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Schema-as-knowledge and schema-as-importance effects on children's memory and organization of gender relevant materials

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SCHEMA-AS-KNOWLEDGE AND SCHEMA-AS-IMPORTANCE EFFECTS ON CHILDREN'S MEMORY AND ORGANIZATION OF GENDER RELEVANT MATERIALS

by

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APPROVAL PAGE

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Recall and recognition of gender relevant stimuli were assessed following a sorting task on which 83 four- to eight-year-olds sorted three sets of four line drawings apiece. Each set contained two stereotyped line drawings (i.e. male actor - masculine activity, female actor - feminine activity) and two counterstereotyped line drawings (i.e. female actor - masculine activity, male actor - feminine activity). Schematic knowledge, but not schematic importance, was related to children's sorting of the drawings. The more advanced sorting strategy was related to higher levels of schematic knowledge. The hypothesized influences of schematic knowledge and schematic importance on children's memory were not found. Schematic knowledge did not predict the proportion of gender stereotyped to gender counterstereotyped items recalled. In addition, schematic importance did not predict the frequency of mnemonic distortions of counterstereotyped items. Children's sex, however, was related to both the proportion of gender stereotyped to counterstereotyped items recalled and the frequency of mnemonic distortions of counterstereotyped items. Boys, but not girls, recalled more stereotyped than counterstereotyped items. Boys also were more likely to make mnemonic distortions of counterstereotyped items than girls. Although schematic

knowledge may play an important role in children's organization of gender relevant stimuli, neither schematic knowledge nor schematic importance was found to be related to children's memory for these stimuli. Thus, children's memory for gender relevant materials appears to be mediated by some aspect of gender schematic processing other than schematic importance or schematic knowledge.

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DEDICATION

This dissertation is dedicated to the memory of my father, the late Fred Harvey Hall Calhoun.

CHAPTER I

INTRODUCTION

Interest in the influence of cognitive processes on children's gender role development has increased steadily in recent years (Maccoby, 1980; Lipps, 1988). Much of this interest has been discussed under the general rubric of Gender Schema Theory. However, there is much confusion over the exact nature and implications of this approach (Ruble & Stangor, 1987). The goals of the present paper are to clarify the nature of the gender schema and to investigate several predictions derived from this approach. Before discussing the gender schema, however, a brief examination of the term schema is warranted.

Use of the term schema has grown prolifically from its roots in the areas of cognitive and perceptual psychology. Currently, the term is used widely in the areas of social, personality, clinical, and developmental psychology. Taylor and Crocker (1981) estimated that "schema" has been used by at least 150 researchers in the area of social psychology alone. Unfortunately, the lack of precision associated with the use of the term in the areas of cognition and perception (Neisser, 1976) has been expanded during its adoption by other areas of psychology (Taylor & Crocker, 1981). The various conceptualizations of the term schema share the

basic concept that an individual's prior knowledge about a domain guides the individual in seeking out, selecting and interpreting new information relevant to that domain. However, the specific nature of the underlying knowledge and the extent to which a schema is shared by members of the culture vary widely from one usage of the term to the next. For example, Mandler's (Mandler, 1983; Mandler & DeForest, 1979) use of the term schema represents a conceptualization of a schema as an abstract knowledge structure, whereas, Fivush's (1984) use of the term represents a more specific, content-bound conceptualization. According to Mandler, "a story schema consists of a set of expectations about the kinds of units found in stories and the way in which they are sequenced" (Mandler & DeForest, 1979, p. 886). That is, a story schema consists of general knowledge such as "stories have settings", not specific knowledge such as "the setting of Peter Pan was Never-never-land". Furthermore, the content of the story schema was assumed to be comparable for members of the same or similar cultures (Mandler & DeForest, 1979). In contrast, Fivush (1984) investigated children's schematic representations of a day in kindergarten. In this case, schemata were assumed to consist of much more specific knowledge such as "putting stuff in your locker" and "sitting on the blue line during meeting". Although similarities in the kindergarten schemata of children from the same classroom ware noted, it

was assumed that the content of a schema is unique for each individual (Fivush, 1984). This example illustrates only a fraction of the many ways in which the term schema has been used. The diversity with which the term has been applied has led reviewers to conclude that a definition of the term schema general enough to encompass its many applications would be too general to provide a practical basis for guiding or evaluating research (Alba & Hasher, 1983; Taylor & Crocker, 1981). In response to ambiguity associated with the term schema, Taylor and Crocker (1981) cautioned researchers to be more precise in defining their use of the term. This can be accomplished by continuing the precise use of terms that have already been defined as representing a specific approach derived from the general schema concept (e.g., script, prototype) or by specifying the exact meaning of "schema" in a particular application (e.g., story schema).

Influential theoretical descriptions of a gender schema model have been proposed separately by Bem (1981; 1985) and by Martin and Halverson (1981). A recent review of these models concluded that the differences between the models were due to differences in the emphasis placed on various aspects of gender schematic processing by the theorist and that the models were complementary (Ruble & Stangor, 1986). Both Bem (1981, 1985) and Martin and Halverson (1981) assumed that the gender schema consists of specific

knowledge regarding the gender appropriateness of various traits and behaviors (i.e. gender stereotypes) and that this knowledge is acquired during early childhood. Both also assumed that the contents of the gender schema would by highly similar among members of the same culture. However, the theorists differed in the major focus of their work. Martin and Halverson (1981) were directly concerned with the influence of children's level gender schematic knowledge on their behavior. In contrast, Bem (1981, 1985) concentrated on the implications of individual differences in adult's reliance on their gender schematic knowledge. Ruble and Stangor (1986) used the terms schema-as-knowledge and schema-as-importance to describe this difference between the theorist.

The distinction between schema-as-knowledge and schema-as-importance is similar to the distinction between construct availability and construct accessibility (Higgins & King, 1981). Construct availability refers to the presence or absence of knowledge of a construct. A construct is available if the individual has knowledge of the construct and is unavailable if the individual has no knowledge of the construct. However, the availability of schematic knowledge does not insure that it will be used in organizing and interpreting new information. Construct accessibility refers to the readiness or frequency of a construct or schema's use. A schema that is used frequently

and is readily applied to a variety of situations is considered accessible or important. Although a schema must be available to be used, the amount of information relevant to that schema does not determine the accessibility of the schema. A similar distinction can be made regarding schema-as-knowledge and schema-as-importance. Schema-as-knowledge refers to the amount and/or detailedness of schematic knowledge; whereas, schema-as-importance refers to the accessibility or likelihood that a schema will be used to process information. In terms of gender schema theory, schema-as-knowledge refers to individuals' general knowledge of gender stereotypes and their specific knowledge of own-sex-stereotyped information; schema-as-importance refers to how likely individuals are to use this information in their everyday life.

Martin & Halverson (1981) represent a schema-as-knowledge or availability approach; whereas, Bem (1981, 1982) represents a schema-as-importance or accessibility approach. Martin and Halverson (1981) described the gender schema as children's knowledge of the gender-appropriateness of various objects and behaviors. They also proposed that detailed knowledge of objects and behaviors considered appropriate for their own sex was a related aspect of gender-schematic processing. Predictions regarding the impact of gender-schematic processing on children's behavior were based on schema-as-knowledge aspects of the gender

schema. For Martin and Halverson the key factor in describing the gender schema was the presence or availability of gender relevant information. Schema accessibility or importance was assumed to be consistent across individuals and unrelated to gender-schematic influences on behavior.

In contrast, Bem (1981) discussed gender schema theory in terms of the construct accessibility of gender as a dimension for processing self-relevant information. She assumed that individuals vary in the extent to which they rely on their knowledge of cultural gender stereotypes in processing information. From this perspective, gender-schematic knowledge was assumed to be consistent and irrelevant, and individual differences in gender schema importance were assumed to be solely responsible for individual differences on all tasks designed to assess gender-schematic processing.

Although the differences in emphasis given to schema-as-knowledge and schema-as-importance by Bem and by Martin and Halverson appear to render the models contradictory, Ruble and Stangor (1987) asserted that these approaches are actually complementary. They suggested that both schematic knowledge and schematic importance are critical aspects of gender schematic processing and should be considered in future research. It should be stressed that in making this suggestion Ruble and Stangor (1986) were not advocating

attempts to support either Bem's (1981) or Martin and Halverson's (1981) models over the other. Instead they asserted that both the availability and the accessibility of the gender schema are important and that they may have independent effects on behavior. Ruble and Stangor (1986) then addressed the probable roles of schematic importance and schematic knowledge on children's memory.

Specifically, Ruble and Stangor (1986) speculated about the impact of gender schematic processing on the deletion and reconstruction of counterstereotyped information. It is unclear from their discussion whether Ruble and Stangor (1986) assumed that deletion and reconstruction act on the encoding, storage, or retrieval of information. Thus deletion could refer to a failure to attend to or encode information, forgetting the information, or difficulty in remembering the information. Likewise, reconstruction could occur during encoding, storage, or retrieval. Typically, children remember gender-stereotyped stimuli better than counterstereotyped stimuli (Cann & Garnett, 1984; Liben & Signorella, 1980; Martin & Halverson, 1983). Ruble and Stangor attributed this to the deletion of counterstereotyped information and hypothesized that schema-as-knowledge aspects of gender-schematic processing may explain the discrepancy in children's memory of gender-stereotyped and counterstereotyped stimuli. Ruble and Stangor (1986) further assumed that schema-as-importance

aspects of gender-schematic processing affect the frequency of mnemonic distortion or reconstruction of gender relevant materials. Mnemonic distortions occur when a subject misreports the sex of the character or the nature of the activity depicted in the stimulus. For example, reporting seeing a female nurse or a male doctor when the presented stimulus actually depicted a female doctor are mnemonic distortions. Mnemonic distortions of gender-counterstereotyped stimuli are more common than distortions of stereotyped stimuli (Signorella & Liben, 1984; 1985a).

Although most researchers have used only one measure of gender-schematic processing to investigate individual differences in memory for gender relevant material, Ruble and Stangor's hypotheses can be addressed only by separately assessing schema-as-knowledge and schema-as-importance aspects of gender-schematic processing. Finding that a schema-as-knowledge measure predicts the amount of discrepancy between children's memory of gender-stereotyped and counterstereotyped stimuli would support their first prediction. Finding that a schema-as-importance measure predicts the frequency of mnemonic distortions would support their second prediction. The first step in evaluating these predictions involves the selection of separate measures for individual differences in schema-as-knowledge and schema-as-importance aspects of gender-schematic processing. In the following sections, measures that have been developed to

assess gender stereotyping will be reviewed in order to determine their usefulness for measuring schematic knowledge and schematic importance.

Measures of Gender Stereotyping

One reason that individual differences in children's gender-schematic processing have not been more widely studied lies in the inadequacies of most measures of gender stereotyping. Several of the existing measures can only measure individual differences in preschool-aged children because kindergarten and school-aged children's performance is at ceiling levels. Furthermore, Ruble and Stangor's (1986) distinction between knowledge- and importance-based aspects of gender-schematic processing is a recent one and was not considered in the development of these measures. Signorella (in press) identified three approaches to measuring children's gender stereotyping. The measures have accessed either children's knowledge of gender stereotypes, children's flexibility in the application of stereotypes to others, or children's flexibility in the application of stereotypes to themselves. Measures of children's knowledge of gender stereotypes assess basic awareness of gender stereotypes. Measures of flexibility in applying stereotypes to others assess the extent to which children believe that the stereotypes are valid for people in general. Measures of flexibility in applying stereotypes to self assess the extent to which children's personal choices

are influenced by gender stereotypes. Of course these measures of stereotypes are somewhat related, but they are not equivalent. Although knowledge of a stereotype is necessary for someone to believe in its validity for oneself and others, it is possible to be aware of the stereotype and reject its validity. For example, a boy may know that most nurses are women, but still accept that it is permissible for men to become nurses or want to become a nurse himself. Similarly, flexibility in applying stereotypes to others does not ensure flexibility in applying stereotypes to oneself. A boy may accept that it is permissible for men to become nurses, but totally reject the idea of pursuing nursing or any female dominated profession himself. It is important to keep the distinction among these measures of gender stereotyping in mind when reviewing and conducting research in the area of gender schema theory. An evaluation of these types of measures in terms of their usefulness with children older than five-years and the schema-as-knowledge -- schema-as-importance distinction is essential for future research on children's gender-schematic processing. These three types of measures are discussed below.

Knowledge of Gender Stereotypes. Measures of children's knowledge of gender stereotypes assess the schema-as-knowledge aspects of gender-schematic processing. Examples of this type of measure include the Sex-Role Discrimination Scale (SRD) of the Sex-Role Learning Index

(SERLI; Edelbrock & Sugawara, 1978) and Williams, Bennett, and Best's (1975) measure of trait stereotype knowledge. These measures test children's knowledge of gender stereotypes by presenting them with a situation that adults consider gender-stereotyped (e.g., being aggressive) and having the child indicate whether that situation is more common for males or females. Responses that indicate agreement with the adult judgments (e.g., that males are more likely to be aggressive) are considered indicative of gender stereotype knowledge. Children with relatively high (i.e. adult consistent) scores are considered more stereotyped than children with lower scores. This definition of stereotyping is directly related to Martin and Halverson's (1981) definition of gender-schematic processing and to the availability of gender schemata.

Unfortunately, the usefulness of these measures in identifying individual differences in children's knowledge of gender stereotypes is severely limited by the prevalence of ceiling effects. When a group of children gives adultlike responses to all of the items on a particular measure of gender-stereotyped knowledge (i.e. a ceiling effect), it is impossible to tell if all of the children have identical levels of gender-stereotyped knowledge or if some of the children have knowledge of gender stereotypes that were not included on the instrument. Ceiling levels are approached on the SRD and other measures of children's

knowledge of stereotyped behavior with kindergarten children. Other measures can distinguish among more or less knowledgeable kindergarten and early elementary school-aged children, but the same measure can not be used tc distinguish among more or less knowledgeable preschool-aged children. For example, ceiling levels on Williams et al.'s measure are not approached until second grade (Williams et al., 1975), but chance levels of responding are found with preschool-aged children (Coker, 1984). One approach to avoiding the difficulty of finding a measurement of gender-stereotypic knowledge that is appropriate for several age levels has been to use both Williams et al.'s (1975) stereotyped trait measure and a measure of stereotyped activities that is appropriate for younger children (e.g., Coker, 1984).

Application of Stereotypes to Others. The second type of gender-stereotyping measures identified by Signorella (in press), measures of children's flexibility in applying stereotypes to others, often use materials adapted from measures of stereotype knowledge. Whereas, measures of stereotype knowledge are designed to determine how familiar children are with gender stereotypes, measures of flexibility in applying stereotypes to others are designed to determine how strongly children believe in the stereotypes. The two types of measures are distinguished by the phrasing of the task instructions and the type of

responses permitted (Signorella & Liben, 1985b). On the Gender-Stereotyped Attitude Scale for Children (GASC) and the modified version of Williams et al.'s (1975) task that Signorella and Liben have used in their research, children are asked to indicate whether the activity or trait can be associated with men, women, or both men and women. Signorella and Liben (1985b) assert that including an explicit both men and women response and asking who can perform the activity instead of who usually performs it transforms measures of children's knowledge of stereotypes into measures of their attitudes regarding gender stereotypes. The emphasis placed on measuring children's attitudes instead of their knowledge suggests that Signorella and Liben (1985b) intended for the GASC to more closely approach a measure of schema importance than schema knowledge.

However, some evidence suggests that preschool-aged children's flexibility in applying stereotypes to others is heavily influenced by their limited knowledge of gender stereotypes. Carter and Levy (1988) found a negative correlation between their measures of schema knowledge and schema flexibility. As Signorella (in press) acknowledges, this correlation suggests that this type of measure may be influenced by knowledge of gender stereotypes as well as attitudes toward the stereotypes. Thus, it is unclear whether the GASC and similar measures assess importance-

based or knowledge-based aspects of gender-schematic processing.

Application of Stereotypes to Self. Schema-as-importance aspects of gender-schematic processing may be better addressed by measures of children's flexibility in applying gender stereotypes to themselves. Bem (1981, 1984) discusses the gender schema in the context of self-schemata, and the measures of gender-schematic processing that she advocates assess the application of gender stereotypes to the self. Thus, measures of children's application of stereotypes to themselves are more consistent with adult measures of schema-as-importance aspects of processing. An example of this type of measure is the version of the Personal Attributes Questionnaire (PAQ) for children that was developed by Hall and Halberstandt (CPAQ; 1980). On the CPAQ children are required to indicate their agreement with a series of statements that are associated with instrumentality (i.e. masculinity) or a socioemotional orientation (i.e. femininity). For example, one of the statements addressing instrumentality is "I would rather do things for myself than ask grownups and other kids for help" (see Table 1 of Hall & Halberstandt, 1980). Unfortunately, the CPAQ was developed for use with children in late elementary school, and its usefulness with younger children is dubious (Signorella, in press).

A more widely used method of assessing young children's application of gender stereotypes to themselves is through measures of toy and activity preferences such as the Sex-Role Preference (SRP) component of the SERLI (Edelbrock & Sugawara, 1978) and Coker's (1984) item preference scale. On these measures children are asked to indicate their preference for a variety of traditionally masculine and traditionally feminine toys and activities. Children's responses are scored according to whether each choice would be considered gender-appropriate or gender-inappropriate according to the stereotyped nature of the toys. A common observation regarding these measures is that they are not useful in determining individual differences in children over four-years-old because virtually all of the choices are gender-appropriate ones (Signorella, in press). Therefore, the use of this type of measure in research on the impact of gender schema accessibility on children's behavior is very limited.

A recent revision of toy preference measures that assesses the amount of time needed to make decisions regarding the attractiveness of various toys offers an excellent method of assessing schema-as-importance aspects of gender-schematic processing (Signorella, in press). Levy and Carter's (1987; Carter & Levy, 1988) schematic processing measure is based on Bem's (1981, 1984) observation that gender-schematic individuals' processing of

certain information would be enhanced by the gender schema and that their processing of other information would be inhibited by it. Line drawings of toys that were selected by children in previous research as examples of masculine-, feminine- and neutral-stereotyped toys were used in this task. Levy and Carter (1987) compared children's reaction time when selecting between twelve cross-stereotyped pairs (e.g., gun and doll), twelve same-stereotyped pairs (e.g., gun and truck or doll and kitchen set), and twelve stereotyped-neutral pairs (e.g., gun and telephone or doll and telephone). Carter and Levy (1988) developed and used a shorter version of this task in order to reduce the total amount of time needed to complete the task. Relatively fast reaction times on the cross-stereotyped pairs (i.e. schema facilitated) and relatively slow reaction times on the same-stereotyped pairs (i.e. schema inhibited) would indicate gender-schematic processing. This measure is similar to Bem's (1981) use of reaction time in judging items from the BSRI as self-descriptive in investigating individual differences in gender-schematic processing. The measure has been used successfully with preschool-aged children and can be used with older children (Carter & Levy, 1988; Levy & Carter, 1987).

In reviewing existing measures of individual differences in children's gender stereotyping, it appears that the selection of a measure of the schema-as-knowledge

component of children's gender-schematic processing is complicated by practical considerations. All of the existing measures are useful only within a narrow age range. Given that Ruble and Stangor (1986) suggested that both preschool- and school-aged children be included in future gender schema research, an adequate test of their hypotheses using only one of the current measures of children's knowledge of gender stereotypes seems unlikely. However, a composite measure that can be used with both preschool- and school-aged children can be obtained by combining items from Williams et al.'s (1975) measure of stereotyped traits and a measure of stereotyped activities (cf. Coker, 1984).

The most promising measure of schema-as-importance or accessibility aspects of gender-schematic processing is Levy and Carter's (1987) schematic processing measure. The use of reaction times in assessing the level of stereotyping is conceptually based on the theoretical concept of schematic importance and accessibility. Another advantage is that it is appropriate for use with both preschool- and school-aged children. The other available measures that can be considered measures of schematic importance are appropriate only for very limited age ranges.

In spite of the problems associated with many of the measures of individual differences in gender schematic processing, the relationship between children's performance on these measures and their memory for gender relevant

material has been investigated (e.g. Cann & Newbern, 1984; Carter & Levy, 1988; Martin & Halverson, 1983; Signorella & Liben, 1984). A variety of measures were used to assess children's level of stereotyping in these studies. In her review of this literature, Signorella (in press) concluded that failures to find differences between high- and low-stereotyped children's performance was due to the use of individual difference measures that were inappropriate for the age of the children in these studies. An alternative explanation involves Ruble and Stangor's (1986) predictions regarding the independent effects of knowledge- and importance-based aspects of gender-schematic processing. Because this distinction was made very recently, past research may not have used measures that assessed the aspect of gender-schematic processing that influences the type of memory that the study addressed. Past research on differential memory for counterstereotyped and stereotyped stimuli and on mnemonic distortion of gender relevant material will be reviewed in light of Ruble and Stangor's (1986) predictions.

Memory of Gender-Stereotyped and Counterstereotyped Materials

A common technique used in developmental studies of gender schematic processing has been to investigate children's memory for line drawings of people engaged in gender-stereotyped and counterstereotyped activities (e.g.

Cann & Newbern, 1984; Carter & Levy, 1988; Martin & Halverson, 1983; Signorella & Liben, 1984, 1985a). Free recall, cued recall, and recognition procedures all have been used to assess differential recall and mnemonic distortion of stereotyped and counterstereotyped materials. Several of these studies also included measures of children's level of stereotyping. Although a variety measures have been used, measures of flexibility in applying stereotypes to others have been the most common (Signorella, in press). This is unfortunate because of the interpretation problems associated with this type of measurement. Unlike measures of children's knowledge of gender stereotypes and measures of children's flexibility in applying stereotypes to themselves, it is unclear whether the GASC and other measures of flexibility in applying stereotypes to others assess schema-as-knowledge or schema-as-importance aspects of gender-schematic processing. Studies of differential memory and mnemonic distortion of gender relevant drawings and the use of individual difference measures in these studies will be reviewed next.

Differential Memory of Gender Relevant Drawings. Signorella and Liben (1984; 1985a) used free recall and a measure of flexibility in applying gender stereotypes to others to investigate differential memory of gender stereotyped and counterstereotyped line drawings. These studies used a recall criterion in which an item was

considered correct when the activity was reported correctly even if the sex of the person performing the activity was not reported or was reported incorrectly. Furthermore, a distorted version of the activity could be considered correct if the subject was able to identify the drawing to which he/she had referred. In each of the studies children were divided into high and low stereotyping groups based on their responses to the GASC and a modification of Williams et al.'s (1975) measure. Signorella and Liben's (1984) first study included kindergarten, second-, and fourth-grade children. High-stereotyped children recalled stereotyped materials better than counterstereotyped materials. Low-stereotyped children recalled more counterstereotyped than stereotyped materials. Only first-grade children participated in the second study reported by Signorella and Liben (1984). In this study, there was no difference in low-stereotyped children's recall of stereotyped and counterstereotyped materials, but high-stereotyped children recalled more stereotyped than counterstereotyped items. Similarly, Signorella and Liben (1985) found that high-stereotyped boys recalled stereotyped activities more often than counterstereotyped activities when the stimulus person was male. High-stereotyped girls recalled stereotyped information more often than counterstereotyped regardless of the sex of the stimulus person. No differences were observed for low-stereotyped children. The most interesting

finding in this study was that high-stereotyped boys recalled counterstereotyped activities more often than stereotyped activities when the stimulus person was female. This appeared to be due to the large number of mnemonic distortions (i.e., the activity was recalled as being performed by a man) observed on these items. In a second analysis of this in which the criterion for correct recall was more stringent (i.e. the activity and sex of character both had to be recalled correctly), stereotyped items were recalled better than counterstereotyped items by high-stereotyped girls and boys. Furthermore, boys recalled more stereotyped pictures featuring men than counterstereotyped pictures featuring men.

Researchers also have used a variety of recognition techniques to assess differential memory for stereotyped and counterstereotyped materials. Liben and Signorella (1980) presented children with 40 examples of gender stereotyped (e.g., male carpenter, female nurse), counterstereotyped (e.g., male typist, female police officer) and neutral drawings (e.g., male singing, female writing). The recognition task consisted of selecting the previously observed drawings from a set containing 20 of the original drawings (e.g., female nurse, male typist, female writing) and 20 sex-of-character transformations of the original drawings (e.g., female carpenter, male police officer, female singing). First- and second-grade children were

divided into high- and low-stereotyped groups based on the number of items on the GASC that they indicated were appropriate for both males and females. High-stereotyped children were more likely to recognize pictures of males engaged in gender-stereotyped than counterstereotyped activities, but there was no difference in their recognition of gender-stereotyped and counterstereotyped pictures of females. Low-stereotyped children did not show a difference in their recognition of gender-stereotyped and counterstereotyped pictures.

Cann and Garnett (1984) used a combination of the SRD and SRP subscales of the SERLI to select high- and low-stereotyped children for their study. Although both schema-as-knowledge (i.e. SRD) and schema-as-importance (i.e. SRP) aspects of gender-schematic processing were assessed in this study, the comparisons were based on a composite of the two aspects of processing. The recognition task used in this study required children to choose the previously presented items from pairs of items consisting of the originally presented item and the sex-of-character transformation of it. Children in this study made more recognition errors on counterstereotyped than stereotyped items regardless of their level of stereotyping.

Carter and Levy (1988) also used a recognition task to assess memory for gender relevant stimuli; however, their study differed from the previous studies in several

important ways. The children who participated in this study were younger than the children who participated in the other studies. Children in this study ranged from two-years-nine-months-old to five-years-eight-months-old. None of the other studies reviewed used children under five-years-old. Furthermore, other researchers only used sex-of-character transformations as distractor items on the recognition task; Carter and Levy (1988) used both sex-of-character transformations and novel drawings in their recognition task. In addition, Carter and Levy (1986) used more than one technique to assessed individual differences in gender-schematic processing. These measures included the schema inhibited and schema facilitated scores from their measure of gender-schematic processing and the sex-role knowledge (i.e. SRD) and sex-role flexibility (i.e. SRP) scores based on the SERLI. Of these measures only the schema inhibited score predicted the proportion of counterstereotyped items recognized. An increase in children's level of gender schematic processing, as indicated by the schema inhibited score, was related inversely to the number of counterstereotyped items they recognized. None of the measures predicted the proportion of stereotyped items recognized. This study is particularly interesting because it provides an initial test of Ruble and Stangor's (1986) prediction that schema-as-knowledge aspects of gender schematic processing predict the differential memory of

gender stereotyped and counterstereotyped materials. In contrast to this prediction, a measure of schematic importance, not schematic knowledge, predicted recognition of counterstereotyped items.

Martin and Halverson (1983) used both free and probed recall procedures to assess memory for gender relevant drawings. The probed recall consisted of asking the subjects if particular activities had been presented in the pictures. When items were identified as having been presented, the subjects were asked the sex of the person performing the activity. The sex-role preference (SRP) inventory from the SERLI was used to assess children's level of stereotyping in this study. Interestingly, the SRP is a measure of children's flexibility in applying stereotypes to themselves and represents an assessment of individual differences in schema-as-importance aspects of gender-schematic processing. According to Ruble and Stangor's (1986) predictions, an effect of the stereotyping measure on children's differential recall of stereotyped and counterstereotyped materials would not be expected in this study.

Martin and Halverson (1983) did not report any differences in memory for gender relevant materials for the free recall procedure. Using correct identification of the activity as the sole criterion for scoring the probed recall task, Martin and Halverson found that children remembered

stereotyped activities better than counterstereotyped activities when the actor was female, but remembered counterstereotyped activities better when the actor was male. As in Signorella and Liben's (1985a) study, the use of a more strict recall criterion influenced the results of the study. When Martin and Halverson (1983) re-analyzed their results with the added criterion of correctly recalling the sex of the target person, they reported low levels of memory for male actors in counterstereotyped roles. The only significant effect involving level of stereotyping suggested that children with stronger preferences for same-sex-typed toys recalled more items than children with weaker preferences for same-sex-typed toys.

Of the past studies of children's memory for stereotyped and counterstereotyped stimuli only Carter and Levy's (1988) included an individual difference measure that assessed only schema-as-knowledge aspects of gender-schematic processing. The other studies either assessed only schema-as-importance aspects (Martin & Halverson, 1983) or used measures that did not clearly assess either schematic knowledge or schematic importance (Cann & Garnett, 1984; Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a). Overall the results are not supportive of Ruble and Stangor's prediction that the discrepancy between recall of counterstereotyped and stereotyped stimuli increases as gender-schematic knowledge increases. Although Carter and

Levy (1988) included a measure of knowledge-based aspects of gender-schematic processing, this measure did not predict recognition of stereotyped or counterstereotyped stimuli. In studies with slightly older children, only the studies that used a measure of children's flexibility in applying stereotypes to others have found evidence of an effect of level of stereotyping on children's recall of stereotyped and counterstereotyped materials (Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a). To the extent that measures of flexibility in applying stereotypes to others assess attitudes toward gender stereotypes and not knowledge of the stereotypes, this research fails to support Ruble and Stangor's (1986) prediction. However, to the extent that knowledge of gender stereotypes influence the scores on measures of flexibility in applying stereotypes to others, Signorella and Liben's research can be interpreted as supportive of Ruble and Stangor's prediction. Research conducted with children from a wider age range that includes explicit schema-as-knowledge and schema-as-importance measures of gender-schematic processing and allows for direct comparison of memory for stereotyped and counterstereotyped stimuli would clarify this issue.

Mnemonic Distortion. An important aspect of any schematic approach to memory is the investigations of the mnemonic distortions or memory errors that result from schematic processing (Taylor & Crocker, 1980). In studies

of mnemonic distortion of gender relevant material, it is often important to distinguish between the types of distortions that can occur. Mnemonic distortions in which the sex of the person presented in the stimuli has been reversed are referred to as sex-of-character distortions. Activity distortions occur when the activity reported is more consistent with the stimulus person's sex than the original activity. For example, the sex-of-character distortion for a man setting the table would be a woman setting the table. An activity distortion of the same stimulus would be a man waiting to be served dinner. Both sex-of-character and activity distortions can occur when using a free recall task to assess children's memory of gender relevant material. However, only sex-of-character distortions can occur when using a recognition or probed recall task.

Ruble and Stangor (1986) predicted that mnemonic distortion of gender relevant material is influenced by schema-as-importance aspects of gender-schematic processing. Specifically, they suggested that individuals for whom the gender schema is relatively important (i.e., readily accessible) would make more mnemonic distortions than individuals for whom the gender schema is less important.

Several of the previously discussed studies of children's memory for gender relevant material investigated mnemonic distortions as well as overall recall or

recognition of stereotyped and counterstereotyped stimuli (Cann & Garnett, 1984; Carter & Levy, 1988; Martin & Halverson, 1983; Signorella & Liben, 1984; 1985a). Of these studies, Martin and Halverson's (1983) and Carter and Levy's (1988) are the most relevant in investigating Ruble and Stangor's (1986) prediction because the analyses included measures that assess schema-as-importance aspects of gender-schematic processing. On both their free recall and probed recall tasks, Martin & Halverson (1983) identified only sex-of-character distortions. More distortions were found for counterstereotyped than stereotyped stimuli on both the probed and free recall tasks. Level of stereotyping was assessed using the SRP scale from the SERLI. The proportion of distortions that were attributable to high- and low-stereotyped children were not reported for the free recall task; however, Martin and Halverson (1983) reported that level of stereotyping did not influence the frequency of mnemonic distortions on the probed recall task.

Carter and Levy (1988) investigated children's false recognitions of the gender-stereotyped versions of originally counterstereotyped stimuli (i.e. sex-of-character mnemonic distortions). No mnemonic distortions of originally stereotyped materials were observed. Results of the regression analysis performed on these data are supportive of Ruble and Stangor's (1986) prediction that the greater the importance-based aspects of gender-schematic processing

the higher the frequency of mnemonic distortions. However, only one of their measures of schema-as-importance, the schema inhibited scale, predicted the proportion of gender transformations. The schema facilitated score and all other predictor variables used in this study did not predict the gender transformations.

All of the other studies of mnemonic distortion of gender relevant material found more distortion of counterstereotyped than stereotyped items (Cann & Garnett, 1984; Signorella & Liben, 1984; 1985a). However, only one of these studies (Signorella & Liben, 1984, study one) reported a level of stereotyping effect on mnemonic distortions. Both sex-of-character and activity distortions were identified in this study, and it included subjects from a wider age range than other studies of mnemonic distortion. Unfortunately, the GASC and a revision of Williams et al.'s (1975) measure were used to assess individual differences in level of stereotyping in this study. As previously mentioned, this measure does not assess either importance or knowledge aspects of gender-schematic processing. Therefore, it does not provide any clear evidence regarding Ruble and Stangor's (1986) prediction.

Evidence regarding Ruble and Stangor's prediction that importance-based aspects of gender-schematic processing affect the frequency of mnemonic distortions is mixed. Most of the studies do not find evidence for an effect of level

of stereotyping on this behavior. However, the majority of these studies did not directly measure importance-based aspects of gender-schematic processing. Of the two studies that did measure schema-as-importance, one found that schema importance predicted mnemonic distortions (Levy & Carter, 1988) and the other found that it did not (Martin & Halverson, 1983). Both of these studies limited their investigation to sex-of-character distortions. This may have suppressed the overall level of mnemonic distortions. Levy and Carter (1988) further limited their investigation by only including preschool-aged children in their sample. The present study considered both sex-of-character and activity distortions and included both preschool- and school-aged children.

Organization of Gender Relevant Material

A failure to consider both schema-as-importance and schema-as-knowledge aspects of gender schematic processing has led to confusion in areas of research other than children's memory for gender relevant drawings. In their investigations of children's use of target sex as the basis for making match-to-sample decisions, Serbin and her colleagues (Doyle et al., 1987; Serbin & Sprafkin, 1986) overlooked the possible influence of schematic knowledge on their findings. This type of task requires children to select which of a set of alternatives is most like a target stimulus. The alternatives vary in the dimension on which

they resemble the target stimulus (e.g., sex, ethnicity). The dimension on which the target and selected alternative are similar is considered the basis for making the selection. The researchers interpreted the decline in the use of target sex as the basis for making match-to-sample decisions observed in these studies as an indication of a decline in gender-schematic importance (Doyle et al., 1987; Serbin & Sprafkin, 1986). However, examination of the materials used in these studies suggests that the findings may actually be due to an increase in gender-schematic knowledge. A summary of the findings and materials used in these studies follows.

Serbin and Sprafkin (1986) had children choose among stimuli that were either the same sex as the target, performing a similar activity, or performing a different activity. For example, one of the target stimuli was a man stirring a pot, and the related alternatives were a man reading, a woman rolling dough, and a woman sweeping. Serbin and Sprafkin (1986) found a decline in the use of sex-based classifications in their sample of three- to seven-year-olds. Therefore, in the preceding example choices of the man reading declined. Because Serbin and Sprafkin (1986) only considered matching on the basis of target sex indicative of gender schematic processing, they concluded that gender schematic processing declines as age increases across this age range. Although a decline in

schematic importance could account for these results, an increase in schematic knowledge also could be responsible. If it is assumed that matching the man stirring the pot to the woman rolling the dough was influenced by the fact that they are both stereotypically feminine activities, then the age differences observed in this study could be attributed to an increase in schematic knowledge. In this study there is no way to distinguish between the effects of schema-as-importance and schema-as-knowledge on the match-to-sample task.

The study by Doyle et al. (1987) contains the same potential confound as Serbin and Sprafkin's (1986) study. A sample of the target stimuli used in this study was a girl holding a softball and glove, and the choices were a girl holding a broom, a boy holding a bat and glove, and a boy holding a book. This study also investigated the use of body size (i.e. fat vs. thin) and ethnicity (i.e. French- vs. English-speaking Canadian) as bases of categorization. An example of the target stimuli for the body size dimension would be a fat child holding a softball and glove, and the choices would be a fat child holding a broom, a thin child holding a bat and glove, and a thin child holding a book. A decline in sex-based classifications in favor of activity-based classifications was found, but a corresponding decline in body size- and ethnicity-based classifications was not. Doyle et al. (1987) interpreted this finding as indicating

that gender, but not race and body size, becomes a less important basis for classification from kindergarten to sixth-grade. However, the example of the stimuli used in the study depict the same type of confounding seen in Serbin and Sprafkin's study. The shift from matching the girl with the ball and girl with the broom to matching the girl with the ball and the boy with the bat may represent an increase in schematic knowledge, and not a decrease in schematic importance.

In addition to investigating the impact of schematic knowledge and schematic importance on children's memory, the present study addressed their impact in a situation similar to the match-to-sample task used previously (Doyle et al., 1987; Serbin & Sprafkin, 1986). In order to accomplish this, children in the present study were asked to organize the memory stimuli prior to the recall and recognition tasks. A sorting task on which children were required to sort four stimuli into two sets was used. There were three possible strategies that could be used to sort these materials. First, the drawings could be sorted on the basis of the sex of the character depicted in the drawing. That is the drawings of males would constitute one set and drawings of females would constitute the second set. This strategy would be equivalent to the sex-of-target choices on a match-to-sample task. Second, the drawings could be sorted on the basis of the gender associated with the

activities. That is the drawings of the masculine activities would constitute one set and drawings of feminine activities would constitute the second set. This strategy is equivalent to the activity based choices on the match to sample tasks. Third, the drawings could be sorted on the basis of the orthodoxy of the stimuli. That is the stereotyped items would constitute one set and the counterstereotyped items would constitute the other set. There is no equivalent strategy on the match-to-sample task. If a decrease in schematic importance is responsible for the change from sex-of-character to activity based organizational strategies, then use of the sex-of-character strategy should be associated with higher levels of schematic importance. On the other hand, if the use of that strategy is associated with lower levels of schematic knowledge, then the schema-as-knowledge explanation is more tenable.

Encoding and Mnemonic Distortions

An additional benefit of having children sort the memory stimuli prior to recall was that it allowed this study to explore the relationship between encoding conditions and mnemonic distortions. Although Ruble and Stangor (1986) ignored the issue of whether encoding, storage, or retrieval processes were responsible for mnemonic distortions, several researchers have attempted to identify the source of mnemonic distortions (Cann & Newbern,

1984; Martin & Halverson, 1983; Signorella & Liben, 1984; 1985a). To date, the evidence suggests that encoding is a particularly relevant process in explaining mnemonic distortions.

Martin and Halverson (1983) investigated the role of both encoding and retrieval in explaining mnemonic distortions. Retrieval processes would be implicated if mnemonic distortions could be explained by a tendency to make gender-stereotyped guesses when one is unsure which sex was portrayed in a particular stimulus. Martin and Halverson (1983) reasoned that if mnemonic distortions were due to the use of this strategy, children would be less confident in their recall of distorted stimuli. However, confidence ratings for distorted stimuli were found to be equivalent to confidence ratings for correctly remembered stimuli. Even in cases of mnemonic distortion, children expressed relatively high confidence in reporting that an activity had been performed by an appropriate-sex actor. Confidence ratings were low in cases where a counterstereotyped activity was reported. Thus children were more confident of their memory of counterstereotyped stimuli when they had distorted the stimuli than when they had reported it correctly. Martin and Halverson (1983) concluded that encoding processes may play a particularly important role in children's memory distortions.

Signorella and Liben (1984) investigated the role of encoding in children's distortion of counterstereotyped stimuli by having children label the stimuli after completing the free recall task. Then the children's mnemonic distortions and labeling errors were compared. Signorella and Liben (1984) found evidence of both sex-of-character and activity distortions on the recall task; however, activity distortions were more likely to occur on the labeling task. In one of the two studies, a total of 37 mnemonic distortions of counterstereotyped stimuli were found. Of these 20 were sex-of-character distortions and 17 were activity distortions. Sixteen of the 17 activity distortions and one of the 20 sex-of-character distortions also were observed in the labels provided by the children following the recall task. The remaining activity distortion and sex-of-character distortions were observed only in recall. The results of the second study were similar; the majority of the distortions that were observed only on the recall task were sex-of-character distortions and the majority of the distortions that were also observed on the labeling task were activity distortions (Signorella & Liben, 1984).

Other studies have attempted to address the role of encoding in mnemonic distortions by explicitly labeling the stimuli when they are presented to the children (Cann & Newbern, 1984; Signorella & Liben, 1985a). Because the

accuracy of the labels provided by children after the recall task do not necessarily reflect the accuracy of labeling at encoding, Signorella and Liben (1985a) directly manipulated the accuracy of stimulus encoding by providing activity labels to half of their school aged subjects. The results of the study supported the prediction that fewer distortions would occur when accuracy of the labels was insured. Only two percent of the items recalled under the labeling condition were distorted, however, 16% of the items recalled under the non-labeling condition were distorted. As in previous studies, the distortions mainly occurred on counterstereotyped stimuli and both sex-of-character and activity distortions were observed.

Cann and Newbern's (1984) study can be considered an investigation of mnemonic distortion. The recognition task used required children to indicate which member of a pair of stimuli had been presented previously. The pairs consisted of the original stimuli and stimuli that differed only in the sex of the person depicted in the drawing. Thus an error on this task was equivalent to a sex-of-character distortion. Cann and Newbern (1984) provided half of their subjects with activity labels as they presented the stimuli. There were more errors on the counterstereotyped stimuli when activity labels had been provided than when activity labels had not been provided. Labels did not effect the error rate for stereotyped stimuli.

Although the studies by Signorella and Liben (1985a) and by Cann and Newbern (1984) produced apparently contradictory results, neither of the findings are surprising when sex-of-character and activity distortions are considered separately. It is logical to assume that labeling the activity presented in the stimulus drawing would have different effects on the two types of distortions. In previous research using these materials, a relationship between mislabeling the activity presented in the drawings and activity oriented mnemonic distortions has been established (Signorella & Liben, 1984). Providing the correct activity labels should reduce this type of distortion. Activity labeling may also have an influence on sex-of-character distortions. When the drawings are presented with labels, the amount of attention devoted to the sex of the stimulus person may be reduced or the child may be more likely to misinterpret the stimulus person's sex. This could result in an increased tendency to make sex-of-character errors. The assumption that the labeling task would reduce activity distortions partially accounts for Signorella and Liben's (1985a) finding of fewer mnemonic distortions under the labeling than nonlabeling condition. Furthermore, Cann and Newbern's (1984) finding of more sex-of-character errors under the labeling condition is consistent with the assumption that activity labeling can influence the encoding of the stimulus person's sex. The

only aspect of these studies that may not be consistent with the assumed effects of labeling is Signorella and Liben's (1985a) finding of fewer sex-of-character distortions under the labeling condition. It should be noted, however, that a lack of sex-of-character distortions is not equivalent to correct reporting of sex presented in the stimuli. Because Signorella and Liben (1985a) did not require children to report the sex of the stimulus person, it is possible that children who had received activity labels simply omitted the sex of the stimulus person during recall. This finding would be entirely consistent with the assumption that labeling reduces the attention given to the sex of the stimulus person. Unfortunately, there is no way to determine this given Signorella and Liben's (1985a) summary of their findings.

Research in this area would benefit from the use of a methodology that allows investigators to study the effects of encoding on both sex-of-character and activity distortions, and the sorting task employed in this study provided a method of doing so. Grouping the stimuli into categories required that the children attend to a particular dimension of the stimuli. There were three possible dimensions along which gender relevant stimuli could be classified. One was to classify the material according to the sex of the person presented in the stimulus picture (i.e. male - female). The second was to classify the

material according to the gender stereotype of the activity (i.e. masculine - feminine). The third was to classify the material according to the orthodoxy of the drawing (i.e. stereotyped - counterstereotyped). If encoding processes play a major role in mnemonic distortion of gender relevant material, the type of mnemonic distortion observed would reflect the sorting strategy used at encoding. Activity distortions would be more likely following sorting based on the sex of the stimulus character because the activity dimension would have received less attention when this sorting strategy was used. Similarly, sex-of-character distortions would be more likely following sorting based on the gender stereotype of the activity. Sorting the stimuli according to the degree of stereotyping presented required that attention be directed to both the sex of the character and the activity presented in the stimuli. Therefore, neither sex-of-character nor activity distortions were expected to occur more frequently when this strategy was used.

Issues Addressed in the Present Study

The hypotheses addressed in this study can be discussed under three main subheadings. First, differential memory and mnemonic distortion of counterstereotyped and stereotyped drawings was addressed. Specifically, the relative contributions of schematic importance and schematic knowledge to individual differences in the tendency to

recall stereotyped drawings more often and more accurately than counterstereotyped drawings were addressed. Second, individual differences in children's organization of gender relevant material were assessed to determine whether they were more closely associated with individual differences in schematic knowledge or schematic importance. Third, the role of encoding processes in explaining mnemonic distortions was examined by comparing the type of sorting strategies used during encoding with the type of mnemonic distortions observed on the recall measure. A more detailed consideration of these hypotheses follows.

Children in this study were shown an equal number of gender stereotyped and gender counterstereotyped drawings. Based on the prevalence of similar findings in past research, the children in this study were expected to recall more of the gender stereotyped drawings than counterstereotyped drawings. Furthermore, they were expected to make more mnemonic distortions of the counterstereotyped than stereotyped drawings. However, important individual differences in children's tendency to follow this pattern also were expected (Ruble & Stangor, 1986). The proportion of stereotyped activities recalled by the children was expected to increase as their knowledge of gender stereotypes, as assessed by the schema-as-knowledge measure, increased. The frequency of mnemonic distortion of the counterstereotyped activities was expected to increase

as the accessibility of the gender schema, as assessed by the schema-as-importance measure, increased.

In addition to investigating the implications of gender schematic processing on memory, this study also investigated children's organization of gender relevant material. The procedure used in this study allowed the children to sort the materials according to the sex of the character, the gender associated with the activity, or the degree of stereotyping presented in the drawing. Schema-as-importance and schema-as-knowledge differences between children employing the different sorting strategies were examined to determine whether schematic knowledge or schematic importance was more central to determining the sorting strategy used by the children (cf. Doyle et al., 1987; Serbin & Sprafkin, 1986).

The final issue investigated in this study involved the role of encoding processes in mnemonic distortions of gender relevant material. The impact of the type of sorting strategy on the type of mnemonic distortion was determined. Using the sex of the character as the criterion for sorting was predicted to lead to mnemonic distortions of the activity presented in the stimulus. Sorting according to the gender stereotypically associated with the activity was expected to lead to sex-of-character mnemonic distortions. Sorting according to the orthodoxy of the stimuli was not predicted to lead to a predominance of either type of

distortion because this strategy required children to attend to both the sex of the character and the gender stereotype of the activity.

CHAPTER II

METHOD

Subjects

Forty boys and forty-three girls between 51- and 107-months-old participated in the present study. The mean age was 74.55 months. Eight additional children began participation in the study but did not complete it because they did not want to continue participating or were unavailable for the second phase of testing. All of the children attended a day or after-school care facility in the Raleigh, NC area. Only children who agreed to participate in the study and had written parental consent for participation were included in the study.

Materials

Schematic Processing Measures. Separate measures of schema-as-knowledge and schema-as-importance aspects of gender schematic processing were used. Children's knowledge of the gender stereotypes associated with the 14 masculine and 14 feminine activities and occupations that are included in the GASC (Signorella & Liben, 1985b) and 12 masculine and 12 feminine traits derived from Williams et al. (1975) were used to assess individual differences in the schema-as-knowledge aspects of gender-schematic processing. Although these items were drawn from two different sources, they are

similar enough to combine into a single measure of gender-schematic knowledge. Furthermore, the combination provided a task difficult enough to detect differences in eight-year-olds' knowledge of gender stereotypes without being to difficult to detect differences in four-year-olds' knowledge of gender stereotypes. Levy and Carter's (1987) response latency measures were used to assess the schema-as-importance aspects of processing. In addition, children's preference for same sex-typed toys was derived from Levy and Carter's (1987) task.

Materials for the assessment of knowledge of gender stereotypes were line drawings of a male, a female, and a question mark and the 52 behavioral descriptions taken from Signorella and Liben (1985b) and Williams et al. (1975). Examples of the descriptions include "be a ballet dancer" (feminine activity, Signorella & Liben), and "gets into fights" (masculine trait, Williams et al.). The line drawings were mounted on 4 x 6 inch index cards.

The materials required for the schema-as-importance measure were 24 line drawings of pairs of toys and a stopwatch. In developing this task, Levy and Carter (1987) only used toys that children in previous research had indicated were gender-stereotyped or gender-neutral. Nine of the pairs combine masculine- and feminine-stereotyped toys (e.g., doll - gun), six compare gender-neutral and gender-stereotyped toys (e.g., beach ball - gun, beach ball

- doll), and six compare same-gender stereotyped (e.g., doll - kitchen set, gun - truck). In addition, three combinations of gender neutral toys (e.g., beach ball - telephone) were used. The gender neutral pairs were not used in either of Levy and Carter's (1987, Carter & Levy, 1988) previous studies.

Sorting and memory tasks. The stimuli for the sorting and memory tasks were the stereotyped and counterstereotyped versions of the six masculine and six feminine activities determined to be familiar to young children during pilot testing. Two sets of drawings were used. The sex of the character performing each activity was reversed from the first set to the second set. Each set contained three drawings of men engaged in stereotypically masculine activities (e.g., a male soldier), three of men engaged in stereotypically feminine activities (e.g., a male ironing), three of women engaged in stereotypically masculine activities (e.g., a female hammering), and three of women engaged in stereotypically feminine activities (e.g., a female nurse). The drawings were divided into three subsets containing drawings representative of each of the four possible sex-of-character and gender stereotype-of-activity combinations. Each drawing was mounted on a 4 x 6 inch index card and covered in transparent plastic. A set of four drawings depicting striped and solid square and triangles and two 5 x 6 inch plastic trays also were used in

the sorting task. A set of 12 9 x 12 inch cards with four line drawings mounted on each card was used in the recognition task. Each card contained the stereotyped and counterstereotyped version of one of the 12 activities depicted in the sorting trials and the stereotyped and counterstereotyped version of one of the other activities that had been used during the pilot study. Each card contained a masculine and a feminine stereotyped activity. A microcassette recorder was used for both the sorting and memory tasks.

Procedure

All of the children were tested on all measures in a familiar area of their day or after school care facility by a female experimenter. Both parental written consent and child verbal consent were obtained prior to testing. In order to avoid fatiguing the subjects, the tasks were divided into two sessions that were held one day to one week apart. The schema-as-knowledge measure and materials for the sorting and memory tasks have some items in common. For example, the schema-as-knowledge measure asked "who takes care of children" and one of the activities depicted in the sorting and memory tasks was holding a baby. If the schema-as-knowledge measure preceded the sorting and memory tasks, it could lead to increased memory for the stereotyped items and increased mnemonic distortions of the counterstereotyped items that are found on both tasks. In addition, general

interference from items on both the schema-as-knowledge and schema-as-importance tasks might be observed in the form of intrusions. On the other hand, it seemed doubtful that the limited exposure to the sorting and memory stimuli would have a large impact on the children's performance on the schematic processing measures. Only four of the 52 items that make up the schema-as-knowledge measure could be effected by the exposure to the sorting and memory stimuli, and this would only occur if seeing the stimuli led a child to modify his/her existing gender schema knowledge. Given the relatively brief exposure to the stimuli during the memory task this seems unlikely. Therefore, the sorting and memory tasks were always given several days prior to the schematic processing tasks. The order of the schematic processing measures within this session was counterbalanced. Approximately half of the children completed the schema-as-knowledge task first, and the remainder completed the schema-as-importance task first.

Schematic Processing Measures. For the schema-as-knowledge task, line drawings of a male, a female, and a question mark were displayed in front of the child. The order of the pictures was randomized for each child. The children were read the following instructions:

> I have a list of things that people do. Some of them are things that people say boys or men do more often than girls or women. Others are things that people say

girls or women do more often than boys or men. When I tell you each thing, I want you to point to the person that you think does it the most. If you think that a girl or woman does the thing most, point here (indicate female figure). If you think that a boy or man does the thing most, point here (indicate male figure). If you don't know who does the thing most or you aren't sure what the thing means point here (indicate question mark). Now where do you point if you think a man does the thing more? Where do you point if you think a woman does the thing more? Where do you point if you don't know who does it more? Good. Who (first item) more, a man or a woman?

The fifty two items were read to the children in one of two random orders. Children occasionally responded that both men and women performed an activity. When this occurred, the children were reminded that the task was to tell who performed the activity the most and asked, "do you think men or women (item) more, or do you not know who does it most?" The alternative of indicating that both males and females do the activity equally was not given on this task because providing such an alternative is considered a characteristic of measures of stereotype flexibility, not knowledge.

For the schema-as-importance task, the 24 line drawings of pairs of toys were shown to the children one at a time. For each drawing, the children were asked to point to the

member of the pair that they would prefer to play with. The instructions stressed that a preferred toy must be indicated on all trials and that the choice must be made as quickly as possible. The response latencies were timed by the experimenter with a digital stopwatch. The toy choices and response latencies in hundredths of a second were recorded.

Sorting Task. The sorting task consisted of one practice trial and three trials using gender relevant materials. Prior to the trials, two plastic baskets were placed in front of the children and they were read the following instructions "I'm going to show you some pictures, and I want you to put the ones that are alike together. Put the ones that go together into the same basket. Try to put two pictures into each basket." The practice set of a solid square, a striped square, a solid triangle, and a striped triangle was arranged in a single row in front of the children, and they were reminded to put the pictures that belonged together into the baskets. Then the children were asked to sort each of the three sets of gender relevant drawings. The order of presentation of the sets and the order of presentation of the pictures in each set was randomized. After completing each sort, the children were asked why those stimuli belong together, and their responses were transcribed verbatim and tape-recorded.

Free Recall. Following a three-minute delay during which they were allowed to draw pictures, the children were asked to recall as many of the line drawings as possible. Whenever a child recalled an activity without mentioning the sex of the actor, he or she was prompted for that information. Vague responses such as "they were working" were followed by prompts asking for more explicit information. Children also were prompted to recall additional items after each response. Their responses were recorded verbatim and tape recorded.

Recognition. Next children were told that they would see another set of pictures and that one picture on each page was identical to one of the pictures that they had seen before. The children were instructed to point to the picture on each page that they had seen before. Then the 12 picture sets were presented in a random order.

Labeling. Children were shown the drawings that they had seen in the sorting task one at a time and were asked to name the activity depicted in the drawing. Their responses were recorded verbatim.

Scoring

Schematic Processing Measures. The score on the schema-as-knowledge measure was the number of gender-stereotyped responses given to the 26 masculine- and 26 feminine-stereotyped descriptions. Items on which children indicated that they did not know the sex associated with the

description or gave a counterstereotyped response were not be counted. Therefore, the minimum score on this task is 0 and the maximum score is 52.

The scores on Carter and Levy's (1988; Levy & Carter, 1988) schema-as-importance measure were determined using the procedure described in their research. The schema facilitated scores were based on the response latencies to the masculine-feminine pairs. On this measure, lower scores indicate greater schematic processing. The schema inhibited scores were based on response latencies to the masculine-masculine and feminine-feminine pairs. On this measure, higher scores indicated greater schematic processing.

A score representing children's preference for own-sex-typed toys was derived using the masculine-feminine pairs of schema-as-importance measure. Girls' toy preference scores were equal to the number of times they selected feminine stereotyped toys over masculine stereotyped toys on the schema-as-importance measure. Boys' toy preference scores were equal to the number of times they selected the masculine stereotyped toy over the feminine stereotyped toy on this task. For both boys and girls the toy preference scores could range from 0 to 9.

Memory of Gender Relevant Materials. There were three main measures of children's memory for gender relevant materials. The children's responses to the free recall task provided a measure of correct recall and a measure of

mnemonic distortion. Correct recall was defined as accurately reporting an activity and the sex of the character performing the activity. Mnemonic distortions occurred when the sex of the character performing the activity was reported incorrectly or a distorted version of the activity was reported. Children's verbal descriptions of the activity during the labeling task and references to the drawings on the sorting task were used to clarify the stimulus referred to when an activity distortion occurred. For example, one child reported seeing a nurse during the free recall task. The same child mentioned a sick person during the sorting task and described the drawing of a dentist on the labeling task as "a nurse helping the child." The third measure of children's memory for gender relevant material was provided by the recognition task. Children's correct recall, recognition, and frequency of mnemonic distortions were totaled separately for the stereotyped and counterstereotyped drawings. The scores on each of these measures could range from 0 to 6. In addition, the proportion of stereotyped items recalled by each child was determined by dividing the number of stereotyped items recalled by the number of stereotyped and counterstereotyped items recalled. The proportion of stereotyped items correctly recognized by each child also was determined. The scores on these measures could range from 0 to 1.0. A score of 1 indicated that all of the items recalled were

stereotyped; a score of 0 indicated that all of the items recalled were counterstereotyped, and a score of 0.5 indicated that half of the items recalled were stereotyped and half were counterstereotyped.

Sorting Task Each child's responses on the sorting task were examined to determine the type of sorting strategy that was used with each stimulus set. The three classifications of sorting strategy that were possible with these stimuli are sex of character (i.e., placing the males together and the females together), gender of activity (i.e., placing the masculine activities together and the feminine activities together), and orthodoxy of drawing (i.e., placing the stereotyped drawings together and the counterstereotyped drawings together). In addition, the exclusive use of one strategy by a child was noted. Children were classified as using a particular strategy exclusively or as having no dominant sorting style.

CHAPTER III

RESULTS

This study addressed the effect of children's age in months, sex, gender schematic knowledge, and gender schematic importance on their recall, recognition, mnemonic distortion, and organization of gender stereotyped and counterstereotyped drawings. Gender schematic importance was assessed using three measures, the schema facilitated score, the schema inhibited score, and the toy preference score. The schema facilitated score and the schema inhibited score were based on children's response latancies on a toy preference task. The toy preference score was the number of same-sex-typed toys selected on the same-sex-typed -- opposite-sex-typed trials. Children's gender schematic knowledge was indicated by their stereotype knowledge score. Children's recall and recognition were assessed by the overall number of stereotyped and counterstereotyped drawings remembered and the proportion of stereotyped drawings remembered. The frequency of mnemonic distortions of stereotyped and counterstereotyped stimuli was assessed for each child. In addition, whether the mnemonic distortion involved the sex of the character preforming the activity or the nature of the activity was noted. The type of organizational strategy used on each sorting trial was

identified. Whether each child used a variety of organizational strategies or only one of the three possible strategies was determined.

Memory of Stereotyped versus Counterstereotyped Drawings

The overall recall score for the stereotyped and counterstereotyped materials was equal to the number of items for which both the activity and sex of the person performing the activity were reported correctly. The overall recognition score for these materials was the number of times the identical drawings was indicated on the recognition task. The possible range of scores on these measures was 0 to 6. The mean recall score for the stereotyped and counterstereotyped stimuli were 1.61 and 1.54, respectively. The mean recognition scores for the stereotyped and counterstereotyped stimuli were 5.05 and 4.83, respectively. In addition to assessing the overall levels of recall and recognition the proportion of stereotyped items recalled out of the total number of items recalled was assessed. For each child, the number of stereotyped items he or she recalled correctly was divided by the total number of items that he or she had recalled. Note that subjects whose overall recall or recognition scores were zero would be eliminated from the analysis at this point because of the mathematical impossibility of dividing by zero. Three boys and one girl were eliminated from analyses using the proportional scores for this reason.

Scores could range from 0 to 1 on this measure. The mean proportion of stereotyped items recalled was 0.540. The mean proportion of stereotyped items correctly identified on the recognition task was 0.522.

The overall levels of recall and recognition of stereotyped and counterstereotyped stimuli each were analyzed using a 2 (age group) by 2 (sex of subject) by 2 (type of drawing) analysis of variance. The type of drawing (stereotyped vs. counterstereotyped) was a within subjects variable and the remaining variables were between subjects variables. For recognition the ANOVA revealed a significant main effect for age group $F(1,79)=13.47$, $p<.001$. The recognition score was higher for the older children ($M=5.40475$) than for the younger children ($M=4.46345$). The main effect for the type of drawing also approached significance $F(1,79)=3.46$, $p<.066$. Children's recognition of the stereotyped items ($M=5.0482$) was more accurate than their recognition of the counterstereotyped items ($M=4.8313$).

The ANOVA on the recall scores produced a main effect for age $F(1,79)=15.97, p<.001$, an age group by sex of subject interaction $F(1,79)=4.46, p<.038$, and a sex of subject by type of drawing interaction $F(1,79)=7.67, p<.007$. Overall, older children ($M=1.9405$) recalled more than younger children ($M=1.2073$). In addition, older boys ($M=2.0714$) recalled more than younger boys ($M=.92105$), but older girls

(M=1.8095) and younger girls (M=1.45455) recalled equivalent amounts. Table 1 illustrates the sex of subject by type of drawing interaction. Multiple comparisons using Tukey's (HSD) test and a .05 level of significance revealed that boys, but not girls, recalled stereotyped items better than they recalled counterstereotyped items. In addition, girls recalled the counterstereotyped, but not the stereotyped, items better than boys did.

Table 1

Mean number of stereotyped and counterstereotyped drawings by sex of subject

	Sex of Subject	
Type of Drawing	Boys	Girls
Stereotyped	1.77498	1.4651
Counterstereotyped	1.27499	1.7906

The schema-as-knowledge score, schema inhibited score, schema facilitated score, toy preference, age of subject, and sex of subject were predictor variables in regression analyses using the proportion of stereotyped items recalled and the proportion of stereotyped items recognized as

criterion variables. Additionally, separate regression analyses were conducted for each sex using the schema-as-knowledge score, schema inhibited score, schema facilitated score, toy preference, and age of subject as predictor variables and the proportion of stereotyped items recalled and the proportion of stereotyped items recognized as criterion variables. Correlations between the predictor variables and the recall and recognition scores are contained in Table 2. These correlations were based on a pairwise deletion of missing data.

In the overall analysis, sex of subject was the only predictor variable to enter into the regression equation for the proportion of stereotyped items recalled, R^2=.05865, $F(1,73)$=4.54794, $p<.0363$. Examination of the correlation between sex and recall indicated that boys recalled proportionally more stereotyped items than girls did (see Table 2). None of the predictor variables entered into the regression equations predicting the proportion of stereotyped items recognized.

When the data were analyzed separately for boys and girls, no variables entered into regression equations for any measure of the girls' memory or for the boys' recall. The analysis of the boys' recognition performance indicated that their knowledge of gender stereotypes predicted the proportion of stereotyped items correctly recognized, R^2=.12357, $F(1,34)$=4.79355, $p<.0355$. The less knowledgeable

boys are of gender stereotypes the higher the proportion of stereotyped items they recall (see Table 2).

Table 2

Correlations between Predictor and Criterion Variables

Predictor Variables	Criterion Variables: Recognition r	Recognition n	Recall r	Recall n
Total Sample				
Age	-.101	83	-.135	79
Sex	-.221**	83	-.242**	79
Schema Inhibited	.076	83	-.020	79
Schema Facilitated	-.145	83	-.154*	79
Toy Preference	.043	78	-.088	75
Stereotype Knowledge	-.135	83	-.110	79
Boys Only				
Age	-.169	40	-.264	37
Schema Inhibited	-.043	40	-.015	37
Schema Facilitated	-.010	40	-.023	37
Toy Preference	-.087	36	-.255*	34
Stereotype Knowledge	-.352**	40	-.075	37
Girls Only				
Age	-.008	43	-.043	42
Schema Inhibited	.247*	43	-.143	42
Schema Facilitated	-.219*	43	-.178	42
Toy Preference	-.017	42	-.156	41
Stereotype Knowledge	.076	43	-.193	42

*$p<.10$ **$p<.05$

Mnemonic Distortions

A total of 44 mnemonic distortions were made by 36 children. Twenty five (56.8%) of the distortions were sex-of-character distortions of counterstereotyped stimuli, nine (20.4%) were sex-of-character distortions of stereotyped stimuli, and five (11.4%) were activity distortions in which a counterstereotyped activity was recalled as a stereotyped activity. The five (11.4%) remaining distortions were cases in which the activity was reported incorrectly, but the activity that was reported was either gender neutral or shared the same gender stereotype as the original activity. Thus 68.2% of the mnemonic distortions observed were transformations of counterstereotyped to stereotyped stimuli; 20.4% were transformations of stereotyped to counterstereotyped stimuli, and 11.4% did not change the level of stereotyping of the stimuli.

In order to investigate the possible relationship between the mnemonic distortions of counterstereotyped stimuli and the subjects' age, sex, and levels of gender schematic processing, children who did not make any mnemonic distortions were compared with children who made mnemonic distortions of counterstereotyped stimuli. The eleven children who only made mnemonic distortions of stereotyped stimuli were omitted from these analyses. A chi-square procedure was used to examine the relationship between mnemonic distortions and sex of subject. A series of t-

tests was conducted to contrast the age and gender schematic processing scores of the children who did and did not make mnemonic distortions.

A relationship between sex of subject and the tendency to make mnemonic distortions of counterstereotyped stimuli was found in the Chi-square analysis $X^2(1,\underline{N}=72)=4.2604$, $p<.05$. Examination of the predicted and actual frequencies based on the Chi-square indicated that boys were more likely and girls less likely to make mnemonic distortions of counterstereotyped stimuli than would be predicted. Forty percent of the boys, but only 21% of the girls made mnemonic distortions of counterstereotyped drawings.

The t-tests conducted to determine whether or not the children who made mnemonic distortions of counterstereotyped stimuli differed from children who did not make mnemonic distortions revealed only one significant difference between the two groups. Children who made mnemonic distortions of counterstereotyped stimuli had a higher preference for gender appropriate toys ($\underline{M}=7.087$) than children who did not make such distortions ($\underline{M}=6.0$), $\underline{t}(66)=-2.21$, $p<.031$. No differences were found between the two groups of children based on their age, knowledge of gender stereotypes, schema inhibited, or schema facilitated scores, all $\underline{t}(70)$'s < 1.0 and > -1.0.

Sorting Task

Both the overall use of the sorting strategies and the tendency of children to use a particular sorting strategy exclusively were examined. Three types of sorting strategy were possible, sex of characters (male-female), gender of activities (masculine-feminine), and orthodoxy of drawings (stereotyped-counterstereotyped). Table 3 contains the frequency of each sorting strategy for the three sorting trials combined. The relative frequency of each strategy was the same for each stimulus set and was, in decreasing order, sex of characters, gender of activities, and orthodoxy of drawings.

Although the majority of children used at least two different strategies on the sorting task (n=55), the sex of characters sorting strategy was the most likely to be used exclusively (n=20). In addition, eight children used the gender of activities sorting strategy on every trial, but none of the children used the orthodoxy of drawings strategy exclusively. Sex, age, and gender schematic processing differences between children who exclusively used sex of character or gender of activity sorting strategies were ascertained. No relationship between sex of subject and sorting strategy was found $X^2(1,n=28)<1$. T-tests investigating age and gender schematic processing differences between the two groups revealed that children who exclusively used the gender of activity sorting strategy

had significantly higher knowledge of gender stereotypes (M=37.625) than children who exclusively used the sex of character sorting strategy (M=33.350), $t(26)=-2.43$, $p<.022$. The two groups did not differ in their age or other measures of gender schematic processing, all t's < 1.5 and > -1.5.

Table 3

Use of Sorting Strategies and Their Relationship to Sex-of-Character and Activity Mnemonic Distortions

Type of Sorting Strategy	In Total Sample	Type of Mnemonic Distortion			
		Sex of Character		Activity	
		c to s[a]	s to c[b]	c to s[a]	no ch[c]
Sex of Character:					
frequency	125	13	4	5	5
percentage	50.2[d]	52.0	44.4	100.0	100.0
Gender of Activity:					
frequency	87	5	2	0	0
percentage	34.9	20.0	22.2	0.0	0.0
Level of Stereotyping					
frequency	37	7	3	0	0
percentage	14.9	28.0	33.3	0.0	0.0

[a]counterstereotyped stimuli distorted to stereotyped.

[b]stereotyped stimuli distorted to counterstereotyped.

[c]stimuli distorted, but level of stereotyping unchanged.

[d]percentage based on values in the same column.

Influence of Sorting on Mnemonic Distortions

Further analysis of children's mnemonic distortions centered on the relationship between the type of sorting strategy used when that stimulus was presented and the type of mnemonic distortion observed. As seen in Table 3, all of the activity distortions occurred following sorting trials in which a sex of character sorting strategy was used. In contrast, sex of character distortions followed examples of all three of the sorting strategies.

Relationships Among Measures of Gender Schematic Processing

Correlations among sex, age, schema inhibited score, schema facilitated score, toy preference, and knowledge of gender stereotypes are presented in Table 4. Several interesting relationships among the variables are displayed in this Table. It is important to note that the measure of stereotype knowledge is not correlated with any of the schema-as-importance measures. Although the schema facilitated score and schema inhibited score are highly correlated with each other, their relationships to the toy preference measure are much weaker. Age in months is correlated with stereotype knowledge and more modestly, with toy preference. Older children know more about gender stereotypes and are more likely to choose same sex-typed toys. One of the most interesting observations that can be drawn from Table 4 is that sex is correlated with all of the predictor variables except age and stereotype knowledge.

The negative correlation between sex and toy preference indicates that boys in this sample had a stronger preference for same-sex-typed toys than girls. Furthermore, boys were more likely to show schema facilitated and schema inhibited processing than girls.

Table 4

Correlations among Predictor Variables

	1	2	3	4	5	
1. Age	1.00	-.01	-.15*	.07	.17*	.28**
		(n=83)	(n=83)	(n=83)	(n=78)	(n=83)
2. Sex		1.00	-.17*	.23**	-.37**	-.11
			(n=83)	(n=83)	(n=78)	(n=83)
3. Schema Inhibited			1.00	-.42**	.17*	.05
				(n=83)	(n=78)	(n=83)
4. Schema Facilitated				1.00	-.15	-.03
					(n=78)	(n=83)
5. Toy Preference					1.00	-.03
						(n=78)
6. Stereotype Knowledge						1.00

*p<.10 **p<.05

CHAPTER IV

DISCUSSION

The present study addressed a number of concerns that have been raised by current theoretical and empirical work on children's gender schematic processing. For most of the issues addressed, the distinction between schema-as-knowledge and schema-as-importance aspects of gender schematic processing was crucial. Recall, recognition, and mnemonic distortions of stereotyped and counterstereotyped drawings were measured. In addition, children's organization of these drawings was observed. The relationship between that organization and mnemonic distortions was noted. Each of these issues will be discussed in turn. In conclusion, the overall importance of schema-as-knowledge and schema-as-importance measures of gender schematic processing will be re-examined.

Memory of Stereotyped versus Counterstereotyped Drawings

Past research has found that gender stereotyped items were better remembered than counterstereotyped items. This finding was replicated in the present study on the recognition task and by the boys' performance on the recall task. However, Ruble and Stangor's (1986) prediction that children with higher levels of schematic knowledge would remember proportionately more stereotyped items was not

supported. Neither the schema-as-knowledge measure nor any of the schema-as-importance measures predicted the proportion of stereotyped items the children recalled. Although schematic knowledge scores did predict the proportion of stereotyped items that the boys recognized, the proportion of stereotyped items recalled was lower for boys who were more knowledgeable about gender stereotypes.

The relationship between the boys' schematic knowledge and the proportion of stereotyped items they recalled was apparently an artifact of the high level of recognition of stereotyped items and the relationship between schematic knowledge and recognition in general. When boys' recognition of stereotyped and counterstereotyped items were considered separately, it was discovered that recognition of both types of stimuli increased as schematic knowledge increased (counterstereotyped, $r=.369$, $p<.05$; stereotyped, $r=.228$, $p<.10$). Given that the boys' recognition of stereotyped items ($M=5.1$) was nearer the maximum possible score of 6 than their recognition of counterstereotyped items ($M=4.7$), there was a greater opportunity for the boys' recognition of the counterstereotyped items to improve than for their recognition of the stereotyped items to improve. Thus, the proportion of stereotyped items recognized decreased as the boys' overall levels of recognition and schematic knowledge increased.

One intriguing aspect of the present study was the finding that boys, but not girls, recalled stereotyped items better than counterstereotyped items. Although there is not a large precedent for the sex of subject by type of drawing interaction, the finding is not that surprising. When sex differences in children's responses to gender schematic processing have been found, the girls have been less influenced than the boys. For example, Signorella and Liben (1985a) found that boys recalled stereotyped drawings of males better than counterstereotyped drawings of males. Girls in their study recalled stereotyped and counterstereotyped drawings of both males and females equally well. Although Bradbard, Martin, Endsley, and Halverson (1986) were investigating a different set of predictions drawn from gender schema theory, they also found that the boys' memory pattern was more consistent with their predictions than the girls. In this study, boys but not girls, remembered more information about novel items that had been labeled as appropriate for their sex. Similarly, Calhoun and White (1987) found that boys remembered information about a fictitious occupation better when it was identified as male dominated than when it was identified as female dominated. The supposed gender domination of the occupation did not influence the girls' recall of the information. Boys have been found to be more gender stereotyped than girls on a variety of measures (e.g.,

Nadelman, 1970; 1975), and the findings of a sex difference in children's recall typically have been associated with sex differences in other aspects of gender schematic processing.

In studies that have found sex differences in gender schematic effects on children's memory, either individual differences in gender schematic processing were not measured (Bradbard et al., 1986; Calhoun & White, 1987), or they were found to have the predicted effects on memory (Signorella & Liben, 1985a). In the present study, however, the predicted influence of the gender schematic processing measures on children's recall was not found. If the sex difference observed in this study was due to a confounding between subject sex and a dimension of gender schematic processing that predicts the proportion of stereotyped items recalled, then the measures of gender schematic processing used in this study were unable to tap this dimension. Either a dimension of gender schematic processing other than schematic importance and schematic knowledge is responsible for the superior recall of stereotyped items or the measures used in the present study did not adequately assess schematic importance and/or schematic knowledge. The adequacy of the measures of schema-as-importance and schema-as-knowledge used in this study and of the schema-as-importance -- schema-as-knowledge approach to gender schematic processing will be discussed further in a subsequent section of this paper.

Mnemonic Distortions

Ruble and Stangor (1986) predicted that the frequency of mnemonic distortions of counterstereotyped stimuli would be related to schema-as-importance aspects of gender schematic processing. Of the three measures of schematic importance included in this study, only toy preference was found to be systematically related to mnemonic distortions. Children who made mnemonic distortions of counterstereotyped stimuli had higher toy preference scores than children who did not make mnemonic distortions. The children's age and knowledge of gender stereotypes were not associated with whether or not children made mnemonic distortions of counterstereotyped stimuli. However, a sex difference was observed. A larger proportion of boys than girls made mnemonic distortions of counterstereotyped stimuli. It is important to note that sex of subject was also significantly correlated with toy preference. Boys had stronger preferences for gender-appropriate toys than girls. This clouds the interpretation of these findings. It is unclear whether or not children's toy preferences per se are an important factor in predicting their likelihood of making mnemonic distortions. The higher toy preference scores for the children who made mnemonic distortions could be solely due to a confounding of subject sex and toy preference scores. Thus, an unassessed dimension of gender schematic processing may be responsible for mnemonic distortion of

counterstereotyped stimuli as well as for superior memory of stereotyped stimuli.

Sorting Task

The issue of whether schema-as-importance or schema-as-knowledge aspects of gender schematic processing has a greater influence on children's organization of gender relevant material was tested by investigating the exclusive use of the sex-of-character and gender-of-activity sorting strategies. Although relatively few children exclusively used one of these strategies, it was clear that the children who used a sex-of-character strategy were less knowledgeable regarding gender stereotypes than children who used a gender-of-activity strategy. There were no differences between the two groups of children on any of the measures of schematic importance. Thus schematic knowledge, not schematic importance, was found to be related to children's organizational strategy use. This finding casts doubt on Serbin's (Doyle et al., 1987; Serbin & Sprafkin, 1986) assertion that her match-to-sample studies indicate that schematic importance decreases with age. Increases in schematic knowledge may have been responsible for the age changes in strategy use that were observed in these studies.

Of course, the present finding of the relationship between schematic knowledge and children's organizational strategies is preliminary, and the assumption that a decrease in schematic importance was not responsible for the

age changes observed on match-to-sample studies needs confirmation. One source of convergent evidence for this assumption would be to demonstrate that children only choose activity-based organizational strategies over sex-of-character based strategies when the activities are gender stereotyped. This would indicate that knowledge specific to gender stereotyped activities, not knowledge in general, determines whether children use sex-of-character or activity-based organizational strategies.

Influence of Sorting on Mnemonic Distortions

The finding that the type of organizational strategy used during encoding influenced the occurrence of activity mnemonic distortions confirmed the importance of encoding processes in explaining activity mnemonic distortions. However, the lack of a relationship between the type of strategy used and the frequency of sex-of-character mnemonic distortions indicated that processes other than encoding must be considered when discussing sex-of-character mnemonic distortions. Although Cann and Newbern's (1984) study demonstrated that manipulating encoding by directing attention to the activity dimension can result in sex-of-character distortions, the present study demonstrated that this type of mnemonic distortion can occur even when the characters' sex was attended to during encoding. The possibility that different processes are responsible for sex-of-character and activity mnemonic distortions was

suggested by Liben and Signorella's (1984) finding that activity mnemonic distortions were often repeated on a labeling task whereas sex-of-character distortions occurred only on the memory task. The present study provides further support for this view.

The present study demonstrates the need for future research to consider both sex-of-character and activity mnemonic distortions. General conclusions regarding mnemonic distortions cannot be made without considering both types of distortions because the processes that underlie them may be different. In particular, studies of the influence of encoding processes on mnemonic distortions must not exclude the possibility of activity mnemonic distortions as has been done in the past (Cann & Newbern, 1984; Martin & Halverson, 1983). Furthermore, the role of processes other than encoding (e.g., retrieval) in explaining sex-of-character mnemonic distortions needs to be explored.

General Discussion

The main focus of the present study was to test Ruble and Stangor's (1986) hypotheses regarding the roles played by schema-as-importance and schema-as-knowledge in explaining gender schematic effects on children's memory. As it did not support either of Ruble and Stangor's (1986) predictions, a closer examination of the predictions, the model from which they were drawn, and the methods used to test them is merited. There are three possible reasons why

the present study did not support Ruble and Stangor's predictions. First, the predictions may not have been adequately tested because the measures of schema-as-importance and schema-as-knowledge were not valid. Second, an aspect of gender schematic processing other than schema-as-importance and schema-as-knowledge may underlie children's memory for gender relevant material. Third, a schema model may be an ill-suited approach to the study of children's gender role development. Each of these possibilities will be discussed in turn.

There are several criteria for addressing the adequacy of the schema-as-importance and schema-as-knowledge measures. The first is their face validity. The schema-as-importance task consisted of three measures of schematic importance. The schema facilitated score and the schema inhibited score were based on the time required to make toy preference choices. The choices were then used to determine a toy preference score. According to Ruble and Stangor's (1986) definition, schematic importance refers to the accessibility of the gender schema. Given that the schema inhibited and schema facilitated scores are based directly on the accessibility of the gender schema the face validity of these measures seems high (Carter & Levy, 1988; Levy & Carter, 1987). The toy preference score is a less direct measure of schematic importance. High preferences for same-sex-typed toys are associated with high schematic importance

because of the assumption that the automatic use of gender schematic information in making the toy preference choices would lead to more same-sex-typed choices than the use of individual behavioral evidence would (Carter & Levy, 1988). The face validity of the schema-as-knowledge measure also is high. The directions and materials used were designed to insure that subjects' responses were based on their knowledge of gender stereotypes, not on their belief in the flexibility of these stereotypes.

The intercorrelations among the measures of gender schematic processing were useful in evaluating their discriminant validity. Given that schematic importance and schematic knowledge were assumed to be separate and independent dimensions of gender schematic processing, the measures of these dimensions should not be correlated. None of the correlations between the stereotype knowledge score and the schema inhibited score, the schema facilitated score, or the toy preference score approached significance. Thus, the measure of schematic knowledge and the measures of schematic importance were indeed assessing different aspects of gender schematic processing.

The issue of convergent validity was critical to evaluating the three measures of schematic importance. Since the schema facilitated score, schema inhibited score, and toy preference score were designed to assess the same concept, the measures should be significantly correlated

with each other. A significant correlation between the schema inhibited and schema facilitated scores was observed; however, the relationship between toy preference and these measures was much weaker. Overall, the correlation between toy preference and the schema inhibited score only approached significance, and the correlation between toy preference and the schema facilitated score was nonsignificant as well. This calls into question whether or not the toy preference measure was assessing the same aspect of gender schematic processing as the schema inhibited and schema facilitated measures. Given the lower face validity of the toy preference measure and the lack of convergent validity with the other measures of schematic importance, the conclusion that the toy preference measure did not tap schema-as-importance aspects of gender schematic processing seems tenable.

Although the validity of the toy preference measure as a means of assessing schematic importance seems questionable, the schema inhibited and schema facilitated scores provided adequate measures of schematic importance, and the stereotype knowledge score provided an adequate measure of schematic knowledge. Thus, invalid measurement of schema-as-importance and schema-as-knowledge does not appear to have been responsible for the failure of the present study to support Ruble and Stangor's (1986) predictions. The probability that an aspect of gender

schematic processing other than schema-as-importance and schema-as-knowledge actually underlies children's memory for gender relevant material will now be considered.

The sex differences observed in the present study demonstrated that the preferential recall of stereotyped items and the frequency of mnemonic distortions of counterstereotyped items vary systematically across children. Furthermore, other investigators have been able to predict individual differences on these measures (Carter & Levy, 1988; Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a). With the exception of Carter and Levy (1988), only investigators using measures of flexibility in applying gender stereotypes to others have found an effect of individual differences in gender schematic processing on children's preferential recall of stereotyped drawings (Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a) or frequency of mnemonic distortions of counterstereotyped drawings (Signorella & Liben, 1984). In the earlier discussion of measures of flexibility in applying stereotypes to others, the fact that they are not indisputable measures of either schema-as-importance or schema-as-knowledge aspects of gender schematic processing was noted (see pp. 11-12). Thus, it seems likely that measures of flexibility in applying stereotypes to others assess some other aspect of gender schematic processing and that this aspect of gender schematic processing plays a

critical role in memory for gender relevant materials. The discussion that follows first considers what aspect of gender schematic processing measures of flexibility assess. A process by which this aspect influences memory for stereotyped and counterstereotyped drawings then will be proposed. Finally, the likelihood that the sex differences observed in the present study were due to individual differences in this aspect of gender schematic processing will be evaluated.

Measures of flexibility in applying stereotypes to others typically require children to indicate whether activities can be performed by males only, females only, or by both males and females. The number of items assigned to the both males and females category determines the children's score. The more items that a child considers appropriate for both sexes the more flexible he/she is considered. It is important to keep in mind that the children may know that an activity is stereotypically associated with a particular sex even if they assign it to the both category. Thus, flexibility may be best viewed as reflecting tolerance of deviation from known gender stereotypes. This tolerance may be the aspect of gender schematic processing that influences memory for gender relevant materials. Research on the role of degree of stereotype discrepancy in recall illustrates how tolerance for deviation from stereotypes can influence memory.

Several studies have demonstrated that stimuli that are highly discrepant from a stereotype are remembered differently from stimuli that are only moderately discrepant from the stereotype (Seta, 1987; Taylor & Crocker, 1981; Trepanier-Street & Kropp, 1987). Although under certain conditions the highly discrepant items can be remembered better than the moderately discrepant items, superior recall of the moderately discrepant items has been observed on tasks similar to the one used in the present study (Seta, 1987; Taylor & Crocker, 1981). From this perspective, a finding that stereotyped items were remembered better than counterstereotyped items would indicate that the counterstereotyped items were highly discrepant; whereas, a finding that counterstereotyped items were remembered as well as or better than stereotyped items would indicate that the counterstereotyped items were only moderately discrepant. Past research has demonstrated that children who are low in their flexibility in applying stereotypes to others exhibit the pattern of recall that would be predicted for highly discrepant counterstereotyped items; whereas, children who are high in their flexibility in applying stereotypes to others exhibit the pattern of recall that would be predicted for moderately discrepant counterstereotyped items (Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a). Thus, it is reasonable to assume that individual differences in memory for

stereotyped and counterstereotyped stimuli are due to individual differences in the evaluation of the discrepancy level of the counterstereotyped stimuli.

The review of studies that measured children's flexibility in applying stereotypes to others indicates that children vary in the extent to which they consider specific stimuli as deviant and that this influences their memory for gender relevant materials (Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a; 1985b). Similarly, the review of studies that manipulated their stimuli's degree of stereotype discrepancy indicated that the extent to which stimuli deviate from gender stereotypes can influence memory for the items (Trepanier-Street & Kropp, 1987). These observations may be used to explain previous findings that children who are more flexible in applying stereotypes to others remember counterstereotyped stimuli as well as or better than stereotyped stimuli; whereas, children who are less flexible remember stereotyped items better than counterstereotyped ones (Liben & Signorella, 1980; Signorella & Liben, 1984; 1985a). Furthermore, the sex difference in children's recall and mnemonic distortions of gender relevant materials observed in the present study may be explained by the assumption that boys in this study were less flexible than the girls. Several observations lend credence to this explanation of the data. A study of parents' reactions to their child's play indicated that

fathers respond positively to sex-typed play and negatively to cross-sex-typed play more consistently than mothers (Langlois & Downs, 1980). In addition, the tendency to respond negatively to real-life instances of cross-sex-typed play has been observed in male toddlers (i.e. 21- to 25-month olds), but not in female toddlers (Fagot, 1985). Signorella and Liben (1985b) noted that in some of the samples used to develop the GASC girls were more flexible than boys. Additionally, Carter and Levy (1988) reported that the GASC was highly correlated with toy preference. Less flexible children had a greater preference for same-sex-typed toys than more flexible children. The correlation between sex and toy preference observed in the present study indicated that the boys had a greater preference for same-sex-typed toys than girls did; it is plausible to assume that the boys were less flexible in applying stereotypes to others as well.

Although the hypothesis that the influence of level of tolerance for deviation from gender stereotypes on children's memory is due to differential assessments of the level of stereotype discrepancy is intriguing, it can not be sufficiently evaluated from the results of the present study alone. This hypothesis can be tested only by including measures of both children's tolerance for stereotype deviation and the materials' stereotype discrepancy in the same study. Children who have a low tolerance for

stereotype deviation would be expected to remember stereotyped materials better than both highly and moderately counterstereotyped materials. In contrast, children who have a high tolerance for stereotype deviation would be expected to remember the moderately counterstereotyped materials as well as or better than the stereotyped materials; however, a memory deficit for highly counterstereotyped materials would still be expected. Before such an investigation were undertaken, however, it would be prudent to consider the third possible explanation for the failure of the present study to support Ruble and Stangor's (1986) predictions. Thus, the suitability of gender schema theory itself will be discussed next.

The most serious criticism of schema theories, in general, has been that they are untestable and unfalsifiable (Taylor & Crocker, 1981). Some of the predictions drawn from schema theory have been contradictory, and evidence that is inconsistent with the theory has tended to be ignored. As Taylor and Crocker (1981, p. 127) stated, "failure to show a hypothesized effect [derived from a schema theory] will likely be attributed to failing to specify the right schema or measurement error, rather than a failure of the theory itself." The present study could very easily perpetuate this misuse of the schema concept. Concluding that tolerance in deviation from gender stereotypes accounted for the results of the present study

would be comparable to attributing the results to specifying the wrong schema. Similarly, concluding that the measures of schema-as-importance and/or schema-as-knowledge were unsuitable would be an example of attributing the results to measurement error. Thus, gender schema theory exhibits the same faults that led Taylor and Crocker (1981) to conclude that schema theories in general do not meet the criteria of a good theory. Taylor and Crocker (1981) suggested that the reworking of any schema theory into a falsifiable form requires specification of how the schema develops and changes with experience and the conditions under which the schema will be utilized. Similarly, a recent review has suggested that before gender schema theory can be considered useful, theorists must deal with the issues of how the gender schema develops and why gender is a salient basis for schematic processing (Roopnarine & Mounts, 1987). Unless gender schema theory addresses these issues and a version of the theory that meets the criteria of a good theory can be framed, truly productive research in this area cannot be conducted.

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APPENDIX A

SELECTION OF MEMORY STIMULI

A pilot study was conducted to insure that the drawings used in the present study represented activities that are familiar to young children. Although Liben and Signorella (1980) reported using children's books as the source for the activities used in constructing their materials, it is unclear what age level of texts were consulted. Thus it was uncertain whether or not preschool-aged children would be familiar with these activities. Therefore, a large set of drawings of masculine and feminine activities that have been used by previous researchers (i.e. Liben & Signorella, 1980; Cann & Newbern, 1984) were examined to determine their familiarity to young children.

Method

Subjects

Twenty-seven children (16 boys and 11 girls) participated in the pilot phase of the study. The children were between 48- and 107-months-old with a mean age of 69.6 months. The children were divided into two groups based on their age. The younger group (n=16) consisted of children between the ages of 48 and 71 months (i.e. four- and five-year-olds). The older group (n=11) consisted of children

between the ages of 72 and 107 months (i.e. six- to eight-year-olds). All of the children attended a day or after school care facility in the Raleigh, NC area.

Materials

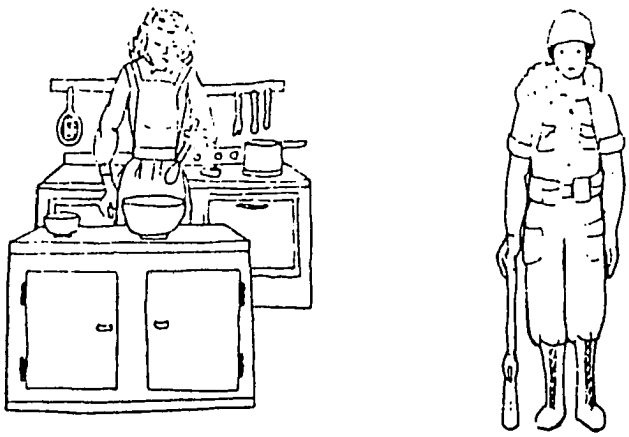
Forty black and white line drawings depicting masculine and feminine stereotyped activities and occupations were used in this phase of the study. The drawings were mounted on 4 x 6 inch note cards and covered in transparent plastic. Although most of the drawings were identical to the original drawings used by Liben and Signorella (1980), six masculine and six feminine stereotyped activities were alterations or additions taken from another source (Cann & Newbern, 1984) or made by the present author. Three activities depicted in Liben and Signorella's (1980) original set were omitted. Cann and Newbern's (1984) transformation of the drawing of carpenter from someone hammering to someone sawing was used instead of the original picture. Inspection of Liben and Signorella's (1980) drawings and Cann & Newbern's (1984) modifications revealed that the vast majority of masculine stereotyped activities were occupations, whereas, the feminine stereotyped activities were more equally divided between occupations and household chores. Therefore, the present author replaced one of the original masculine stereotyped occupations (loading a ship) with a masculine stereotyped household chore (mowing the lawn) selected from the GASC. In order to avoid confusion between two similar

feminine activities in Liben and Signorella's (1980) original drawings (i.e. preparing a meal and cooking), the present author replaced the drawing representing preparing a meal with a drawing representing vacuuming. Vacuuming was selected as a specific representative of the activity cleaning the house which is a feminine stereotyped activity on the GASC. Other differences between the drawings originally used by Liben and Signorella (1980) and in the present study were modifications made by Cann and Newbern (1984) or the present author in order to clarify the activity depicted in the drawing. For example, in the original set the occupation nurse was conveyed solely by the nurse's uniform and cap. In the present study, the occupation nurse was conveyed by both the nurse's clothing and by the activity of taking someone's temperature.

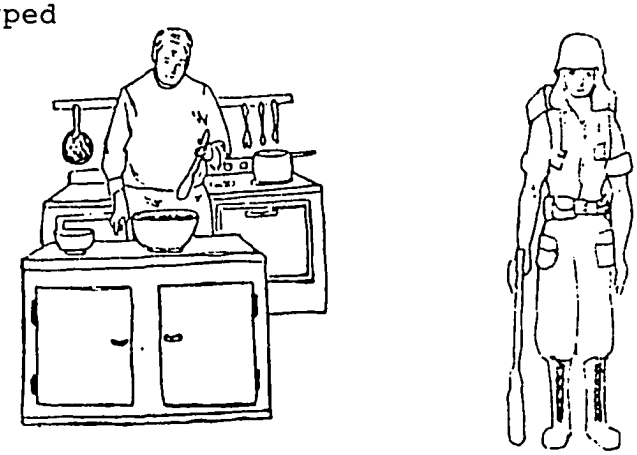
Stereotyped, counterstereotyped, and neutral versions of the 20 masculine and 20 feminine activities were used. The stereotyped and counterstereotyped drawings depicted the activity being performed by a person whose sex was either consistent or inconsistent with the stereotyped nature of the activity. The neutral versions depicted the activity being performed by an invisible person. This was done by concealing the person performing the activity with correction fluid. Figure A-1 illustrates the three versions of the activities cooking and being a soldier.

Figure A-1. Examples of Stereotyped, Counterstereotyped, and Neutral Stimuli.

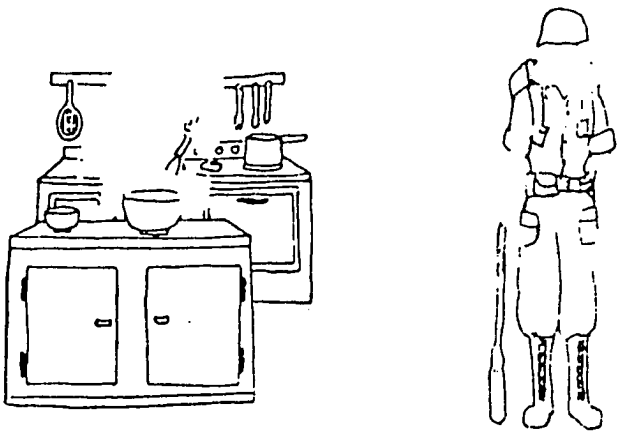
Stereotyped



Counterstereotyped



Neutral



Three sets of 40 drawings apiece were developed such that only one version of each activity was depicted in any given set and each version of all the activities was represented. Thus, each set contained 13 or 14 examples of each type of drawing.

Procedure

Testing occurred in a familiar area of the children's day or after-school care facility and was conducted by a female experimenter. The experimenter told each child that he or she would be shown pictures of people doing things and that his or her task was to say what the person was doing or what their job was called. The children also were told that some of the people in the pictures were men, some were women, and that some were invisible. Children were shown the pictures one at a time and prompted with the phrase "What is this (invisible) person doing? What is this person's job?" The children's responses were recorded verbatim. The picture set used and the order of pictures within the set were determined randomly with the limitation than an equal number of children was tested with each set.

Results

An item was scored as correctly identified if the occupation was named or described fully enough to indicate that the child understood the activity. For example, for the activity veterinarian, which was depicted by a person examining a puppy with a stethoscope, the responses "a vet,"

"veterinarian," "doctoring a dog," and "checking the dog's heart" all were counted as correct; however, the responses "doctor" and "brushing the dog" were considered incorrect. Scoring of the data was conducted by the present author.

Table A-1 contains a list of the 40 activities and the percentage of times each items was identified correctly by all of the children in the study. Although some of the activities were identified correctly by all of the children, other activities were never correctly identified. Eighteen of the items were correctly identified by fewer than 50% of the children. Only ten of the items were identified correctly by at least 80% of the children. For some of the items, the low level of correct identification can be attributed to the condition in which the activity was depicted as being performed by an invisible person. For example, the activity holding a baby was identified correctly by all of the children who saw the stereotyped and counterstereotyped versions of the drawing. However, only one third of the children who saw the neutral version of the drawing were able to identify the activity correctly. For other items, the low level of correct identification was due primarily to the younger children being unable to correctly identify the activity. The most notable examples of this were the occupations teacher and farmer. Although 72.73% of the older children were able to correctly identify these occupations, only 43.75% of the four- and five-year-olds were able to do so.

The selection of drawings for inclusion in the main phase of the study was based on a combination of the total percentage of times the activity was correctly identified and the percentage of times the items were correctly identified by younger children who had seen the stereotyped and counterstereotyped versions of the drawings. The ten masculine and ten feminine items that had the lowest overall frequency of correct identification were eliminated from further consideration. Four additional drawings representing each gender stereotype were eliminated on the basis of the younger children's identification of the activities. Because only stereotyped and counterstereotyped drawings were to be used in the main phase of the study, more weight was given to the identification of these versions of the drawings than the neutral version. This policy lead to the inclusion of some items in the final sample that had lower overall recall scores than some of the items that were omitted from the final sample. For example, the occupation farmer was eliminated from the final sample because only 68.75% of the younger children correctly identified the activity. Similarly, a larger percentage of the younger children were able to identify the stereotyped and counterstereotyped versions of the activity holding a baby (100%) than of grocery shopping (70%). Eighty percent of the younger children were also able to correctly identify the stereotyped and counterstereotyped versions of washing

clothes and setting the table. The choice between these two activities was made randomly. The twelve items that were included in the main phase of the study are indicated in Table A-1.

Table A-1

Percentage of Children Correctly Identifying Each Item

Feminine Stereotyped	%	Masculine Stereotyped	%
teacher	63.0	sawing	92.6*
cashier	51.9	soldier	18.5
washing dishes	59.3	fire fighter	55.6
buying shoes	48.1	giving sermon	18.5
arranging flowers	81.5*	pumping gas	70.4*
switchboard operator	7.4	mowing lawn	96.3*
holding baby	77.8*	mail carrier	100.0*
cooking	92.6*	plastering	14.8
typist	37.0	archaeologist	7.4
ironing	81.5*	veterinarian	55.6
file clerk	7.4	judge	40.7
librarian	51.9	farmer	77.8
stenographer	0.0	dentist	74.1*
making bed	25.9	chopping wood	100.0*
nurse	40.7	surveyor	0.0
grocery shopping	81.5	welding	3.7
setting table	59.3*	ambulance attendant	11.1
sewing	18.5	baseball player	63.0
washing clothes	85.2	police officer	37.0
vacuuming	96.3*	delivering milk	55.6

*items included in experiment