect sizes are presented in a stem-and-leaf plot (see Table A7). A visual inspection of Table A7 indicates that the data forms a leptokurtic distribution in which the majority of effect sizes cluster between the values of .0 and .6. The mode is around .4 to .5.

The standard deviation of observed effect sizes (calculated as the sample correlation variance; Hunter & Schmidt, 2004), $\sigma_r$, was .022. Hedges and Vevea’s (1998) estimate of between-studies variance, $\tau^2$, was .0168, or 0.13 when expressed as a standard deviation. A chi-square test of homogeneity of effect sizes was significant, $\chi^2 (160) = 308.81, p < .001$. This result suggests the presence of considerable variation in overall effect sizes and supports the a priori decision to employ a random-effects model to analyse the data.

Based on Hedges and Vevea’s (1998) random-effects model, there was an overall positive medium relationship (Cohen, 1992) between symbolic play and language, $r = .341$, CI$_{95}$ [0.311, .370], $z = 20.92, p < .001$. This suggests that, overall, there is a medium positive relationship between symbolic play and language acquisition.

One potential problem in meta-analyses is the possibility of publication bias. This was assessed using three methods. Firstly, a funnel plot of Fisher-transformed effect sizes and corresponding Fisher-transformed standard error (Vevea & Woods, 2005) were visually inspected, which revealed evidence of symmetry. Next, a Begg and Mazumdar (1994) rank correlation was conducted, which was small and non-significant ($r = .08, p = .161$). Finally, a file-drawer analysis (Rosenthal, 1991, 1995) revealed that 47,949 studies that were otherwise unavailable (e.g., new, unpublished, filed,
unretrieved) would be required to bring this calculated average effect size from significance to non-significance. These analyses suggest that the observed medium positive association between symbolic play and language is not due to publication bias.

4.3.2 Combined effects of study design and language modality.

The moderator analyses were then conducted to investigate the effect of study design (concurrent versus longitudinal) and language modality (comprehension versus production) on the play-language relationship. Table A4 shows a stem-and-leaf plot divided by the study design (concurrent or longitudinal) and the modality of the language measurement (comprehension or production). Studies that used language tasks that were classified as measurements of both comprehension and production without separating the two modalities were excluded from this analysis (3 effect sizes: Bornstein, Vibbert, Tal, & O’Donnell, 1992, 1996; Neilson, unpublished).

The results of meta-analyses conducted separately for both study design and language modality are presented in Table 4.2. Similar medium significant estimates of population effect sizes were reported for both study design and language modality. The confidence intervals (CI$_{95\%}$) did not include zero for both population effect size estimates, indicating that the positive relationship evident between play and language can be generalised beyond the studies included in this analysis (Cumming & Finch, 2005; Higgins, Thompson, Deeks, & Altman, 2003). However, the significance of these results should be interpreted with caution, as significance testing of population effect sizes has been criticised (Field & Gillett, 2010). Overall, these analyses suggest that study design and language modality do not significantly affect the play-language relationship when these are analysed as separate moderator variables.
Table 4.2

*Results of Overall Individual Random-Effects Meta-Analyses by Study Design and Language Modality*

<table>
<thead>
<tr>
<th></th>
<th>( \tau^2 )</th>
<th>( Q(df) )</th>
<th>CI95 for ( \hat{r} )</th>
<th>Lower</th>
<th>Mean</th>
<th>Upper</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concurrent-longitudinal</td>
<td>.007</td>
<td>51.29 (44)</td>
<td>( .007 )</td>
<td>.309</td>
<td>.354</td>
<td>.397</td>
<td>14.38***</td>
</tr>
<tr>
<td><strong>Language modality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehension-production</td>
<td>.008</td>
<td>49.75 (42)</td>
<td>( .007 )</td>
<td>.306</td>
<td>.352</td>
<td>.396</td>
<td>13.99***</td>
</tr>
</tbody>
</table>

*Note.* *p* < .05, one-tailed. *** *p* < .001, one-tailed. CI = Confidence Interval; \*Q statistic is non significant indicating homogeneity of effect sizes.

The moderating variables of study design and language modality were then combined in the one analysis using a mixed-design moderator analysis. That is, the dual effect of both moderators within one single analysis is reported. In this analysis, if individual studies examined the effect of symbolic play on language at multiple levels of study design and language modality, these studies contributed multiple effect sizes. The decision to employ a mixed design was made because it accounts for the dependence or skewing of results in favour of studies that contribute more than one effect size. The mixed-effects model accounts for potential dependence by including each of these studies in the analysis as a random factor (DeCoster, 2004). For example, Tamis-LeMonda and Bornstein (1994) reported effect sizes of the concurrent and longitudinal relationship between symbolic play and language when both language comprehension and language production was measured. The analysis accounted for the dependence between these effect sizes by treating study design as a random factor.

In the first analysis of the data, variables of study design and language modality were analysed simultaneously to examine their joint ability to predict the observed relationship between symbolic play and language. Contrasted weights were assigned to study design and language modality to ensure that the resulting beta values were...
representative of the differences between observed population effect size estimates in
the different conditions. Overall, the inclusion of both study design and language
modality significantly predicted the observed effect sizes, $t(44) = 16.40, p < .001$. This
suggests that at least one of these variables moderates the relationship symbolic play
and language acquisition. Fixed and random-effects regressions were then conducted to
identify the source of this effect.

The fixed-effects regression analysis revealed a significant medium association
between symbolic play and language, $r = .336, p < .001, \text{CI}_{95} [0.314, 0.357]$. This was
not significantly moderated by study design, $\chi^2 (1) = 1.95, p = .163$, or language
modality, $\chi^2 (1) = 0.47, p = .495$. The random-effects model also revealed a significant
medium association between symbolic play and language, $r = .351, p < .001, \text{CI}_{95}
[0.306, 0.395]$. Once again, neither study design nor language modality significantly
moderated the overall association between symbolic play and language, $\chi^2 (1) = 1.18, p
= .277$, and, $\chi^2 (1) = 0.13, p = .716$, respectively.

**4.3.3 Individual effects of study design and language modality.**

Separate moderator analyses were conducted with study design and language
modality as categorical predictors. This analysis was conducted for two reasons: (i) to
examine the unique ability for each variable to predict the relationship between
symbolic play and language, and (ii) to examine how under-represented levels of
moderator variables (e.g., there were very few effect sizes that measured longitudinal
comprehension, see Table 4.3 and Table A5) influence the overall relationship between
play and language. It is important to identify the small sample sizes here as a potential
caveat for this analysis. Field and Gillett (2010) argue that the presence of missing data,
whether random or not, should not preclude moderator analysis, but it should restrain
interpretation and highlight the presence of potential bias (e.g., moderator analysis with
as few as 5 and 3 effect sizes conducted by Brewin, Kleiner, Vasterling, & Field, 2007).
Therefore, the results of these moderator analyses should be interpreted conservatively.

Table A5 shows effect sizes in stem-and-leaf plots broken down by study design (concurrent, longitudinal) and language modality (comprehension, production).

Four separate random-effects meta-analyses and moderator analyses were conducted to ascertain the influence of both levels of each predictor variable on the observed relationship between symbolic play and language. The four variables were: concurrent-comprehension, concurrent-production, longitudinal-comprehension, and longitudinal-production.

Table 4.3

Results of Individual Random-Effects (Hedges and Vevea) Meta-Analyses by Study Design and Language Modality

<table>
<thead>
<tr>
<th>Design</th>
<th>Language</th>
<th>$\hat{t}^2$</th>
<th>$Q(df)$</th>
<th>CI$_{95}$ for $\hat{t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Concurrent</td>
<td>Comprehension</td>
<td>.000</td>
<td>8.60 (13)$^a$</td>
<td>.301</td>
</tr>
<tr>
<td>Concurrent</td>
<td>Production</td>
<td>.016</td>
<td>30.07 (21)$^a$</td>
<td>.301</td>
</tr>
<tr>
<td>Longitudinal</td>
<td>Comprehension</td>
<td>.039</td>
<td>1.88 (2)$^a$</td>
<td>-.005</td>
</tr>
<tr>
<td>Longitudinal</td>
<td>Production</td>
<td>.000</td>
<td>3.99 (5)$^a$</td>
<td>.181</td>
</tr>
</tbody>
</table>

Note. * $p < .05$, one-tailed. *** $p < .001$, one-tailed. $^aQ$ statistic is non significant indicating homogeneity of effect sizes.

Overall mean population effect sizes for current associations between symbolic play and language were higher than longitudinal associations. All mean effects sizes were significant with the exception of longitudinal comprehension. However, only three effect sizes contributed to this analysis; therefore the reliability of the analysis is questionable. I therefore caution against interpreting this null effect as evidence for the lack of a longitudinal relationship between symbolic play and language comprehension.

The presence of any differences between the mean effect size for each cell in the
moderator analysis (e.g., concurrent-comprehension versus concurrent-production) were then analysed. Individual betas, associated 95% confidence intervals and their significance based upon a chi-square statistic with 1 degree of freedom are presented for these four contrasts in Table 4.4.

Table 4.4

<table>
<thead>
<tr>
<th>Predictor</th>
<th>CI95 for b</th>
<th></th>
<th></th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concurrent-comprehension vs. concurrent-production</td>
<td>.319</td>
<td>.379</td>
<td>.440</td>
<td>39.90</td>
<td>.224</td>
</tr>
<tr>
<td>Longitudinal-comprehension vs. longitudinal-production</td>
<td>.150</td>
<td>.279</td>
<td>.407</td>
<td>42.44</td>
<td>.437</td>
</tr>
<tr>
<td>Concurrent-comprehension vs. longitudinal-comprehension</td>
<td>.281</td>
<td>.360</td>
<td>.440</td>
<td>11.75</td>
<td>.698</td>
</tr>
<tr>
<td>Concurrent-production vs. longitudinal-production</td>
<td>.301</td>
<td>.375</td>
<td>.449</td>
<td>32.99</td>
<td>.162</td>
</tr>
</tbody>
</table>

*Note.* *p* < .05, one-tailed, ***p* < .001, one-tailed.

Table 4.4 shows there were no significant differences in mean effect sizes across the different combinations of study design and language modality. Overall, these four contrasts did not significantly predict the observed relationship between symbolic play and language. That is, the symbolic play-language relationship cannot be explained by differences in language modality when measured concurrently and longitudinally, and by study design when language is measured via comprehension and production.

Subsequently, these comparisons do not provide any insight into how the symbolic play-language relationship may differ across differences in symbolic play and language measurement. However, it is important to consider that these tests would have lacked
power. These results emphasise that more research is required to describe the unique predictive ability of concurrent and longitudinal study design and language production and comprehension on the positive relationship between symbolic play and language.

4.3.4 Independence in effect sizes: overall analysis.

All the previous analyses included multiple effect sizes from individual studies where they were available. In the next analysis, the overall analysis was again conducted but this time only one overall effect size from each study was included. That is, if a study contributed more than one effect size, the mean effect size was computed and included. This ensures parity of contribution from each study, and therefore independence between effect sizes in the analysis. The overall analysis of all effect sizes was reduced to 31. Table A6 shows overall calculated effect sizes for each study in a stem-and-leaf plot. The data still form a leptokurtic distribution, the mode of the data is around .3, and effect sizes cluster evenly between the intervals of .1 and .5.

The standard deviation of observed effect sizes, \( \sigma_r \), was .005. Field (2005) reported that standard deviations in correlational meta-analyses published between 1997 and 2002 in Psychological Bulletin varied between 0 to 0.3; therefore our observed \( \sigma_r \) of .005 is consistent with other results reported in the psychological literature. Between-studies variance (\( t^2 \); Hedges & Vevea, 1998) was estimated at .0069 (0.08 expressed as a standard deviation). A non-significant chi-square test of homogeneity of effect sizes, \( \chi^2 (30) = 33.46, p = .303 \), indicated that population effect sizes are likely to be homogenous. Together these findings indicate that variation exists in overall effect sizes, but that this variability in the data is most likely attributable to random variation. Based on Hedges and Vevea’s (1998) random-effects model, a significant overall positive medium relationship was revealed between symbolic play and language, \( r = .356, CI_{95} [0.304, .407], z = 12.40, p < .001 \). These results are broadly consistent with the previously reported results in this study. When independence of the data is retained,
the reported mean effect size is .015 higher than when multiple effect sizes are contributed by selected studies in the analysis.

Four different methods were employed to examine publication bias. Some evidence of symmetry was evident on inspection of a funnel plot, with Fisher-transformed effect sizes and their standard errors. Begg and Mazumdar’s rank correlation, although non-significant, should be interpreted with caution as this test has moderate power to detect publication bias when the sample size is small. Rosenthal’s (1991, 1995) file-drawer analysis revealed that 3,546 new, unpublished, filed, or unretrieved studies would be required to bring this overall meta-analytic mean effect size to non-significance. Together these methods of examining the presence of publication bias suggest that the presence of publication bias is possible. To examine this sensitivity to publication bias further, selection bias models (Vevea & Woods, 2005) were applied to the data. The unadjusted population effect size ($r$) based on the random-effects model was .358. When parameter estimates were adjusted, lower population effect size estimates were reported, and these estimates differed by .013 under both moderate one- and two-tailed selection bias (.345 and .347, respectively). The application of severe one- and two-tailed selection bias models to the data resulted in lower estimates of the population effect size (.331 and .334, respectively). Despite the fluctuations in adjusted effect sizes (maximum difference of .027), the average population effect size is still considered medium by Cohen’s criteria (1992) even when moderate and severe selection bias models are applied to the data, thereby strengthening confidence in the presence of a positive medium relationship between symbolic play and language.

4.3.5 Effects of age.

The next analysis examined the hypothesis, derived from the Piaget’s suggestion that the concurrent symbolic play-language relationship is limited to the ages of 36
months and under. This was initially examined by conducting a moderator analysis with age as a categorical predictor. With independence assumed, contrasted weights were assigned to one effect size from unique samples in studies comprising children who were either 36 months or younger \((k = 20)\) or children older than 36 months \((k = 11)\). Any overlap in this arbitrary age range was resolved by classifying the study into the age range that represented the majority of the sample. For example, as ages ranged from 12 and 72 months of age in the study conducted by Lewis et al. (2000), it was assigned to the “greater than 36 months” group. However, in the case of the Callaghan and Rankin (2002) study, as the sample of 28 to 42 month-old children fell evenly between the age-range groups, it was classified into the lower age-range group. Overall, the fixed-effects regression analysis revealed a significant medium association between symbolic play and language, \(r = .334, p < .001, CI_{95} [0.311, 0.356]\). This association was significantly moderated by age, \(\chi^2 (1) = 4.09, p = .043\). The random-effects model also revealed a significant medium association between symbolic play and language, \(r = .352, p < .001, CI_{95} [0.298, 0.404]\), but age was not a significant moderator, \(\chi^2 (1) = 3.72, p = .054\). Since there was evidence of significant heterogeneity among effect sizes, \(\chi^2 (30) = 45.35, p = .036\), the random-effects model should be interpreted as most appropriate (Field & Gillett, 2010). However, because there was evidence of age-related changes, two separate meta-analyses were run for each of these categorical age ranges (i.e., \(\leq 36\) months & \(> 36\) months).

A Hedges and Vevea’s (1998) random-effects model conducted on studies with samples older than 36 months of age revealed a significant positive medium association between symbolic play and language, \(r = .275, CI_{95} [0.168, 0.376], z = 4.92, p < .001;\) independence assumed). Rosenthal’s file-drawer analysis was reported to be 124. When this analysis was restricted to studies comprising children 36 months or younger, a Hedges and Vevea’s (1998) random-effects model also revealed a significant positive
medium relationship between symbolic play and language, \( r = .385, \text{CI}_{95} [0.326, .442] \) \( z = 11.62, p < .001 \). A file-drawer analysis revealed that 2,301 new, unpublished, filed, or unretrieved studies would be required to bring the significance of this average effect size to non-significance (Rosenthal, 1991, 1995). These results indicate that the symbolic play-language association is higher when examined in samples of children who are 36 months or younger, but that the relationship still exists in older children. Therefore, there is evidence to suggest that there is a positive association between symbolic play and language across early childhood development, which may attenuate but is still significant as children approach elementary school age.

4.4 Discussion

A significant medium association between symbolic play and language acquisition was found using meta-analytic techniques. This relationship was largely consistent regardless of study design (concurrent or longitudinal) and the modality in which language was measured (comprehension or production). Further confidence in the presence of the relationship can be assumed because this association was still present when a more conservative analyses controlling for dependence between effect sizes was employed, and the fact that the relationship was observed despite considerable variability in how individual studies operationalised both symbolic play and language. On the basis of these data it was concluded that symbolic play and language are related in development.

These results reveal a direct relationship between the two domains; growth in symbolic play ability is associated with growth in language, a relationship that is evident concurrently and longitudinally. Although Step 3 of this analyses may have been underpowered, the results suggest that there was no difference in the magnitude of the concurrent and longitudinal relationships. Further, the age-related results were inconsistent with Piaget’s (1962) constructivist account which predicts that any
symbolic play-language association is restricted to the period of transition to symbolic functioning and should therefore not be observed beyond 36 months. The results revealed that although the symbolic play-language relationship attenuated in children older than 36 months, it was still significant, suggesting that the relationship is still evident as children approach elementary school age. These cumulative findings are consistent with Kirkham et al. (2013), who reported a reciprocal play-language relationship in 3–4-year-old children, with only language predicting symbolic play (and not vice-versa) one year later. However, the sample for the longitudinal data was small ($N = 31$). Larger longitudinal studies are required to more comprehensively examine the dynamic nature of the symbolic play-language relationship across development.

A clear limitation of this study was that additional potential mediating variables were not included in the analyses (e.g., non-verbal IQ, maternal sensitivity), which may have accounted for some variance in the play-language relationship. Their absence in this analysis was for good reason. Many past studies have not included these control variables, and some studies that did find significant symbolic play-language associations once controlling for some of these factors could not be integrated into the meta-analysis because the statistics provided were not available in the appropriate metric (e.g., Corrigan, 1982; Jurkovic, 1978; Lyytinen 1983, Lyytinen et al. 1999; McCune, 1995; Shore, 1986). Therefore, while it is likely that these variables contribute to language acquisition, it is suggested that they would not reduce the symbolic play-language relationship to zero.

4.4.1 Outstanding issues.

Overall, these results resolve any ambiguity around the presence and strength of the play-language relationship in early childhood and provide a foundation for research to establish which factors influence the nature of this robust relationship. One primary
factor that influences the symbolic play-language relationship is the way in which both
domains are measured. Most studies included in these analyses used measures of
solitary symbolic play elicited under laboratory conditions. If symbolic play provides a
conducive context for language learning, then ecologically valid measures of play may
be more appropriate. In infancy, the most common form of symbolic play is social, with
infants typically spending the majority of their symbolic play time interacting with their
primary caregiver (Haight & Miller, 1993). We currently lack of clear understanding of
how dyadic symbolic play relates to language acquisition. These issues are considered
further in Chapters 6 – 8.

The issue of language measurement is also important. Although comparable
concurrent symbolic play-language associations were found when language was
measured through either comprehension or production, the only significant longitudinal
association was found when play was measured through production. It is possible that
this reflects specificity in the play-language relationship, although this could also be
attributable to the fact that symbolic play is almost exclusively measured through
production. However, it is equally likely that the null effect for the longitudinal play-
language comprehension relationship can be attributed to lack of power, since this
analysis had the fewest effect sizes of any relationship examined. At the very least,
conclusions from these analyses are that the strength of the concurrent symbolic play-
language association does not vary according to whether language is measured through
production or comprehension, but that language modality may be more relevant
longitudinally.

There are additional general issues associated with meta-analysis. The technique
provides a mostly objective method of evaluating the presence of a cumulative effect in
the population. However, combining studies that use different measures for the same
concept has been criticised because the results may mean different things (however
slight the difference may be) (Rosenthal & DiMatteo, 2001). This is relevant to both independent variables in this study, since a number of different measures were used to tap into these concepts (as evident in Table A2). With respect to symbolic play, a very strict definition was adhered to in order to ensure comparability across studies. With respect to language, the final study list included tests of comprehension and production of both vocabulary and grammar, which depended on both the age of the children and the type of test used in each individual study. Few studies separated the influence of symbolic play on vocabulary and grammar separately, which removed any option of isolating an analysis to examine a specific relationship to these sub-components of language. This is a matter for future research. Suffice to say, vocabulary and grammar are tightly coupled during acquisition (e.g., Bates & Goodman, 1997), making it possible that symbolic play is related to both.

Finally, these analyses were limited to correlational studies. As already noted, training studies of symbolic play and language exist, and consistent with our findings, have often reported positive effects of symbolic play on language (e.g., Christakis, Zimmerman, & Garrison, 2007; Levy, Schaefer, & Phelps, 1986; Smilansky, 1968). However, as argued by Lillard et al. (2013), few of these studies have effectively controlled for other factors that may account for increases in language competence independent of play (e.g., control groups, the role and the quality of adult intervention, blind experimenters). Although this past research has suffered from methodological shortcomings, it is suggested that the result of this study show promise for future efforts aimed at modernising this evidential base (which has already begun, e.g., Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, 2013; Han, Moore, Vukelich, & Buell, 2010). The current study has identified a robust relationship between symbolic play and language in development and has done so using rigorous statistical techniques, allaying any doubt that this association exists. Future studies can dissect and scrutinise the relationship
further using a mixture of correlational and training studies.

4.5 Synopsis and Outlook

This meta-analysis of the symbolic play-language literature suggests robust concurrent and longitudinal associations between the two domains in preschool children. These results provide a largely unbiased and theoretically neutral basis for future research. In practical terms, an accurate understanding of the size of the symbolic play-language association will allow \textit{a priori} power analyses, which enables the calculation of adequate sample sizes. This is an important contribution, since many past studies have lacked adequate power. In theoretical terms, the field can move beyond debating the existence of the relationship and begin to design studies that scrutinise this relationship. Accordingly, the next chapter will describe the methodology for a longitudinal study designed to explore the nature of the symbolic play-language relationship.
Chapter 5
Research Outline and Methodology

This methodological section details the research methodology for the longitudinal study upon which the following three empirical chapters of this PhD thesis were based. The study was designed to address the limitations of the current knowledge of play-language relationship as identified in the qualitative (Chapters 2 and 3) and quantitative analysis (Chapter 4) of the empirical literature. These were: (i) the lack of research examining the role of the social context in the symbolic play-language relationship (a Vygotskian perspective), and (ii) the presence of few studies investigating specific verbal and non-verbal communicative behaviour in symbolic play compared to a comparable joint activity. The study was observational and longitudinal in design. Parents and their infants were observed playing in their home environment and the data obtained contributed to three separate studies. Specifically, these studies were designed to investigate how parent-infant interactions during symbolic play differ from non-play contexts in early childhood, and how these differences influence language acquisition.

5.1 Procedure

Ethics approval for the study was obtained from The Australian National University Human Research Ethics Committee (protocol: 2013/578). The majority of dyads were observed in their own home. Six of the 106 testing sessions were observed in a research room at the university.

Informed consent was obtained from parents prior to the study commencing. Parents typically completed the MB-CDI first, which took approximately 20 – 30 minutes. This time allowed the infant to increase their familiarity and comfort with the researcher and the experimental setting. Parents were advised to complete the MB-CDI by indicating whether or not their infant could understand or understand and say words
and phrases presented in the list. They were encouraged not to deliberate over their responses. During this time, the researcher set up the video recorder and the play mat, and entertained the infant.

Prior to play sessions, the parent was requested to play with their infant as they normally would at home, and were encouraged to sit on the play mat on the floor and face the direction of the camera if possible. If their infant wandered off they were encouraged to invite their infant back to the play mat. During filming, the researcher was typically hidden from view, controlling the videotaping equipment. Play sessions allowed for breaks as required.

Dyads completed both the functional and the symbolic play conditions in a continuous play session (within-subjects). Each play session lasted approximately 20 minutes. Play conditions (i.e., functional or symbolic) averaged ten mins ($M = 602s$, $SD = 52.62s$) and ranged in duration between 7mins, 30s and 12mins, 23s. Although they are referred to in this thesis as separate play sessions, parents were not aware that play sessions were distinct. The order of conditions was randomised across participants to avoid order and practice effects. Play sessions were recorded by video and an additional microphone to provide visual and audio recordings for later transcription and coding.

The semi-structured interview was completed following the first play session only. Sessions at time one were approximately 60 - 90 minutes in duration and at time two were approximately 60 mins. Following the final testing session (at 24 months), parents were debriefed in person regarding the overall aims of the study.

5.1.1 Language transcription.

Parent-infant interactions were transcribed verbatim from audio and/or videotape by two trained research assistants and the primary researcher using the conventions of the Child Language Data Exchange System (CHILDES) in the Codes for the Analysis of Human Language program (CHAT; MacWhinney, 2013). Only verbal exchanges
between the parent and infant were transcribed. Verbal exchanges that included interactions with the researcher were not included in the analysis. An utterance was defined as a unit of speech marked by a transition in speaker, grammatical closure, and/or greater than a 2-second pause (Golinkoff & Ames, 1979; Miller & Chapman, 1981).

Fifteen percent of play sessions were randomly selected to calculate inter-transcriber reliability. Reliability was obtained by manually comparing each transcribed utterance. Utterances were scored 1 for a match and 0 for a non-match. Matches were only scored a 1 if they were identical for both transcribers or if speech acts were transcribed verbatim but identified as separate utterances. Matches were also scored as 1 if mimetics, contractions, discourse participles and infant’s babbles were phonemically similar (e.g., *shlurp* vs *schlurp*, *gotta* vs *godda*, *mmm* vs *mmhm*, *ba* vs *bap*), as these elements of spoken language were not of empirical interest in the study. Irrespective of the length of the utterances, non-matches were scored a 0 if an intelligible utterance was not identically transcribed, or only one transcriber had identified an utterance as audible.

Due to the dichotomous nature of inter-rater scoring, Cohen’s Kappa (Cohen, 1960) could not be calculated as only two cells were available for analysis (i.e., transcriptions either matched or they did not match). Therefore, the most accurate and informative assessment of inter-rater reliability was raw agreement. To compute the proportion of correct matches between transcribers the number of matches was summed and divided by the number of total utterances. The average probability of matches between the researcher and transcriber was 95.41%. Non-matches were equally distributed between parent (52%) and infant utterances (48%) and were primarily associated with one

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1 The calculation of Cohen’s (1960) Kappa was not possible for the calculation of inter-rater reliability for language transcription, play level observed, and gesture use. This was due to an inability to calculate the absence of language, play level, or gesture and the presence of only two statistics available for comparison between coders (i.e., agreement or no agreement). Therefore, the most appropriate reliability calculation for these data is the percentage agreement/error. It is noted that these reliability calculations do not account for agreements that might occur due to chance and may overestimate the level of agreement (Hallgren, 2012).
transcriber missing utterances, words or writing that the utterances were intelligible when the other transcriber had heard and written an utterance and/or word. Some ambiguity was also evident when transcribing infant’s speech and babbles. Overall, agreement was high and the distribution of error was similar between the parent and the infant across interactions. These errors were therefore not problematic for subsequent analysis.

5.1.2 Symbolic play.

Play was coded from videotaped footage of the play sessions. Both conditions were coded to determine if the symbolic condition elicited more symbolic play than the functional condition. Symbolic play was coded according to the Pretend Play Observation Scale (Brown, 1997; Brown et al., 2001), a well-developed coding scheme based on previous pretend play literature that describes the typical developmental sequence of pretend play according to ten stages. For a description of these stages and their examples see Table 5.2.
Table 5.1

Pretend Play Observation Scale

<table>
<thead>
<tr>
<th>Stage</th>
<th>Age (mts)</th>
<th>Descriptor and example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12 &gt;</td>
<td>Pre-symbolic (closes eyes and pretends to sleep)</td>
</tr>
<tr>
<td>2</td>
<td>12-15</td>
<td>Autosymbolic (feeds self with empty spoon)</td>
</tr>
<tr>
<td>3</td>
<td>13-18</td>
<td>Decentered (feeds doll/partner with empty spoon)</td>
</tr>
<tr>
<td>4</td>
<td>16-19</td>
<td>Linear sequence (feeds self and doll in any order)</td>
</tr>
<tr>
<td>5</td>
<td>18-24</td>
<td>Combinatorial sequence with single recipient (feeds and bathes doll in any order)</td>
</tr>
<tr>
<td>*6</td>
<td>18-26</td>
<td>Planned action (searches for, requests, offers materials incorporated into play)</td>
</tr>
<tr>
<td>7.0</td>
<td>20&gt;</td>
<td>Simple object transformation (uses saucepan as hat, aerosol lid as cup)</td>
</tr>
<tr>
<td>7.5</td>
<td>20&gt;</td>
<td>Complex object transformation (more than one object at a time, within a combinatorial sequence, and/or involving greater dissimilarity to the represented object)</td>
</tr>
<tr>
<td>8</td>
<td>21-30</td>
<td>Agency attribution (adopts vocal or physical attributes of another e.g., cat, driver)</td>
</tr>
<tr>
<td>9</td>
<td>30&gt;</td>
<td>Ordered sequences (mixes cake, bakes it, eats it, retaining logical order)</td>
</tr>
<tr>
<td>10</td>
<td>30&gt;</td>
<td>Imaginary transformation (places imaginary cake on plate, interacts with imaginary character)</td>
</tr>
</tbody>
</table>

Note. Adapted from Brown, Rickards, & Bertoli (2001). * Stage 6 was not coded for parents.

Similar to Morrissey (2014), there were two modifications to this coding scheme. Firstly, Stage 7 (object transformations) of Brown’s scale was separated into two stages: simple (7.0) to represent early forms of object transformations (e.g., using a saucepan as a hat, cylinder as a cup) and complex (7.5) forms of object transformations (e.g., transforming more than one object at a time, transforming within a combinatorial sequence, and transformations involving greater dissimilarity to the represented object). Secondly, the coding of Stage 6 planned play was not applied to parents’ play as their play activity was considered "modelling" and was frequently accompanied by
verbalised intention (planning). If all planned parental play was coded at Stage 6
(planned action) the contribution of parental modelling of play between earlier Stages 2
and 5 (autosymbolic, decentered, linear and combinatorial sequences) would have
been lost. Therefore, removing Stage 6 as a coding stage for parental play allows for
nuances of their earlier play activity to be captured descriptively within the coding
scheme.

5.1.3 Coding.

A minimum of five real-time passes over video footage were conducted as per
the Figure 5.1. Detailed and specific coding schemes for each variable are described in
individual chapters.

1. Assess level of Symbolic Play

2. Transcribe parent and infant language

3. Coding parent and infant language

4. Coding joint attention

5. Coding parent and infant gesture

Figure 5.1. Coding passes.

5.2 Participants

Fifty-four primary caregivers (50 mothers, 4 fathers) and their biological infants
(31 girls and 23 boys) participated in the study. Participant dyads were recruited from
the Canberra metropolitan area through advertisements at childcare and early learning
centres and family services, local libraries, a local children’s magazine, online mother’s
groups, and word of mouth. Dyads were recorded either in their homes or at The
Australian National University when they were approximately 18 months of age. Infants
were recruited within this age range as this age marks the point at which children begin to (i) regularly engage in symbolic play (Fein, 1981; McCune, 1995, 2008; Rubin & Howe, 1985) and (ii) rapidly acquire language after a prior period of slow developmental gains (Benedict, 1979; Lyytinen et al., 1999). Parents completed an additional language questionnaire at 21 months. At time of first testing, infants were 16.58 to 20.26 months old (M = 18.32, SD = 0.98). Three months later at the second time point, infants age ranged between 19.68 and 23.32 months old (M = 21.29, SD = 0.97). Six months after initial testing, infants were 22.71 to 26.42 months old (M = 24.28, SD = 1.01) for the final testing session. Fifty-two dyads completed all testing sessions. After the first session, two participant dyads did not respond to contact for follow-up sessions.

All infants were monolingual and typically developing, with no known or suspected developmental delay or difficulty, as identified via a semi-structured interview conducted during the first testing session (see Appendix B4). Fifty-three infants were born at full term and one participant was born 10 weeks early but was identified by parents prior to the study as typically developing according to medical advice, and had achieved all developmental milestones on time. As shown in Table 5.2, 70% of the infants were first born (n = 38), 67% did not have any siblings (n = 36), and 65% attended childcare (n = 35; $M_{\text{days/week}} = 1.73$, $SD_{\text{days/week}} = 1.51$). Fifty-one infants lived in the same home as both their father and mother; three lived solely with their mother.

The average age of mothers ($M_{\text{age}} = 33.80$ years, $SD = 4.11$) and fathers was similar ($M_{\text{age}} = 34.81$ years, $SD = 4.77$). Eighty-three percent of mothers (n = 45) and 82% of fathers were born in Australia. Consistent with the average level of education for Canberra (Australian Bureau of Statistics, 2011), 78% mothers (n = 42) and 69% fathers (n = 37) had bachelor degrees or higher. Accordingly, socio-economic status, as
estimated from parental education, was high. While some parents reported speaking a different language in addition to English, all parents were raising their infants monolingually. Details of infant demographics as presented in Table 5.2.

Table 5.2

Infant Demographics

<table>
<thead>
<tr>
<th>Birth order</th>
<th>Childcare (days/wk)</th>
<th>Age commenced childcare</th>
<th>Primary caregiver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1-2</td>
<td>3-5</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>19</td>
<td>18</td>
</tr>
</tbody>
</table>

| n  | 38 | 12 | 3  | 1   | 19  | 18  | 17      | 20  | 17 | 17 | 50 | 4 |
| %  | 70.4 | 22.2 | 5.6 | 1.9 | 35.2 | 33.3 | 31.5 | 37.0 | 31.5 | 31.5 | 92.6 | 7.4 |

N = 54

5.3 Materials

5.3.1 Play conditions.

As discussed in Chapter 3, no study to date has compared parent-infant interactions in symbolic play with a comparable play condition. Whereas prior studies have studied symbolic play in isolation or have compared free play with other practical conditions (e.g., book reading, bathing, eating a snack), an equivalent, non-symbolic play condition was required in this longitudinal study to provide a valid examination of the unique socio-cognitive ecology of symbolic play. Functional play is a play activity that, like symbolic play, can have a dyadic and social component, but unlike symbolic play does contain the symbolic transformation of objects, entities and actions. Therefore, functional play is a context comparable to symbolic play with one crucial component removed. As such, comparisons of behaviour across the two contexts are likely to reveal the contribution of symbolic behaviours to development.


5.3.2 Sets of toys.

Children’s play is influenced by the number and type of toys and materials available (Morrisey, 2014). Accordingly, two sets of toys were chosen to elicit functional and symbolic play (see Figure 5.2). The distinction between realistic and representational (e.g., toy phone, doll, tea set) as opposed to functional (e.g., puzzles, musical instruments) toys was used to select toys for each condition, as representational toys elicit more sophisticated levels of play in infants 9 and 12 months of age (Largo & Howard, 1979). As gender-stereotyped toys influence the nature of the parent-child interaction irrespective of the gender of parent or child (Caldera, Huston, & O’Brien, 1989), toys were relatively gender neutral to provide each dyad with equal opportunity to engage in play. Additionally, as infants are able to integrate less realistic and more abstract materials into play as they develop, which in turn promotes higher levels of symbolic play behaviours, both representative and non-representative (abstract) toys were included in the symbolic play condition to support emergent pretend play behaviours and higher levels of pretence (Tamis-LeMonda & Bornstein, 1996).

The functional condition set of toys consisted of a magnetic drawing board and magnetic stamps, a wooden peg and hammer set, a wooden animal block puzzle and its wooden tray, and a wooden maraca and castanet. These toys were chosen as they have a specific function or are “rule-based” (e.g., the hammer bangs the pegs, the magnetic drawing board is for drawing), and do not immediately lend themselves to symbolic play.

For the symbolic play condition the set of toys included a saucepan, its lid and a wooden spoon, a teapot, two teacups and a red teaspoon, a teddy bear and a plastic toy mobile phone. These toys were “representational” in the sense that they iconically represent real objects in the world. Whereas real and toy household items (e.g., the saucepan, lid and wooden spoon and the tea set) tend to elicit pretence behaviours (e.g.,
pretending to cook soup or eating and drinking behaviours), representational items (e.g., the teddy) provide an item upon which the child may project these behaviours (e.g., Brown et al., 2001; Lewis & Boucher, 1997). The “representational” toy mobile phone has been used to elicit pretend conversations with others absent or present (e.g., see Taylor, Cartwright, & Carson, 1993). There were also “non-representational” objects: a piece of red cloth, a small yellow cylinder, and small white cube. These do not immediately represent real world artifacts, and as more “abstract” items encourage object substitution (e.g., the red cloth is a “picnic rug” or a “cape” for teddy).

Figure 5.2. Functional (left) and symbolic (right) condition toys.

A blue blanket (157cm x 130cm) was also used. Parent-infant dyads were asked to sit on the blanket while they were playing, which served to keep them within range of the video camera.

5.3.3 Recording.

An Olympus WS-811 digital voice recorder (stereo recorder and integrated USB stick; serial number 200141311) and SONY microphone (ECM-T140) were used to record the audio of play sessions. A SONY digital HD video camera recorder (HVR-V1P) was used to provide a visual and audio record of the play sessions for ID1 – ID38,
and a Zoom Q2HD Hand Video Recorder was used to record sessions for ID39 – ID54. Video recorders were set up on a tripod during play sessions.

5.3.4 Infant language.

The MacArthur-Bates Communicative Development Inventory (MB-CDI; Fenson et al., 2007) was used to provide a parental-report measure of the infant’s expressive and receptive language ability. The MB-CDI comes in two forms: (i) Words and Gestures, and (ii) Words and Sentences. Both were used at different time points in the current study.

The Words and Gestures form is designed for typically developing infants between 8 and 18 months. In this study, infants 18 months and older were not at ceiling on the measure (highest participant production score was 394, maximum score is 680). Part 1 prompts parents to document their child’s understanding of 396 early vocabulary items separated into 19 semantic categories such as animal names, household items and action words. As the form is based on American English, parents were instructed to indicate if their child responded to Australian English synonyms of the vocabulary items. In part 2 parents indicate if their child has tried or completed 63 actions or gestures (early: first communicative gestures, games and routines and later: actions with objects, pretending to be a parent, imitating other adult actions). This form typically takes 20 – 30 minutes to complete.

The Words and Sentences form is designed for use with 16- to 30-month-old infants. It consists of two scales: words and sentence complexity. Part A prompts parents to indicate if their infant is able to say items on a list of words (including nouns, verbs, adjectives, pronouns, prepositions, quantifiers, articles and connectors). Part B assesses the infant’s use of morphology and syntax, including plurals (-s), possessives (-’s), progressive (-ing) and past tense (-ed), and word combinations. The version used in
the present study included amendments to reflect Australian English (with publisher permission, see Hall et al., 2013).

The Words and Gestures form of the MB-CDI reports good internal consistency for all three scales: words understood ($\alpha = .95$), words produced ($\alpha = .96$), and total gestures ($\alpha = .88$). Similarly, the Words and Sentences form of the MB-CDI reports good internal consistency for words produced ($\alpha = .96$). Good short-term test-re-test reliability is reported for the Words and Gestures form (correlations in the upper .80s; average time between testing of 1.35 months) and Words and Sentences form (correlations in the .90s; average test-re-test lag of 1.38 months). When used with typically developing samples, the MB-CDI also reports acceptable concurrent validity with laboratory-based assessments on measures of language production (e.g., the Expressive One Word Picture Vocabulary Test, Gardner, 1981; Bayley Expressive Language, Dale, Bates, Reznick, & Morisset, 1989) and language comprehension (e.g., Index of Productive Syntax, Scarborough, 1990), with correlations ranging between .53 to .73. As vocabulary and grammar are tightly coupled during acquisition (e.g., Bates & Goodman, 1997), it is possible that symbolic play is related to both aspects of language development. The MB-CDI allowed for the measurement of infant’s vocabulary and grammar using the one instrument.

5.3.5 Semi-structured interview.

A semi-structured interview was conducted by researchers with the primary caregiver (see Appendix B4). This interview was designed to gather demographic information about the parents (e.g., age, place of birth, education, and occupation), the infant’s living arrangements (e.g., with parents, siblings), childcare attendance (e.g., age of commencement, frequency) and to screen for typical development (e.g., checklist of basic milestones that may suggest developmental or cognitive delay).
5.4 Overall Design

The longitudinal study followed a within-subjects design with data collection at three points over a 6-month time period. A timeline for data collection is outlined in Table 5.3.

Table 5.3

*Data Collection Timeline Across Testing Sessions*

<table>
<thead>
<tr>
<th>Variable</th>
<th>T1  (18mts)</th>
<th>T2  (21mts)</th>
<th>T3  (24mts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play Sessions</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant language: MB-CDI</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Semi-structured interview</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debrief of study aims</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Play conditions (functional, symbolic) served as the main independent variable. Conditions were randomised and counterbalanced between dyads to minimise practice and fatigue effects. This design allowed for a comparison of differences in play across contexts while controlling for individual differences in parental and infant spoken language and play style. Dependent variables included measures of parental and infant verbal and non-verbal communicative behaviours (described in more detail in each individual chapter).
Chapter 6

Empirical Study 2: The Language of Parent-Infant Interactions during Symbolic Play

Chapter 4 established the presence of a significant medium positive relationship between symbolic play and language acquisition. The effect was observed across both concurrent and longitudinal studies, and establishes the likely presence of a symbolic play-language relationship given the accumulated empirical evidence that to exists to date. In Chapters 2 and 3 it was argued that, while most studies have explored this relationship assuming that symbolic play and language are linked via a common underlying cognitive structure (thereby implicitly assuming a Piagetian perspective), fewer studies have investigated how the social context of symbolic may affect language development. Chapters 6 – 8 report on the results of a study that aims to fill this gap in the literature.

6.1 The Play Context

Chapter 2 detailed the differences and similarities between play contexts, particularly between functional and symbolic play (e.g., see Pellegrini; 2013; Pellegrini & Hou, 2011; Smilansky 1968). The study detailed in the following chapters adopted previous definitions of these play contexts as follows:

- **Functional play** denotes the use of objects in play according to their intended purpose. For example, this can involve using objects according to their function (e.g., banging pegs with a hammer, shaking the maraca), combining related objects (e.g., placing blocks on top of each other), and making objects do what they are intended to do (e.g., drawing on the magnetic board, then pulling the cleaning lever).

- **Symbolic play** included the nonliteral use of objects, actions or persons. For example, object substitution (e.g., using a saucer as a telephone), imagining
absent objects (e.g. drinking tea from an empty teacup), and assigning absent attributes as in sociodramatic play (e.g., teddy is stirring the pot cooking soup).

6.2 The Social Ecology of Play

Family forms a primary support structure for the development of language competence within an infant’s environment and, in Western Industrial societies, play is a typical context where this transaction takes place (Bernstein, 2004; Damast, Bornstein, & Tamis-LeMonda, 1996). Infants spend much of their time engaged in different types of play and an infant’s first playmate is typically their parent. Accordingly, Haight and Miller (1993) reported that some 75% of children’s pretence is social, first carried out with parents and later with peers. Social interaction is also fundamental to language acquisition. Within play, infants are exposed to and demonstrate a range of verbal behaviours (e.g., CDS) and socio-cognitive behaviours with objects (e.g., gestures, facial expressions, functional and pretence play behaviours), which have been associated with later cognitive competence (as reviewed in Chapter 3). Socio-pragmatic accounts of language acquisition argue that interactional contexts like symbolic play provide fertile social contexts for the mutual exchange of meaning through the use of verbal and non-verbal behaviours, helping an infant to develop a sense of self within a larger social context and to unravel the symbolic nature of the world (Bruner, 1983; Nelson, 2007; Tomasello, 2003). As development progresses the play context also provides a forum in which newly acquired language can be put to good use (e.g., Baumer, Ferholt, & Lecusay, 2005; Fekonja et al., 2005). Frequent engagement in symbolic play may therefore furnish children with opportunities to refine and acquire additional socio-cognitive skills, including language. While there has been a recent surge of empirical interest in this play-language relationship (Fisher et al., 2013; Lillard et al., 2013; Weisberg, Zosh, et al., 2013), few studies have examined how the context of symbolic play may be different from other familiar and comparable forms of
interaction, and whether those features unique to symbolic play are related to language acquisition. Chapters 6 and 7 describe a study designed to examine the unique ecological features of symbolic and functional play, focusing on linguistic and socio-cognitive variables that may vary according to these contexts.

6.3 The Current Study

The study reported on in this and subsequent chapters was designed to investigate the linguistic and socio-cognitive ecology of symbolic play, aiming to identify what is unique about joint parent-infant symbolic play and whether these unique features significantly predict subsequent language acquisition. Eighteen month-old infants and their primary caregiver were recorded interacting in two play conditions: (i) a symbolic play context, in which toys elicited a high proportion of symbolic acts, and (ii) a functional play context, in which toys were used primarily for a functional goal (e.g., completing a puzzle). The subsequent interactions were coded for language use and socio-cognitive variables such as JA and gesture use (reported in Chapter 7). The data reported in this chapter addresses the second research question: How do verbal communicative acts differ when a parent and their infant interact during symbolic play compared to functional play? It reports on an analysis of language use across the two contexts, primarily by parents (i.e., CDS) but also by infants.

There were three hypotheses. First, infants would use more complex language during symbolic play compared to functional play, as previous literature has shown certain aspects of free play (e.g., symbolic transformation) encourage greater language complexity in children (Fekonja et al., 2005). Second, as early pretend play is characterised by co-operative action and negotiation (Rakoczy, 2008), it was also hypothesised that greater interactional complexity would be observed during symbolic play versus functional play between parents and their infants, as measured by the number of conversational turns. Third, due to the importance of parental scaffolding
(Bornstein, et al., 1996; Damast, et al., 1996) during play, CDS was examined between play contexts. Specifically, differences were expected in the pragmatic function of parents’ speech due to the complex negotiations required in symbolic play. As such, it was predicted that parents would pose a greater number of interrogatives (questions) in symbolic play compared to functional play. Other pragmatic types of parental speech (e.g., statements) were explored to understand the context of language use across symbolic and functional play.

6.4 Method

6.4.1 Participants.

This study was based upon concurrent data collected at the first time point of the longitudinal research project. Fifty-four primary caregivers (50 mothers, 4 fathers) and their biological infants (31 girls and 23 boys) participated in the study when infants were 16.58 to 20.26 months old ($M = 18.32$, $SD = 0.98$).

6.4.2 Design.

The current study had a within-subjects design with two play conditions (functional, symbolic). The dependent variables were specific components of parental and infant language. Specifically, language measures were observational measures of parent and infant MLU, type-token ratio of vocabulary, and the number of conversational turns between the parent and infant. Parental speech acts were measured according to their pragmatic function (declaratives, imperatives, exclamatives, interrogatives, naming and mimetics), and compared for differences between the two play conditions. Data were analysed maintaining significance at an alpha level of .05 with SPSS 22 (2013).
6.4.3 Coding.

Language.

Play transcripts were coded for variety of speech acts and were analysed using the Child Language Analysis (CLAN) software (MacWhinney, 2013). The following variables were coded:

Mean Length of Utterance (MLU). MLU is a measure of grammatical complexity and an index of linguistic productivity in early childhood. MLU is a ratio which is calculated by dividing the total number of morphemes by the total number of utterances produced during an observational interaction (Brown, 1974). A morpheme is defined as the smallest grammatical unit that has semantic meaning. For example, the word *cup* is one morpheme and the word *cups* consists of two morphemes (i.e., *cup + -s*). Morphemes were counted for all complete and intelligible utterances following a conservative standard approach (for examples see Table C1; Brown, 1974). Contracted forms (e.g., *isn’t*), words ending with the *–s* plural, *-ed* past tense and *–ing* and progressive tense markers (e.g., *magnets, talked and drawing*) were counted as two morphemes. Irregular plurals and past tense verbs (e.g., *men* and *drank*) and diminutives (e.g., *blankie*) were counted as one morpheme, as they are assumed to be stored as whole words in the mental lexicon (Kirkham, et al., 2013). Although MLU is typically a measure of grammatical development in early language acquisition, parental MLU was also calculated as a measure of parental language complexity across play conditions (Golinkoff & Ames, 1979; Miller & Chapman, 1981).

Conversational turns. The frequency of turn-taking (conversational turns) during each play condition was used as a measure of interactional complexity (Golinkoff & Ames, 1979; Ninio & Snow, 1999). At this stage of child development, expressive language is limited. For this reason, non-words and other communicative vocalisations as well as recognisable words were included as conversational turns. Non-verbal
vocalisations that occurred as a natural consequence of the infant’s action (e.g., “ugh”) were excluded. The total number of turns taken by the infant during the condition was tallied. This tally provided a measure of the amount of times the conversation switched between mother and infant during the interaction.

**Child-directed speech.** The basic unit of spoken language is the utterance. Following past research, the coding and analysis of CDS was based on their pragmatic function to see if different play contexts elicit different types of speech acts from parents (Cameron-Faulkner, Lieven, & Tomasello, 2003; Rowe et al., 2004; Tomasello, Conti-Ramsden, & Ewert, 1990; Wu & Gros-Louis, 2014). At a broad pragmatic level, utterance types can be categorised into four main categories: declaratives, imperatives, exclamatives and interrogatives (Hoff-Ginsberg, 1985: Huddleston, Pullum, & Bauer, 2002; Ninio & Snow, 1999; Wu & Gros-Louis, 2014). For descriptions of the coding scheme and examples of each utterance type see Table 6.1.

**Declaratives** convey information in the form of statements (e.g., *You made me a cup of tea.*). **Imperatives** are used to express a command, such as attempts to get the infant’s attention or perform an action (e.g., *Make me a cup of tea!*). **Exclamatives** are statements used to emphasise an idea and typically include emotive meaning (e.g., “I can’t believe you made me a cup of tea!”). **Interrogatives**, commonly known as questions, are used to elicit a response and gain information from the responder (e.g., *Is this my cup of tea?*) (Huddleston, 1984; Huddleston et al., 2002). Interrogatives were further divided into *wh*- and *yes/no*-questions. *Wh*-questions are marked by the presence of one or more of the following interrogative words: who, whom, which, whose, what, where, when, why, how. These function to elicit open-ended answers (Ninio & Snow, 1999). In contrast, *yes/no*-questions elicit a *yes or no* response. *Yes/no*-questions can be classified further into tag questions, in which a declarative statement or imperative is turned into a question through adding an interrogative tag such as ‘isn’t it?’ (e.g., *This is*
a cup of tea, isn’t it?) (Huddleston, 1984; Huddleston et al., 2002). The status of tag questions as true questions is equivocal, since they are not typically used to elicit information unknown to the speaker, but are instead used to negotiate common ground between speakers due often to (degrees of) uncertainty (e.g., This is a cup of tea, isn’t it? You like tea, don’t you? cf. Is this a cup of tea? Do you like tea?). Therefore, tag and yes/no-questions were treated separately in the analyses. Naming refers to the explicit identification of an object or its features (e.g., It’s a tea cup) (Wu & Gros-Louis, 2014). Mimetics refers to word forms which mimic the sounds associated with the referent (e.g., iconic sounds: bang, crash; pretence sounds: schlurp to mimic drinking, and animal sounds: bak bak, woof woof). The final Other category comprised incomplete or inaudible utterances and those that did not fit into another category. Examples include conventional social routines (e.g., yes, no, thank you, hi), singing, and those which occur in social play "peek-a-boo". The frequency of each classification was recorded and converted into a proportion of the total utterances spoken by the parent per condition, thus giving the probability of the specific utterance type being used.
Table 6.1

**Coding Scheme for Types of Utterances used in Child-Directed Speech**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Declaratives</strong></td>
<td>Statements that convey information; requires a verb or implied verb</td>
<td>Let’s stir the soup</td>
</tr>
<tr>
<td></td>
<td>You made me a cup of tea</td>
<td></td>
</tr>
<tr>
<td><strong>Interrogatives</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wh-questions</td>
<td>Questions beginning with what/where/when/who/why/how/etc.</td>
<td>Who are you calling?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What are you doing?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where did the picture go?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How does this work?</td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>Questions eliciting a yes or no answer</td>
<td>Is that a chicken?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Should we hide teddy?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Will you make me a picture?</td>
</tr>
<tr>
<td>Tag questions</td>
<td>Declarative, imperative or naming statement ending with an interrogative tag</td>
<td>It’s noisy, isn’t it?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You want the phone, don’t you</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We haven’t seen teddy, have we</td>
</tr>
<tr>
<td><strong>Imperatives</strong></td>
<td>Directives; attempts to direct infant’s attention or to perform an action</td>
<td>Look at this</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Come over here</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Careful</td>
</tr>
<tr>
<td><strong>Exclamatives</strong></td>
<td>Statements that emphasise an idea typically with emotive meaning</td>
<td>Daddy’s on the phone!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wow!</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boo!</td>
</tr>
<tr>
<td><strong>Naming</strong></td>
<td>Identifying an object or feature of an object</td>
<td>That’s a tea cup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It’s pink</td>
</tr>
<tr>
<td><strong>Mimetics</strong></td>
<td>Words forms which mimic and/or symbolise the sound associated with the referent (e.g., iconic, pretence or animal sounds)</td>
<td>Slurp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crash</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Woof woof</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Incomplete/inaudible sentences</td>
<td>Unintelligible /How about...</td>
</tr>
<tr>
<td></td>
<td>Social routines</td>
<td>Yes/no/thank you/hi, yum</td>
</tr>
<tr>
<td></td>
<td>Discourse particles</td>
<td>Oh, hey, oi, eh, hey</td>
</tr>
</tbody>
</table>

*Note. Adapted from Cameron-Faulkner, et al., 2003; Rowe, et al., 2004; Tomasello, et al., 1990; and Wu & Gros-Louis, 2014.*
6.5 Results

This study aimed to examine differences in parental and infant language use in naturalistic symbolic and functional play contexts. Multiple aspects of language use were compared across play contexts (e.g., use of *wh*-questions across the symbolic and functional play sessions). Since many of the dependent variables are interdependent, analysis procedures such as repeated measures ANOVA are not suitable. For instance, it is not possible to analyse the use of interrogatives in a 2 (play context: symbolic versus functional) X 2 (Interrogative: *wh*- versus yes/no question) ANOVA because the use of each interrogative type is not independent (i.e., the use of one *wh*-question reduces the probability of yes/no question incidence across the sampling period). Language use in both conditions was therefore analysed using multiple two-tailed paired-sample *t*-tests conducted with a significance level set at \( \alpha = .05 \). This analysis strategy increases the probability of Type 1 errors (a false positive; familywise error). In these cases, the Bonferroni adjustment is recommended to adjust significance levels according to the number of comparisons being made. However, the strategy can also inflate the probability of Type II errors (false negatives). For these reasons, *t*-tests were reported in conjunction with effect sizes and their confidence intervals, which provide an objective and standardized measure of the magnitude of the observed effects. This approach is consistent with recommendations made by researchers who criticise null hypothesis significance testing (for a review see Nickerson, 2000; also see Field, 2005; Meehl, 1978; Schmidt & Hunter, 2002), and is commonly used in fields like behavioural ecology, where multiple comparisons are often made on interdependent measures (Garamszegi, 2006; Nakagawa, 2004). This approach allows for our results to be compared to other studies despite differences in measures and sample sizes. Cohen’s *d* effect sizes, which express the difference between two means in terms of the size of the standard deviation, were reported. Following Cohen (1988), an effect size of less than
or equal to 0.2 was considered small, an effect size of greater than 0.2 and less than or equal to 0.5 was considered medium, and an effect size greater than 0.5 was considered large. Confidence intervals (lower- and upper-bound) around the effect size for $t$-tests were also reported.

**6.5.1 Levels of pretend play.**

As a manipulation check, parent-infant interactions were assessed for the level of symbolic play elicited in both play conditions prior to any coding or analysis. This was completed to ensure that the toys used in the symbolic play condition elicited more symbolic play than the toys used in the functional play condition. The highest level of play for both parents and infants was recorded using the Pretend Play Observation Scale (Brown, et al., 2001). The reliability of coding was tested by calculating the nominal agreement between two independent coders for 12 of 54 (22%) of play sessions. The average probability of matches between the two coders was 91.67%. Overall, percentage error was 8.33% and was only evident for assessments of infant play levels. Paired-sample t-tests were used to compare levels of symbolic play in parents and infants across play conditions. The symbolic play condition was confirmed to have significantly higher levels of symbolic play compared to the functional condition for both infants ($M = 5.74$, $SD = 2.19$ and $M = 0.19$, $SD = 1.03$), $t(53) = 15.78$, $p < .001$, $d = 3.24$, CI$_{95}$ [2.67, 3.82], and parents ($M = 7.26$, $SD = 1.91$ and $M = 0.52$, $SD = 1.85$), $t(53) = 17.80$, $p < .001$, $d = 3.59$, CI$_{95}$ [2.98, 4.19]. Both effect sizes were large. This indicates that the toys used in the symbolic play condition elicited higher levels of symbolic play from infants and their parents in comparison to the toys used in the functional play condition. The results suggest that the play manipulation was successful.

**6.5.2 Language use across play contexts.**

Table 6.2 shows the results of paired-samples t-tests for conversational turns and parent and infant MLU and type-token ratio across conditions.
Table 6.2

Paired-Sample T-tests for Language Complexity Between Conditions

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>Cohen’s d</th>
<th>CI95 of d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent MLU</td>
<td>-.11</td>
<td>53</td>
<td>1.65</td>
<td>.105</td>
<td>0.15</td>
<td>-0.53 to 0.23</td>
</tr>
<tr>
<td>Infant MLU</td>
<td>.10</td>
<td>53</td>
<td>1.81</td>
<td>.076</td>
<td>0.27</td>
<td>-0.65 to 0.11</td>
</tr>
<tr>
<td>Conversational Turns</td>
<td>8.91</td>
<td>53</td>
<td>4.90</td>
<td>.000*</td>
<td>0.41</td>
<td>-0.84 to 1.66</td>
</tr>
<tr>
<td>Parental Type-token Ratio</td>
<td>.01</td>
<td>53</td>
<td>2.42</td>
<td>.019*</td>
<td>0.33</td>
<td>-0.71 to 0.05</td>
</tr>
<tr>
<td>Infant Type-token Ratio</td>
<td>.02</td>
<td>53</td>
<td>0.44</td>
<td>.660</td>
<td>0.08</td>
<td>-0.46 to 0.30</td>
</tr>
</tbody>
</table>

Note. *p < .05, two-tailed.

MLU.

As seen in Table 6.2, the results suggest that both parent and infant MLU did not significantly differ between functional (M = 4.21, SD = 0.70 and M = 0.92, SD = 0.42) and symbolic (M = 4.10, SD = 0.69 and M = 1.02, SD = 0.32) play conditions. This suggests that language complexity and linguistic productivity for both parents and infants was similar when dyads were engaged in functional and symbolic play.

Conversational turns.

In contrast to MLU, Table 6.2 shows that conversational turns were significantly greater during interactions in the symbolic play condition (M = 42.13, SD = 21.58) than conversational turns in the functional play condition (M = 33.22, SD = 19.00). Therefore, turn-taking between parents and infants occurred more frequently during symbolic play, but this did not lead to more morphologically complex utterances during conversation. These findings for MLU and conversational turns held when fathers’ data were removed from the analysis, with increases in the effect sizes (i.e., medium).
Type-token ratio.

Type-token ratio was calculated by dividing the total number of unique words by the total number of words used by the same speaker. As shown in Table 6.2, parental type-token ratio was significantly higher during interactions in the functional play condition ($M = 0.08$, $SD = 0.02$) than the symbolic play condition ($M = 0.07$, $SD = 0.02$). However, when fathers’ data was removed from the analysis this difference was no longer significant, although the effect size was medium, $t(53) = 1.90$, $p = .063$, $d = 0.29$). This suggests that parental lexical variety does differ slightly between symbolic and functional play contexts. In contrast, infants produced significantly more types and tokens in the symbolic play condition ($M = 3.59$, $SD = 2.71$ and $M = 28.19$, $SD = 31.80$) than they did in the functional play condition ($M = 2.61$, $SD = 2.10$ and $M = 18.30$, $SD = 19.46$), $t(53) = -4.02$, $p < .001$, $d = 0.29$ and $t(53) = -3.01$, $p = .004$, $d = 0.29$, respectively. However, infant type-token ratio did not significantly differ between conditions. Overall, these results indicate that when controlling for how much a parent and infant spoke during each condition, their lexical variety was similar when engaged in functional and symbolic play.

Child-directed speech.

To provide insight into the types of CDS infants were exposed to during different play contexts, the frequency of parental utterance types were counted for each play condition. Raw scores of the means and standard deviations for the frequency of parental utterance types produced during functional and symbolic play contexts are presented in Table D2. To control for individual differences in parental speech production, the frequency of parental utterance types were counted and divided by total parental utterances produced during each condition. This provided a measure of the proportion of each utterance type used during each interaction, thereby controlling for

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2 The significance of this result without fathers’ data is marginal and Cohen’s $d$ remained similar (.33 to .29), suggesting that parental type-token ratio is higher in functional play than it is in symbolic play.
the amount of language produced by each parent. Means and standard deviations are presented in Table 6.3.

Table 6.3

Means and Standard Deviations for Child-Directed Speech Types as a Proportion of Overall Parental Utterances by Condition

<table>
<thead>
<tr>
<th></th>
<th>Functional</th>
<th>Symbolic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Declaratives</td>
<td>0.18</td>
<td>0.06</td>
</tr>
<tr>
<td>Exclamatives</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Imperatives</td>
<td>0.14</td>
<td>0.06</td>
</tr>
<tr>
<td>Mimetics</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Naming</td>
<td>0.10</td>
<td>0.06</td>
</tr>
<tr>
<td>Tag questions</td>
<td>0.10</td>
<td>0.07</td>
</tr>
<tr>
<td>Wh-questions</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>0.21</td>
<td>0.07</td>
</tr>
</tbody>
</table>

$N = 54$

Note. Data are proportions of total parental utterances.

As per Table 6.3, means and standard deviations reveal differences in CDS between conditions. Overall, as a proportion of overall utterances, parents used more mimetics, wh-, and yes/no-questions during the symbolic play condition than they did in functional play. In contrast, parents used more declaratives, imperatives, exclamatives, naming, and tag questions in the functional compared to the symbolic play condition.

Paired-sample t-tests were conducted to examine if differences between CDS were significant between conditions, the results of which are presented in Figure 6.1 and Table 6.4. For ease of presentation, Figure 6.1 shows the mean differences (symbolic play condition – functional play condition) across play contexts, with bars in the positive range indicating comparatively greater incidence of that specific utterance type.
in the symbolic play condition, whereas bars in the negative range indicate comparatively greater incidence in the functional play condition.

Table 6.4

*Paired-Sample T-tests for Child-Directed Speech Between Conditions*

<table>
<thead>
<tr>
<th></th>
<th>Mean difference</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>Cohen’s d</th>
<th>CI_{0.05} of d</th>
<th>Lower bound</th>
<th>Upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaratives</td>
<td>-0.03</td>
<td>53</td>
<td>-4.41</td>
<td>.000*</td>
<td>0.48</td>
<td>-0.86</td>
<td>-0.10</td>
<td></td>
</tr>
<tr>
<td>Exclamatives</td>
<td>-0.003</td>
<td>53</td>
<td>-0.71</td>
<td>.483</td>
<td>0.11</td>
<td>-0.48</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Imperatives</td>
<td>-0.06</td>
<td>53</td>
<td>-7.44</td>
<td>.000*</td>
<td>1.09</td>
<td>-1.50</td>
<td>-0.69</td>
<td></td>
</tr>
<tr>
<td>Naming</td>
<td>-0.01</td>
<td>53</td>
<td>-1.44</td>
<td>.155</td>
<td>0.21</td>
<td>-0.59</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Wh-questions</td>
<td>0.04</td>
<td>53</td>
<td>5.67</td>
<td>.000*</td>
<td>0.86</td>
<td>0.47</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>0.03</td>
<td>35</td>
<td>3.69</td>
<td>.001*</td>
<td>0.43</td>
<td>0.05</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>Mimetics</td>
<td>0.01</td>
<td>53</td>
<td>1.95</td>
<td>.057</td>
<td>0.34</td>
<td>-0.04</td>
<td>-0.72</td>
<td></td>
</tr>
</tbody>
</table>

*N* = 54

*Note.* Data are proportions of total parental utterances. *p < .05, two-tailed.*
As per Table 6.4 and Figure 6.1, significant differences between play conditions were evident in four of the seven utterance types across the two play contexts. The results of pairwise t-tests revealed significantly more wh-questions and yes/no-questions in the symbolic play condition compared to the functional play condition. In functional play, significantly more declaratives and imperatives were found compared with symbolic play. Mimetics were more prevalent in symbolic play, and exclamatives and naming were more prevalent in functional play; however, these differences were not significant.

These results reveal a clear difference in the types of utterances used more frequently in each play condition. Utterance types used more frequently in the functional play condition were statements; that is, comments (declaratives, naming) or
instructions to infants on the nature of events (imperatives). Conversely, utterance types more common in the symbolic play condition were interrogatives; that is, requests for information from the infants in the form of questions (either yes/no or wh-questions). Interrogatives are commonly used in CDS (Cameron-Faulkner et al., 2003), yet they were significantly more common in symbolic play. In fact, interrogatives for the symbolic play condition constituted 38.7% of total parental utterances compared to 31.4% for the functional play condition. Additionally, more mimetics (sound-symbolic word forms) were also used in the symbolic play condition.

Tag questions were coded as a subtype of yes/no-questions and were calculated as a proportion of the total amount of yes/no-questions per condition. Due to their different denominator, tag questions were not included in Figure 6.1 as they are not comparable to other utterance types. The total proportion of yes/no-questions consisted of more tag questions in the functional play condition ($M = 0.098$, $SD = 0.086$) than the symbolic play condition ($M = 0.081$, $SD = 0.077$), although this difference was not significant, $t(53) = 1.81$, $p = .076$, $d = 0.20$, CI$_{95\%}$. $d [0.17, 0.59]$.

6.6 Discussion

The majority of previous research examining the link between play and language has explored associations between the two domains. The results from the meta-analysis in Chapter 4 demonstrated that, overall, the accumulated research evidence suggests that there is a robust association between the two domains. Following Piagetian theory, this association has commonly been interpreted to reflect a common underlying structure across the two domains. One limitation of this research strategy is that does not take into account the fact that early play is inherently social and performed with a competent other (Haight & Miller, 1993). The current study therefore examined the nature of linguistic interactions during symbolic and functional play, with the aim of investigating
whether the ‘linguistic ecology’ of play differs according to whether the play context is symbolic or not.

There were significantly greater conversational turns in the symbolic play condition compared to the functional play condition, which supported the second hypothesis. In support of the third hypothesis, parents produced a greater number of interrogatives (wh- and yes/no-questions) in symbolic play compared to functional play. The greater frequency of wh- and yes/no-questions in symbolic play may in turn lead to greater conversational turns as parents deliberately ask more questions of their infant and in doing so, “pass the turn” to their infant (Snow, 1977). That is, parents provide the infant with opportunities to communicate, share ideas and establish a common frame of reference regarding the direction and nature of the play situation (Garvey, 1990; Göncü & Kessel, 1988). From a Vygotskian perspective, pretence arises through social interaction (Göncü, 1993; Haight & Miller, 1993; Lillard & Witherington, 2004; Tomasello & Rakoczy, 2003). Accordingly, symbolic transformation encourages parents to use language that promotes complex patterns of interaction (Cristofaro & Tamis-LeMonda, 2011; Fekonja, et al., 2005; Tamis-LeMonda et al., 2001). Specifically, turn-taking in symbolic play promotes the negotiation of “as-if” rules (e.g., using a saucepan lid “as-if” it is a steering wheel), in addition to encouraging the infant’s involvement and commitment to the shared activity (Nicolopoulou at al., 2015; Vygotsky, 1962, 1978).

Although infants had more opportunities to participate in conversation during symbolic play, these opportunities did not lead to any differences between contexts in the quantity and complexity of language heard or spoken by infants (as measured by MLU). This did not support the first hypothesis that infants would use more complex language during symbolic play compared to functional play. These findings are inconsistent with past research with older children that did report greater linguistic
complexity in play contexts (Fekonja et al., 2005). Previous research has found wide variation in the complexity and reciprocity of a child’s language when negotiating shared understanding (e.g., Farver, 1992; Göncü, 1993). This may also be attributed to the age of participants at testing. At 18 months, infants are beginning to speak. The infants’ overall infant MLU was 1 (morpheme), with 12 infants scoring an MLU of 0. Thus most infants were still within the one-word stage. The small productive vocabularies of infants in this may explain the absence of differences in infant language complexity between play contexts. Overall, these results indicate that the quantity and complexity of language used did not differ between conditions, yet the greater prevalence of parental questions during symbolic play changed the quality of the interaction between parent and infant as it presented infants with more opportunities to participate in conversational turns.

There were clear differences in CDS directed to infants during play contexts. During symbolic play, parents were more likely to request information from their infant using questions. This supported the hypothesis that parents would use more interrogatives (wh- and yes/no-questions) during symbolic play than they would during functional play. By contrast, during functional play parents were more likely to either comment on activities using declaratives or direct their infant’s behaviour using imperatives. Thus there was a complementary distribution of interrogatives, on the one hand, and imperatives and declaratives, on the other hand, across the two play contexts. This is a novel finding, suggesting that the symbolic and functional play have unique linguistic ecologies that reflect differences in interaction.

The function of declaratives is to convey information in the form of statements. One interpretation for the higher prevalence of declaratives in the functional play condition may be due to the goals of the play activity. In functional play, the goal of the activity was known (i.e., the pegs go in the board and are banged with the hammer), and
the achievement of this goal becomes the focus of the parents’ activity (O'Brien & Nagle, 1987). In comparison to the symbolic play condition, where the goal of the activity is social, the concrete goal in functional play activities encourages the use of statements designed to convey information about the activity and what the infant needs to do with the toys. Accordingly, parents may use declarative statements to assist with the execution of the functional play goals. As there is little negotiation required when an activity’s goal is known, the use of declaratives in the functional play condition is similar to imperatives (also characteristic of the functional play condition), as they function to inform and do not require a high level of information processing or verbal response from infants (Barnes, Gutfreund, Satterly, & Wells, 1983; Blount, 1972).

The use of imperatives and interrogatives distinguish CDS from adult speech (Barnes et al., 1983; Cameron-Faulkner et al., 2003; Snow, 1977). Imperatives, in particular, are used by parents to shape and/or control an infant’s behaviour (Barnes, et al., 1983; Blount, 1972). Compared with other utterance types, the use of imperatives differed most between play contexts and was associated with the largest effect size. Imperative use positively influences language acquisition during the earliest stages of development, as their use does not demand the high level of information processing that interrogatives do (Barnes, et al., 1983; Blount, 1972). However, the opposite may be true as an infant begins to speak (e.g., Cristofaro & Tamis-LeMonda, 2011; Leech, Salo, Rowe, & Cabrera, 2013; Rowland et al., 2003; Valian & Casey, 2003).

In contrast to commands which restrict a child’s response, questions that elicit information from a child may be of greater benefit for language development. Therefore, different types of speech may be of greater importance during different stages of language acquisition and parents may adjust their CDS acts accordingly (Blount, 1972). Wh- and yes/no-questions were specifically associated with the symbolic play context. When a parent uses wh- and yes/no-questions during
conversation, they are seeking a response from their infant. In symbolic play, both yes/no- and wh-questions may share the same function: they are used as the parent-infant dyad establish and maintain a common understanding of what objects represent and the nature of the pretence situation. Unlike the functional play context, when “rules” are explicitly known or established based on cultural convention, the symbolic play context is ambiguous and requires a shared understanding of the purpose and the nature of events. That is, it requires collective intentional (Rakoczy, 2008). The process of resolving and negotiating this ambiguity is likely to be fostered through linguistic negotiation, particularly the use of questions. Brown et al. (1996) argue that a series of reciprocal and mutually agreed upon negotiations and collaborations between play partners must occur in order to achieve this mutual understanding. Without negotiation within this social interaction, collaborative pretence will not be established nor continue. Much of this negotiation of meaning is likely to be done using interrogatives, and this is why it is likely that a greater number of this utterance type was observed in the symbolic play condition.

Unexpectedly, parents used a higher proportion of tag questions in functional play compared to symbolic play context, although this difference was not significant. Tag questions transform a statement into an interrogative via the addition of a “tag” (Huddleston, 1984; Huddleston et al., 2002). The social function of tag questions is to establish agreement and negotiate common ground (Gaskins, Miller, & Corsaro, 1992). Unlike yes/no-questions, which request information, tag questions provide information in the form of an assertion or evaluation with an expectation of agreement (Kimps, Davidse, & Cornillie, 2014). As a result, tag questions require a less complex response from children than regular interrogatives require. Therefore, it makes sense that tag questions were more prevalent in functional play as this is congruent with the overall
finding that infants are more likely to hear language associated with comments or instruction (declaratives) in functional play than symbolic play.

Naming was also used more frequently in the functional play condition. Typically, infants learn object names when a parent points to an object in the infant’s view and labels it (Ninio, 1980; Ninio & Bruner, 1978). The toys in the symbolic play condition were more abstract and ambiguous than those in the functional play condition and required the parent and infant to negotiate what each represented. Thus it is plausible that naming would have been more prevalent in symbolic play, yet this was not the case. One potential explanation for the result concerns the toys used in the functional play context, which provided parents with more opportunities to name colours, animals and shapes. Another explanation is that naming was just as prevalent in both conditions, but used indirectly in symbolic play. For example, in functional play a parent might say “It’s a red peg” whereas in symbolic play, naming may be embedded within more complex sentences (e.g., “Let’s pour tea from the teapot”) or questions (e.g., “Are you banging with the big spoon?” and “Do you think teddy is tired?”). The suggestion is that parents are likely to have established reference within the context of other utterance types, which were not coded as naming. Additionally, naming is frequently accompanied by the use of pointing gestures, and pointing gestures are frequently used to establish JA between a parent and an infant. Exploring the prevalence of pointing gestures and JA between contexts may provide further information about whether or not naming is used explicitly by parents to facilitate word learning (i.e., through word-to-word mapping) during functional play contexts.

The comparison of object references between symbolic play and functional play also deserves attention, as object references may help an infant understand symbolic representation, while maintaining an accurate representation of the world (Lillard & Witherington, 2004). Comparing the proportion of object references used across
symbolic and functional play contexts would extend the Lillard and Witherington (2004) study, who found that mothers used proportionately more object references during pretence than they did during a “real” condition.

Finally, the influence of the types of toys chosen for functional play condition may have also contributed to similar use of sound-symbolic forms (mimetics) between play contexts. This is consistent with general findings that mimetics are used frequently during free play (Fekonja et al., 2005); however, it is inconsistent with previous findings that found mothers use more sound effects to signal pretence to their children in pretend play contexts (e.g., see Lillard & Witherington, 2004). The functional play toys may have inflated parent’s use of mimetics as these toys promoted the use of animal noises (e.g., baa-baa, cluck) and noises associated with the function of the toys (e.g., bang, crash). Although care was taken with the choice of toys used in each condition, this finding highlights the influence of specific types of toys on the nature of the parent-infant interaction (Caldera et al., 1989).

6.7 Synopsis and Outlook

This chapter examined whether there are differences in the language used by parents and infants during symbolic as compared to functional play. Overall, the results suggest that differences in play contexts lead to differences in linguistic interaction. More specifically, that the context of symbolic play provides a rich environment in which infants hear more interrogatives and are encouraged to engage in greater amounts of dyadic interaction.

This chapter focused on examining unique aspects of verbal communication between parents and their infants during symbolic play. However, other processes and qualities of parent-infant interactions during play have been associated with later language development. The next chapter focuses on two of these: joint attention (Kristen, Sodian, Thoermer, & Perst, 2011; Laakso et al., 1999; Tomasello & Farrar,
1986) and gesture (Colonnesi et al., 2010; Tomasello et al., 2007). Language acquisition is facilitated when parents engage in aspects of social interaction at a level that challenges, supports and provides multiple opportunities for their infants to learn (Bruner, 1983; Vygotsky, 1978; Wood et al., 1976). From a socio-cultural perspective, further examination of socio-cognitive factors associated with parent-infant interactions between functional and symbolic play contexts and how these relate to concurrent and longitudinal language development is warranted. This is the topic of Chapters 7 and 8.
Chapter 7

Empirical Study 3: Parent-Infant Non-Verbal Communication in Symbolic Play

Chapter 6 revealed specific patterns of linguistic interaction characteristic of symbolic play contexts. During symbolic play, parents were more likely to encourage infant participation through the use of questions. Accordingly, infants also demonstrated active participation in conversation as evinced by greater conversational turns between dyads during symbolic play. These verbal communicative acts were interpreted to facilitate the negotiation and exchange of meaning during symbolic play. However, verbal communication is only one modality by which a parent and their infant communicate. As didactic agents of language learning, parents use both verbal and socio-cognitive behaviours during interactions with their infants (e.g., Messer, 1994; Messer & Turner, 1993). It is not yet clear whether symbolic play promotes specific patterns of joint attention (JA) and gesture use during parent-infant interaction, which may further foster this communicative exchange. Therefore, this chapter examined the presence of and differences in JA and gesture use observed in parents and their 18-month-old infants between symbolic and functional play contexts. This chapter addresses the third research question: Does JA and gesture use differ during parent-infant interaction when they are engaged in symbolic play compared to when they are engaged in functional play?

7.1 Joint Attention

JA is an important feature of both play and parent-infant interaction. It has been defined as a situation in which two individuals share a mutual and intersubjective focus on an external object or event (Bakeman & Adamson, 1984; Carpenter, Nagell, et al., 1998; Mundy & Newell, 2007; Tomasello, 1995). Socio-cultural approaches to development recognise JA as a functionally significant type of interaction across several dimensions of development (e.g., Bruner, 1983; Tomasello, 2003). The broad proposal
is that JA episodes are important for learning about other people’s experiences and the nature of social interaction itself, especially when the focus of mutual attention involves the negotiation of ambiguous objects or events (Moll & Tomasello, 2007; Saarni, Campos, Camras, & Witherington, 2007). JA is an advanced skill for an infant and within dyadic symbolic play, JA is necessary for the negotiation of meaning. JA skills are likely to support the core features of symbolic play: (i) knowledge that multiple meanings are possible for the same referent (e.g., the yellow cylinder can be a “cup”, “telephone”, and “food”; (ii) an understanding that their play partner may not have the same perspective as they do; (iii) communication of meaning to a play partner, and; (iv) an ability to manipulate the perception of another’s understanding of what an object or event represents.

In terms of language acquisition, JA is widely accepted as a context that privileges word learning in early childhood (Baldwin, 1991, 1993; Carpenter, Nagell, et al., 1998). Accordingly, a positive relationship between JA and the development of language has been demonstrated across many empirical studies (e.g., Carpenter, Nagell, et al., 1998; Delgado et al., 2002; Markus, Mundy, Morales, Delgado, & Yale, 2000; Morales et al., 2000; Smith, Adamson, & Bakeman, 1988; Tomasello & Todd, 1983). However, it is important to note that not all studies have found this positive relationship (e.g., see Saxon & Reilly, 1998).

Tomasello (1995, 1999) states that the growing awareness of other people as intentional agents, whose attention to objects and events can be directed and shared, is the key social-cognitive skill underlying the ability to engage in JA behaviours (also see Legerstee & Barillas, 2003). When playing with objects, JA provides infants with a reliable context that helps them correctly identify the referents and attribute meaning to language (Bruner, 1983; Tomasello & Farrar, 1986). For this reason, the current chapter focused specifically on collaborative JA, as it is a context that most likely promotes the
didactic parent-infant interaction required to establish what objects and actions “stand for” in dyadic interaction.

7.2 Gestures

Gesture plays a positive role in language acquisition (Markus et al., 2000; Morales et al., 2000; Smith et al., 1988; Tomasello & Todd, 1983) and general cognitive functioning (Smith & Ulvund, 2003). As discussed in Chapter 3, infants use communicative gestures to manipulate their parents’ attention during interaction (Bruner, 1983; Carpenter, Nagell, et al., 1998; Tomasello, 2007). Two broad types of gestures are described within the literature: deictic (declarative, imperative) and iconic gestures. As a subtype of deictic gestures, declarative gestures, such as points, function to share information about objects and events with their parents (Bates, 1979; Franco, 1997; Liszkowski et al., 2004; Tomasello, 2008; Werner & Kaplan, 1963). By comparison, imperative gestures function to request objects and/or events from others and are not specifically associated with JA behaviours (Bates, 1979; Desrochers et al., 1995; Tomasello & Camaioni, 1997). Iconic gestures convey semantic or representational information about the identity, function and/or characteristics about the labelled object/idea (Acredolo & Goodwyn, 1988; Namy et al., 2000).

Within parent-infant interaction, gestures provide a route via which children can express different meanings before they have fully developed the oral-motor abilities or lexical knowledge to verbalise these meanings in speech (e.g., communicative pointing, Cartmill, Hunsicker, & Goldin-Meadow, 2014; McNeill, 2005). Gestures also supplement information conveyed verbally by clarifying and/or enriching the verbal content for both the user and recipient (McNeill, 2005, Nicolopoulou, 2005). For this reason, a gesture-word combination is a simpler communicative act (i.e., less cognitively demanding to interpret and produce) than a multi-word speech combination. Accordingly, infant’s use of gesture typically precedes and predicts the acquisition of
spoken language (Goldin-Meadow, Nusbaum, Kelly, & Wagner, 2001; Wagner et al., 2004).

Gesture use may be encouraged in symbolic play because of the inherently representational nature of the context (Hall et al., 2013). The symbolic play context is ambiguous, and meaning must be negotiated between play partners. In the absence of the verbal competence to establish reference, infants (and caregivers) are likely to use gesture to do so, thereby establishing a common ground with their interlocutor (i.e., collective intentionality, Rakoczy, 2006, 2008). The analyses reported in the current chapter investigate this possibility.

7.3 The Current Study

The aim of this study was to explore differences in specific socio-cognitive aspects of the parent-infant interaction during functional versus symbolic play. Specifically, parent-infant interactions were examined for differences between the frequency and duration of JA episodes. Additionally, since infants’ early communicative exchanges are gesture-rich, and because the symbolic play context may further promote gesture use, the presence of points (declarative, imperative) and gestures (deictic, iconic) within JA episodes was analysed. There were two hypotheses. First, as the context of symbolic play requires on-going negotiation of the pretence situation requiring advanced cognitive abilities (Lillard & Witherington, 2004; Lillard et al., 2007; Nishida & Lillard, 2007), it was hypothesised that JA episodes would be more frequent and of greater duration during the symbolic play condition compared with the functional play condition. Second, due to the ambiguous nature of what objects/events may represent, it was hypothesised that the frequency of overall parental and infant gestures would be greater in the symbolic play condition compared with the functional play condition.
7.4 Method

7.4.1 Participants

Participants in this study were 54 parent-infant dyads recruited to the larger longitudinal PhD study on symbolic play and early childhood language development (demographic details are provided in detail in Chapter 5). All parents were primary caregivers (50 mothers, 4 fathers) of their biological infants (31 girls, 23 boys). The data reported in this chapter was based on data obtained when infants were 18 months (range = 16.58 to 20.26 months, $M = 18.32$, $SD = 0.98$) and were visited in their homes. A small number attended The Australian National University for the session.

7.4.2 Design

The current study had a within-subjects design with two play conditions (functional, symbolic). JA duration and frequency were measured and compared for differences between the two play conditions. JA episodes were also coded for deictic (imperative and declarative points) and iconic gestures (in-hand, out-of-hand). Gestures were coded within JA episodes to ensure they were communicative acts. Unlike verbal acts that convey information without visual attention, gestures require a visual shared attention to convey information between interlocutors and visual attention is a prerequisite of JA (Tomasello et al., 2005). Further, outside of JA, gestures are less likely to be attended to are therefore unlikely to facilitate communication between interlocutors. However, within JA interlocutors understand one another as intentional agents and engage in social referencing behaviours to communicate meaning (Carpenter et al., 1998). Therefore, within JA episodes, interlocutors are more likely to produce and attend to gestures as a form of communication (Carpenter, Nagell, et al., 1998). Variables are described in further detail in the materials and coding sections below.
7.4.3 Coding

Joint attention.

There is little consistency in the way JA has been defined in past literature. Therefore, JA was operationalised to include the major definitions published in previous empirical literature (e.g., Bakeman & Adamson, 1984; Bigelow, MacLean, & Proctor, 2004; Carpenter, Nagell, et al., 1998; Saxon & Reilly, 1998; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). The onset, offset, and who initiated and ended JA episodes were coded from video footage and included as separate tiers in the CHAT transcripts for each parent-infant dyad, allowing automated analysis using CLAN (MacWhinney, 2013). Co-ordinated JA coding criteria and examples are provided in Table 7.1.

Co-ordinated JA episodes met the following inclusion criteria:

1. a) An episode of JA began when one member of the dyad attempted to engage the other in interaction with an object or activity (Bakeman & Adamson, 1984; Bigelow et al., 2004; Tomasello & Todd, 1983). Either parent or infant could initiate JA onset.

b) Episodes were not coded as established until it was evident that the infant had acknowledged their parent’s involvement in the interaction. This was indicated by the infant alternating their gaze from an object, to their parent's face, and back to the same object (Bakeman & Adamson, 1984; Carpenter, Nagell, et al., 1998). This may also have been accompanied by a gesture or vocalisation directed at the parent. In instances when an infant's face was not visible to the camera, other behavioural cues (e.g., head tilting) were used to determine if the infant alternated their gaze between object and parent.

c) Episodes were coded as initiated by the parent when the parent showed (e.g., communicative gesture such as a point), gave, or manipulated an object which they had chosen and the infant consequently looked at, reached for, touched or
manipulated.

d) JA onset was coded from the time JA was established, rather than the time it was initiated by either the parent or infant.

2. Both parent and infant then visually focused on the same object or activity for a minimum of three seconds (Tomasello & Todd, 1983). After the initial three seconds, either member of the dyad could look away briefly during an extended episode of JA (provided JA has already been established for three secs).

3. For an attentional episode to be considered co-ordinated JA, the parent’s involvement had to include manipulation of the object, turn-taking, or another active involvement in an activity. Episodes were not coded if they were established, but were not co-ordinated within 10 seconds.

4. JA offset was coded when one of the following occurred:
   a) The infant played with the object for 10 seconds without acknowledging their parent’s involvement (either through a look vocalisation, communicative gesture, or turn-taking) (Bakeman & Adamson, 1984; Bigelow et al., 2004; Tomasello & Todd, 1983).
   b) A period of 10 seconds passed without the parent actively involving herself (e.g., just watching their infant play or narrating their infant’s actions).
   c) One member of the dyad shifted their attention to a new object or activity, and the other individual did not follow within three seconds (Carpenter, Nagell, et al., 1998).

Exclusion criteria: the following non-co-operative JA episodes (as defined by Raver & Leadbeater, 1995; Saxon & Reilly, 1998; Tomasello & Todd, 1983) were not considered co-ordinated and therefore not coded for the purposes of this study:

1. One member of the dyad watched while the other played with a toy.
2. Both parent and infant played next to one another in parallel but not together.

3. The parent set up the toy with an agenda to play, and the infant looked at the toy but did not play, the parent did not persist.

4. The infant played with an object alone and the parent was visually focused on the object that the infant was playing with and/or describing the infant’s actions/behaviours throughout. This excluded onlooking either by infant or parent (Tomasello & Todd, 1983).

Table 7.1

<table>
<thead>
<tr>
<th>Joint Attention Episode Coded According to Inclusion Criteria</th>
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<tr>
<td><strong>Criterion</strong></td>
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<td>1a</td>
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<td>1b</td>
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<td>2</td>
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<td>3</td>
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To determine JA inter-rater agreement, a second coder was trained and independently coded the duration, frequency and who initiated/ended JA episodes of ten (19%) randomly selected dyads. Reliability for episode frequency, duration, initiated
and ended coding categories were calculated by manually assigning matches between raters a value of 1 and non-matches a value of 0. To be considered a match, episode frequency and who initiated/ended episodes had to be coded exactly the same for both raters. Episode duration was considered a match if coding was accurate within two seconds and a non-match if it differed by more than two seconds. The proportion of agreement over and above chance was calculated using Cohen’s (1960) Kappa, which is recommended as an appropriate index of inter-rater reliability for categorical data (as it considers levels of agreement/disagreement between raters plus the probability of agreement which may occur due to chance) (Fleiss & Cohen, 1973; Hallgren, 2012). According to the Kappa Interpretation Scale\(^3\) (Landis & Koch, 1977), inter-rater reliability for these variables was substantial, \(\kappa = .751\) (\(SE_\kappa = 0.07, CI_{95, \kappa} [0.614, 0.889]\), (percentage agreement was 88.04%). Discrepancies were resolved via discussion with a third senior researcher who was blind to play conditions.

**Joint attention and gesture.**

The specific provision and type of gesture used between infants and parents across play contexts was then examined. Gestures were coded for parents and infants within JA episodes from video footage and recorded as separate tiers in the CHAT transcripts of the interaction. As these behaviours were only coded during JA episodes, all gestures were considered in this context to be communicative. Based on previous coding schemes, gestures were coded into two broad categories according to their (i) form and (ii) relation to speech (e.g., Acredolo & Goodwyn, 1988; Iverson & Goldin-Meadow, 2005; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Namy & Nolan, 2004; Namy et al., 2008; Tomasello & Farrar, 1986):

\(^3\) According to the Kappa Interpretation Scale, agreement is interpreted as follows: \(< 0 = \text{poor}, 0.0 - 0.20 = \text{slight}, 0.21 - 0.40 = \text{fair}, 0.41 - 0.60 = \text{moderate}, 0.61 - 0.80 = \text{substantial}, \text{and} 0.81 - 1.00 = \text{almost perfect} \) (Landis & Koch, 1977).
Deictic gestures. This category was restricted to points which were defined as an extension of the arm (either fully or slightly bent) accompanied by an index finger or open hand, palm down, in the direction of (or touching) a referent in the immediate environment (Iverson & Goldin-Meadow, 2005). Motives of the points were coded as: declarative (wishing to divert the attention of the play partner) or imperative (if the individual appeared to be requesting or wanting an object, which is often accompanied by behaviours such as leaning forward, displaying negative affect, whining, reaching).

Iconic gestures. This category included any representational gestures with or without an object in hand. Out-of-hand (“empty handed”) gestures included the concrete imagistic representation of an object or action’s characteristics (e.g., running fingers through hair “as-if” they are the teeth of a comb, flapping arms in air “as-if” the wings of a bird, using a hand as a telephone, and sniffing gesture for “flower” or panting gesture for “dog”; Acredolo & Goodwyn, 1988; Hall et al., 2013). In-hand gestures were defined as representational gestures completed with an object held in hand (e.g., stirring imaginary food with a wooden spoon in a pot, talking on a toy telephone; drinking tea from an empty teacup; Namy et al., 2000, 2008).

To avoid artificial inflation of gestural use between play contexts, repeated deictic and iconic gestures were only counted as one gestural token (e.g., multiple points to the same object were counted as one deictic gesture; repeated sips of “tea” during a “tea party” were counted as one iconic gesture). The following gesture types were not coded: (i) non-manual gestures (e.g., facial expressions, eye gaze, posture), (ii) conventional non-verbal communicative acts (e.g., nod “yes”, gestures learned within the context of a song such as “star” in “Twinkle Twinkle Little Star”), (iii) emblematic gestures (e.g., unambiguous culturally specific gestures used to convey emotional content such as “thumbs up”), and (iv) beat gestures (e.g., hand movements that emphasise discourse elements of speech). These were not coded because, unlike deictic
and iconic gestures, they have not been shown to predict later language development, the topic of Chapter 8.

Due to the proposed bootstrapping function that gestures serve at a critical point in language development (Namy & Nolan, 2004), all gestures were further classified as produced co-temporally with speech (gesture + speech) or without speech (gesture only). Gesture + speech combinations included all communicative, meaningful vocalisations co-temporally occurring with gestures. These consisted of either English words (e.g., “bang”, “hot”, “bed”) or patterns of speech sounds consistently used to refer to a specific object or event (e.g., “te” for “teddy”) (e.g., see Iverson & Goldin-Meadow, 2005).

This coding scheme provided three broad measures of gesture, which were compared between play contexts: (i) the number of occurrences (tokens) of each gesture category (as a measure of quantity) (ii) the proportion of speech utterances accompanied by a gesture, and (iii) proportion of gestures occurring without speech. As subtypes of deictic gestures, declarative and imperative points were counted and computed as proportions of overall deictic gestures per condition. Similarly, in-hand and out-of-hand iconic gestures were calculated as proportions of overall iconic gestures. Overall inter-rater agreement between gesture presence and type was substantial, $\kappa = .655$ ($SE_\kappa = 0.06$, CI$_{95,.\kappa}[0.539, 0.771]$; Landis & Koch, 1977), (percentage agreement was 82.72%). Discrepancies were resolved via discussion with a third senior researcher who was blind to play conditions.

7.5 Results

This study aimed to investigate whether the contexts of symbolic and functional play results in differences in JA and gesture in naturalistic parent-infant interaction. The analysis strategy was the same as the one used in Chapter 6. That is, a series of two-tailed paired comparisons across play contexts were conducted and effect sizes are
reported. The data violated assumptions of normality required for dependent t-tests. Therefore, non-parametric Wilcoxon signed-rank tests (Wilcoxon, 1945) were used.  

While Wilcoxon signed-rank tests are usually reported with medians, means and standard deviations are also reported to indicate the range of data dispersion (Field, 2013). The significance level was set at .05.

**7.5.1 Joint attention.**

The number of episodes of JA a dyad engaged in was measured to provide a measure of how frequently JA was established in both play contexts. Every dyad engaged in at least one episode of JA in the testing session. However, there was an absence of JA across dyads in 15 functional play conditions and only one symbolic play condition. A Wilcoxon signed-rank test indicated that JA was established significantly more frequently in the symbolic play condition ($M = 5.49, SD = 3.64, M_{dn} = 4.50$; range = 16) than it was in the functional play condition ($M = 2.19, SD = 2.30, M_{dn} = 2.00$; range = 9), $z = 5.91$, $p < .001$, $r = .57$. This suggests that, compared with functional play, symbolic play provides a context in which parents and infants are more likely to engage in JA.

Data were then analysed to compare differences in the duration of time spent in JA between functional and symbolic play. To account for differences in the length of time each dyad spent in play interactions, the duration of time spent in JA was divided by the total interaction time for each condition. This provided a measure of the proportion of time spent in JA for each interaction, which was compared across play conditions. As evident in Figure 7.1, when accounting for differences in the duration of total play interactions, dyads spent proportionally more time in JA in the symbolic play versus the functional play context.

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4 Effect sizes for Wilcoxon signed-rank tests were calculated using the formula: $r = \frac{z}{\sqrt{\text{observations}}}$ (as recommended by Field, 2013) and is interpreted according to Cohen’s (1988) criteria (where .1 = small, .3 = medium, .5 = large).
A Wilcoxon signed-rank test indicated that the proportion of time spent in JA was significantly higher during the symbolic play condition ($M = 0.28$, $SD = 0.20$, $M_{dn} = 0.27$, range = 0.76) than it was during the functional play condition ($M = 0.10$, $SD = 0.13$, $M_{dn} = 0.06$, range = 0.55), $z = 5.95$, $p < .001$, $r = .57$. Therefore, parent-infant dyads were more likely to spend more time in JA when engaged in symbolic play compared to when they were engaged in functional play.

Overall, these results reveal specific differences in the quality of the interaction between a parent and their infant when they are engaged in different play contexts. Parent-infant dyads established JA more frequently and for longer periods of time in symbolic play than they did in functional play contexts. In fact, during symbolic play parents and their infants spent 28% of their time engaged in JA compared with only 10% of their time spent in JA in functional play. This suggests that there is something unique about the symbolic play interaction that encourages both the establishment and the maintenance of JA episodes between a parent and infant.
7.5.2 Gesture

The JA episodes were then analysed for the frequency and type of gestures used by parents and infants in each play condition. As gestures were only measured within JA episodes, dyads who did not establish JA were categorised as not gesturing within the conditions. This applied to 15 dyads within the functional play condition and one dyad within symbolic play condition. When JA was established, one dyad did not gesture at all, three infants did not gesture and every parent gestured at least once. Across conditions, 13 dyads did not gesture at all during functional play. Further, six parents did not gesture when their infants did (functional = 4, symbolic = 2), and 14 infants did not gesture despite their parents gesturing (functional = 13, symbolic = 1).

Overall, Wilcoxon signed-rank tests revealed that total gestural use during JA episodes was greater in symbolic play than functional play. Specifically, parents used significantly more gestures in JA episodes in the symbolic play condition ($M = 5.02$, $SD = 3.60$, $M_{dn} = 4.00$, range = 15) than they did in the functional play condition ($M = 1.19$, $SD = 2.22$, $M_{dn} = 0.00$, range = 11), $z = 5.76$, $p < .001$, $r = .55$. Infant gesture use was also significantly greater in JA episodes that occurred within symbolic play ($M = 6.02$, $SD = 4.56$, $M_{dn} = 5.00$, range = 19) than it was in functional play ($M = 0.56$, $SD = 1.25$, $M_{dn} = 0.00$, range = 6), $z = 6.10$, $p < .001$, $r = .59$. Therefore, within JA episodes, infants were exposed to a greater number of parental gestures and produced more gestures themselves in the symbolic play context compared to when they are engaged in functional play.

The data were then analysed to determine the distribution of gesture types, how frequently they were used, and if their use differed between JA episodes that occurred with functional and symbolic play contexts. The frequency of deictic (declarative, imperative) and iconic (in-hand, out-of-hand) gestures was counted and compared across conditions. Descriptive statistics and Wilcoxon signed-rank tests analyses for raw
scores are provided in Appendix D and Table D1. The prevalence of deictic and iconic gestures for parents and infants were then computed as proportions of overall gestures used within JA episodes to control for individual differences in gesture production. Wilcoxon signed-rank tests indicated that, for parents, a significantly greater proportion of iconic gestures were produced in the symbolic play condition ($M = 0.74, SD = 0.28, M_{dn} = 1.00, range = 1$) than the functional play condition ($M = 0.18, SD = 0.32, M_{dn} = 1.00, range = 1$), $z = 3.04, p = .001, r = .29$. Similarly, for infants, a significantly greater proportion of iconic gestures were produced in the symbolic play condition ($M = 0.74, SD = 0.28, M_{dn} = 1.00, range = 1$) compared to the functional play condition ($M = 0.19, SD = 0.39, M_{dn} = 1.00, range = 1$), $z = 2.84, p = .002, r = .27$. In contrast, a significantly greater proportion of deictic gestures were produced in the functional play condition compared with the symbolic play condition for both parents ($M = 0.82, SD = 0.32, M_{dn} = 1.00, range = 1$ and $M = 0.26, SD = 0.28, M_{dn} = 1.00, range = 1$), $z = 3.04, p = .001, r = .29$) and infants, ($M = 0.81, SD = 0.39, M_{dn} = 1.00, range = 1$ and $M = 0.26, SD = 0.28, M_{dn} = 1.00, range = 1$), $z = 2.84, p = .002, r = .27$, respectively.

The frequency of deictic gestures produced as declarative and imperative gestures and the frequency of iconic gestures produced as in-hand and out-of-hand gestures was then examined. Declarative and imperative gestures were computed as proportions of overall deictic gestures used within JA episodes. Likewise, in-hand and out-of-hand gestures were computed as proportions of overall iconic gestures used within JA episodes. These proportional data were compared for parents and infants across conditions. The results are presented in Figure 7.2.
Figure 7.2. Mean proportion of parent and infant gestures by gesture category and condition. *$p < .05$, exact two-tailed.

As shown in Figure 7.2, parents produced a significantly greater proportion of in-hand iconic gestures when engaged in symbolic play ($M = 0.89$, $SD = 0.27$, $M_{dn} = 1.00$, range = 1) compared to functional play ($M = 0.06$, $SD = 0.23$, $M_{dn} = 1.00$, range = 1), $z = 6.46$, $p < .001$, $r = .62$. This trend was replicated for infants, as a significantly greater proportion of iconic gestures were produced during symbolic play ($M = 0.87$, $SD = 0.34$, $M_{dn} = 1.00$, range = 1) compared to functional play ($M = 0.06$, $SD = 0.23$, $M_{dn} = 1.00$, range = 1), $z = 6.56$, $p < .001$, $r = .63$, respectively. This suggests that, during JA episodes, both parents and infants are more likely to use representational gestures with an object in hand more frequently in symbolic play than they are in functional play. No other comparisons were significant.
Parental and infant gestures were then analysed further in relation to their production with or without speech. The frequency of gesture-only and gesture + speech (required temporal overlap) combinations was counted, computed as proportions of gestures with and without speech acts, and compared between and within conditions. The results of these analyses are presented in Figure 7.3.

![Figure 7.3. Mean proportion of parent and infant gestures produced with and without speech by condition. Error bars are standard deviations.](image)

Figure 7.3 shows parent and infant gestures produced with and without speech as proportions of overall gesture use within JA episodes, across conditions. Wilcoxon signed-rank tests revealed that during JA episodes a significantly greater proportion of gestures were produced by parents with and without speech in the symbolic play condition ($M = 0.51, SD = 0.34; M_{dn} = 0.50, range = 1$, and $M = 0.41, SD = 0.33, M_{dn} = 0.42, range = 1$, respectively) than in the functional play condition ($M = 0.31, SD =$}
0.45, $M_{dn} = 0.00$, range = 1, and $M = 0.06$, $SD = 0.20$, $M_{dn} = 0.00$, range = 1, respectively), $z = 2.41$, $p = .015$, $r = .23$, and $z = 4.90$, $p < .001$, $r = .47$, respectively. Similarly, a significantly greater proportion of gestures were produced by infants with and without speech in the symbolic play condition ($M = 0.15$, $SD = 0.23$, $M_{dn} = 0.00$, range = 1, and $M = 0.74$, $SD = 0.34$, $M_{dn} = 0.85$, range = 1, respectively) compared to the functional play condition ($M = 0.04$, $SD = 0.19$, $M_{dn} = 0.00$, range = 1, and $M = 0.22$, $SD = 0.42$, $M_{dn} = 0.00$, range = 1, respectively), $z = 3.20$, $p = .001$, $r = .31$, and $z = 5.25$, $p < .001$, $r = .51$, respectively. This indicates that there is a propensity for parents and infants to gesture both with and without speech in the symbolic play condition compared to the functional play condition.

Figure 7.3 also shows the frequency of gesture-speech combinations within play contexts for parents and infants. Within JA episodes in the functional play condition, a significantly greater proportion of parent’s gestures were produced with speech than without speech, $z = 3.11$, $p = .001$, $r = .30$. Whereas, in symbolic play, a higher proportion of parental gestures were produced with speech than without speech, although this difference was not significant, $z = 1.13$, $p = .264$, $r = .11$. This suggests that within JA parental gestures occur more frequently during symbolic play than functional play and are just as likely to be produced with or without speech. In contrast, fewer parental gestures are produced in functional play and are more likely to be combined with speech than without speech.

The reverse finding was evident for infants. In JA episodes in the functional play condition, a significantly greater proportion of infants’ gestures were produced without speech than with speech, $z = 2.67$, $p = .013$, $r = .26$. A significantly greater proportion of infant gestures were also produced without speech than with speech in the symbolic play condition, $z = 5.39$, $p < .001$, $r = .52$. The size of these effects suggest that differences exist in infants’ use of gesture-alone and gesture-speech combinations.
between play contexts. Specifically, compared to functional play, infants are more likely
to produce more gestures in symbolic play and these gestures are more likely to be
produced without speech.

7.6 Discussion

Following on from the previous chapter’s exploration of verbal communicative
acts across play conditions, the current chapter explored how socio-cognitive
communicative acts differ during parent-infant interaction when the dyad is engaged in
symbolic play compared to when they are engaged in functional play. Two specific
hypotheses were tested. First, as the context of symbolic play requires on-going
negotiation of the pretence situation requiring advanced cognitive abilities, it was
hypothesised that JA episodes would be more frequent and of greater duration during
the symbolic play condition compared with the functional play condition. Second, due
to the ambiguous nature of what objects/events may represent, the frequency of overall
parental and infant gestures was expected to be greater in the symbolic play condition
compared with the functional play condition.

Both hypotheses were supported. First, JA was established more frequently and
episodes were longer in duration during symbolic play than functional play. The
ambiguous nature of the meaning of objects and events during symbolic play likely
promotes the frequency and duration of JA because episodes are more likely to be
established and sustained by the necessity to engage in the complex negotiation of
meaning (e.g., Rakoczy, 2007; Tomasello & Farrar, 1986). Rakoczy (2006, 2008)
argued that symbolic play unambiguously marks the infant’s capacity for collective
intentionality: the notion that as social agents we must represent others’ minds during
interaction. The finding that the symbolic play context elicited greater JA suggests that
this context may foster infants’ burgeoning ability to represent others’ minds in
interaction, a suggestion that is consistent with socio-cultural approaches to
development (e.g., Tomasello et al., 2005) and past empirical work (e.g., Charman et al., 2000). I return to this point in the General Discussion.

Second, parents and infants gestured more frequently during JA episodes that occurred within symbolic play than JA episodes that occurred within functional play, and the majority of these gestures were iconic gestures. This can be understood in terms of the instrumental role that parents play in their infants’ learning during play (e.g., Messer, 1994, Messer & Turner, 1993). During play, parents scaffold their child’s learning via communicative acts and the modelling of play behaviours (e.g., Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Tamis-LeMonda, Shannon, & Cabrera, & Lamb, 2004). The greater prevalence of parental gesture during symbolic play suggests that parents use different modalities to facilitate how their infant understands and navigates the ambiguous nature of a symbolic play situation (Saarni et al., 2007). This is consistent with the work conducted by Goldin-Meadow et al. (1999), who have found that parents use gesture to compliment and extend their child's understanding of concepts and ideas during interactions, which in turn leads to benefits in their child's language learning.

The higher prevalence of infant representational gestures during symbolic play also suggests that infants are more likely to attempt to express their understanding of the meaning of objects and interactions during symbolic play. In line with Nicolopoulou et al. (2015), gestures that are representational may be used by infants to convey their understanding of what an object may stand for and the nature of the pretend play scenario (e.g., I'm a shopkeeper selling you an apple). The function of gestures used within the functional play condition was very different to the function of gestures used during symbolic play. During the functional play context, the majority of gestures produced by parents and infants were deictic declarative gestures. That is, they were more likely to point to redirect their play partner's attention and/or provide information.
about the location of an object. This supports the idea that, during functional play, the rules of the interaction require no negotiation of meaning because they already exist as cultural norms (e.g., you shake the maraca) and as such do not require on-going negotiation between a parent and infant. However, the pretend play interaction is a fluid process and is not bound by these explicit rules (e.g., the maraca can be a lolly pop, or a microphone). During symbolic play, rules are only limited by the infant’s knowledge of and experience with objects and their capacity to communicate these with their play partner (Rakoczy, 2006, 2008). With limited verbal communication, the preverbal infant may more heavily rely on these types of gestures to convey their understanding of the play scenario to their parent. Therefore, it makes sense that representational gesture for both a parent and their infant is more frequent during symbolic play interactions as these gestures facilitate the exchange of meaning.

Third, parents’ overall gesture use was greater in symbolic play than functional play and this contributed to more gesture and speech combinations than gesture alone during symbolic play than during functional play. Parents were just as likely to use gestures with and without speech during symbolic play. However, the proportion of gestures used with speech rather than without speech was significantly greater in functional play. Therefore, although overall gesture use was lower during functional play compared with symbolic play, when gesture was used in functional play, it was more likely to be accompanied with speech. This is consistent with empirical evidence that supports play as a context which facilitates word-to-word mapping (Baldwin, 1993; Tomasello, Strosberg, & Akhtar, 1996). While they are not characteristic of the symbolic play context, these findings reveal more gesture-speech combinations overall in symbolic than functional play contexts. While it could be assumed that these gesture-speech combinations lead to greater opportunities for word-to-world mapping during symbolic interactions, word-to-world mapping is only achieved when the information in
the accompanying speech is redundant (e.g., says ‘microphone’ while pretending to sing into toy). As gesture and speech often do not convey the same information and the congruence of gesture-speech combinations was not analysed, it is not possible to conclude that symbolic play is a context which facilitates word-to-word mapping.

What can be concluded is that the use of gesture in symbolic play, particularly in-hand gestures, is consistent with the representative nature of symbolic play. It is possible that during symbolic play parents may use gesture to either replace or enrich verbal content (e.g., when saying “teddy is sleeping, he's tired” a father may pretend to put a blanket on teddy, and hold his fingers up to his mouth saying “shh”) (McNeill, 2005). This combination of gesture and speech conveys to the infant the parents’ understanding of what objects stand for (e.g., the red cloth is a blanket, the pot is a bed) and implicit social rules associated with the act (e.g., when someone is tired they go to bed, and others are quiet).

Consistent with the age of the children tested and empirical evidence that gesture use precedes spoken language (e.g., Acredolo & Goodwyn, 1988; Bates et al., 1979; Iverson & Goldin-Meadow, 2005; Kidd & Holler, 2009; Orr & Geva, 2015), infants produced significantly more gestures without speech than they did with speech in the symbolic play condition. These trends were also observed in the functional play context.

Some limitations merit comment. Overall, JA is rich in naturally occurring elements of dyadic interaction. To exclude parts of these elements (e.g., facial expressions, voice intonation, synchronicity of interaction) may have ignored important elements of JA, which may be associated with later language learning (the topic of Chapter 8). In addition, these results did not consider the sequence of interactions which may either foster or frustrate JA (e.g., who initiated and ended play). Research suggests that JA is influenced by whether the parent or infant initiates the episode (e.g.,
Tomasello & Farrar, 1986). Future designs may benefit from greater analysis of the socio-cognitive characteristics and overall synchronicity of dyadic interactions across play contexts. These analyses may provide insight into other characteristics that may contribute to the unique social ecology of the symbolic play context.

7.7 Synopsis and Outlook

There is a substantial amount of research documenting the importance of JA in a child’s healthy development. Importantly, this study extends this understanding by suggesting that some play contexts, in particular symbolic play, facilitate the establishment and maintenance of JA episodes, are associated with greater gesture use, and are characterised by the use of specific iconic gestures with an object in hand. The outstanding question is if the specific qualities characteristic of parent-infant interactions in symbolic play are indeed predictive of later language growth. This question will be addressed in Chapter 8.
Chapter 8

Empirical Study 4: Symbolic Play and Longitudinal Language Development

The research reviewed in Chapter 3 described a positive empirical relationship between play and language development, which Chapter 4 revealed is statistically robust both concurrently and longitudinally. Chapters 6 and 7 identified significant differences in the linguistic and socio-cognitive components of interaction between parents and their 18-month-old infants when they are engaged in symbolic play compared with functional play. Specifically, in symbolic play, infants hear more questions and participate in more complex conversations (Chapter 6), engage in longer and more frequent episodes of JA, and witness more iconic gestures, and parental gestures accompanied by speech (Chapter 7). Vygotsky (1962, 1978) and other socio-cultural theorists (e.g., Bruner, 1983; Rakoczy, 2008; Tomasello, 1999, 2003) argued for the importance of the symbolic play context. As verbal and socio-cognitive differences in parent-infant interactions within symbolic play are observed when compared to a closely related play context, the next step is to determine whether these differences have developmental implications for language. The current chapter investigated the extent to which these unique aspects of parent-infant interactions are associated with language proficiency in early childhood.

8.1 The Quality of the Parent-Infant Interaction and Language Development

The results from Chapters 6 and 7 suggest that parent-infant interactions during symbolic play can be characterised as a rich “conversational duet” (Hirsh-Pasek et al., 2015, p. 1082). The quality of the parent-infant interaction is a key factor in language development (e.g., Hoff, 2006; Snow, 1977). Recent findings suggest that the quality of the parent-child interaction acts to scaffold an infant’s engagement with shared objects, which support language learning over time (e.g., see Golinkoff et al., 2015; Hirsh-Pasek et al., 2015: Tamis-LeMonda, Kurchirko, & Song, 2014). When a parent and infant
establish a mutual understanding of the purpose and/or nature of objects, actions, and situations during symbolic play, they engage in on-going negotiations in meaning and co-operative action, which is argued to develop with additional communicative skills such as turn-taking (Rakoczy, 2008). This on-going negotiation leads to greater interactional complexity and is furnished by the use of specific verbal and socio-cognitive communicative acts. Elements of this parent-infant interaction may serve to increase the complexity of play and language behaviours, leading to important developments in both domains.

Kuhl (2007) suggests that the way that language is used within social interactions promotes language learning. Parents in Western Industrial societies actively work to engage their child in conversation (though this varies with socio-economic status, Golinkoff, 1986; Snow, 1977). One way in which parents maintain, expand, and repair conversations with their children is via the use of interrogatives (Bornstein et al., 2008; Rowland et al., 2003). Studies have shown that the use of interrogatives is correlated with children’s language outcomes (Tardif, Shatz, & Naigles, 1997). For instance, the frequency of mothers’ open-ended wh-questions at 26 months is a significant predictor of language production four months later at 30 months (Hoff-Ginsberg, 1985). Similarly, the frequency of mothers’ use of wh-words is predictive of how a child learns to use wh- questions between 18 -36 months (Rowland et al., 2003).

In contrast, Fekonja et al. (2005) found that the use of yes/no-questions only encouraged minimal responses from children, which they described as hindering rather than encouraging a child’s expression of language. Thus, it appears that the way parents use language during parent-infant interactions can encourage infant involvement in conversation to differing degrees, such that frequent utterance types like imperatives, yes/no- and wh- questions fall on a continuum. For example, imperatives require a behavioural response (e.g., in response to “get that block” an infant picks up the block),
*yes/no*- questions require a minimal and often verbal response (e.g., to the question “Do you like tea?” an infant will respond “yes or no”), and *wh*-questions require a more elaborate response from infants (e.g., to the question “Who is coming for tea?” an infant may say “teddy” or “daddy”). Parental use of language that seeks to control a child’s behaviour (e.g., imperatives) is unlikely to have the same predictive relationship with language development as language that restricts children’s role in conversation (e.g., yes/no-questions), and language that elicits more complex responses and draws children into the conversation (e.g., Cristofaro & Tamis-LeMonda, 2011; Leech et al., 2013; Rowland et al., 2003).

In a recent study, Hirsh-Pasek et al. (2015) reported associations between parent-infant co-constructed conversations during free play and language development. The authors analysed parent-infant (24-month-olds) interactions with three sets of toys to see if the quality of interactions (i.e., the use of conversation to scaffold object engagement, sharing familiar routines, and the mutual negotiation of play situations) predicted language growth in a sample of low SES dyads. They found that the quality of interactions accounted for more of the variance in infant language growth than did the quantity of language (i.e., an observational measure of mothers’ words per minute) children heard during these interactions. The authors concluded that engaging children in conversation, irrespective of SES, is beneficial to language development. Therefore, the co-construction of conversation appears to be beneficial to language learning over time. However, the authors did not explore if the co-construction of conversations differed when parent-infant dyads played with the three sets of toys. Therefore, it is still unknown if parents and infants co-construct conversations differently across play contexts, and how these differences may contribute to language acquisition.

Additionally, empirical studies report that JA and gesture play an important role in children’s emerging language abilities (e.g., JA: Baldwin, 1993; Carpenter, Nagell, et
al., 1998; Delgado et al., 2002; Markus et al., 2000; Smith et al., 1988; Tomasello & Todd, 1983; Tomasello & Farrar, 1986; Tomasello et al., 1986; and Gesture: Acredolo & Goodwyn, 1988; Bates et al., 1979; Capirci et al., 1996, 2005; Iverson, Capirci, & Caselli, 1994; O’Reilly, Painter, & Bornstein, 1997; Özçalışkan & Goldin-Meadow, 2005; Pizzuto & Capobianco, 2005; Rowe & Goldin-Meadow, 2009; Rowe, Özçalışkan, & Goldin-Meadow, 2008). Therefore, if differences in JA and gesture use are characteristic of parent-infant interactions within the symbolic play context, it is possible that these differences will be associated with later language acquisition.

8.2 Current Study

The current chapter examines whether verbal and socio-cognitive behaviours that significantly differ between symbolic play and functional play conditions predicted infant’s language acquisition concurrently at 18 months and longitudinally at 21 and 24 months. There were three hypotheses. First, as symbolic play is characterised by the ongoing negotiation of meaning and cooperation, it was hypothesised that interactional complexity (as assessed through conversational turns) would be associated with greater infant language development over time. Second, due to the complex negotiations required within symbolic play, it was hypothesised that the two interrogative types (wh- and yes/no-questions) characteristic of the symbolic play condition would be positive predictors of infant language (Hoff-Ginsberg, 1985; Rowland et al., 2003; Tardif et al., 1997). The final prediction was that JA and gesture would be associated with infant language growth over time. This was predicted because an infant’s ability to engage in JA is a precondition of symbolic play and both gesture and JA promote emerging infant language (Carpenter et al., 1998; Moll & Tomasello, 2007; Saarni, Campos, Camras, & Witherington, 2007).
8.3 Method

8.3.1 Participants

This study was based on the full range of data obtained when infants were 18 months (range = 16.58 to 20.26 months, \( M = 18.32, SD = 0.98 \)), 21 months (range = 19.68 to 23.32 months, \( M = 21.29, SD = 0.97 \)), and 24 months (range = 22.71 to 26.42 months, \( M = 24.28, SD = 1.01 \)). Fifty-two participants completed all testing sessions (two dyads did not respond to contact from the researcher following the first session). All parents were primary caregivers (49 mothers, 3 fathers) of their biological infants (30 girls, 22 boys).

8.3.2 Design

The current study had a correlational design with concurrent and longitudinal analyses. Indices of infant language growth over 3 (production vocabulary) and 6 months (production vocabulary and syntax, as measured by the MB-CDI) served as outcome variables. The dependent variables of CDS that distinguished between the two play conditions (functional, symbolic, see Chapters 5 – 7) were collapsed across play conditions to provide independent variables that were indicative of overall production during full play sessions. These independent variables were: the two interrogative types (\( wh \)- and yes/no- questions) and mimetics that were characteristic of the symbolic play condition and the three utterance types characteristic of the functional play condition (naming, declaratives, and imperatives). Therefore, the analyses reported in this chapter aimed to identify those variables that differ across symbolic and functional play which are associated with the infants’ language development.\(^5\)

\(^5\) It is important to emphasise that the analysis process had multiple steps. First, as outlined in Chapters 6 and 7, the unique linguistic and socio-cognitive features of symbolic and functional play were identified. For instance, there were more conversational turns in symbolic play. In order to determine whether overall conversational turns (i.e., those produced across both play contexts) had an impact on the infants’ language development I investigated whether they were correlated with measures of infant language. Overall measures were used under the assumption that these variables do not qualitatively differ across contexts, but in their frequency of use. If the correlation was significant the variable was entered into subsequent regression equations.
As in previous analyses, variables were proportions of total parental utterances to control for individual differences in parental language production. However, in contrast to previous analyses, these variables were measures of overall production for full play sessions rather than play conditions. Socio-cognitive behaviours served as independent variables in separate analyses: JA (duration, frequency), and gesture use (parental and infant overall and in-hand).

Simple correlations were used to examine associations between infant language proficiency and the verbal and socio-cognitive variables of play interactions identified as characteristic of the symbolic and functional play contexts. This correlational analysis was used to identify variables significantly correlated with infant language development as predictor variables for further analyses. Multiple linear regression was then used to model the effects of each of these variables to predict infant language production and comprehension as measured by the MB-CDI. Data were analysed maintaining significance at an alpha level of .05 with SPSS 22 (2013).

8.4 Results

These analyses aimed to examine the predictive ability of variables characteristic of symbolic and functional play contexts in infants’ concurrent and longitudinal language development. A correlational analysis of all variables was conducted to identify which overall variables were associated with later language development. Multiple regression analyses were then used to assess whether specific verbal and socio-cognitive acts characteristic of symbolic and functional play contexts at the time of testing (18 months) predicted infant linguistic knowledge (as measured by the MB-CDI) concurrently at 18 months, and whether they predicted language growth three (21 months) and six months after testing (24 months).

Independent (predictor) language variables were proportions of total parental utterances across full play sessions to control for individual differences in parental
language production. The social-cognitive variables of JA (frequency and duration) and parental and infant gesture (total and iconic in-hand) were also calculated as proportions of total interaction duration and parental and infant in-hand gesture variables were proportions of total parental and infant gesture use to control for individual differences in interaction duration and total gesture use. For the concurrent regression analysis at the 18-month time point, total MB-CDI vocabulary scores were used as the DV. For the longitudinal regression analyses, the DVs were difference scores capturing language growth. Language production MB-CDI scores at time 1 (18 months) were subtracted from scores at time 2 (21 months) and time 3 (24 months). Due to the assumption that infants are only just beginning to combine words at 18 months (Capirci et al., 1996), a syntactic complexity growth score was not calculated. Therefore, infant syntactic complexity scores as measured by the MB-CDI at 21 and 24 months served as the dependent variables in these analyses.

Prior to conducting the main analyses, normality was checked for all variables through a visual scan of distributions via scatter plots and histograms, and Kolmogorov-Smirnov and Shapiro-Wilk tests of normality. The results indicated that age at time 1, yes/no-questions, overall interrogatives, declaratives, and imperatives did not significantly deviate from a normal distribution (p > .117). The following variables violated the assumption of normality: wh-questions, mimetics, conversational turns, 18 and 24 month vocabulary production, 21 and 24 month syntactic complexity, complexity growth at 24 months, JA duration and frequency, and total gesture use variables (infant and parent) were positively skewed and the in-hand gesture variables (infant and parent) were negatively skewed. A square-root transformation was computed for these variables (reverse-scored first for in-hand gesture variables; as recommended for skewed data, Field, 2013). With the exception of 21 and 24 month syntactic complexity, total parent gestures and parent and infant in-hand gesture
variables (Shapiro-Wilk ≥ .75, p ≤ .040) all other variables were non significant after transformation (Shapiro-Wilk ≥ .96, p ≥ .062). As it is not essential that predictors are normally distributed for simple linear regression (Field, 2013), all gesture variables were analysed without transformation.

8.4.1 Verbal and socio-cognitive acts and infant’s linguistic knowledge:
Correlations.

Simple correlations were used to examine associations between parental language use and socio-cognitive acts and infant’s linguistic knowledge at 18 months (gesture use, vocabulary production and vocabulary comprehension scores as measured by scores on the MB-CDI at 18 months), 21 months (vocabulary production and syntax as measured by scores on the MB-CDI at 21 months and a difference score between MB-CDI vocabulary production scores measured at 18 months and 21 months), and 24 months of age (vocabulary production and syntax as measured by scores on the MB-CDI at 24 months and a difference score between MB-CDI vocabulary production scores measured at 18 months and 24 months). Results of these analyses are presented in Table 8.1.
Table 8.1

Simple Bivariate Correlations between Verbal and Socio-Cognitive Acts and Infant’s Linguistic Knowledge over Time

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Socio-cognitive</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WHQ YNQ DEC IMP</td>
<td>Conv MIM</td>
<td>JA Duration</td>
<td>JA Frequency</td>
<td>Total Gestures</td>
<td>Total Gestures</td>
<td>In-hand Parent</td>
<td>In-hand Infant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Parent rs</td>
<td>Infant rs</td>
<td>Parent rs</td>
<td>rs</td>
</tr>
<tr>
<td>18 mths</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB-CDI Gestures ≥</td>
<td>.04</td>
<td>.18</td>
<td>.13</td>
<td>- .19</td>
<td>.32*</td>
<td>.23#</td>
<td>.03</td>
<td>-.05</td>
<td>.15</td>
</tr>
<tr>
<td>Production</td>
<td>.14</td>
<td>.05</td>
<td>-.10</td>
<td>-.28*</td>
<td>.39**</td>
<td>.53***</td>
<td>-.05</td>
<td>-.12</td>
<td>-.03</td>
</tr>
<tr>
<td>Comprehension</td>
<td>.21</td>
<td>.08*</td>
<td>-.12</td>
<td>-.18</td>
<td>.36*</td>
<td>.45***</td>
<td>.02</td>
<td>-.04</td>
<td>.14</td>
</tr>
<tr>
<td>21 mths</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Production</td>
<td>.03</td>
<td>.12</td>
<td>.04</td>
<td>-.31*</td>
<td>.20</td>
<td>.46***</td>
<td>-.09</td>
<td>-.13</td>
<td>-.06</td>
</tr>
<tr>
<td>Complexity, rs</td>
<td>.04</td>
<td>-.06</td>
<td>-.03</td>
<td>-.35*</td>
<td>.27*</td>
<td>.33*</td>
<td>-.30*</td>
<td>-.29*</td>
<td>-.24#</td>
</tr>
<tr>
<td>Vocab Growth</td>
<td>-.14</td>
<td>.11</td>
<td>.15</td>
<td>-.29*</td>
<td>.09</td>
<td>.31*</td>
<td>-.04</td>
<td>-.11</td>
<td>-.01</td>
</tr>
<tr>
<td>24 mths</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>.07</td>
<td>.11</td>
<td>.002</td>
<td>-.43**</td>
<td>.27*</td>
<td>.55***</td>
<td>.07</td>
<td>-.03</td>
<td>.08</td>
</tr>
<tr>
<td>Vocab Growth</td>
<td>-.06</td>
<td>.10</td>
<td>.07</td>
<td>-.41**</td>
<td>.18</td>
<td>.42**</td>
<td>.16</td>
<td>.03</td>
<td>.16</td>
</tr>
<tr>
<td>Complexity, rs</td>
<td>.21</td>
<td>.30*</td>
<td>-.04</td>
<td>-.49***</td>
<td>.10</td>
<td>.50***</td>
<td>-.04</td>
<td>-.10</td>
<td>-.12</td>
</tr>
</tbody>
</table>

Note: * = p ≤ .10 ≥ .05, ** = p ≤ .01, *** = p ≤ .001; two-tailed. ^ = Later Gesture Use as measured by the MB-CDI. Correlations are Pearson’s r unless otherwise stated. Spearman’s rho = r. Shaded areas emphasise significant associations.
These results revealed two clear associations between properties of parent-infant interaction at 18-months and infant’s language development. Firstly, conversational turns were positively associated with infant’s spoken language development both concurrently and longitudinally. This was true for both vocabulary and syntax. Secondly, parental use of imperatives was negatively associated with infant’s spoken language development concurrently and longitudinally. Once again this was true for vocabulary and syntax.

Yes/no-questions were the only interrogative significantly associated with infant language development. Specifically, yes/no-questions were positively associated with syntactic knowledge at 24 months. Parental use of mimetics was positively associated with 18-month language production and comprehension. Parental use of mimetics was also the only variable significantly associated with infant gesture use at 18 months. All other associations were not significant.

Simple correlations conducted between socio-cognitive variables of play interactions and infant language proficiency revealed few significant associations and these were only evident when infant language was measured at 21 months. There was a significant negative association between complexity scores at 21 months and JA duration and frequency. The only significant positive association between socio-cognitive variables and infant language measures was between infant syntax at 21 months (as measured by MB-CDI complexity scores) and in-hand infant gestures. All other associations were not significant.

Overall, these results suggest four variables (conversational turns, parental use of imperatives, yes/no-questions, and mimetics) are associated with infants’ language development. The next set of analyses used linear multiple regression to examine the extent to which these variables are predictive of (i) infants’ concurrent linguistic knowledge at time 1, and (ii) later language growth when accounting for infant age and language production at time 1.
The relevant assumptions for multiple regression were met. The sample size of 52 was deemed adequate given the number of independent variables included in the analyses (Tabachnick & Fidell, 2001). Singularity was met as independent variables included in the analysis were not combinations of other independent variables. An examination of correlations revealed that no independent variables were highly correlated. Collinearity statistics (e.g., Tolerance and VIF) were within accepted limits (Bowerman & O'Connell, 1990; Menard, 1995; Myers, 1990), and the assumption of multicollinearity was met (Coakes, 2005; Hair et al., 1998). Extreme univariate and multivariate outliers identified in initial data screening were removed from analyses. Following these steps, residual and scatter plots indicated the assumptions of normality, linearity and homoscedasticity were satisfied (Hair et al., 1998; Pallant, 2001).

Conversational turns and imperatives were added as predictor variables in regression analyses to examine their unique contribution to infant linguistic knowledge at 18, 21, and 24 months of age, mimetics and yes/no-questions were added as predictor variables at 18 and 24 months, respectively. Analyses controlled for infants' vocabulary (as measured by MB-CDI vocabulary production scores) and infant age (days) at time of testing by adding these as predictor variables in the first block of each regression analysis. Consistent with previous studies in developmental psychology (e.g., Hartmann & George, 1999), infant chronological age (days) was used as a proxy variable for cognitive development.

8.4.2 Concurrent predictors of Infant Language at 18 months.

The first analysis was a two-step multiple regression examining whether conversational turns, imperatives, and mimetics explained additional variance in infant language production (as measured by the MB-CDI) at 18 months over and above infant age at time 1. Results are reported in Table 8.2.
As per Table 8.2, in Block 1 infant age at time 1 did not account for a statistically significant proportion (7%) of the variance in infant vocabulary at 18 months, \(F(1, 49) = 3.64, p = .062\). The addition of conversational turns, imperatives, and mimetics in Block 2 accounted for an additional 33.5% of the variance \((R^2 = .40, \text{Adjusted } R^2 = .34, SE = 2.52)\) in infant language vocabulary. This was a significant improvement compared with Model 1, \(\Delta F(4, 45) = 6.33, p < .001\). Infant age, conversational turns and mimetics were unique positive predictors of 18 month infant vocabulary production (as measured by scores on the MB-CDI). Imperatives were a negative predictor of infant vocabulary; however, their contribution to the model was not significant.

### 8.4.3 Predictors of Infant Language Development at 21 months.

A two-step multiple regression was conducted to examine if overall imperatives and conversational turns explained additional variance in infant language production at 21 months (as measured by the MB-CDI) over and above growth in vocabulary production and infant age at time of testing. Mimetics were not included in subsequent analyses because the
correlational analyses suggested that they were not significantly associated with language beyond 18-months. Results are reported in Table 8.3.

Table 8.3

*Multiple Regression for Verbal Acts and Infant Vocabulary Production Growth at 21mths*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>CI95 for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.44</td>
<td>212.12</td>
<td>0.01</td>
<td>.995</td>
<td>-425.06</td>
<td>427.95</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>13.59</td>
<td>3.28</td>
<td>.54</td>
<td>4.15</td>
<td>.000</td>
<td>7.00</td>
</tr>
<tr>
<td>T1 age</td>
<td>.07</td>
<td>.40</td>
<td>.02</td>
<td>0.17</td>
<td>.864</td>
<td>-.73</td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>97.26</td>
<td>225.17</td>
<td>0.43</td>
<td>.668</td>
<td>-355.99</td>
<td>550.52</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>12.06</td>
<td>3.67</td>
<td>.48</td>
<td>3.29</td>
<td>.002</td>
<td>4.67</td>
</tr>
<tr>
<td>T1 age</td>
<td>-.05</td>
<td>.41</td>
<td>-.02</td>
<td>-0.12</td>
<td>.908</td>
<td>-.86</td>
</tr>
<tr>
<td>Conv turns</td>
<td>1.97</td>
<td>5.76</td>
<td>.05</td>
<td>0.34</td>
<td>.734</td>
<td>-.96</td>
</tr>
<tr>
<td>Imperatives</td>
<td>-363.76</td>
<td>282.13</td>
<td>-.17</td>
<td>-1.29</td>
<td>.204</td>
<td>-931.66</td>
</tr>
<tr>
<td>N = 51</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Note: p = significance < .05, two-tailed.*  
*Block 1 $R^2 = .31$ $SE = 77.25$ Block2 $R^2 = .34.  

As per Table 8.3, in Block 1 infant vocabulary production and age at time of testing accounted for a statistically significant proportion (31%) of the variance in infant language growth at 21 months, $F(2, 48) = 10.54, p < .001$. The addition of imperatives and conversational turns in Block 2 accounted for an additional 3% of the variance ($R^2 = .34$, Adjusted $R^2 = .28, SE = 77.17$) in infant language growth. This was not a significant improvement compared with Model 1, $\Delta F (2, 46) = 1.05, p = .359$. Imperatives and conversational turns were not unique predictors of 21-month infant vocabulary growth.

A regression analysis was repeated to examine if conversational turns and imperatives significantly predicted infants’ syntactic complexity (as measured by the MB-CDI) at 21 months. Results are presented in Table 8.4.
Table 8.4

*Multiple Regression for Verbal Acts and Language Complexity at 21mths*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
<th>CI$_{95}$ for $B$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block 1</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.08</td>
<td>8.76</td>
<td>0.35</td>
<td>.727</td>
<td>.000</td>
<td>-14.58, 20.74</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>0.97</td>
<td>0.17</td>
<td>.69</td>
<td>5.60</td>
<td>.000</td>
<td>0.62, 1.32</td>
</tr>
<tr>
<td>T1 age</td>
<td>-0.01</td>
<td>0.02</td>
<td>-.09</td>
<td>-.74</td>
<td>.465</td>
<td>-.05, 0.02</td>
</tr>
<tr>
<td><strong>Block 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>8.13</td>
<td>9.26</td>
<td>0.88</td>
<td>.385</td>
<td>.672</td>
<td>-10.55, 26.82</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>0.91</td>
<td>0.18</td>
<td>.65</td>
<td>4.97</td>
<td>.000</td>
<td>0.54, 1.29</td>
</tr>
<tr>
<td>T1 age</td>
<td>-0.12</td>
<td>0.02</td>
<td>-.12</td>
<td>-.94</td>
<td>.353</td>
<td>-.05, 0.02</td>
</tr>
<tr>
<td>Conv turns</td>
<td>-0.10</td>
<td>0.23</td>
<td>-.05</td>
<td>-.43</td>
<td>.672</td>
<td>-.57, 0.37</td>
</tr>
<tr>
<td>Imperatives</td>
<td>-18.40</td>
<td>11.49</td>
<td>-.20</td>
<td>-1.60</td>
<td>.117</td>
<td>-41.58, 4.77</td>
</tr>
<tr>
<td>$N = 48$</td>
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<td></td>
</tr>
</tbody>
</table>

Note: $p = significance < .05$, two-tailed. * Block 1 $R^2 = .43$, Block 2 $R^2 = .47$.

As per Table 8.4, Block 1 with vocabulary production and infant age at time of testing was statistically significant, $F(2, 44) = 16.88$, $p < .001$, and accounted for approximately 43% of the variance in infant syntactic complexity at 21 months ($R^2 = .43$, Adjusted $R^2 = .41$, $SE = 3.06$). Vocabulary production was a significant contributor to the model, but age at testing was not. The addition of conversational turns and imperatives in Block 2 did not account for a significant amount of variance (an additional 3%; $R^2 = .47$, Adjusted $R^2 = .42$, $SE = 3.04$) in infant syntactic complexity at 21 months. Infant vocabulary at 18 months remained the only significant and unique predictor of infant syntactic complexity.
8.4.4 Predictors of Infant Language Development at 24 months.

The next regression examined the predictive power of conversational turns and imperatives in infant language growth 6 months after the first testing session. Results for this analysis are presented in Table 8.5.

Table 8.5

*Multiple Regression for Verbal Acts and Vocabulary Production Growth at 24mths*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>CI_{95} for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>Constant</td>
<td>272.06</td>
<td>314.84</td>
<td>0.86</td>
<td>.392</td>
<td>.14</td>
<td>905.44</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>9.80</td>
<td>4.80</td>
<td>.31</td>
<td>2.04</td>
<td>.047</td>
<td>19.45</td>
</tr>
<tr>
<td>T1 age</td>
<td>-.12</td>
<td>.59</td>
<td>-.03</td>
<td>-0.21</td>
<td>.833</td>
<td>-1.31</td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>559.60</td>
<td>296.31</td>
<td>1.89</td>
<td>.065</td>
<td>.281</td>
<td>1156.40</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>2.01</td>
<td>4.77</td>
<td>.06</td>
<td>0.42</td>
<td>.676</td>
<td>11.61</td>
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<tr>
<td>T1 age</td>
<td>-.57</td>
<td>.53</td>
<td>-.15</td>
<td>-1.09</td>
<td>.281</td>
<td>.49</td>
</tr>
<tr>
<td>Conv turns</td>
<td>15.57</td>
<td>7.57</td>
<td>.31</td>
<td>2.06</td>
<td>.045</td>
<td>30.82</td>
</tr>
<tr>
<td>Imperatives</td>
<td>-1066.64</td>
<td>372.96</td>
<td>-.39</td>
<td>-2.86</td>
<td>.006</td>
<td>-315.47</td>
</tr>
</tbody>
</table>

N = 50

*Note: p = significance < .05, two-tailed. Block 1 R^2 = .09, SE = 113.68; Block2 R^2 = .33.*

As per Table 8.5, infant vocabulary production was a unique predictor of infant language development at 24 months, whereas age at time of testing was not. Together in Block 1, these variables did not account for a statistically significant proportion (9%) of the variance in infant language growth at 24 months, $F(2, 47) = 2.27, p = .115$. However, infant vocabulary production was no longer a significant predictor when conversational turns and imperatives were added to Block 2. These two language variables accounted for an additional 24% ($R^2 = .33$, Adjusted $R^2 = .27$) of the variance in infant’s language growth compared with Model 1, $\Delta F (2, 45) = 8.23, p = .001, SE = 99.42$. This difference was a significant
improvement in the model. Conversational turns was a unique positive predictors and imperatives a unique negative predictor of infant language growth over and above infant language proficiency and age at time 1 of testing.

A final regression analysis was run to explore if conversational turns and imperatives significantly predicted infants’ syntactic complexity (as measured by scores on the MB-CDI) at 24 months. Results of this analysis are reported in Table 8.6.

Table 8.6

*Multiple Regression for Verbal Acts and Infant Syntactic Complexity at 24mths*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-17.49</td>
<td>21.71</td>
<td>-0.81</td>
<td>.424</td>
<td>.424</td>
<td>-61.12</td>
<td>26.14</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>1.63</td>
<td>0.33</td>
<td>.59</td>
<td>4.90</td>
<td>.000</td>
<td>0.96</td>
<td>2.30</td>
</tr>
<tr>
<td>T1 age</td>
<td>0.03</td>
<td>0.04</td>
<td>.09</td>
<td>0.70</td>
<td>.488</td>
<td>-0.05</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Block 2</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.12</td>
<td>21.77</td>
<td>-0.01</td>
<td>.996</td>
<td>.996</td>
<td>-43.94</td>
<td>43.71</td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>1.34</td>
<td>0.36</td>
<td>.48</td>
<td>3.77</td>
<td>.000</td>
<td>0.63</td>
<td>2.05</td>
</tr>
<tr>
<td>T1 age</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.03</td>
<td>-0.25</td>
<td>.804</td>
<td>-0.09</td>
<td>0.07</td>
</tr>
<tr>
<td>Convt turns</td>
<td>0.63</td>
<td>0.56</td>
<td>.14</td>
<td>1.14</td>
<td>.260</td>
<td>-0.49</td>
<td>1.75</td>
</tr>
<tr>
<td>Imperatives</td>
<td>-51.43</td>
<td>27.17</td>
<td>-0.22</td>
<td>-1.89</td>
<td>.065</td>
<td>-106.12</td>
<td>3.25</td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>27.61</td>
<td>16.94</td>
<td>.18</td>
<td>1.63</td>
<td>.110</td>
<td>-6.49</td>
<td>61.72</td>
</tr>
<tr>
<td>N = 49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: p = significance < .05, two-tailed. * Block 1 $R^2 = .49$, Block2 $R^2 = .59.$

As reported in Table 8.6, Block 1 with vocabulary production and infant age at time of testing was statistically significant, $F(2, 46) = 15.97$, $p < .001$, and accounted for approximately 40% of the variance in infant syntactic complexity at 24 months ($R^2 = .40$, Adjusted $R^2 = .37$, $SE = 7.93$). Vocabulary production was a significant contributor to the model, but age at testing was not. The addition of conversational turns, imperatives, and yes/no-questions to Block 2, accounted for a significant amount of variance (an additional
10%; $R^2 = .50$, Adjusted $R^2 = .44$, $SE = 7.45$) in infant syntactic complexity at 24 months. Model 2 identified one unique predictor of infant syntactic complexity at 24 months, vocabulary production at time 1. Conversational turns, imperatives, *yes/no*-questions, and age at time 1 did not explain unique variance in infant syntactic complexity at 24 months$^6$.

Due to the age of testing at time 3 (approximately 24 months), some infants were yet to reach multi-word utterances. Consequently, 17 infants scored equal to or less than four on the MB-CDI measure of syntactic complexity (nine infants scored zero). This is likely to have weakened the analysis of the predictive ability of variables of parent-infant interaction to predict infant syntactic complexity at 24 months. Therefore, a binary logistic regression was then performed to assess the influence of interrogatives, imperatives and conversational turns on the likelihood that infants would report higher or lower levels of syntactic complexity at 24 months. A median split was conducted on MB-CDI scores of time 3 complexity into higher and lower levels of syntactic proficiency ($M_{dn} = 9.5$). The model contained five independent variables (time 1 vocabulary production, age at time 1, *yes/no*-questions, imperatives, and conversational turns). The full model containing all predictors was statistically significant, $\chi^2(5, N=50) = 53.68$, $p <.001$, indicating that the model could distinguish between infants who reported higher and lower levels of syntactic complexity 6 months after initial testing. The model as a whole explained between 65.8% (Cox and Snell R square) and 87.8% (Nagelkerke R squared) of the variance in levels of syntactic complexity, and correctly classified 90.0% of cases. These results are presented in Table 8.7.

$^6$ All multiple regression results held when accounting for number of days infants spent in childcare per week.
Table 8.7

**Binary Logistic Regression for Verbal Acts and Language Complexity at 24mths**

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>Wald's $\chi^2$</th>
<th>df</th>
<th>$p$</th>
<th>$e^\beta$ (odds ratio)</th>
<th>CI 95 for $e^\beta$ Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block 0</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.08</td>
<td>.28</td>
<td>.08</td>
<td>1</td>
<td>.777</td>
<td>1.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>7.32</td>
<td>14.00</td>
<td>.27</td>
<td>1</td>
<td>.601</td>
<td>1502.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 vocab production</td>
<td>1.90</td>
<td>.92</td>
<td>4.29</td>
<td>1</td>
<td>.038</td>
<td>6.69</td>
<td>1.11</td>
<td>40.41</td>
</tr>
<tr>
<td>T1 age</td>
<td>-.04</td>
<td>.04</td>
<td>1.45</td>
<td>1</td>
<td>.229</td>
<td>.96</td>
<td>.89</td>
<td>1.03</td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>.08</td>
<td>.04</td>
<td>3.70</td>
<td>1</td>
<td>.055</td>
<td>1.09</td>
<td>1.00</td>
<td>1.19</td>
</tr>
<tr>
<td>Imperatives</td>
<td>-.28</td>
<td>.13</td>
<td>4.71</td>
<td>1</td>
<td>.030</td>
<td>.75</td>
<td>.58</td>
<td>.97</td>
</tr>
<tr>
<td>Conv turns</td>
<td>.64</td>
<td>.52</td>
<td>1.53</td>
<td>1</td>
<td>.216</td>
<td>1.90</td>
<td>.69</td>
<td>5.27</td>
</tr>
</tbody>
</table>

*Note: p = significance < .05, two-tailed.*

Table 8.7, shows vocabulary production at time 1 and imperatives made unique statistically significant contributions to the model, recording odds ratios of 6.69 and 0.75 respectively. *Yes/no*-questions approached significance as a unique positive predictor of infant syntactic complexity. Conversational turns did not provide a unique contribution as a predictor of infant syntactic complexity. The odds ratios suggest that increasing vocabulary production at time 1 is associated with an increased likelihood of infants having higher levels of syntactic complexity at time 3. Conversely, as the reported odds ratio for imperatives is below one (0.91) this suggests that increasing imperatives at time 1 is associated with a reduction in the likelihood of reporting higher syntactic complexity at time 3 (6 months after testing).

### 8.5 Discussion

Following on from the previous two chapters, the current study aimed to explore the ability of verbal and socio-cognitive acts characteristic of symbolic play versus functional
play to predict concurrent and longitudinal language acquisition. Three overall predictions were explored: (i) interactional complexity (as assessed through conversational turns) and (ii) the two interrogative types (wh- and yes/no- questions) were expected to positively predict infant language growth, and (iii) JA and gesture were examined for their contribution to predicting emerging infant language. The general conclusion is that different play contexts elicit different patterns verbal and socio-cognitive behaviours and some of these are predictive of infant language acquisition over and above age and language proficiency.

### 8.5.1 Language variables.

The analyses revealed two clear associations between the linguistic properties of parent-infant interaction at 18-months and subsequent language acquisition. The most consistent association was evident with conversational turns. In fact, the number of conversational turns in play interactions was significantly and positively associated with all measures of infants’ linguistic knowledge at 18, 21, and 24 months. In Chapter 6 it was suggested that unique patterns of parental language found in the symbolic play context (i.e., increased number of conversational turns and the higher use of interrogatives) were due to the need for on-going negotiation of meaning and cooperation (Rakoczy, 2006, 2008). The current chapter adds to these findings by revealing that one index of interaction, conversational turns, predicts subsequent language development (Hoff, 2006; Snow, 1977). These findings extend those reported by Golinkoff et al. (2015) and Hirsh-Pasek et al. (2015) by focusing on the specific qualities of the parent-child interaction that facilitate infant language learning and by revealing symbolic play as a specific context that encourages a conversational duet (Hirsh-Pasek et al., 2015, p. 1082) between parent-infant dyads.

The negative association between the proportion of imperatives in CDS and all infant language measures, with the exception infant comprehension at 18 months, further supports the role of the conversational duet as a primary platform for language learning (Golinkoff et
al., 215; Hoff, 2006; Hirsh-Pasek et al., 2015; Snow, 1977). Imperatives act to direct a child’s behaviour rather than include them in conversation (Barnes, et al., 1983). Parental use of imperatives is frequent with preverbal infants as they require less of a response from the infant than do interrogatives, which demand higher information processing (Barnes, et al., 1983; Blount, 1972; Cristofaro & Tamis-LeMonda, 2011; Tamis-LeMonda et al., 2001). Imperatives differed the most between conditions and had the largest effect size out of all utterance types (Chapter 6). The regression analyses showed that the use of imperatives was the only significant negative CDS predictor of infant language growth, with greater use of imperatives associated with lesser infant language growth over time. The use of imperatives may be more prevalent during functional play as the goal of the activity is known and the achievement of this goal becomes the focus of the parents’ activity, whereas in symbolic play the goal is social (O’Brien & Nagle, 1987). Although this finding was not hypothesised, it is not surprising, as imperatives do not promote the establishment of conversation between a parent-infant dyad as interrogatives do (Fekonja et al., 2005; McCune-Nicolich, 1981; Pellegrini, 2009).

The lack of association between infant language growth and the two interrogative types (wh and yes/no-questions) characteristic of the symbolic play condition was not consistent with previous findings that have found interrogatives positively predict language development (Hoff-Ginsberg, 1985; Rowland et al., 2003; Tardif et al., 1997). The only association between interrogatives and language development found was between yes/no-questions and infant language complexity at 24 months. The ages of the infants in this study may explain the (mostly) null results. Parents alter their CDS according to the age of their infants, with imperatives more frequently used with younger infants. In contrast, interrogatives (particularly wh-questions) are less frequently used with younger infants due to the cognitive demands they place on the infant (Barnes, et al., 1983; Blount, 1972; Cristofaro
& Tamis-LeMonda, 2011; Tamis-LeMonda et al., 2001). Therefore, it is plausible that parental use of yes/no- and wh-questions at 18 months was less likely to be associated with language growth at 21 months as some parents may have limited their use of yes/no- and wh-questions due to the age of the infants in the study (therefore reducing the power of the analysis). Further, there was an association between yes/no-questions and infant syntactic complexity at 24 months, yet no relationship was found between 18 and 21 months. It is possible that the three months between 18 and 21 months was insufficient to capture language growth within this age range, as many infants in this sample at 21 months of age were largely pre-verbal and yet to experience the onset of rapid acceleration of word learning that typically occurs towards the end of the second year (e.g., Bates, Camaioni, & Volterra, 1975; Benedict, 1979).

8.5.2 Socio-cognitive variables.

The prediction that socio-cognitive communicative acts characteristic of symbolic play (JA, gesture) would be associated with infant language growth was not supported. These findings were unexpected and are inconsistent with previous research that has documented concurrent and longitudinal relationships between language acquisition and JA (Carpenter, Nagell, et al., 1998; Laakso et al., 1999; Morales et al., 2000; Tomasello & Farrar, 1986) and gesture use (Acredolo & Goodwyn, 1988; Bates et al., 1979; Capirci et al., 1996, 2005; Iverson, Capirci, & Caselli, 1994; O’Reilly et al., 1997; Özçalişkan & Goldin-Meadow, 2005; Pizzuto & Capobianco, 2005; Rowe & Goldin-Meadow, 2009; Rowe et al., 2008). There are several possible reasons why the current study failed to replicate previous results. First, in terms of JA, differences between this study and others may be due differences in coding schemes, as vast differences in the inclusion and exclusion criteria for coding JA exists within the literature (see discussion of this point in Chapter 3). Adopting a different definition of JA (e.g., non-collaborative JA) or different inclusion/exclusion criteria (e.g., excluding 3
second JA episodes) would have influenced the frequency and duration of JA and in turn, the opportunity to capture instances of gesture use within interactions.

Concerning the specific relationship between JA duration and language development, Carpenter, Nagell, et al. (1998) reported that only JA episodes longer than 30 seconds in duration correlated with children’s language production. In the present study, episodes of JA were relatively short (i.e., mean duration of 28 seconds in symbolic play and 10 seconds in functional play). It is possible that JA episodes in this study were too short to reveal associations with infant language measures. An alternative explanation is that the JA-language relationship is not as strong in infants at 18 months old compared with younger infants. Morales et al. (2000) found an infant’s tendency to respond to bids for JA (JA establishment) was positively correlated with language development between 6 and 18 months of age (measured once every two months), yet found no relationship at 21 and 24 months. Therefore, they proposed that the JA-language relationship is moderated by age, and an optimal timeframe may exist in which JA relates to language development.

8.6 Synopsis and Outlook

Overall, the analyses reported in this chapter revealed that two features that distinguish functional and symbolic play, the use of imperatives and conversational turns, had differential longitudinal effects on infant language development. It remains unclear whether differences between play contexts in the frequency and duration of JA and the presence of gestures are predictive of infant language development or if this relationship is moderated by the age of the infant. Overall, these results suggest that one unique socio-linguistic quality of parent-infant interaction fostered by the symbolic play context, the tendency to engage in greater conversational interaction, provides a powerful communicative foundation for infant language acquisition (Golinkoff et al., 2015; Hirsh-Pasek et al., 2015).
Chapter 9

General Discussion

In this final chapter, the main findings of this thesis are discussed in the context of the research questions outlined in the introduction. Second, the socio-linguistic ecology of symbolic play is discussed as a context which promotes specific qualities of parent-infant communication (i.e., conversational turns), which positively influences language acquisition in early childhood. Third, limitations are discussed, and fourth, implications and future directions are reviewed.

9.1 Overview of Main Findings

This thesis sought to answer four broad research questions:

- What can existing literature tell us about the quantitative relationship between symbolic play and language?
- How do verbal communicative acts differ when a parent and their infant interact during symbolic play compared to functional play?
- How do joint attention and gesture use differ during parent-infant interaction when they are engaged in symbolic play compared to when they are engaged in functional play?
- Are there differences in the parent-infant interaction across play contexts that are related to infant language development?

9.1.1 Study 1: A meta-analytic review of the play-language relationship

Chapter 4 presented a quantitative analysis of the existing symbolic play-language literature, addressing the first research question. The meta-analysis revealed a significant medium association between symbolic play and language acquisition. The association was attested despite the use of a conservative analysis strategy and considerable variability in how individual studies had operationalised symbolic play and language, suggesting that we can be
confident that the relationship is real. Given the accumulated empirical evidence that currently exists, these results provide an answer the first research question and reveal a direct and robust relationship between the two domains; specifically, growth in symbolic play ability is associated with growth in language, a relationship that is evident concurrently and longitudinally. The result is important given recent debate regarding whether or not this relationship exists (i.e., Lillard et al., 2013). The conclusion is that it does exist, providing a platform for future research to further scrutinise the developmental mechanisms underlying the symbolic play-language relationship.

9.1.2 Study 2: The Language of Parent-Infant Interactions during Symbolic Play

Chapter 6 addressed the second research question. The results suggested that play contexts influenced the distribution of parental utterance types and the subsequent verbal communication between parent-infant dyads. In functional play parents were more likely to comment on (declaratives) and direct their infant's behaviour (imperatives), whereas in symbolic play parents presented infants with more opportunities to participate in conversation through the use of wh- and yes/no-questions. This led to a greater number of conversational turns in the symbolic play condition. Previous research suggests exposure to parental language varies according to the social environment (for a review see Hoff, 2006). This research extends these findings by suggesting that specific play contexts foster different opportunities for children to hear and respond to different forms of language that vary in pragmatic function (Camaioni et al., 1998), which either foster or hinder conversational interaction (Heubner & Meltzoff, 2005). These findings are consistent with the socio-cultural approach, which argues that the co-construction of communication within play provides infants with opportunities to develop their ability to communicate with others (Vygotsky, 1962, 1978). Specifically, the symbolic play context elicits the use of CDS which act to promote co-operative action and negotiation as the parent-infant dyads clarify symbolic
transformations and establish a shared understanding about what objects stand for and the nature of the play situation (also see Brown et al., 1996; Fekonja et al., 2005; McCune-Nicolich, 1981; Pellegrini, 2009; Rakoczy, 2008).

9.1.3 Study 3: Parent-infant socio-cognitive communication in symbolic play.

Chapter 7 reported on the same data set presented in Chapter 6 and addressed the third research question. When parent-infant dyads engaged in symbolic play, unique patterns of socio-cognitive communication acts were evident. Compared with functional play, during symbolic play the frequency and duration of JA was greater, and JA episodes were characterised by greater parental and infant gesture use, particularly the use of iconic gestures with an object in hand. This unique pattern of JA and gesture use within JA is consistent with the suggestion, drawn from socio-cultural theory, that JA is more likely to be established and sustained by the necessity to engage in the complex negotiation of meaning (e.g., Tomasello & Farrar, 1986; Rakoczy, 2007). Due to the nonliteral nature of pretence, the symbolic play context demands the negotiation of meaning between an infant and their parent as they establish a shared understanding about what objects and actions represent (e.g., during object substitution, projecting imaginary characteristics onto objects, and imagining situations that do not exist). Building on the findings from Chapter 6, preverbal infants and their parents use speech and gesture to establish this collective intentionality. Within symbolic play, the use of iconic gestures and gesture-speech combinations promotes infants' understanding, expression, and navigation of pretence situations (Goldin-Meadow et al., 1999; Nicolopoulou et al., 2015; Saarni et al., 2007).

9.1.4 Study 4: Symbolic play and longitudinal language development.

Chapter 8 examined whether the verbal and socio-cognitive communicative acts identified in Studies 2 and 3 as characteristic of functional and symbolic play predicted infant language acquisition. In particular, conversational turns, mimetics and imperatives were
concurrently associated with infant language knowledge at 18 months. Imperatives and conversational turns were longitudinally associated with infant language measures at 21 and 24 months. Yes/no-questions were also longitudinally associated with infant language at 24 months. When controlling for infant age and language proficiency at 18 months, conversational turns positively predicted vocabulary production at 24 months, whereas imperatives negatively predicted infant language growth and syntactic complexity at 24 months. Thus these results revealed the use of imperatives and conversational turns, which distinguished functional and symbolic play, had differential longitudinal effects on infant language development, with the greater interactional complexity characteristic of symbolic play positively predicting development. These findings accord well with literature that has documented that exposure to CDS within the context of conversational exchange with parents supports early language acquisition, with infants playing an active in their own language learning (e.g., Bloom, Margulis, Tinker, & Fujita, 1996; Ko, Seidl, Cristia, Reimchen, & Soderstrom, 2015; Snow, 1977).

9.2 Theoretical Implications

From a theoretical perspective, this research was motivated by consideration of the competing notions of the importance of the symbolic play context in language acquisition proposed within the Piagetian constructivist and Vygotskian socio-cultural accounts of development. Chapter 4 revealed that, collectively, the accumulated empirical literature suggests a medium positive relationship between symbolic play and language. This robust association between the two domains was recognised by both Piaget and Vygotsky, who viewed the symbolic play environment as a unique venue within which a child navigates and rehearses symbolic relationships.

Piaget proposed that infants demonstrate their mastery of symbolic representation in the symbolic play context (Piaget, 1962; Piaget & Inhelder, 1977). However, the research
reported in this thesis reveals the importance of learning through the symbolic play environment. These findings align with the socio-cultural approach to development which describes symbolic play as a context in which mastery is achieved (Vygotsky, 1978). That is, within the symbolic play context, infants are furnished with opportunities to engage in complex interaction with their parents, and this engagement in conversation is predictive of later language learning.

Symbolic play is unequalled as a play context to provide infants and parents with an opportunity to navigate and rehearse symbolic relationships. Instrumental to this communication is the use of tools (e.g., objects) and signs (e.g., language, gesture), which rely on the support of the social context (Rakoczy et al., 2004; Striano et al., 2001; Tomasello, 1999). The symbolic nature of this specific play context promotes the shared exchange and negotiation of meaning between interlocutors during interaction. As infants navigate symbolic relations they develop the ability to separate referent from object, and they rehearse this ability more frequently and with greater complexity when interacting with their caregiver, particularly when sharing one another's attention (also see Bornstein et al., 1996; Bretherton et al., 1989; Lyytinen, 1989; Ungerer et al., 1981; Weisberg, et al., 2015).

Social interaction supports and motivates infant engagement in symbolic play. Symbolic play promotes instances of and the duration of shared attention. Parents then encourage their infant’s engagement in conversation (e.g., using questions) and infants are active participants in this process (Kwon, Bingham, Lewsader, Jeon, & Elicker, 2013), continuing the symbolic dialogue using communicative acts such as gesture and speech. These findings demonstrate the social construction of language, such that language both originates from and develops towards supporting social contexts (Tomasello, 1999; Tomasello et al., 1999; Striano et al., 2001; Vygotsky, 1978). Overall, the results of this thesis suggest that the social context itself influences an infant’s action and learning and
therefore supports the concept of development occurring *within social interaction* (Vygotsky, 1978).

### 9.3 Research Limitations

Although the longitudinal study presented in this thesis provides a rich source of data to study parent-child dyads, naturalistic observational studies have their distinct challenges. The longitudinal within-subjects design allowed for the direct comparison of parent-child interactions across contexts. The use of naturalistic data raises the possibility of overestimation of parental scaffolding behaviours, as parents were instructed to engage in play with their child, which may have reduced spontaneity and provided some artificiality (Gardner, 2000; Tamis-LeMonda & Baumwell, 2012). While the ecological validity of this data is not infallible, the extent of observer reactivity and imposed instruction on the parent-infant interactions was minimised by ensuring familiarity with the observer, using unobtrusive filming equipment, filming interactions in the home environment, and minimal interaction with participants during recording sessions (Gardner, 2000).

Additionally, the generalizability of the results may be impeded by sampling characteristics such as SES and gender, as the majority of participants were middle-class, mothers, and of Caucasian background. The average socio-economic status of Canberra residents is generally higher than other Australian states and territories. This was reflected in our sample through parental education levels, with the vast majority of parents possessing university qualifications. The lack of demographic variability may therefore limit the generalisability of these findings. For instance, smaller vocabularies in low-income children have been linked to impoverished language environments including parent’s diminished use of gesture (Rowe & Goldin-Meadow, 2009) and reduced exposure to child-directed speech (Hart & Risley, 1995; Hoff, 2002; Tamis-LeMonda & Baumwell, 2012). However, our descriptive analyses indicated that there was a wide variation in the quantity of speech
directed to infants, which is consistent with previous literature that indicates large variability in parental communicative style within socio-economically homogenous samples (Leech et al., 2013). As the key data of interest do show variability, the potential lack of sample representativeness does not call into question the overall validity of the study.

Further, parents in this study were predominantly mothers. Previous research on the relationship between play and language has focused primarily on the role of the mother in parent-infant social interactions (e.g., Camaioni et al., 1998; Cristofaro & Tamis-LeMonda, 2011; De Villiers & De Villiers, 1973; Garrett-Peters, Mills-Koonce, Adkins, Vernon-Feagans, & Cox, 2008; Hart & Risley, 1995; Hoff & Naigles, 2002; Huttenlocher et al., 2010; Nelson, 1996; Olson & Masur, 2011; Tamis-LeMonda et al., 2001; Tamis-LeMonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998; Tomasello & Todd, 1983; Yont, Snow, Vernon-Feagans, 2003). Fathers’ use of socio-cognitive and verbal communicative behaviours during play with their children and differences between maternal and paternal language use have received much less attention. Recently, studies have recognised that a higher proportion of fathers are adopting the role of primary caregiver (see Leech et al., 2013; Martins et al., 2014; for a review see Leaper, Anderson, & Sanders, 1998). As this study included only four fathers, no comparisons between mothers and fathers could be made. Tamis-LeMonda and Baumwell (2012) reported no differences between mother–child and father-child interactions, and child language measures. Similarly, few statistical differences were found when father-child data was removed from analyses in this study. This suggests there is little statistical evidence that the inclusion of these four fathers in the sample influenced the study findings. However, it is the case that the fathers who volunteered for this study were men who reported a high level of involvement with their children and were considered the primary caregiver. Therefore, this is a self-selected sample of fathers and may not reflect the interactional style of fathers who do not assume primary caregiver duties.
Future research investigating addressing differences between the interaction styles of fathers and mothers across different play contexts would be useful given the trend towards more fathers adopting the role of primary caregiver.

9.4 Future Directions

9.4.1 Maternal contingency

Another key avenue for future research is to establish more clearly how elements of the quality of the parent-infant interaction during symbolic play influence language acquisition beyond 24 months of age. For instance, consistent with the zone of proximal development, parental modelling and scaffolding during symbolic play promotes the development of symbolic play and language in early childhood (Bornstein et al., 1996; Damast et al., 1996; Tamis Le-Monda et al., 1992; Tamis Le-Monda & Bornstein, 1994). Analysing the current data to determine who elicits play episodes (parent or infant) and how these relate to the complexity of symbolic play levels within play episodes would be an important next step, as parents adjust their levels of symbolic play to either meet or exceed their infant’s level of play in a manner that promotes language development. This analysis would add to the findings of a recent study by Melzer and Palermo (2015), who reported that children achieve higher symbolic play complexity scores when they initiate symbolic play episodes and lower scores when this play was parent initiated.

Parent and infant behaviours that occur within JA have been described as important for early language acquisition (Morales, Mundy, & Rojas, 1998; Mundy & Jarrold, 2010). Past empirical evidence suggests that there are two forms of JA behaviours in infancy (an infant’s ability to respond to and initiate JA behaviours) that are related to language development in different ways (Mundy & Jarrold, 2010). For example, significant correlations have been found between infant JA behaviours measured at 18 months and vocabulary size at 30 months (Morales et al., 2000). However, when measured at 14 and 17
months of age, this relationship differs with language production by whether JA behaviours are either responding to or initiating JA. Stronger correlations are evident between infant responding JA behaviours and language comprehension, and initiating JA behaviours and language production (Mundy & Jarrold, 2010). Empirical evidence also suggests a relationship between parental JA behaviours and infant language development. For instance, if parental labelling and verbal descriptions of objects of mutual attention occur, word learning is more apparent when parents follow the infant’s focus as the infant does not have to shift attention (Tomasello & Todd, 1983). Following previous findings regarding the relationship between JA and parental sensitivity (Gaffan et al., 2009; Hobson et al., 2004), future research could examine how JA within symbolic play is related to the contingency of parental and infant verbal and socio-cognitive responses and how these relate to later language development.

When exploring the contingency of parent-infant interactions, the play-language literature has only recently started to focus on infants as active participants in this social exchange. The results of this thesis suggest that, through conversational turns, infants play an active role in these bimodal (CDS, gesture) parent-infant interactions during symbolic play, and that this particular aspect symbolic play is predictive of later language acquisition. During symbolic play, infants demonstrate an ability to recruit their partners' participation in conversation using gesture and verbal utterances (e.g., see Begus, Gliga, & Southgate, 2014; Orr & Geva, 2015). Further, conversations contingent with the infants needs and interests have been described as more beneficial to language learning. Future studies using this dataset could examine which member of the dyad (parent or infant) initiated and ended conversational turns and JA episodes (i.e., via verbal or non-verbal communication), the modality of how this is achieved (e.g., speech, gesture), and how this influences the duration and frequency of parent-infant conversations during symbolic play. An extension of such an
analysis could examine the contingency of interrogative use (yes/no- and wh-questions) within symbolic play and if this influences infant engagement in JA and later language learning. These explorations may reveal whether contingent and noncontingent verbal responses and gesturing in symbolic play leads to differences in conversational turns and differences in later language acquisition. This would also highlight the importance of infants actively engaging in acquiring information, and the capacity for symbolic play in providing a context in which this engagement is fostered and contingent to the needs of the infant. Future studies based on these suggestions would provide further insight into how parent-child interactions within symbolic play support language development in early childhood.

9.4.2 Later age groups

The current research concentrated on 18 to 24-month-old infants. Recent research has shown that the quality of verbal and socio-cognitive parent-child interactions at 24 months is also a potent predictor of later language production at 3 years (Hirsh-Pasek et al., 2015). Replicating this study in later age groups could involve parent-child and child-peer interactions during symbolic play, how language use differs in this context in comparison to others, and how the tendency to engage in symbolic play affects language acquisition overall. This research would be valuable, as previous studies have documented that a child’s capacity to engage in JA, which this thesis has shown is particularly likely during symbolic play, increases with age (Hoehl & Striano, 2013). Furthermore, Ninio (2016) has found differences in language use as a method of establishing JA between parent-child and child-peer dyads during naturalistic play interactions, and suggested that a child’s motivation for engaging adults and peers in JA may differ. During parent-child interactions, 88% of parents (n = 391) and 62% of 14 to 43 month-old children (n = 268) used directives used to establish JA with their conversational partner (e.g., Look! See!). However, when interacting with peers, only 26% of children aged 14 to 39 months (n = 15) used language to redirect their peers’
attention. Although she did not study non-verbal directives such as pointing gestures, Ninio suggested that even a conversationally proficient child is motivated to share attention with parents because of the assistance and information they provide, whereas this is not the case with peers (also see Bakeman & Adamson, 1984). An examination of peer and parent verbal and socio-cognitive communicative acts during interactions across play contexts could reveal how dyadic interactions differ as a child ages and develops greater spoken language proficiency, and whether the symbolic play context provides motivation for a child to engage in conversation with peers as it does with adults. This will strengthen the knowledge of how symbolic play influences the quality of interactions and if these differences are predictive of later language acquisition.

9.4.3 Clinical Implications

The current thesis focused on typical development. An obvious avenue of future research is to investigate similar themes in atypical populations. One possible population to study would be children with Autism Spectrum Disorder. A variety of early developmental domains are identified as correlates of language acquisition in children with ASD, including play (McGovern & Sigman, 2005), JA (Adamson et al. 2014; Mundy et al., 1994; Shumway & Wetherby 2009), and gesture use (Luyster et al. 2008). These social and communicative deficits are proposed to arise due to difficulties with symbolic representation (e.g., Leslie, 1987) and/or impairments in intersubjective engagement (Hobson, 1993; Mundy, Sigman, & Kasari, 1994).

Similar to the findings of this thesis, recent findings in play and language in ASD populations discuss the importance of encouraging children in conversation. In atypical development, specific types of parental language influence later language growth. For example, the following aspects of CDS have been associated with language growth in children with ASD: (i) when parents respond verbally to the child’s verbal communication
(Haebig, McDuffie, & Weismer, 2013), (ii) when CDS is contingent with the child’s interests and needs (McDuffie & Voder, 2010), and (iii) when CDS requires a response from a child (e.g., the use of questions) (Walton & Ingersoll, 2015). Examining whether symbolic play contexts promote the use of conversation in atypical populations (e.g., ASD), and in turn if elements of parent-infant conversation during symbolic play promote language growth in atypical populations appears a worthy avenue of research, and could form an empirical foundation for intervention.

9.5 Conclusion

This thesis adds to the growing body of literature that reports positive effects of symbolic play on language learning. The results specifically highlight the importance of the symbolic play context in promoting qualities of the parent-infant interaction, which predict language growth in early childhood. If particular play contexts promote the exchange of meaning (e.g., introducing a cup as a hat), this negotiation of meaning between play partners will not only help establish common reference, it will also extend and promote the development of the child’s language and play abilities. Therefore, the results of this thesis provide a possible answer to the important question concerning how the linguistic and socio-cognitive properties of parent-infant interaction influence language learning, and reveals the importance of the symbolic play context in fostering this communicative exchange between parents and their infants.
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### Table A1

**Descriptive Statistics of Overall Effect Sizes of Symbolic Play and Language from Included Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Design</th>
<th>Mean</th>
<th>k</th>
<th>Range</th>
<th>Language Modality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acredolo &amp; Goodwyn (1988a)</td>
<td>38</td>
<td>Concurrent</td>
<td>.530</td>
<td>1</td>
<td>.000</td>
<td>P</td>
</tr>
<tr>
<td>Acredolo &amp; Goodwyn (1988b)</td>
<td>16</td>
<td>Longitudinal</td>
<td>.480</td>
<td>1</td>
<td>.000</td>
<td>P</td>
</tr>
<tr>
<td>O’Reilly et al. (1997a)</td>
<td>28</td>
<td>Concurrent</td>
<td>.707</td>
<td>2</td>
<td>.200</td>
<td>C</td>
</tr>
<tr>
<td>O’Reilly et al. (1997b)</td>
<td>25</td>
<td>Concurrent</td>
<td>.393</td>
<td>3</td>
<td>.310</td>
<td>C</td>
</tr>
<tr>
<td>O’Reilly et al. (1997a)</td>
<td>171</td>
<td>Concurrent</td>
<td>.304</td>
<td>2</td>
<td>.220</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>.476</td>
<td>3</td>
<td>.200</td>
<td>C</td>
</tr>
<tr>
<td>Bates et al. (1980)</td>
<td>32</td>
<td>Concurrent</td>
<td>.208</td>
<td>24</td>
<td>.820</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Hall et al. (in press)</td>
<td>50</td>
<td>Concurrent</td>
<td>.326</td>
<td>6</td>
<td>.520</td>
<td>P</td>
</tr>
<tr>
<td>Smith &amp; Jones (2011)</td>
<td>63</td>
<td>Concurrent</td>
<td>.290</td>
<td>1</td>
<td>.000</td>
<td>P</td>
</tr>
<tr>
<td>Hughes et al. (2006)</td>
<td>111</td>
<td>Concurrent</td>
<td>.490</td>
<td>2</td>
<td>.170</td>
<td>P</td>
</tr>
<tr>
<td>Lewis et al. (2000)</td>
<td>40</td>
<td>Concurrent</td>
<td>.501</td>
<td>4</td>
<td>.330</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>McCune (1995)</td>
<td>72</td>
<td>Concurrent</td>
<td>.374</td>
<td>5</td>
<td>.300</td>
<td>P</td>
</tr>
<tr>
<td>McEwen (2007)</td>
<td>5,070</td>
<td>Concurrent</td>
<td>.330</td>
<td>1</td>
<td>.000</td>
<td>P</td>
</tr>
<tr>
<td>Youngblade &amp; Dunn (1995)</td>
<td>50</td>
<td>Concurrent</td>
<td>.515</td>
<td>2</td>
<td>.030</td>
<td>P</td>
</tr>
<tr>
<td>Pellegrini et al. (1991)</td>
<td>12</td>
<td>Longitudinal</td>
<td>.520</td>
<td>4</td>
<td>.190</td>
<td>P</td>
</tr>
<tr>
<td>Bates et al. (1979)</td>
<td>25</td>
<td>Concurrent</td>
<td>.481</td>
<td>11</td>
<td>.250</td>
<td>P</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>.436</td>
<td>12</td>
<td>.210</td>
<td>P</td>
</tr>
<tr>
<td>Shore (1986)</td>
<td>30</td>
<td>Concurrent</td>
<td>.414</td>
<td>5</td>
<td>.180</td>
<td>P</td>
</tr>
<tr>
<td>Tamis-LeMonda et al. (1992)</td>
<td>78</td>
<td>Concurrent</td>
<td>.470</td>
<td>1</td>
<td>.000</td>
<td>C</td>
</tr>
<tr>
<td>Callaghan &amp; Rankin (2002)</td>
<td>16</td>
<td>Concurrent</td>
<td>.046</td>
<td>6</td>
<td>1.010</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Tamis-LeMonda &amp; Bornstein (1994)</td>
<td>41</td>
<td>Concurrent</td>
<td>.277</td>
<td>5</td>
<td>.410</td>
<td>P &amp; C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longitudinal</td>
<td>.212</td>
<td>5</td>
<td>.400</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>.245</td>
<td>10</td>
<td>.480</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Bornstein et al. (1992)</td>
<td>34</td>
<td>Concurrent</td>
<td>.236</td>
<td>2</td>
<td>.320</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Tamis-LeMonda &amp; Bornstein (1990)</td>
<td>43</td>
<td>Concurrent</td>
<td>.178</td>
<td>4</td>
<td>.480</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Kirkham et al. (2013a)</td>
<td>60</td>
<td>Concurrent</td>
<td>.369</td>
<td>6</td>
<td>.210</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Kirkham et al. (2013b)</td>
<td>31</td>
<td>Longitudinal</td>
<td>.360</td>
<td>6</td>
<td>.560</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Lyytinen (1983)</td>
<td>79</td>
<td>Concurrent</td>
<td>.467</td>
<td>5</td>
<td>.250</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Casby &amp; Corte (1986)</td>
<td>15</td>
<td>Concurrent</td>
<td>.873</td>
<td>2</td>
<td>.060</td>
<td>P</td>
</tr>
<tr>
<td>Jurkovic (1978)</td>
<td>26</td>
<td>Concurrent</td>
<td>.346</td>
<td>3</td>
<td>.538</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Bornstein et al. (1996)</td>
<td>138</td>
<td>Concurrent</td>
<td>.050</td>
<td>2</td>
<td>.100</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Nielsen (unpublished)</td>
<td>75</td>
<td>Concurrent</td>
<td>.438</td>
<td>3</td>
<td>.306</td>
<td>P &amp; C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longitudinal</td>
<td>.399</td>
<td>3</td>
<td>.066</td>
<td>P</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>.419</td>
<td>6</td>
<td>.306</td>
<td>P &amp; C</td>
</tr>
<tr>
<td>Kidd (unpublished)</td>
<td>28</td>
<td>Concurrent</td>
<td>.219</td>
<td>6</td>
<td>.521</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longitudinal</td>
<td>.395</td>
<td>6</td>
<td>.416</td>
<td>C</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>.310</td>
<td>12</td>
<td>.648</td>
<td>C</td>
</tr>
</tbody>
</table>

*Note: k = the number of effect sizes; Range = largest effect size – smallest effect size
P = production; C = comprehension*
### Table A2

**Measures and Modalities of Play and Language Employed by Studies in the Meta-Analysis**

<table>
<thead>
<tr>
<th>Study</th>
<th>P/C</th>
<th>Operationalisation of Symbolic Play</th>
<th>Free/Structured</th>
<th>Measure</th>
<th>Grammar/Vocab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acredolo &amp; Goodwyn (1988a and b)</td>
<td>P</td>
<td>Maternal interview: frequency of object substitutions (empty handed object signs)</td>
<td>F</td>
<td>Maternal interview of child’s verbal vocabulary in words, prompted with categories (e.g., food items). Scored 0 - 10 based on the number of words estimated in child’s vocabulary (0 = 0-9 words, 1 = 10-19, 2 = 20-29, etc.).</td>
<td>Vocab</td>
</tr>
<tr>
<td>O’Reilly et al. (1997b)</td>
<td>C</td>
<td>Pantomime Comprehension Task: identification of 12 imaginary objects by watching video of woman ‘pretending’ with a series of objects “What was she pretending to do?” No verbal prompts were included.</td>
<td>S</td>
<td>Test for the Auditory Comprehension of Language - Revised (TACL-R; Carrow-Woolfolk, 1985): 3 language comprehension scales; words, morphology, sentences.</td>
<td>Both</td>
</tr>
</tbody>
</table>
Hall et al. (in press)  P  Test of Pretend Play (ToPP; Lewis & Boucher, 1997) -non-verbal version designed for children <3 yrs. Child required to model or engage in spontaneous play. Object substitutions, representational alone play and self-alone play (without the aid of toys).

Smith & Jones (2011)  P  Observation: set thematically related objects (sleeping, eating, person action) presented with a typical component missing & a similar shaped object available for substitution (‘target object’). Play acts on either sparse (geometric structures) or rich objects (detailed objects) were coded as appropriate or not.

Hughes et al. (2006)  P  Observation: coded for pretence (Hughes & Dunn, 1997; Youngblade & Dunn, 1995): pretence was defined as the transformation or nonliteral treatment of action/object/person or place in the here & now (e.g., use of pretend voices, non-verbal pretence action, role enactment, discussion of & solo pretence).

Lewis et al. (2000)  P  ToPP; Lewis & Boucher, 1997)
SPT (Lowe & Costello, 1988): no measure of symbolic play as a percentage of overall functional and symbolic play.

Aстington & Jenkins (1995)  P  Observation: free play coded for joint proposals & explicit role assignment: speech containing nonliteral play, playing or assigning a role, planning an imaginary activity, substituting one object for another & using replica objects as real objects. Joint proposals: reference had to be made to another person & to the self within the same turn.


S  P  The MacArthur-Bates Communicative Development Inventory (MB-CDI; Fenson et al., 2007): Words and Sentences.

Parole in Gioco (‘Words Games’) vocabulary inventory (Bello, Caselli, Pettenati & Stefanni, 2010) -vocab comprehension & production (only production data included in analyses). Noun & predicates subtests. Also used to elicit gestures Observation of bimodel-gesture & speech as child interacted with researcher.

F  P  MCDI (Fenson et al., 1994): productive vocabulary, number of nouns recorded due to its relation to object recognition.

Vocab


Vocab

S  P & C  Pre-School Language Scale (PLS-3; Zimmerman, Steiner, Pond, Boucher, & Lewis, 1997) – UK version (Boucher & Lewis, 1997): receptive and expressive language

Vocabulary

F  P & C  Test of Early Language Development (Hresko, Reid, & Hammul, 1981): receptive & expressive syntactic & semantic abilities Observation of production of joint proposals

Both

F  P  Observation of mental state terms: Frequency of utterances containing ≥1 16 cognitive mental state terms (e.g., know, pretend, wonder, mean; derived from Shatz et al., 1983). Assigned to Tager-Flusberg’s (1992) categories: idiomatic use, conversational use, or mental states.
<table>
<thead>
<tr>
<th>Author(s) (Year)</th>
<th>Type</th>
<th>Observation:</th>
<th>Task</th>
<th>receptive Language Inventory (Bates et al., 1988): receptive vocab scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bates et al. (1979)</td>
<td>P</td>
<td>Social &amp; play behaviour, checklist &amp; narrative notes - Observation was scored for frequency of combinatorial and symbolic play, number of different symbolic play schemes (number of symbolic play schemes, relative frequency of symbolic play schemes, combinatorial Play).</td>
<td>F</td>
<td>Observation scored for: unritualised requests, ritualised requests, frequency of word comprehension, frequency of nonreferential and referential speech, number of referential words.</td>
</tr>
<tr>
<td>Tamis-LeMonda et al. (1992)</td>
<td>P</td>
<td>Observation: mothers present, set of toys present (doll, blanket, tea-set for 2, telephone, train, 2 picture books, ball, nesting barrels), 60 x 15sec intervals were coded for unitary functional activity, inappropriate &amp; appropriate combinatorial play, transitional play (non-symbolic), self-, other-, sequential &amp; substitution pretence (symbolic).</td>
<td>F</td>
<td>Productive &amp; Receptive Language Inventory (Bates et al., 1988): receptive vocab scale</td>
</tr>
<tr>
<td>McCune (1995)</td>
<td>P</td>
<td>Observation (McCune-Nicolich, 1981). Five play levels were: Sensorimotor: pre-symbolic, self-pretend (autosymbolic) Symbolic: other-(decentered), combinatorial, hierarchical pretend. Scores assigned for onset or independent execution of a level of play.</td>
<td>F</td>
<td>Observation: lexical onset (≥ five or more spontaneous single words), onset (production of three or more multword types) and predominance of multword stage.</td>
</tr>
<tr>
<td>Youngblade &amp; Dunn (1995)</td>
<td>P</td>
<td>Naturalistic observation: other-directed pretend participation. Diversity of Pretend themes: 14 possible subcategories (female &amp; male activities, adult occupations, violence, animals, daily activities, transportation, fantasy figures, adventure, music, adult “deviant” activities, social relationships, holidays/special events).</td>
<td>F</td>
<td>Observation - Child-sibling Feeling State Talk (Dunn, Brown, Breadsall, 1991) including state terms, phrase feeling states, and expletives. Overall feeling state talk was calculated by subtracting any instances of state talk during pretence to ensure that the variables were independent.</td>
</tr>
<tr>
<td>Pellegrini et al. (1991)</td>
<td>P</td>
<td>Free play observation: Fantasy utterances coded as: Object transformations: animation, reification (pretend to drink from an empty cup), attribute of object property (Brmm motor sound while pushing a truck or imaginary truck), and substitution. Ideational transformations: object realism (pretend an imaginary object exists), attribution of non-existent object property (cuddle an imaginary baby), situation attribution (pretend a make-believe situation exists: “This is the kitchen”), role attribution</td>
<td>F</td>
<td>Concepts of Print (Clay, 1972): measure of knowledge of lexicon of books &amp; print Writing Task (narratives): based on Pellegrini, Galda, &amp; Rubin, 1984): children required to tell/dictate/write a story about 3 thematically related pictures.</td>
</tr>
<tr>
<td>Bates et al. (1979)</td>
<td>P</td>
<td>Observation: Social &amp; play behaviour, checklist &amp; narrative notes - Observation was scored for frequency of combinatorial and symbolic play, number of different symbolic play schemes (number of symbolic play schemes, relative frequency of symbolic play schemes, combinatorial Play).</td>
<td>F</td>
<td>Observation scored for: unritualised requests, ritualised requests, frequency of word comprehension, frequency of nonreferential and referential speech, number of referential words. Maternal Interview - Number of words comprehended, number of nonreferential words produced, number of referential words produced, level of word comprehension that distinguishes between comprehension only in routine places and games versus comprehension involving goal-directed search for objects and persons in new contexts.</td>
</tr>
<tr>
<td>Tamis-LeMonda et al. (1992)</td>
<td>P</td>
<td>Observation: mothers present, set of toys present (doll, blanket, tea-set for 2, telephone, train, 2 picture books, ball, nesting barrels), 60 x 15sec intervals were coded for unitary functional activity, inappropriate &amp; appropriate combinatorial play, transitional play (non-symbolic), self-, other-, sequential &amp; substitution pretence (symbolic).</td>
<td>F</td>
<td>Productive &amp; Receptive Language Inventory (Bates et al., 1988): receptive vocab scale</td>
</tr>
<tr>
<td>Study</td>
<td>Measure</td>
<td>Authors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Semantics: based upon spontaneous speech during play, diversity of meanings expressed in speech. Fourteen categories signifying functional (recurrence) &amp; grammatical (agent) relations included: action, possession, recipient, locative. Utterances expressed to service symbolic play were not included.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MLLU - mean length of 5 longest spontaneous utterances during spontaneous speech during play. Coded for morpheme length (use of word combinations, plurals, inflections, auxiliaries, articles, prepositions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language Interview (Bates, Bretherton, &amp; Snyder, 1988): composite score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bornstein et al. (1992)</td>
<td>Elicited &amp; Spontaneous Play: to determine the highest level of spontaneous play &amp; then highest level of elicited play levels (Belsky &amp; Most, 1981). Low level manipulation, functional, and higher level prentce (e.g., (first holding the telephone to the ear, then speaking into the telephone, then holding the telephone to a doll’s ear). Composite play score was created by adding spontaneous &amp; elicited scores together.</td>
<td>RDLS – R (Reynell, 1981): verbal comprehension, expressive language scales.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language Interview (Bates, Bretherton, &amp; Snyder, 1988): composite score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkham et al. (2013a)</td>
<td>Observation of free play with a standard set of representational &amp; non-representation materials provided (e.g., doll, teddy bear, toy phone, dinner set, blocks, trucks, wooden farmyard animals &amp; a cloth. Presence of symbolic play was determined according to format provided in ToPP.</td>
<td>PSL-3 (Zimmerman, Steiner, &amp; Pond, 1992): language production &amp; understanding, expressive &amp; receptive components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkham et al. (2013b)</td>
<td>Observation of free play with a standard set of representational &amp; non-representation materials provided. Presence of symbolic play was determined according to format provided in ToPP.</td>
<td>PSL-3 (Zimmerman, Steiner, &amp; Pond, 1992): language production &amp; understanding, expressive &amp; receptive components.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lyytinen (1983) P Observation (McCune-Nicolich, 1981). Five play levels were: Sensorimotor: pre-symbolic, self-pretend (autosymbolic) Symbolic: other-(decentered), combinatorial, hierarchical pretend. Scored the highest symbolic play level achieved during the play session.

Casby & Corte (1986) P Symbolic play task: children were given a two-word command to play with objects that increasingly became more decontextualised. Coding included: dissimilar object play & mean symbolic play. (object- substitution symbolic play was scored as present or absent)

Jurkovic (1978) P Observation – total play - inclusive of toy combinations (functionally appropriate), role differentiation (btwn dolls & animals), spatial arrangement (boundaries, enclosures, distance), sequential connections (logical or continuous).

Bornstein et al. (1996) P Observation of free play with a standard set of age-appropriate toys. Play was scored according to play categories (adapted from Bornstein & O'Reilly, 1993; Tamis-LeMonda & Bornstein, 1991, 1994). Self-directed, other-directed, sequential and substitution pretend were coded. Differentiated between solitary and child-initiated symbolic play with mother.

Nielsen (unpublished) P MCDI (Fenson et al., 1994) Words and Gestures Subscales: Pretending with objects, pretending to be a parent

Kidd (unpublished) P Percentage of elaborate play actions symbolic Number of Object Substitutions Symbolic

McEwan (2007) P Parent Report of Children’s Abilities (PARCA; Saudino et al., 1998) Pretend play production – six yes/no items - parents asked to indicate whether or not they had witnessed their child engaging in specific types of symbolic play (e.g., object substitution, sociodramatic play)

Note. P = production (expressive); C = comprehension (receptive)
Table A3

Characteristics of Participants in Studies Included in the Meta-Analysis

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Country of testing</th>
<th>SES</th>
<th>Age Range (months)</th>
<th>Native Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acredolo &amp; Goodwyn (1988a)</td>
<td>38</td>
<td>America</td>
<td>Middleclass</td>
<td>16-18</td>
<td>NR</td>
</tr>
<tr>
<td>Acredolo &amp; Goodwyn (1988b)</td>
<td>16</td>
<td>America</td>
<td>Middleclass</td>
<td>11-24</td>
<td>NR</td>
</tr>
<tr>
<td>O’Reilly et al. (1997a)</td>
<td>28</td>
<td>America</td>
<td>Middleclass</td>
<td>24-48</td>
<td>NR</td>
</tr>
<tr>
<td>O’Reilly et al. (1997b)</td>
<td>25</td>
<td>America</td>
<td>Middleclass</td>
<td>48-60</td>
<td>NR</td>
</tr>
<tr>
<td>Lyytinen et al. (1999)</td>
<td>171</td>
<td>Finland</td>
<td>NR</td>
<td>18</td>
<td>Finnish</td>
</tr>
<tr>
<td>Bates et al. (1980)</td>
<td>32</td>
<td>America</td>
<td>Middleclass</td>
<td>13</td>
<td>NR</td>
</tr>
<tr>
<td>Hall et al. (in press)</td>
<td>50</td>
<td>America</td>
<td>Middleclass</td>
<td>18-31</td>
<td>AusE</td>
</tr>
<tr>
<td>Smith &amp; Jones (2011)</td>
<td>63</td>
<td>America</td>
<td>NR</td>
<td>18-27</td>
<td>NR</td>
</tr>
<tr>
<td>Hughes et al. (2006)</td>
<td>111</td>
<td>England</td>
<td>Diverse</td>
<td>24</td>
<td>BrE</td>
</tr>
<tr>
<td>Lewis et al. (2000)</td>
<td>40</td>
<td>England</td>
<td>Lower</td>
<td>12-72</td>
<td>BrE</td>
</tr>
<tr>
<td>Nielsen &amp; Dissanayake (2000)</td>
<td>31</td>
<td>Australia</td>
<td>Middleclass</td>
<td>36-54</td>
<td>AusE</td>
</tr>
<tr>
<td>McCune (1995)</td>
<td>72</td>
<td>America</td>
<td>Middleclass</td>
<td>8-24</td>
<td>AmE</td>
</tr>
<tr>
<td>Youngblade &amp; Dunn (1995)</td>
<td>50</td>
<td>America</td>
<td>Middleclass</td>
<td>33-40</td>
<td>NR</td>
</tr>
<tr>
<td>Pellegrini et al. (1991)</td>
<td>12</td>
<td>America</td>
<td>NR</td>
<td>42-66</td>
<td>NR</td>
</tr>
<tr>
<td>Bates et al. (1979)</td>
<td>25</td>
<td>America &amp; Italy</td>
<td>Middleclass</td>
<td>9.5-12.5</td>
<td>12 Italian, 13 AmE</td>
</tr>
</tbody>
</table>

Note. NR = not reported.
Table A4

*Stem-and-Leaf Plot of Effect Sizes (rs) by Study Design and Language Modality*

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
<th>Study Design</th>
<th>Language Modality</th>
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</thead>
<tbody>
<tr>
<td>-2</td>
<td>00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.0</td>
<td>00</td>
<td>30&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>.1</td>
<td>61</td>
<td>90 95</td>
<td></td>
</tr>
<tr>
<td>.2</td>
<td>06</td>
<td>10&lt;sup&gt;a&lt;/sup&gt; 19 21 52 56&lt;sup&gt;a&lt;/sup&gt; 90 92</td>
<td></td>
</tr>
<tr>
<td>.3</td>
<td>26</td>
<td>30 30 74 81 84 93 95&lt;sup&gt;a&lt;/sup&gt; 94 99&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>.4</td>
<td>05</td>
<td>10 11 14 58 70 76 80&lt;sup&gt;a&lt;/sup&gt; 90 95</td>
<td></td>
</tr>
<tr>
<td>.5</td>
<td>15</td>
<td>20&lt;sup&gt;a&lt;/sup&gt; 30 38 65 85</td>
<td></td>
</tr>
<tr>
<td>.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.8</td>
<td>73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Longitudinal effect sizes are marked with <sup>a</sup>; Comprehension effect sizes are marked with <sup>b</sup>.
Table A5

*Stem-and-Leaf Plots of Effect Sizes (rs) by Study Design and Language Modality*

<table>
<thead>
<tr>
<th></th>
<th>Concurrent</th>
<th></th>
<th>Longitudinal</th>
<th></th>
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<tbody>
<tr>
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<td>Stem</td>
<td>Leaf</td>
<td>Stem</td>
<td>Leaf</td>
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<td>Comprehension</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- .2</td>
<td>.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- .1</td>
<td>.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- .0</td>
<td>.0</td>
<td></td>
<td>-.0</td>
<td></td>
</tr>
<tr>
<td>.0</td>
<td>00</td>
<td></td>
<td>.0</td>
<td>30</td>
</tr>
<tr>
<td>.1</td>
<td></td>
<td>.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.2</td>
<td>19 21 52 92</td>
<td>.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.3</td>
<td>30 81 84 93 94</td>
<td>.3 95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.4</td>
<td>10 70 95</td>
<td>.4 10</td>
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<td>.7</td>
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</tr>
<tr>
<td>.8</td>
<td></td>
<td>.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Production

|                |            | .2       | .2           | 10 56    |
|                | .0         | .0       | .0           |          |
| .1             | 61 90 95   | .1 15 74  |              |          |
| .2             | 06 64 90   | .2 15 30  |              |          |
| .3             | 26 30 74   | .3 30 81  |              |          |
| .4             | 05 11 14 81 90 | .4 36 |              |          |
| .5             | 15 30 38 65 85 | .5 20 |              |          |
| .6             |            | .6       |              |          |
| .7             |            | .7       |              |          |
| .8             | 73         | .8       |              |          |

Table A6

*Stem-and-Leaf Plot of Overall Effect Sizes (rs)*

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0</td>
<td>46 50</td>
</tr>
<tr>
<td>.1</td>
<td>61 78</td>
</tr>
<tr>
<td>.2</td>
<td>06 08 36 64 73 89 90</td>
</tr>
<tr>
<td>.3</td>
<td>10 26 30 46 60 69 74 93</td>
</tr>
<tr>
<td>.4</td>
<td>14 19 58 67 70 76 90</td>
</tr>
<tr>
<td>.5</td>
<td>01 15 20 30</td>
</tr>
<tr>
<td>.6</td>
<td></td>
</tr>
<tr>
<td>.7</td>
<td></td>
</tr>
<tr>
<td>.8</td>
<td>73</td>
</tr>
</tbody>
</table>
Table A7

**Stem-and-Leaf Plot of Effect Sizes (rs) by Study Design**

<table>
<thead>
<tr>
<th>Stem</th>
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</tr>
</thead>
<tbody>
<tr>
<td>-.4</td>
<td>0</td>
</tr>
<tr>
<td>-3</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>2 3</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>-.0</td>
<td>2 3 6</td>
</tr>
<tr>
<td>.0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>.1</td>
<td>0 6 7</td>
</tr>
<tr>
<td>.2</td>
<td>1 1 1</td>
</tr>
<tr>
<td>.3</td>
<td>0 1 1</td>
</tr>
<tr>
<td>.4</td>
<td>0 0 0</td>
</tr>
<tr>
<td>.5</td>
<td>0 1 1</td>
</tr>
<tr>
<td>.6</td>
<td>0 2 2</td>
</tr>
<tr>
<td>.7</td>
<td>8</td>
</tr>
<tr>
<td>.8</td>
<td>4</td>
</tr>
<tr>
<td>.9</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note. Stem unit 0.1, Leaf unit is 0.01 (e.g., -.4 and 9 = -.49).*
Appendix B

Chapter 5: Methodology

B1: Semi-Structured Interview

<table>
<thead>
<tr>
<th>Participant ID:</th>
<th>Date of Administration:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Page 1 of 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age:</th>
<th>Year</th>
<th>Month</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronological Age:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex:</th>
<th>M</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language spoken at home:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was the child born at full-term?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do they have any known or suspected developmental or cognitive delay (e.g., as identified by maternal health nurses?) ***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Siblings?</th>
<th>Yes / No</th>
<th>Ages?</th>
<th>Sex?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the child live with both parents?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the child attend childcare?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If so, at what age did they start attending childcare?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If so, how frequently do they attend childcare?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary caregiver (e.g., mother, father, grandmother)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s age:</td>
</tr>
<tr>
<td>Mother’s place of birth:</td>
</tr>
<tr>
<td>Mother’s highest level of education:</td>
</tr>
<tr>
<td>Mother’s occupation:</td>
</tr>
<tr>
<td>Father’s age:</td>
</tr>
<tr>
<td>Father’s place of birth:</td>
</tr>
<tr>
<td>Father’s highest level of education:</td>
</tr>
<tr>
<td>Father’s occupation:</td>
</tr>
<tr>
<td>Caregiver’s age:</td>
</tr>
<tr>
<td>Caregiver’s place of birth:</td>
</tr>
<tr>
<td>Caregiver’s highest level of education:</td>
</tr>
<tr>
<td>Caregiver’s occupation:</td>
</tr>
</tbody>
</table>
*** Questions to elicit evidence for developmental or cognitive delay may include:

<table>
<thead>
<tr>
<th></th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Demonstrate an understanding of the meaning of no and yes, or word or gesture with the same meaning (e.g., stops activity briefly; continues activity, smiles briefly)?</td>
</tr>
<tr>
<td>2.</td>
<td>Listen to a story for at least 5 minutes (i.e., remains relatively still and directs attention to the storyteller or reader)?</td>
</tr>
<tr>
<td>3.</td>
<td>Say “Da-da”, “Ma-ma”, or another name for parent/caregiver (including their first name)?</td>
</tr>
<tr>
<td>4.</td>
<td>Point to object he/she wants that is out of reach?</td>
</tr>
<tr>
<td>5.</td>
<td>Point or gesture to indicate preference when offered a choice (e.g., “Do you want this one or that one?”)?</td>
</tr>
<tr>
<td>6.</td>
<td>Repeat or try to repeat common words immediately upon hearing them (e.g., ball, car, go)?</td>
</tr>
<tr>
<td>7.</td>
<td>Name at least three objects (e.g., bottle, dog, favourite toy)?</td>
</tr>
<tr>
<td>8.</td>
<td>Say one-word requests (e.g., up, more, out)?</td>
</tr>
<tr>
<td>9.</td>
<td>Drink from a cup or glass (may spill)?</td>
</tr>
<tr>
<td>10.</td>
<td>Let someone know when he/she has a dirty nappy? (vocalise, pull at nappy)?</td>
</tr>
<tr>
<td>11.</td>
<td>Feed him/herself with a spoon?</td>
</tr>
<tr>
<td>12.</td>
<td>Suck from a straw?</td>
</tr>
<tr>
<td>13.</td>
<td>Show interest in children the same age, other than siblings (watches them, smiles at them)?</td>
</tr>
<tr>
<td>14.</td>
<td>Imitate simple actions (clap hands, wave good-bye)?</td>
</tr>
<tr>
<td>15.</td>
<td>Use actions to show happiness or concern for others (hug, pat arm, hold hands)?</td>
</tr>
<tr>
<td>16.</td>
<td>Show a desire to please others (shares snack or toy)?</td>
</tr>
<tr>
<td>17.</td>
<td>Walking (may be unsteady and fall occasionally)?</td>
</tr>
<tr>
<td>18.</td>
<td>Climb off and on low objects?</td>
</tr>
<tr>
<td>19.</td>
<td>Stand for at least 3 minutes?</td>
</tr>
<tr>
<td>20.</td>
<td>Turn pages of a board or cloth book one at a time?</td>
</tr>
<tr>
<td>21.</td>
<td>Put objects into a container?</td>
</tr>
<tr>
<td>22.</td>
<td>Remove an object from a container?</td>
</tr>
</tbody>
</table>

Notes:
## Appendix C

### Chapter 6: Language and Symbolic Play

### Table C1

**Calculating MLU**

<table>
<thead>
<tr>
<th>Heading</th>
<th>Morphemes</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td><em>Tasty, lovely, pointy, noisy, tricky</em></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td><em>Really</em></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td><em>Pretty</em></td>
</tr>
<tr>
<td>Compound morphemes</td>
<td>2</td>
<td><em>Teacup, sweetheart, teapot, something, somewhere, yourself, everything</em></td>
</tr>
<tr>
<td>Subject-verb agreement</td>
<td>4</td>
<td><em>She makes noise</em></td>
</tr>
<tr>
<td>Past tense</td>
<td>2</td>
<td><em>Frustrated, wooden</em></td>
</tr>
<tr>
<td>Comparatives</td>
<td>2</td>
<td><em>noisier</em></td>
</tr>
<tr>
<td>Superlatives</td>
<td>2</td>
<td><em>noisiest</em></td>
</tr>
<tr>
<td>Contractions</td>
<td>1</td>
<td><em>Gonna [: going to], wanna [: want to], gotta [: got to], outta [: out of ], whaddave [: want have], hiya [: hello], whatcha [: what are you], hafta [: have to], tryna [: trying to]</em></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td><em>C’you [: can you], d’ya [: do you], svery [: it's very], lotsa [: lots of], lookeda [: looked at], onea [: one of], looka [: look at], anen [: and then], sright [: that’s right], whatis [: what does], d’th [: did the], kinda [: kind of], dit [: did it], sthere [: is there], swe [: so we]</em></td>
</tr>
<tr>
<td>Discourse participle</td>
<td>0</td>
<td><em>Ooh, mmm, eh, hey</em></td>
</tr>
<tr>
<td>Repetition</td>
<td>1</td>
<td><em>Mum, mum, mum</em></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td><em>I need a, need a spoon</em></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td><em>You go push push.</em></td>
</tr>
<tr>
<td>Diminutives</td>
<td>1</td>
<td><em>Teddy, cuppa</em></td>
</tr>
<tr>
<td>Frequently used words –</td>
<td>1</td>
<td><em>Christmas</em></td>
</tr>
<tr>
<td>theoretically 2 morphemes but</td>
<td></td>
<td><em>Weetbix</em></td>
</tr>
<tr>
<td>assumed to be stored as whole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>words in the mental lexicon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Adapted from Brown, 1974; Johnson, 2005; and Kirkham, Stewart, & Kidd, 2013.
Appendix D

Chapter 7: Joint Attention, Gesture and Symbolic Play

Descriptive statistics and Wilcoxon signed-rank tests analyses were conducted to determine what types of gestures parents and their infants used, how frequently they used them, and if their use differed between JA episodes that occurred with functional and symbolic play contexts. Results are presented in Table D1.

Table D1

Descriptives of Parent and Infant Deictic and Iconic Gestures Across Conditions

<table>
<thead>
<tr>
<th></th>
<th>Deictic</th>
<th></th>
<th>Deictic</th>
<th></th>
<th>Deictic</th>
<th></th>
<th>Deictic</th>
<th></th>
<th>Deictic</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Declarative M</td>
<td>SD</td>
<td>Mdn</td>
<td>range</td>
<td>Imperative M</td>
<td>SD</td>
<td>Mdn</td>
<td>range</td>
<td>In-hand M</td>
</tr>
<tr>
<td>Parent</td>
<td>Functional</td>
<td>1.04</td>
<td>2.14</td>
<td>0.00</td>
<td>11</td>
<td>0.02</td>
<td>0.014</td>
<td>0.00</td>
<td>1</td>
<td>0.06</td>
</tr>
<tr>
<td>Infants</td>
<td>Symbolic</td>
<td>1.07</td>
<td>1.78</td>
<td>0.00</td>
<td>8</td>
<td>0.07</td>
<td>0.43</td>
<td>0.00</td>
<td>3</td>
<td>3.69</td>
</tr>
<tr>
<td>Infant</td>
<td>Functional</td>
<td>0.30</td>
<td>0.74</td>
<td>0.00</td>
<td>4</td>
<td>0.15</td>
<td>0.68</td>
<td>0.00</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>Symbolic</td>
<td></td>
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<td>1.40</td>
<td>0.00</td>
<td>7</td>
<td>0.06</td>
<td>0.23</td>
<td>0.00</td>
<td>1</td>
<td>5.30</td>
</tr>
</tbody>
</table>

Note. Mdn = median.

As evident in Table D1, there were few differences between gesture use in JA episodes within the symbolic and functional play conditions. Declarative deictic gesture use was greater in JA episodes that occurred within symbolic play than functional play, however this difference was not significant for parents, z = 0.62, p = .543, r = .06, and was approaching significance for infants, z = 1.94, p = .057, r = .19. Imperative deictic gesture use did not significantly differ between conditions for either parents, z = 0.82, p = .750, r = .08, or infants, z = 0.74, p = .625, r = .07. Similarly, there was no significant difference in the use of out-of-hand iconic gestures by parents, z = 1.50, p = .13, r = .14, or infants, z = 1.00, p = 1.000, r = .10, between conditions. There was, however, a significant difference in the frequency of in-hand iconic gestures used by both parents and their infants between play conditions. Parental and infant in-hand gesture use was significantly higher in the symbolic play condition than it was in the functional play condition (z = 6.17, p < .001, r = .59, and z = 5.98, p < .001, r = .58).
### Table D2

**Means and Standard Deviations for Raw Scores of Child-Directed Speech by Condition**

<table>
<thead>
<tr>
<th></th>
<th>Functional</th>
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<th>Symbolic</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Declaratives</td>
<td>26.96</td>
<td>11.95</td>
<td>23.63</td>
<td>11.09</td>
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<tr>
<td>Exclamatives</td>
<td>4.89</td>
<td>4.21</td>
<td>4.61</td>
<td>3.57</td>
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<tr>
<td>Imperatives</td>
<td>19.44</td>
<td>10.29</td>
<td>11.41</td>
<td>7.96</td>
</tr>
<tr>
<td>Mimetics</td>
<td>5.83</td>
<td>6.06</td>
<td>8.26</td>
<td>7.27</td>
</tr>
<tr>
<td>Naming</td>
<td>15.19</td>
<td>10.84</td>
<td>12.98</td>
<td>9.61</td>
</tr>
<tr>
<td>Tag questions</td>
<td>2.96</td>
<td>3.16</td>
<td>2.85</td>
<td>2.97</td>
</tr>
<tr>
<td>Wh-questions</td>
<td>15.28</td>
<td>7.85</td>
<td>22.39</td>
<td>8.06</td>
</tr>
<tr>
<td>Yes/no-questions</td>
<td>31.69</td>
<td>14.68</td>
<td>37.17</td>
<td>15.86</td>
</tr>
<tr>
<td>Interrogatives</td>
<td>46.96</td>
<td>18.48</td>
<td>60.06</td>
<td>18.57</td>
</tr>
</tbody>
</table>

$N = 54$