A Dissertation

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The referent can obscure performance: Requiring young children to use their own bodies impedes their use of 2D human line drawings as self-representations

by

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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Psychology

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May 2015
An Abstract of

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In clinical and forensic practice, professionals often use dolls and human figure drawings (HFDs) to question young children about touch events. These professionals assume children understand the representational nature of the props. However, recent work has shown even 5-year-olds make some errors when using props to show touch occurring on them. The purpose of the present study was to examine whether requiring children to use their own bodies impeded their performance in showing touches when using drawings and dolls as representations. Children’s use of 2D line drawings and 3D objects (i.e., scale models and dolls) as symbols was assessed on three tasks. All children used the symbols to show touch occurring on their own bodies, touch occurring on another person’s body, and to guide their search for a hidden object. For all tasks, children’s performance improved with age; however, even 5-year-olds made some errors showing touch locations. Findings revealed that asking children to use their own bodies did affect their accuracy in using dolls and drawings as symbols. When asked to show touch locations on another person, children’s performance was intermediate to the other two tasks. Children demonstrated improved performance in showing touch locations on
another person as compared to their own bodies. However, this finding was qualified by a significant interaction. Children made the most errors when asked to use 2D drawings to show touch locations that occurred on their own bodies as compared to any other task/symbol combination. Forensic applications and theoretical implications of the findings are discussed.
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List of Abbreviations

AD..............................Anatomically Detailed
HFD.........................Human Figure Drawing
3D.............................Three-dimensional
2D.............................Two-dimensional
Chapter One

Introduction

Children’s ability to give accurate reports of prior events has garnered a great deal of research attention over the past several decades (e.g., see London & Ceci, 2012). Much of this research has been spurred by actual cases of child sexual abuse, which often are characterized by a lack of physical evidence and by the fact that the child and the alleged abuser are the only witnesses (London, Bruck, Ceci, & Shuman, 2005). In most cases, children’s verbal reports are the only means of determining whether a crime was committed.

A principal concern in child sexual abuse investigations is how to best conduct interviews in order to obtain accurate abuse disclosures from truly abused children. The use of forensic props, such as anatomically detailed (AD) dolls and human figure drawings (HFDs), is one technique endorsed by some interview protocols to help children disclose abuse (e.g., American Academy of Child and Adolescent Psychiatry Practice Parameters, 1997; American Professional Society on the Abuse of Children Practice Guidelines, 2002). Professionals who support the use of dolls and drawings contend that the props decrease children’s need for complex language by allowing interviewers to clarify verbal reports, improve children's comfort discussing the sexual nature of abuse, and increase the number and quality of relevant details reported (Anderson et al., 2010; Pipe & Salmon, 2009; Russell, 2008). While the proposed benefits would be valuable, professionals who study investigative techniques have yet to agree on whether dolls and drawings actually provide assistance to children during forensic evaluation.
Extant empirical work investigating whether the use of dolls and drawings promotes children’s event reports has yielded mixed data with most studies failing to provide support. However, these studies obscure the basic issue of children’s memory for a touch event with their ability to show where touch occurred on their own body. That is, past studies on dolls and drawings have asked children to use the props to show where they were touched during an earlier event. If the dolls/drawings do not bolster children’s performance, there are two possible explanations. First, the dolls might not benefit children’s memory for the touch event. Second, and the hypothesis explored in the present study, children may not perform well in using props to show where they were touched. In order for dolls and drawings to promote children’s autobiographical reports, children must use the props as self-representations while accurately mapping the location of touch on their own body to the corresponding location on the prop. The goal of the present study is to add to our body of work exploring children’s basic ability to use dolls and drawings to demonstrate contemporaneous body touch.

The training manuals of many drawing focused interview protocols reference a vast scientific literature on symbolic development in young children by DeLoache and colleagues (e.g., for a review see DeLoache, 2004). Authors argue that DeLoache and colleagues have established that, by age 3, children can successfully use symbols and therefore, by age 3, children should be able to use dolls and drawings to show body touch locations. However, DeLoache and colleagues’ experimental paradigm involves hiding an object in a small-scale model or showing on a picture the location of the object and then having the child search for a larger but similar object in a separate, corresponding space. A closer examination of DeLoache and colleagues’ theory and evidence shows
that symbolic development varies with task demands and context. Therefore, children’s performance in using dolls and drawings to show touch may in fact follow a very different developmental trajectory than using symbols to guide their search for a hidden object.

Lytle, London, and Bruck (2015) recently conducted two studies designed to explore 3- to 5-year-old children’s basic ability to use dolls and drawings to map body touch. In Study 1, the researcher placed a sticker some place on the child (e.g., their elbow) and asked the child to show the sticker location using either a doll or a drawing. Unlike DeLoache’s findings of symbol competence by age 3, children committed many errors and were far from ceiling at age 3. Even 5-year-olds continued to make errors with only 75% of them scoring perfectly.

One possible explanation for children’s poorer performance on the touch task compared with DeLoache’s published findings is that Lytle and colleagues’ task was somehow more difficult or that children did not understand the instructions. To explore this hypothesis, in Study 2, the researchers repeated the task from Study 1. Children also completed a search task, the demands of which were similar to DeLoache and colleagues tasks. The major difference between the two tasks was whether children had to (a) show on a symbol the location on their body on which a sticker was placed versus (b) show on a symbol the location that an object was placed in a larger scale space. In a counterbalanced order, children were asked in one task to show on a 3D doll or a 2D drawing the location of a sticker placed on their body. In the second task, children were asked to show the location of a hidden object (i.e., an apple in a large cardboard barn) on either a 3D or 2D symbol. Lytle and colleagues found that, when compared to their use
of symbols to search for a hidden object, 3- and 4-year-old children demonstrated delayed success in using dolls and drawings as self-representations to show current body touches. Given the researchers carefully matched instructions and task demands on the two tasks, the question of why children show such poor performance in mapping touch versus in mapping the location of a hidden object begs to be addressed.

The most central characteristic that differs in mapping touch versus mapping the location of a hidden object is that showing touch requires the child to appreciate symbols as representative of their own body. This unique demand may impair children’s use of the props as symbols for themselves in the task of showing touch. Children’s developing self-awareness and theory of mind skills may account for improved use of dolls and drawings as self-representations during the pre-school years. The present study was designed to examine whether requiring children to use their own bodies makes the task of using symbols to show touch more difficult than to search for a hidden object.

In the first section below, I review the use of AD dolls and HDFs during forensic evaluation as well as extant research that has examined the usefulness of dolls and drawings when testing children’s event memory. Next, I present research on children’s developing understanding of symbols including their use of dolls and drawings as self-representations. Finally, I address how the requirement of asking children to use their own bodies as the space to be represented may make more difficult the task of using symbols to show touch versus guiding their search for a hidden object.

**The use of AD Dolls and HDFs to promote children’s event reports**

**Anatomically detailed dolls.** In the 1980’s, many child abuse professionals began using AD dolls with children during forensic investigations and therapy. Children
were asked to “show what happened” while demonstrating with a doll (Boat & Everson, 1988; Conte, Sorenson, Fogarty, & Rosa, 1991; Kendall-Tackett & Watson, 1992). The rationale for using dolls with young children was that dolls might help children report additional details when they had difficulty verbalizing or recounting an experience on their own (Boat & Everson, 1986; Kendall-Tackett & Watson, 1992; Yates & Terr, 1988).

A handful of studies have examined whether AD dolls assist children in reporting on experienced events. The major finding is AD dolls sometimes increase the quantity of information reported, but do so at the expense of accuracy (Bruck, Ceci, & Francoeur, 2000; Bruck, Ceci, Francouer, & Renick, 1995; DeLoache & Marzolf, 1995). For example, Goodman, Quas, Batterman-Faunce and Riddlesberger (1997) questioned 3- to 10-year-old children who had undergone genital touch during the course of a needed medical procedure. While use of AD dolls led to increases in the amount of information provided, the youngest children made more mistakes when using dolls than they did during their verbal recall of the event. In fact, when questioned with AD dolls, 3- and 4-year-olds provided as much incorrect information as they did correct information.

DeLoache and Marzolf (1995) pointed out that preschoolers are inexperienced symbol users and likely fail to understand how to use dolls as representations of themselves to communicate personally experienced events.

Despite their intuitive appeal, then, there is little empirical support for the use of AD dolls during forensic interviews with children. Dolls do not appear to aid reporting of relevant details above and beyond what children provide during their verbal reports. When the use of dolls increases the number of places children indicate they were
touched, they show increased reports of both true and false touch locations (see Bruck, Ceci, & Francoeur, 2000; Bruck, Ceci, Francouer, & Renick, 1995; DeLoache & Marzolf, 1995; Lamb, Hershkowitz, Sternberg, Boat & Everson, 1996; Steward & Steward, 1996; Thierry, Lamb, Orbach & Pipe, 2005).

In reaction to research showing that AD dolls do not benefit children’s reports, many professionals began looking for more appropriate tools to use when interviewing children. Most forensic interview protocols\(^1\) have moved away from the use of AD dolls and have adopted the use of HFDs during forensic evaluation.

**Human figure drawings.** Currently, many child forensic interviewers use HFDs when questioning victims of alleged sexual abuse. Typically, the interviewer shows children the front and back view of a same-gender unclothed child and asks them to label body parts. Body parts include public regions (e.g., arm, leg) as well as genital and anal regions. The assumption apparently is that if children can identify body parts on symbols (using either proper terminology or slang) then they should be able to use the symbols to show where they were touched.

After basic body part identification, interviewers generally ask children to point to the location where they were touched (Poole & Dickinson, 2011). Interviewers may also point to a region on the drawing and ask if this is where the child was touched. In some instances, interviewers introduce an adult HFD in an attempt to identify where the child

\(^1\) Many child psychotherapists continue to use dolls during play therapy with children, apparently with the assumption that they will demonstrate important information about their own lives using the dolls.
touched the adult and/or what body parts of the adult touched the child (for review, see Poole & Dickinson, 2011).

As with AD dolls, professionals who use HFDs assume that the drawings will help children overcome communicative obstacles including limited language and fear or embarrassment discussing the sexual nature of abuse (Pipe & Salmon, 2009). Human figure drawings may act as memory cues or reminders for the to-be-remembered event, increasing the number of forensically relevant details reported (Russell, 2008). However, given the relatively recent shift to HFDs, few studies have examined whether children’s reports are improved by using HFDs.

In a field study, Aldridge, Lamb, Sternberg, Orbach, Esplin and Bowler (2004) found that, following an exhaustive forensic interview, HFDs paired with questions about body touch increased the number of forensically relevant details reported by suspected victims of child sexual abuse (ages 4- to 13-years-old). Human figure drawings were particularly useful with 4- to 7-year-old children who recalled 27% of forensically relevant details when asked to use the drawings. However, since reports could not be validated, the effects of HFDs on accuracy could not be determined.

In a controlled laboratory study, Poole and Dickinson (2011) found that questioning 4- to 9-year-old children in this manner led to a slight increase in reports of touch during the open ended phase of questioning (9% reported touch versus no reports in the standard protocol). However, these increased reports of touch came at a cost. Children questioned using the HFDs were apt to include false suggested touches in their reports. Once direct questions were asked, the amount of information reported by children did not differ by interview protocol.
Additional laboratory studies have found that, compared with standard interview protocols, HFDs did not facilitate children’s reports of true touches but led to increases in false reports of touch among 5- to 7-year-olds (Brown, Pipe, Lewis, Lamb, & Orbach, 2007) and 3- to 7-year-olds (Bruck, 2009). Children performed poorly in identifying body touch regardless of whether the interviewer employed HFDs. Willcock, Morgan and Hayne (2006) found that children generally failed to report when touching occurred, and 60% of all touches reported on an HFD were incorrect. Taken together research suggests the inclusion of props during forensic evaluation does not benefit children’s event reports.

All of the forensic developmental studies reviewed above that examined the utility of AD dolls and HFDs have employed the methodology of testing children’s memory about an event, either with or without the props. Unfortunately, this design confounds children’s use of props with their ability to remember a previously experienced event. While the findings generally reveal the props do not aid children’s reports, we are left not knowing why. One possibility, as previously noted, is that props simply do not benefit children’s memory. A more basic possibility is that children do not appreciate the symbolic nature of props necessary for successful mapping of body touch. If children fail to use HFDs or AD dolls as symbols representative of themselves, then forensic interviewers need to reassess their use.

In order for forensic props to promote children’s accurate testimony, a necessary prerequisite is that they must understand the props as symbols representative of their own body on which they can demonstrate previous touch experiences. The props also must somehow aid children’s verbal reporting of a specific experience (e.g., cue memory for a
true touch event). In the next section below, I review the literature on children’s developing symbolic competency including their ability to use symbols to (a) search for a hidden object and (b) as self-representations to show body touch.

Children’s developing understanding of symbols

Deloache and colleagues have conducted over 30 years of research on children’s developing understanding of symbols (for a review, see DeLoache, 2004). They have identified developmental achievements necessary for children to become more competent symbol users and have established specific conditions in which children are more likely to succeed in using symbols across various tasks. Importantly, DeLoache and colleagues have shown that symbol understanding is not an all-or-none development. Children’s symbolic competency undergoes continued improvement throughout the preschool years and is very much dependent on task demands and previous symbol experience.

Representational insight, or the recognition that one object stands for another, marks toddlers’ understanding of the symbolic nature of pictures and their ability to use pictures to solve problems (DeLoache, 1995, 2000). Representational insight develops gradually whereby children become increasingly able to appreciate abstract symbols, such as maps, to solve problems. Two-dimensional pictures or photographs are the first symbols with which children begin to demonstrate representational insight. While representational insight is necessary for children’s success with more complex symbols (e.g., 3D models), it is not in itself sufficient (Suddendorf, 2003). DeLoache (1987, 1991, 2000) has found that in order for children to successfully use 3D objects as symbols, they must have developed a sense of dual representation.

Dual representation is the understanding of a symbol as a real object, and at the
same time, representative of something other than itself (DeLoache & Marzolf, 1995). Through a series of studies, DeLoache and her colleagues have provided strong support for the development of dual representation between 2.5- and 3-years of age (DeLoache, 1987, 1991; DeLoache, Kolstad, & Anderson, 1991).

**Children’s use of 2D and 3D symbols to search for a hidden object.**

DeLoache and colleagues have consistently found that children appreciate 2D objects earlier than they appreciate 3D objects as symbols to guide their search for a hidden object (DeLoache, 1987, 1991; Marzolf & DeLoache, 1994). In a series of studies, children watched as a small Snoopy doll was hidden somewhere in a 3D scale model or were told “Small Snoopy” is hiding “here” as the researcher pointed to the corresponding location on a 2D picture (i.e, photographs and line drawings). Children were then told that a big Snoopy doll was hiding “in the same place” in a corresponding room (i.e., the referent, or space that the 2D and 3D symbols were meant to stand for). Children were asked to find “Big Snoopy”. To successfully search for Snoopy, children had to use the scale model and picture as symbols to guide their search for the hidden Snoopy in the larger room. Two-and-a-half-year-old children failed to use a 3D scale model as a symbol to guide their search for Snoopy, but succeeded in using a 2D picture. DeLoache postulated this was because 2D symbols do not require dual representation. Rather, 2D objects such as line drawings and photographs have a single use: as a symbol. By 3-years of age though, children readily used 2D and 3D symbols to show the location of a hidden Snoopy doll, providing evidence they began to understand the dual nature of 3D symbols.

To transition these findings back to the use of dolls and HFDs, children first must acquire the representational insight that dolls or drawings are symbols of themselves.
Second, children must be able to accurately map from their own body to the doll or drawing. Based on DeLoache and colleagues work, one would predict that children would more readily understand HFDs before an AD dolls since the drawing is 2D and serves only a representational function whereas dolls are both symbols and play objects (DeLoache, 1990; DeLoache & Burns, 1993; DeLoache, et al, 1991). However, recent work by Lytle and colleagues (2015) found the task of showing body touch using dolls and drawings is more complicated than using symbols to search for a hidden object. Further, findings suggest that children’s use of dolls and drawings as symbols is affected by task demands unique to the act of showing body touch.

**Children’s use of dolls and drawings to show touch.** In a newly emerging program of study, Lytle and colleagues (2015) systematically measured children’s use of dolls and drawings as self-representations by employing a simple touch task. Children were asked to demonstrate current touch (as marked by a sticker) on their own body. While the sticker was still on them, children were asked to show on a symbol (e.g., a doll) where they were touched. Because the sticker was left on the children while making their placement on the symbol, memory demands were bypassed, something that other researchers have confounded in their exploration of the effects of dolls and drawings on children’s reports.

In Experiment 1 (Lytle et al., 2015), stickers were placed on 12 different body parts on the children and they were asked to report those touches on three different symbols: a human line drawing, a doll, and an adult researcher. While children’s use of dolls and drawings to show body touches improved with age, even 5-year-olds made some errors. Three- and 4-year-old children were least successful when asked to use the
drawing to demonstrate touch. This was particularly surprising considering the robust finding that children understand the symbolic nature of 2D pictures before 3D models to guide their search for a hidden object (DeLoache, 1987, 1991; DeLoache & Burns, 1994; Marzolf & DeLoache, 1994).

In Experiment 2, Lytle and colleagues (2015) directly compared children’s performance on a DeLoache-like search task using both 2D and 3D symbols with their use of dolls and drawings to show body touch. Findings revealed that the task of using symbols to guide their search for a hidden object was easier for children than to use dolls and drawings as symbols to show touch. Interestingly, 3- and 4-year-olds, again, were better able to show touch using the 3D dolls than the 2D drawings but the reverse pattern was shown on the search task. Children benefited in using the 2D symbol over a 3D symbol when searching for a hidden object.

These findings fit DeLoache’s theoretical framework that children’s symbolic competency undergoes continued improvement throughout the preschool years and is, in part, dependent upon task demands. However, we are left not knowing why children’s use of symbols to show touch is delayed in comparison to their use of symbols to guide their search for a hidden object. One obviously unique element of the touch task is that children were asked to use their own bodies as the space from which they were gathering information. Young children may have difficulty understanding the representational nature of dolls and drawings when specifically asked to use themselves as self-representations.
Requiring children to use their own bodies may influence their use of dolls and drawings as self-representations.

Because even infants demonstrate early symbol understanding, many people mistakenly believe that children will perform proficiently on all symbol tasks (Liben, Kastens & Stevenson, 2002). However, a basic understanding of symbols is not sufficient for completing all types of symbol tasks. For example, we would not expect a 3-year-old child to successfully navigate Los Angeles using a map of the city even though children at this age can use scale models and pictures to search for a hidden toy in a corresponding room. While children’s ability to use symbols continues to improve throughout the school years (Liben & Downs, 1993), at no point are they deemed perfect symbol users. Symbol performance, even for adults, depends on factors such as the complexity of the task and one’s understanding of the symbol-referent relationship (e.g., Levine, Marchon, & Hanley, 1984).

In the task of showing body touch, young children may fail to understand they can represent their own bodies using an inanimate drawing or doll, and thus, fail to identify the necessary symbol-referent relationship to succeed in using the symbols as self-representations. Improvements in self-awareness between the ages of 3- and 5-years-old could provide children skills necessary to overcome the extra requirement of using their own bodies to show touch.

Children’s developing self-awareness. While early experiences are the foundation for the forming self, the preschool years are a time when major advances in self-awareness take place (Flavell, Miller & Miller, 1993; Rochat, 2003; Thomas & Goodvin, 2005). Self-awareness is not a categorial development but continues to
improve through early childhood. For example, children between 2- and 3-years-old realize they can act on and communicate information about their current state. Self-representations at this age, however, are temporally bound. Not until 4-years-old do most children demonstrate they are able to connect and communicate information about a past state to their current state (Povinelli, 2001; Rochat, 2003).

Povinelli (2001) found that 3-year-olds did not use information about themselves provided by a Polaroid photograph or time-delayed video when presented following a target event. The photograph and video both showed that, 3 minutes earlier, a sticker had secretly been placed atop the child’s head. Children readily identified themselves in the photograph and video, but failed to reach up and remove the sticker, suggesting they failed to understand the image represented their current state and provided information on which they could act. These same children, however, reached for and removed the sticker when shown a mirror. Povinelli posited 3-year-olds understood their image in the mirror provided information about their current state and so, they removed the sticker. Interestingly, 4-year-olds who were shown the same covertly placed sticker via the photograph and video quickly reached up to remove it. They demonstrated no difficulty in recognizing the time-delayed information was reflective of their current self.

Similarly, young children’s limited self-awareness may influence their ability to understand forensic props as self-representations. Perhaps, for preschoolers, the inclusion their own body makes more difficult the task of using props to relay information about their body. As children become more self-aware and experienced in sharing information, they may better understand the importance of communicating personal information using symbols. Moore and Lemmon (2001) noted that children’s
self-awareness is further benefited as they are able to hold multiple representations about the self. By 5-years-old children more easily organize their past, present, and future selves (Moore & Lemmon, 2001; Rochat, 2003; Striano, Tomasello, & Rochat 2001). Later developments in self-awareness may contribute to 5-year-old children’s much improved performance in showing body touch via dolls and drawings.

Chapter Two

The Present Study

The purpose of the present study was to examine whether the added requirement of using the child’s own body as the area meant to be represented hindered their success in showing touch by demonstrating on a 2D drawing and 3D doll. The experimental procedure was designed to systematically measure children’s ability to show current touch with and without requiring children to use their own bodies as the referent to be symbolized. The DeLoache inspired search task used by Lytle and colleagues (2015) was also included to evaluate children’s use of symbols across contexts.

Children between 3, 4, and 5-years old participated in six different task/symbol conditions. Three mapping tasks, two different touch tasks and one object search task were designed to be as similar in instruction and cognitive demands as possible. During the touch tasks children were asked to show on a symbol the location of body touches occurring on their own body (i.e., touch on child task) or another person’s body (i.e., touch on another person task). A large sticker was placed on a specific body location. The child was then given a smaller sticker and told to place it on the exact same body part on a symbol. In the search task, a real apple was placed on a specific location in or around a child-sized play barn. The child was then given a small apple replica or an
apple sticker and told to place it on the exact same spot on a barn symbol. The primary goal in conducting the present study was to explore whether some aspect of requiring the children to use their own bodies impaired performance in showing body touch. By including the DeLoache inspired search task we might further be able to gauge the extent to which the presence of the self accounts for task differences. For all three tasks, children were required to use two types of symbols: a 2D line drawing and a 3D model/doll.

**Hypotheses**

**Performance across age.** As has been demonstrated in previous studies, children’s accuracy in using both 2D and 3D symbols was expected to improve with age for all tasks (e.g., DeLoache & Marzolf, 1995; DeLoache & Smith, 1999; Lytle et al., 2015).

**Performance by task.** I expected that all children would perform well when asked to use both 2D and 3D barn symbols to show the location of a real apple in the corresponding play barn, with 4- and 5-year-olds performing at ceiling (DeLoache, 1987, 1991; DeLoache & Burns, 1994; Marzolf & DeLoache, 1994; Lytle et al., 2015). However, based on work by DeLoache and Marzolf (1995) and Lytle and colleagues (2015), it was hypothesized that children would show lagged performance when using symbols to show touch occurring on their own bodies. Even 5-year-olds were expected to make some errors.

The purpose of the present study was to identify whether requiring children to use their own bodies complicated the task of showing touch using 2D line drawings and 3D dolls. If so, children ought to have been more accurate in showing touch occurring on
another person’s body as compared to touch on their own bodies. If the requirement to use their own body accounted for children’s delayed use of symbols to show touch, then children should have performed equally well in the touch on another person and search tasks. We would expect to see children’s performance in the touch on another person task to fall intermediate to the touch on child and search tasks if requiring children to use their own bodies accounted for only a portion of the delay in showing touches.

**Influence of symbol dimension.** By age 3, children readily use symbols to search for a hidden object though often they find an advantage in using 2D symbols over 3D symbols (DeLoache, 1987, 1991; DeLoache & Burns, 1994; Marzolf & DeLoache, 1994; Lytle et al., 2015). The youngest children in the present study were expected to be more accurate when using the 2D drawings over the 3D barn model to show the location of a hidden apple. In the context of showing touch locations, it has been demonstrated that young children benefit in using a 3D doll over the 2D drawing (Lytle et al., 2015); therefore, it was anticipated that children under 5-years-old would be more accurate showing body touches using the 3D doll compared to the 2D drawing.

**Methods**

**Participants.** Eighty-seven 3- to 5-years-old children (M<sub>age</sub> = 3.95 years, SD = 0.81) were recruited from Toledo area schools and daycares. There were 30 3-year-olds (13 female and 17 male), 31 4-year-olds (16 female and 15 male), and 26 5-year-olds (16 female and 10 male). A power analysis conducted using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) recommended a sample size of 93 participants (31 participants of each age) to find a medium effect (f = .25) with power set at .80 and α set at .05. The study was approved by the University of Toledo’s institutional review board. Written
parental permission and child assent were obtained prior to testing. All testing was completed in a single 30-minute session. All children who participated received an age appropriate prize (e.g., play-doh, stencil) for their help and a book was donated to the library of participating schools and daycares.

**Design Overview.** The experiment was a 3 (age in years: 3- vs. 4- vs. 5-) x 3 (task: touch on child vs. touch on another person vs. search) x 2 (symbol dimension: 2D vs. 3D) mixed model design. The independent variables, task and symbol dimension, were within-subjects factors. The quasi-independent variable, age-in-years, was a between subjects factor. The dependent variable was task performance (i.e., children’s accuracy in showing on a symbol the location of a touch or a hidden object). Task performance was scored for each of the task/symbol conditions. Scoring of task performance is further described below.

**Materials.**

**Touch Tasks.** A 22” My Buddy brand doll and line drawings depicting the front and back of a human figure were used as symbols in the touch on child task and the touch on another person task. For both touch tasks, small and large sized stickers of different shapes (e.g., circles) were used to mark body touches. The child participant acted as the referent on which touches occurred in the touch on child task, whereas an adult researcher was the referent on which touches occurred in the touch on another person task. Four different dolls were available to match children and the adult to the doll by sex and race (i.e., male or female, white or black). All dolls were fully clothed. The human figure drawings were taken from a forensic interview manual and clothes were drawn on the figure. Sets of drawings (i.e., front and back of a human figure) were available to
match children and adult researcher to the drawings by sex, race, and age (i.e., male or female, white or black, child or adult). See Appendix A.

**Search Task.** A child-sized play barn (55”L x 36”W x 49”H) constructed from cardboard acted as the referent space in or around which a real apple was hidden. A 3D model barn (13”L x 8”W x 10”H) and two 2D line drawings depicting a barn (8 ½ x 11, front and back) acted as symbols of the play barn during the search task. See Appendix B. A small-scale apple replica (used with the 3D model barn) and an apple sticker (used with the 2D barn drawings) were given to children so they could show on the symbols where the real apple was hiding in the play barn. The size of the apple used corresponded to the size of the barn with which it was paired. These materials were chosen to replicate the scale-model studies conducted by DeLoache and colleagues (for a review see DeLoache, 2004) and have been used successfully in previous studies (see Lytle et al., 2015).

**Procedure.** Children were tested individually in a single 30-minute session at a quiet place at their school or daycare. The researcher began each testing session by explaining that she wanted to play a game with the child. She briefly mentioned the doll, drawings, and stickers so as to give the child an idea of what they would be doing together. The researcher asked each child if he or she wanted to play. The testing session began once the child agreed to participate by writing his or her name or drawing a picture on the assent form.

All children participated in a total of six conditions. Each condition is referred to below by the task completed and type of symbol (including dimension) that was used. The six conditions were as follows: search using a 2D barn drawing; search using a 3D
barn model, touch on child using a 2D HFD depicting a child; touch on child using a 3D doll; touch on another person using a 2D HFD depicting an adult; touch on another person using a 3D doll. Children were asked to show four object locations or four body touches for each task for grand total of 24 placements. All touch placements were on innocuous body locations. The order of the tasks and symbol presentation was fully counterbalanced and children were randomly assigned to one of six different orders. See Appendix C for an example of the experimenter’s script.

**Touch on Child Task.** The researcher began by showing the child either a 2D HFD of a child or a 3D doll, stating it was like them in a lot of ways. The researcher asked the child to point to different body parts on the symbol to emphasize the similarity to the child. For example, the researcher said, “See the doll has an ear. Point to her ear”. She repeated this question using three other body parts (i.e., nose, foot, shoulder).

Next, the researcher explained that she was going to place a big sticker on the child and that the child should place their small sticker on the symbol in just the same place. For example, the researcher placed a sticker on the child’s stomach and said, “The big sticker is right here on you (places sticker on child’s stomach). Your job is to put the little sticker on the doll in just the same place as the big sticker is on you right now.” The researcher did not state the name of the body part (i.e., did not say “on your stomach”), but rather focused the child’s attention to the body part with the sticker placement. After children made their placement on the symbol, stickers were removed and the next trial began. Children were asked to show four different touches occurring on their body by placing a sticker in the same location on each symbol. Children were touched on eight different body locations and asked to make a total of eight sticker placements.
**Touch on Another Person Task.** This task paralleled the *touch on child* task except the child was no longer the referent on which body touches occurred. Instead children were asked to show where touch was occurring on *another* person. Children were asked to show on a symbol the location on which a second researcher was touched. Children were not touched in this task.

The researcher began by introducing her friend (i.e., an adult research assistant). She explained that for this part of the game she would need help. The researcher then presented either a 2D line drawing depicting an adult or a 3D doll and asked the child to point to different body parts (i.e., ear, nose, foot, shoulder) on the symbol to emphasize similarity to the research assistant.

The researcher explained that she was going to place a big sticker on the assistant and that the child should place their small sticker on the symbol in just the same place. For example, she said, “The big sticker is right here on my friend, Brooke, (*places sticker on assistant’s nose*). Your job is to put the little sticker on the doll in just the same place as the big sticker is on Brooke right now.” The researcher did not instruct the child to place the sticker on the body part (i.e., did not say, “place your sticker on Brooke’s nose”) but rather, focused the child’s attention to the body part with the initial sticker placement. After each child’s placement on the symbol, stickers were removed and the next trial began. Children were asked to show the location of four different touches on the assistant’s body. The assistant was touched on eight different body locations and children were asked to make a total of eight sticker placements.

**Search Task.** The task began when the researcher introduced the child-sized play barn, an apple (i.e., the object hidden by the interviewer), a small plastic apple replica or
an apple sticker (i.e., objects used by the child to indicate on a symbol the location of the real apple). Each time a barn symbol was introduced, the researcher emphasized the similarity to the play barn by asking the child to identify four barn locations (e.g., “point to the small barn’s roof”). Next the researcher explained that she wanted the child to watch as she hid the real apple in or around the play barn. Following each placement, the researcher asked the child to show on a symbol (i.e., a 2D line drawing of the barn or on a 3D barn model) the location of the real apple. The child was able to refer to the location of the researcher’s real apple while making his or her placement on the symbol. For each symbol, children were asked to show the location of the apple in four places, making a total of eight placements in search task.

**Scoring. Body Part and Barn Location Identifications.** Children were asked to make four body part identifications on the 2D line drawings and 3D dolls prior to showing touch locations. Participants could score between 0 and 4 correct identifications on each symbol. This activity was included as many forensic interviewers introduce forensic props by asking children to label the body parts. Their assumption is that if children are able to identify the body parts on the doll or drawing they can also use the prop to discuss touch events. In order to keep requirements standard across all tasks, children were also asked to identify four locations on the barn drawings and model barn prior to showing the apple locations. The number of correct body part and barn identifications was recorded.

**Task Performance.** Task performance was measured by how accurately children used each symbol to show the location of the hidden apple or body touch. Children were asked to make four location placements on two symbols for each of the three tasks.
There were a total of six task/symbol conditions. Following each apple location or touch location prompt, the research recorded the children’s placement as correct or incorrect. Participants scored between 0 and 4 correct placements in each of the conditions. If the child’s placement was incorrect, the researcher also recorded where the incorrect placement was made (e.g., a touch that occurred on the wrist but was reported by the child as having occurred on the stomach was marked as such). Placements were coded liberally with responses being correct if the child placed the sticker on or pointed to the correct barn location/body part. Left/right reversals were coded as correct (e.g., a child who placed a sticker on the doll’s right hand correctly identified the touch even if the touch occurred on the child’s left hand). The number of correct placements for each task was tallied in the lab after the testing session.

**Results**

**Preliminary analyses.** Children were randomly assigned to one of six different task/symbol orders stratified across age to ensure performance differences were not due to order effects. Children’s performance on the tasks did not differ by sex. Therefore, the data were collapsed across this variable. All analyses were conducted on raw scores, although percentages are reported for ease of reading.

**Body part and barn location identification.** Children in all age groups performed well when asked to point to different locations on the 2D barn drawing and the 3D barn model (92-100% correct). Children were also highly successful in identifying body parts on both the 2D human drawings and the 3D dolls (90-99% correct). Given children performed near ceiling, no inferential statistics were conducted.
**Body touch and hidden object locations data.** As described in the Methods section, there were four different trials for each of the six different conditions (i.e., 2D vs. 3D, *touch on child* task, vs. *touch on another person* task, vs. *search* task). To examine task performance, a 3 (age in years: 3-, 4- and 5-) by 3 (task: touch on child vs. touch on another person vs. search) by 2 (symbol dimension: 2D vs. 3D) Analysis of Variance (ANOVA) with repeated measures on the last two factors was conducted on the number of correct placements. There was a main effect of age, $F(2, 84) = 14.90, p < .001, \eta^2_p = .26$. Post hoc tests revealed 3-year-olds performed worse across tasks than did 4- and 5-year-olds ($p$’s < .001). Task performance did not differ between 4- and 5-year-old children, ($p > .05$). See Table 1.

**Table 1. Percentages correct by task, symbol dimension, and age**

<table>
<thead>
<tr>
<th>Task/Symbol</th>
<th>3-year-olds</th>
<th>4-year-olds</th>
<th>5-year-olds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Touch on child</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Drawing</td>
<td>54.2%</td>
<td>77.4%</td>
<td>89.4%</td>
<td>73.0%</td>
</tr>
<tr>
<td>3D Doll</td>
<td>65.0%</td>
<td>85.5%</td>
<td>95.2%</td>
<td>81.3%</td>
</tr>
<tr>
<td><strong>Touch on another person</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Drawing</td>
<td>72.5%</td>
<td>82.3%</td>
<td>90.4%</td>
<td>81.3%</td>
</tr>
<tr>
<td>3D Doll</td>
<td>73.3%</td>
<td>95.2%</td>
<td>94.2%</td>
<td>87.4%</td>
</tr>
<tr>
<td><strong>Search</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Barn Drawing</td>
<td>73.3%</td>
<td>96.7%</td>
<td>97.1%</td>
<td>88.8%</td>
</tr>
<tr>
<td>3D Barn Model</td>
<td>75.8%</td>
<td>96.7%</td>
<td>96.2%</td>
<td>89.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>69.0%</td>
<td>89.0%</td>
<td>93.8%</td>
<td>83.5%</td>
</tr>
</tbody>
</table>

There were main effects of task, $F(2, 168) = 14.95, p < .001, \eta^2_p = .15$, and symbol dimension, $F(1, 84) = 12.06, p < .001, \eta^2_p = .13$. These effects were qualified by a significant Task by Symbol Dimension interaction, $F(2, 168) = 3.49, p < .05, \eta^2_p = .04$. 
Simple contrasts revealed children’s performance differed by symbol dimension on the *touch on child* task, $F(1, 84) = 7.63, p < .05, \eta^2_p = .08$. However, performance did not differ by symbol dimension on the *touch on another person* task and *search* task, $F(1, 84) = 3.48, p = .07, \eta^2_p = .04$. That is, symbol dimension influenced children’s success only in the *touch on child* task. Children were less accurate in using the 2D drawings ($M = .73$ of the four trials) than the 3D dolls ($M = .81$ of the four trials) to show touch occurring on their own bodies. See Table 1 and Figure 1.

Figure 1. Line graph depicting means for tasks by symbol dimension

In the context of a forensic interview, even one false touch identification could be highly costly. A child who mistakenly reports being touched on a private area is likely to set in motion an intense investigation which includes more specific (and possibly biased)
questions concerning touch events. For descriptive purposes, then, I next present the percentage of children who demonstrated perfect performance on the symbol tasks.

Table 2. Percentages of children with errorless performance by task, symbol dimension, and age

<table>
<thead>
<tr>
<th>Task/Symbol</th>
<th>3-year-olds</th>
<th>4-year-olds</th>
<th>5-year-olds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch on child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Child Drawing</td>
<td>20.0%</td>
<td>45.2%</td>
<td>57.7%</td>
<td>40.2%</td>
</tr>
<tr>
<td>3D Doll</td>
<td>40.0%</td>
<td>58.1%</td>
<td>88.5%</td>
<td>60.9%</td>
</tr>
<tr>
<td>Errorless on both symbols</td>
<td>13.3%</td>
<td>38.7%</td>
<td>57.7%</td>
<td>35.6%</td>
</tr>
<tr>
<td>Touch on another person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Adult Drawing</td>
<td>50.0%</td>
<td>41.9%</td>
<td>69.2%</td>
<td>52.9%</td>
</tr>
<tr>
<td>3D Doll</td>
<td>43.3%</td>
<td>83.9%</td>
<td>80.8%</td>
<td>69.0%</td>
</tr>
<tr>
<td>Errorless on both symbols</td>
<td>20%</td>
<td>41.9%</td>
<td>57.7%</td>
<td>39.1%</td>
</tr>
<tr>
<td>Search</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D Barn Drawing</td>
<td>56.7%</td>
<td>87.1%</td>
<td>88.5%</td>
<td>77.0%</td>
</tr>
<tr>
<td>3D Barn Model</td>
<td>50.0%</td>
<td>93.5%</td>
<td>88.5%</td>
<td>77.0%</td>
</tr>
<tr>
<td>Errorless on both symbols</td>
<td>50.0%</td>
<td>83.9%</td>
<td>80.8%</td>
<td>71.3%</td>
</tr>
<tr>
<td>Total</td>
<td>3.3%</td>
<td>9.7%</td>
<td>30.8%</td>
<td>13.8%</td>
</tr>
</tbody>
</table>

**Discussion**

The primary aim in conducting this work was to examine whether requiring children to use their own bodies influenced their ability to show touches when using 2D line drawings and 3D dolls as representations. Findings show children were more successful in using symbols to show touches occurring on another person's body versus their own bodies.

Symbol dimension influenced children’s performance when showing touches occurring on their own bodies. Three- to 4-year-old children made the most errors when
asked to use the 2D human figure drawings show touch occurring on themselves. This finding is particularly concerning given the common forensic practice of asking children to demonstrate previously experienced touches by showing on an anatomically correct line drawing.

Although children’s performance across the symbol tasks improved with age, even 5-year-olds made some errors. From a forensic standpoint, even one false touch identification could be costly if private areas are implicated. Errorless performance in showing body touches improved with age though a sizable minority of 5-year-old children committed at least one error in showing touch. When showing current touch on their own bodies, 42.3% of 5-year-olds made at least one error using 2D human drawings and 11.5% made at least one mistake on the 3D dolls. This is especially concerning given that children were not asked to remember where they were touched but needed simply to map the location of a sticker (used to remind children were they were touched) placed on their own body to the corresponding part on the drawing or doll.

The present study replicated findings by Lytle and colleagues (2015) showing children demonstrate later use of symbols as self-representations to show body touch. Requiring children to use their own bodies to show touch locations was a more difficult task than using symbols to show touch on another person’s body or to search for a hidden object. The task of showing touch locations occurring on their own bodies was especially difficult for children when they were asked to use 2D human drawings. These findings highlight the need for researchers to further explore possible mechanisms underlying children’s developing ability to use dolls and drawings to show touch.

Why do children show a dramatic improvement in their ability to show touches
using symbols between 3- and 5-years-old? Possible explanations may relate to children’s developing self-concept (see Morin, 2011; Rochat, 2003, for a review) or theory of mind skills (see Wellman, Cross, & Watson, 2001, for a review) that undergo much development during the preschool years. Both of these socio-cognitive abilities depend on children’s self-awareness, that is, their recognition that they are a unique entity separate from their external environment.

**Children’s developing self-awareness as a possible mechanism underlying improved use of symbols as self-representations**

An individual who is self-aware is able to recognize and reflect on information about the self as separate from other people and objects (Brownell, Zerwas, & Ramani, 2012; Morin, 2011). Self-awareness is comprised of many self-domains including body-awareness (Brownell et al., 2012), self-description (Morin, 2011), and self-recognition (Brownell et al., 2012; Morin, 2011; Rochat, 2003; Thompson, Winer, & Goodvin, 2005). As children age, these self-domains improve whereby children become better able to reflect upon who they are and where they belong in the world.

Self-awareness is not complete by five years old; however, children may have attained the socio-cognitive skills necessary to understand all of the elements required for mapping touches on their bodies to a self-representation. Children at this age may more readily accept their personal experiences as being informative to the adult questioning them. Children’s ability to demonstrate experienced touches on dolls and drawings, likely depends on their understanding of those props as self-representations and also the realization that information about them is valuable to other people. Future studies are needed to examine how additional factors influence children’s use of symbols to show
body touch. Below, I discuss the possible influence that symbol characteristics and the requirement of using one’s own body might have on children’s use of symbols as self-representations.

**Factors that may influence children’s use of symbols as self-representations**

In a large body of work, DeLoache and colleagues have shown that symbolic development is not a categorical occurrence but rather children’s ability to use symbols continues to change as a function of the task demands. DeLoache argued that to understand a symbol, children must appreciate its dual representation as both an *object* and being *representative* of something other than itself (termed *dual representation*). DeLoache and colleagues have examined children’s developing ability to *use* 2D pictures and 3D models as symbols in order to guide their search of an object in another space. DeLoache and colleagues found children consistently show an appreciation of 2D drawings before the 3D model (DeLoache, 1987, 1991; DeLoache & Burns, 1994; Marzolf & DeLoache, 1994). While 2 ½-year-olds had difficulty in understanding that a scale model represents a larger room, by age 3 most children succeed on the task (e.g., DeLoache, 1987, 1991; DeLoache & Burns, 1994; Marzolf & DeLoache, 1994). They posit this is likely because 2D symbols such photographs and drawings serve one purpose, to represent another object. In the present study, children’s performance in the search task reflected findings similar to that of DeLoache and colleagues. That is, by age 3-years children were successful using both 2D and 3D symbols to search for a hidden object. However, in the task of showing touch occurring on their own bodies, young children were least accurate when using the 2D human drawings. This finding suggests
there is some quality related to the drawing that inhibits children’s ability to use it as a symbol representative of themselves.

Influence of symbol characteristics. One possible explanation for children’s poor performance in using the 2D drawings to show touch is that some factor, beyond dual representation, interferes with their use of the symbol as a self-representation. Children in the present study demonstrated an understanding of dual representation as shown by their successful use of both 2D and 3D symbols in the search task. At this age, children’s use of symbols is tenuous. Even in the context of searching for a hidden object, DeLoache and colleagues identified a number of other conditions and parameters that moderate children’s symbol use. For example, the degree of physical similarity between the symbol and the corresponding search location (i.e., iconicity) influenced children’s success in using symbols (DeLoache et al., 1991). Similarly, preschool-aged children may better identify with the 3D nature of the doll as they are 3D beings. This element may increase iconicity between the doll and child and thus, may benefit children’s use of dolls when showing body touches. Research is needed to further explore the role symbol characteristics, like that of iconicity, have on children’s understanding and subsequent use of the symbols as self-representations.

Possible role of using one’s own body as the referent. In the present experiment, symbol dimension was only one factor associated with children’s poor performance in demonstrating touch. Rather, the combination of using a 2D drawing when showing touches occurring on their own bodies led to children’s worst performance. In order to better understand why using one’s own body may complicate the task of showing touch, developmental researchers should consider other symbol tasks
known to be more difficult for children than searching for a hidden object. For example, children (and adults) often fail to use maps as symbols to navigate their way through a larger, corresponding space. Below I present three conditions known to complicate the task of using symbols in the task of navigating a corresponding space. I also address how these same conditions may impede children’s use of symbols as self-representations to show touch.

**Failure to understand the symbol-referent relationship.** Children are known to fail navigation tasks when they do not perceive a map as corresponding to the referent space (Liben et al., 2002). Even older children struggle to accept some seemingly clear symbol-referent relationships. For example, second graders laughed at the idea of using an asterisk to stand for file cabinets because file cabinets do not look like stars (Liben & Downs, 1994). When using symbols to show previously experienced touch, children are required to use their own bodies as the referent from which touch must then be mapped onto a symbol. Asking young children to use their own body may hinder their understanding of the representational relationship between symbol and referent (i.e., themselves). Some children may not accept they can provide information about their own bodies using an inanimate 3D doll or 2D drawing. Further, children who do understand they can use an inanimate object to provide information about their own bodies may identify more readily with 3D dolls because dolls have features more similar to their own as compared to 2D line drawings (i.e., again, iconicity may be especially important when children must involve their own bodies in the symbol event).

**Failure to view the symbol and referent from the same perspective.** Children (and adults) are more likely to fail a navigation task when their map and the
corresponding space are not aligned (e.g., Bluestein & Acredolo). Liben and colleagues (2002) argued that symbol users must be able to match elements from the map to their corresponding location in the larger space in order to find their place within the map. Viewing a map and its referent from different perspectives complicates the task of matching those necessary elements within the map to the corresponding landmarks in the referent space.

Children cannot see themselves from the same perspective that they view the doll or drawing in our touch on child task, meaning, the symbol (i.e., doll or drawing) and referent (i.e., child) are never aligned. Children may have difficulty matching their body parts to the corresponding parts on the doll or drawing even when they understand the dolls and drawings have parts that are similar to their own bodies. This is one possible explanation as to why children performed better using symbols to show touches occurring on another person and to search for a hidden object. In those tasks, children did view the symbols and referent side by side and from the same perspective.

**Failure to discriminate symbols within symbols.** Another issue associated with map users’ failure to navigate a larger space is when the map includes symbols that are difficult to discriminate (Liben & Yenkel, 1996). For example, when asked to navigate a corresponding space, matching a single picnic table to a single square box within the map is relatively easy. When multiple boxes are placed on the map, some standing for other features in the corresponding space, deciding which box is meant to stand for the picnic table becomes more difficult.

In order to demonstrate experienced touch using dolls and drawings, children must first accept the prop as representative of themselves. Further, the dolls and
drawings, like maps, have symbols within them. The doll’s stomach, for example, must be perceived by a child as symbolic of his stomach. Children must then be able to discriminate between very specific places on body parts in order to be precise in their demonstrations of touch. This is especially important in the context of a forensic interview where a touch on the stomach is very different from a touch on the breast even though the body parts are close in proximity.

**Limitations**

In the context of a forensic interview, children are most often asked to remember a touch event and report the location on their body where touch occurred. The tasks in the present study were designed to test children’s ability to use symbols to show the location of a hidden object or body touch without the extra demand of remembering the original location. Presumably our tasks were easier to complete and children would be more accurate than when asked to remember a given location and to show that location on a symbol. Future studies should be designed to consider children’s memory for touches that occur on their own bodies versus other types of experiences.

Findings from the present study show that requiring children to use their own bodies as the area to be represented influences their use of symbols; however, the referent area is only one factor to be considered. Symbol characteristics like iconicity and objectness also affect children’s understanding of the symbol-referent relationship. Generally, more work is needed to identify social and cognitive mechanisms that underlie children’s understanding of symbols in different contexts including when asked to show body touches.

Finally, the instructions on how to use the symbols were relatively simple.
Children were made aware of the similarities between the referent and symbols (as is common practice during forensic interviews) and asked to show the location of the body part on which a sticker was placed by placing their sticker in just the same place on a symbol. In the future, researchers may consider incorporating a training session in which children receive more detailed instructions on how the symbols should be used. This practice may benefit children’s performance by teaching them how to effectively use symbols as self-representations.

**Forensic implications**

More than 30 years ago, forensic interviewers began using AD dolls to help elicit event reports from children in cases of suspected child abuse. Following research demonstrating the suggestive nature of AD dolls, interviewers began searching for a more developmentally appropriate tool. The use of HFDs rather than AD dolls is currently supported by some of the major forensic interview protocols (see Poole & Dickinson, 2011, for a review). The movement away from using dolls and the adoption of HFDs among child abuse professionals likely was propelled by data showing that very young children struggled to use 3D objects as symbols and that 2D symbols by nature served one purpose, as a representation. In an emerging body of work, Lytle and colleagues (2015) found deficits in young children’s ability to show current touches on their own body by demonstrating on dolls and especially drawings. Children’s performance likely would be worse when adding in factors such as time delay, memory decay, and exposure to post-event misinformation.

The present study was designed to better understand children’s imperfect use of dolls and drawings to show body touches. Findings reveal children performed worse
when using dolls and drawings to show the location of touch on their own body versus on another person’s body. Further, there is some quality related to the 2D line drawings that further inhibits their performance in showing touches on their own bodies. This is particularly concerning as many forensic interviewers have moved to using HFDs, believing they are an age appropriate substitute for AD dolls.

The major recommendation that emerges from the present findings is the continued use of AD dolls and HFDs is a potentially dangerous practice. Additional research is needed to understand the mechanisms underlying children’s understanding of dolls and drawings self-representations on which they can demonstrate touch. Studies might also examine whether there is some way to train children on how to use dolls and drawings to demonstrate body touches.
References


Levine, M., Marchon, I., & Hanley, G. (1984). The placement and misplacement of You-
Are-Here maps. Environment and Behavior, 16, 139-158.


capacity to use dolls and human figure drawing as symbols to map body touch.

*Manuscript under review.*


Appendix A

Example referents and symbols used in the touch tasks

Touch on child task.

Touch on another person task.
Appendix B

Example referent and symbols used in the search task
Appendix C

Example experimenter script

Subject #:______________  Time:_______  Test date:________

Testing location:__________________________  Date of birth: _____

Child’s race:__________________________  Age in years: ______

Child is a … boy.  girl.

Interviewer’s name:__________________________  Observer’s name:__________________________

************************************************************************
************************************************************************

Search task using the small barn model.

Small Barn – Part Identification

“Look what I have. I have this big barn (point to cardboard barn) and I have this small barn (point to small barn). The small barn is a lot like the big barn.”
“See- it has a door.”
  “Point to the small barn’s door.”  C  I ____________

“And see it has a window.”
  “Point to the window.”  C  I ____________

“Point to the small barn’s roof.”
  C  I ____________

“And now point to the barn’s floor.”
  C  I ____________

“So you see, the small barn is a lot like the big barn.”

“Now we are going to play a game using the big barn, the small barn, and these apples (show real apple and small apple replica).”

“I am going to hide this big apple in the big barn and your job is to hide this little apple in the very same spot in the small barn.”

Small Barn – Search Task
“The big apple is right here (place apple outside of front, right window). Your job is to put the little apple in just the same place on the small barn as the big apple is on the big barn right now.”

Front Window - Outside C I ____________

“The big apple is right here (place apple by non-silo side of barn). Your job is to put the little apple on just the same place on the small barn as the big apple is on the big barn right now.”

Non-Silo Side of Barn - Outside C I ____________

“The big apple is right here (place apple inside the barn). Your job is to put the little apple in just the same place on the small barn as the big apple is on the big barn right now.”

Inside the barn C I ____________

“The big apple is right here (place apple behind barn- outside middle of open doorway). Your job is to put the little apple in just the same spot on the small barn as the big apple is on the big barn right now.”

Behind the Barn C I ____________

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“Now I am going to put the small barn away and we are going to use this barn drawing. This drawing is like the big barn in a lot of ways.”

Search task using the line drawing

**Barn Drawing – Part Identification**

“See- it has a door.”

“Point to the barn door on the drawing.” C I ____________

“ And see it has a window.”

“Point to the window on the drawing.” C I ____________

“Point to the roof on the barn drawing.” C I ____________

“And now point to the barn’s floor on the drawing.” C I ____________

“So you see, the barn drawing is a lot like the big barn.”

“Now we are going to play the game with the barns.”
“I am going to hide the apple in the big barn and your job is to put the apple sticker on the drawing in the very same spot that the apple is by the big barn right now.”

**Barn Drawing – Search Task**

“The apple is right here *(place apple on the roof)*. Your job is to put the apple sticker in just the same place on the drawing as the apple is by the big barn right now.”

Roof C I ____________

“The apple is right here *(place apple in front of small door- outside)*. Your job is to put the apple sticker in just the same place on the drawing as the apple is by the big barn right now.”

Small Door - Front, Outside C I ____________

“The big apple is right here *(place apple on top of silo)*. Your job is to put the apple sticker in just the same place on the drawing as the big apple is by the big barn right now.”

On top of Silo C I ____________

“The apple is right here *(place apple in the back opening on support beam)*. Your job is to put the apple sticker in just the same place on the drawing as the apple is by the big barn right now.”

Back Opening on Support Beam C I ____________

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**Standard touch task using the doll**

**Doll – Body Part Identification**

“Look what I have now. I have a doll. S/he is like you in a lot of ways.”

“See, s/he has a nose. Point to the doll’s nose.” C I ____________

“And she has a foot. Point to the doll’s foot.” C I ____________

“Point to the doll’s hand.” C I ____________

“And now point to the doll’s shoulder.” C I ____________

“So you see that the doll is like you in a lot of ways.”
“Now we are going to play a game with these stickers. I am going to put a big sticker on you, and your job is to put the little sticker on the doll in just the same place as the big sticker is on you.”

**Doll – Standard Touch Task**

“The big sticker is right here on you (place the sticker on child’s foot). Your job is to put the little sticker on the doll in just the same place as the big sticker is on you right now.”

| Foot | C | I ________________ |

“The big sticker is right here on you (place the sticker on child’s stomach). Your job is to put the little sticker on the doll in just the same place as the big sticker is on you right now.”

| Stomach | C | I ________________ |

“The big sticker is right here on you (place the sticker on calf). Your job is to put the little sticker on the doll in just the same place as the big sticker is on you right now.”

| Calf | C | I ________________ |

“The big sticker is right here on you (place the sticker on child’s neck). Your job is to put the little sticker on the doll in just the same place as the big sticker is on you right now.”

| Neck | C | I ________________ |

“Now I am going to put the doll away and we are going to use this drawing. This drawing is a lot like you.”

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**Standard touch task using the human figure drawing**

**Child Drawing – Body Part Identification**

“The drawing is like you in a lot of ways.”

“See, s/he has a nose. Point to the drawing’s nose.” C I ________

“And s/he has a foot. Point to the drawing’s foot.” C I ________

“Point to the drawing’s hand.” C I ________

“And now point to the drawing’s shoulder.” C I ________
“So you see that the drawing is a lot like you. Now we are going to play a game with these stickers. I am going to put a big sticker on you and your job is to put the little sticker on the drawing in just the same place as the big sticker is on you.”

**Child Drawing - Standard Touch Task**

“The big sticker is right here on you (place the sticker on child’s nose). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on you right now.”

Nose C I ____________

“The big sticker is right here on you (place the sticker on child’s wrist). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on you right now.”

Wrist C I ____________

“The big sticker is right here on you (place the sticker on child’s knee). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on you right now.”

Knee C I ____________

“The big sticker is right here on you (place the sticker on child’s leg above knee). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on you right now.”

On leg - above knee C I ____________

“Before we finish up and go back to the room, let’s put the drawing away and use this doll (choose doll that matches sex and race of observer). My friend, (observer’s name), is going to help too.”

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Self-removed touch task using the doll

“Okay, (child’s name). Let’s start by looking at this doll.

**Doll – Body Part Identification**

“The doll is like my friend, (name) in a lot of ways.”

“See, s/he has a nose. Point to the doll’s nose.” C I ____________

“And s/he has a foot. Point to the doll’s foot.” C I ____________
“Point to the doll’s hand.” C I _________

“And now point to the doll’s shoulder.” C I _________

“So you see that the doll is a lot like (observer’s name).”

“So now, I am going to put a big sticker on (observer’s name), and your job is to put the little sticker on the doll in just the same place as the big sticker is on (observer’s name).”

**Doll – Self-Removed Touch Task**

“The big sticker is right here on (observer’s name) (place sticker on observer’s back). Your job is to put the little sticker on the doll in just the same place as the big sticker is on (observer’s name) right now.”

Back C I ________________

“The big sticker is right here on (observer’s name) (place sticker on observer’s elbow). Your job is to put the little sticker on the doll in just the same place as the big sticker is on (observer’s name) right now.”

Elbow C I ________________

“The big sticker is right here on (observer’s name) (place sticker on observer’s shoulder). Your job is to put the little sticker on the doll in just the same place as the big sticker is on (observer’s name) right now.”

Shoulder C I ________________

“The big sticker is right here on (observer’s name) (place sticker on observer’s forehead). Your job is to put the little sticker on the doll in just the same place as the big sticker is on (observer’s name) right now.”

Forehead C I ________________

Okay, let’s put the doll away and try using a drawing. *Choose drawing that matches sex and race of observer.***

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**Adult Drawing – Body Part Identification**

“The drawing is like my friend, (observer’s name), in a lot of ways.
“See, s/he has a nose. Point to the drawing’s nose.”

“And s/he has a foot. Point to the drawing’s foot.”

“Point to the drawing’s hand.”

“And now point to the drawing’s shoulder.”

“So you see that the drawing is a lot like my friend, (observer’s name).”

So now, I am going to put a big sticker on (observer’s name), and your job is to put the little sticker on the drawing in just the same place as the big sticker is on (observer’s name).

**Adult Drawing – Self-Removed Touch Task**

“The big sticker is right here on (observer’s name) (place sticker on observer’s ear). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on (observer’s name) right now.”

| Ear | C | I ________________ |

“The big sticker is right here on (observer’s name) (place sticker on observer’s hand). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on (observer’s name) right now.”

| Hand | C | I ________________ |

“The big sticker is right here on (observer’s name) (place sticker on observer’s hip). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on (observer’s name) right now.”

| Hip | C | I ________________ |

“The big sticker is right here on (observer’s name) (place sticker on observer’s bicep). Your job is to put the little sticker on the drawing in just the same place as the big sticker is on (observer’s name) right now.”

| Bicep (arm between shoulder and elbow) | C | I ________________ |
“Great Job, (child’s name). We are all finished. I really appreciate all of your help today. Would you like to pick a small ‘thank you’ to take home?”

*Let child choose a prize.*

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Interviewer Notes: