Complex spatial language improves from 3 to 5 years: The role of prompting and overhearing in facilitating direction giving using *Between* and *Middle*☆

Alycia M. Hund*, Lindsay J. Bianchi, Jayne F. Winner, Matthew S. Hesson-McInnis

Department of Psychology, Illinois State University, Campus Box 4620, Normal, IL 61790-4620, United States

A R T I C L E   I N F O

A B S T R A C T

The primary goal of this study was to specify age-related improvements in young children's use of the complex spatial terms *between* and *middle* in response to prompting and overhearing supports. Three- to 5-year-old children described the location of a mouse hidden between two furniture items in a dollhouse. Three prompting conditions (Between Directive, Middle Directive, Nondirective) were compared with two overhearing conditions (Overhearing Between, Overhearing Middle). Children's use of *between* and *middle* was much more frequent in response to directive prompting than in response to nondirective prompting or overhearing. Only 4- to 5-year-old children showed some evidence of using *middle* in response to nondirective prompting and overhearing, demonstrating developmental gains in sensitivity to subtle cues. The secondary goal was to assess young children's production and comprehension of *between* and *middle* using tasks suitable for young children and parent report checklists. As expected, children's spatial language showed strong developmental improvement and was related to direction-giving performance.

1. Introduction

Understanding and communicating about locations is important for children and adults. Young children often give and follow directions to find coats, shoes, and favorite toys. Spatial precision is important in facilitating clear understanding and efficient searches. For example, it is important to determine whether the toy is on the table, under the table, next to the table, or between the table and the chair. Decades of research findings have documented young children's expanding mastery of simple spatial concepts, such as in, on, and under (e.g., Clark, 1973; Dromi, 1978; Jackendoff & Landau, 1991; Johnston & Slobin, 1979). More recently, researchers have begun to focus on more complex concepts, such as nearby, middle, and between (e.g., Foster & Hund, 2012; Hund & Plumert, 2007; Plumert, Haggerty, Mickunas, Herzog, & Shadrick, 2012; Plumert & Hawkins, 2001; see also Johnston & Slobin, 1979); however, we still know relatively little about how children understand and use these complex spatial concepts. As such, the primary goal of this study was to specify age-related improvements in young children's use of the complex spatial terms *between* and *middle* in a challenging direction-giving task based on prompting and overhearing supports. The secondary goal was to assess young children's production and comprehension of these spatial terms using tasks suitable for young children and parent report checklists and to link these findings to direction-giving performance. Exploring *between* and *middle* in the same research

---

* Corresponding author. Tel.: +1 309 438 7863; fax: +1 309 438 5789.
E-mail address: amhund@ilstu.edu (A.M. Hund).

study was important for comparative purposes given the dearth of research regarding these spatial concepts.

Between is complex for a number of reasons. First, it requires comparison with two reference points (e.g., the cup is between the plates), making it more difficult conceptually than spatial terms requiring comparison with only one reference point (e.g., the cup is by the plate). In addition, *between* requires complex syntactic constructions (in English) and is infrequent in language corpora (Durkin, 1981, 1983; Weist, Lyytinen, Wysocka, & Atanassova, 1997). As such, it is not surprising that children's comprehension and production of *between* becomes more precise throughout early childhood (Durkin, 1981, 1983; Internicola & Weist, 2003; Johnston & Slobin, 1979; Messick, 1988; Washington & Naremore, 1978; Weist, Atanassova, Wysocka, & Pawlak, 1999; Weist, Lymburner, Piortowski, & Stoddard, 2000; Weist & Lyytinen, 1991; Weist et al., 1997). For instance, Weist et al. (2000) noted that conceptualization of *between* is evident by 4 years 7 months, which is considerably later than simpler spatial concepts. Like *between*, *middle* also is complex. *Middle* requires comparison with (at least) two reference points, making it relatively difficult conceptually. *Middle* also may refer to the center of a region. In precise usage, *middle* may require detailed information about distance, rendering *middle* equidistant from reference points or boundaries. In English, *middle* adheres to complex syntactic constraints, often involving multiple prepositions (e.g., in the *middle of* the trees), and these constraints differ across reference frames. These conceptual and syntactic aspects may pose difficulties for young children.

Previous research investigating when young children understand and produce the spatial terms *between* and *middle* is sparse. In one early study, 3- to 6-year-old children were shown three sets of picture cards. For example, a bird, rabbit, and fish were alternated so that in each picture, each animal had a different position in a straight line. Children were asked to point to the card depicting the scene that the experimenter explained, such as "Which card shows the rabbit *between* the bird and the fish?" Two-thirds of the 3- and 4-year-olds were able to correctly identify the picture card depicting the appropriate configuration. Five-year-olds were able to correctly identify more pictures than both the 3- and 4-year-olds, and 6-year-olds chose only correct pictures (Durkin, 1983). In another test of comprehension, 3- to 7-year-old children were asked to put a blue brick between two green bricks. Only 25% of 3- to 5-year-old children were successful, whereas 65% of 6- to 7-year-old children were successful, revealing dramatic improvement across childhood (Durkin, 1981). It is interesting to note differences across tasks, suggesting that comprehension across diverse contexts differs from first usage in highly supportive contexts. Overall, these findings reveal improvements in the conceptualization and utilization of *between* in early childhood, particularly between 3 and 5 years (see also Internicola & Weist, 2003; Johnston & Slobin, 1979; Messick, 1988; Washington & Naremore, 1978; Weist & Lyytinen, 1991; Weist et al., 1997, 1999, 2000).

Research findings documenting children's acquisition of the spatial term *middle* are very limited. *Middle* is not included in comprehensive discussions of spatial language acquisition (e.g., Clark, 1973; Johnston & Slobin, 1979; Logan & Sadler, 1996). In one study, Loewenstein and Gentner (2005) tested comprehension by asking young children to point to the spatial position described, probing several spatial terms such as *on, in, under, top, middle,* and *bottom*. Their findings revealed that by 3 years 8 months, children were correct on 84% of trials when asked to point to the middle shelf. Another recent study by Simms and Gentner (2008) indicates that some 3- to 5-year-old children understand and produce the spatial terms *middle* and *between*, and that these language skills closely parallel children's search abilities. Although detailed findings from the language production and comprehension tasks were not provided in their brief report, children's spontaneous production of *middle* and *between* during their search task increased from 3 to 4 and 5 years, consistent with general trends regarding spatial language acquisition (Simms & Gentner, 2008). Similarly, Ankowski, Thom, Sandhofer, and Blaisdell (2012) investigated the interplay of spatial language and search strategies among 2- to 6-year-old children. Although children's searches did not differ as a function of language input, this study documented profound improvement in young children's grasp of the relational concept *middle*. Parents reported that 40% of 2-year-olds, 89% of 3-year-olds, and 100% of 4- to 6-year-olds understood and produced the word *middle*.

What factors facilitate young children's emerging understanding and usage of complex spatial language? There is no doubt that children's conceptual understanding is linked with language development, and that concepts and language grow in scope and complexity across infancy and early childhood. Moreover, there is little doubt that contextual supports, social interactions, and cultural beliefs shape emerging language proficiency. Focusing on child factors points out the central notion that children's competence is important for linguistic development. In contrast, focusing on sociocultural factors shifts the emphasis to children's performance evident in interactions with others, which varies over contexts and with experience. In particular, adopting a sociocultural perspective leads to a focus on the zone of proximal development, which represents the set of activities a child cannot accomplish on his or her own but can complete with support from someone with more expertise (Vygotsky, 1978). Support can take many forms, including scaffolding and overhearing, which are the supports we tested in this study. Scaffolding is the process by which adults provide supportive strategies to children by guiding parts of the interaction that are too complex for children to complete individually, adjusting support as needed to match children's zone of proximal development (Wood, Bruner, & Ross, 1976). We know that scaffolding supports children's ability to solve everyday problems such as building with blocks (Gregory, Kim, & Whiren, 2003), solving math problems (Stevenson & Baker, 1987), and understanding science concepts (Fender & Crowley, 2007).

Scaffolding also supports young children's spatial language. For example, Plumert and Nichols-Whitehead (1996) found that parents adjusted the amount of support they provided to their 3- and 4-year-old children to help them provide complete descriptions of objects hidden in, on, or nearby furniture items in a dollhouse. In particular, they provided more directive support for 3-year-olds, especially early in the session, providing specific spatial language options. Results from a second study showed that initially 3-year-olds had difficulty using nondirective prompts—which pointed out ambiguity but did not offer potential solutions—but their performance improved throughout the session to become indistinguishable from 4-year-olds, demonstrating the importance of appropriate supports. Foster and Hund (2012) extended this line of research by examining how parents and their 4- and 5-year-old children use more complex spatial language in a similar direction-giving task. They found that parents provided more directive