If you were to watch two 3-year-old children playing with trains, the first child could well be linking the cars of the train together, at the same time keeping an eye on the small colored blocks across the way, to which she then drives the train and proceeds to load its cars. The second child might also be linking the cars’ couplers, but instead pulls the engine forcefully causing the cars to fly off the ground before they start to unhinge at the couplers and crash. In both instances, the children are employing a particular set of actions with essentially the same play object. They both know that trains can be hooked together, and their actions suggest that they probably know a fair amount about trains—the engine is used to pull cars, the cars link together to form a line, the wheels enable the train to move forward, the cars can be used for carrying loads. There are still more things these two children could (and, in fact, may) do with the trains. (They could organize the cars by type, they could build a railroad track for the train using big blocks, they could issue tickets for a ride, etc.) Some of these actions may not appear for weeks, some of them may never appear—at least in train play.

It is the thesis of this chapter that the way in which children play with play objects reflects what they represent to themselves as potential actions for play with these objects and may serve to gate information available to them in their subsequent play activity. In particular, the chapter focuses on aspects of young children’s identified interests, or stored knowledge and value, for the play objects in their nursery school class. Findings from two studies conducted on the same sample of children will be used as the basis for this discussion of the role of individually identified interests and noninterests in children’s representation of possibilities for action and their subsequent engagement with play objects.

In the first study, a combined naturalistic-experimental methodology was employed to evaluate the effect of interest on attention and memory of 3-year-old children. In the second study, the naturalistic component
of the first study was examined in more depth. In this study the play
actions of each child in free play were evaluated as a function of the
value (interest, noninterest) of the play object, the affordances of that
play object generally, and the gender of the child. Discussion of both
studies focuses on the interest—representation—activity relation, the
role of specific content in representation, and the implications of individual
variation in interests for understanding children's development.

**Interest, a subject variable**

Interest is here conceptualized as involving elements of both knowledge
and value. Knowledge refers to information about classes of objects and
events in a given domain that the child has stored from past experience
with instances of those objects and events. Value also refers to information
that the child has stored from previous experience with objects and events
in a given domain; however, rather than information about the objects
and events themselves, it is information about the relationship between
the objects and events and the self (Mead, 1934). Value thus refers to that
which underlies the feelings children bring to continued involvement with
the objects and events in a given domain (Vygotsky, 1967).

Operationally, a child identified as having an interest in trains will play
with trains more frequently than with other objects, might fashion a train
out of blocks, and while pushing a boat, may announce that it is “on the
railroad track.” In the nursery school, children’s interests are thought to
be reflected in the degree to which children maintain attention over time
to objects. As Norman (1976) has pointed out, differential attention of
this sort bears a reciprocal relationship to memory. Sustained attention
affects the ease and likelihood with which objects will be encoded in
memory; knowledge and value as long-term memory structures direct
and sustain attention.

Historically, experimental psychological research on memory and at­
tention has had two traditions. One, heavily influenced by if not originat­
ing with Ebbinghaus (1885/1914), has generally focused on stimulus
variables. A second, dating from the very earliest experimental research
on attention (Bessel, 1823) and strongly reinforced by Bartlett’s (1932)
studies of remembering has focused on subject variables.

The “Ebbinghaus” tradition was founded on the notion that psycho­
logical research should parallel the work of the natural sciences by devel­
oping techniques that guaranteed maximum experimental objectivity. As
Ebbinghaus described the basis for his work:

We must try in experimental fashion to keep as constant as possible those circum­
stances whose influence on retention and reproduction is known or suspected,
and then ascertain whether that is sufficient. The material must be so chosen that decided differences of interest are, at least to appearances, excluded. (p. 12)

Ebbinghaus, in other words, realized that interest might exert an important influence on memory process. Rather than choose to study this influence, he chose to rule it out by employing nonsense stimuli that would presumably be equally interesting or uninteresting for all subjects and presented the stimuli under highly controlled conditions. Rather than subject variables, the stimuli themselves and stimulus variables such as order, frequency, and type of presentation became the focus of his research—a legacy that continues to influence many current investigators.

The “Bartlett” tradition, on the other hand, concentrated on the subject and on the subject as an individual. Thus, Bartlett felt that the study of meaningful material was essential to an understanding of the nature of memory as it functions in everyday life. As he suggested, because process and course of recall are inevitably bound up with the kind of material that has to be learned, I have discarded nonsense syllable material. . . . The dissolving power of modern research seems to have split Memory into a number of variously related functions. . . . Remembering is not a completely independent function, entirely distinct from perceiving, imaging, or even from constructive thinking, but it has intimate relations with them all. (pp. 11-12)

As a result, Bartlett chose to focus his investigations on “the conditions of response that have to be considered as resident within the organism,” that is, in the subject.

With the transition to cognitive psychology (e.g., Berlyne, 1960; Broadbent, 1958; Bruner, Goodenow, & Austin, 1956; Hebb, 1949; Hunt, 1965; Miller, Galanter, & Pribram, 1960; Triesman, 1960) the two traditions of research on attention and memory became better integrated in a subject–stimulus interactionism. For example, Moray’s (1959) use of the subject’s name in shadowing experiments illustrated, at least in a limited way, that individual differences exist in information processing. Gray and Wedderburn’s (1960) introduction of meaningful material in dichotic listening tasks demonstrated that meaning had to be taken into account in any analysis of processing mechanisms. Findings of this sort, together with the reemergence of a concern with cognitive development (Flavell, 1963; Piaget, 1954), eventually led to cognitive information-processing models of memory and attention in which performance was understood in terms of both conceptually driven (top-down) processes organized in relation to the subject’s knowledge system and data-driven (bottom up) processes organized in relation to stimulus variables (Lindsay & Norman, 1976; Neisser, 1966; Norman, Rumelhart, & the LNR Research Group, 1975).
This focus on the interaction between stimulus and subject variables led to a shift from linear, single-task research models to multidimensional, multitask methods. Such methods permit both analysis of individual differences in the subject and for the study of relationships between these individual differences and performance across tasks. As Mostofsky (1970) noted, attention in particular requires multidimensional analysis for it involves the attentional process, the attentive subject, and the attention-getting stimulus. Similarly, Jenkins's (1979) tetrahedral research model goes even further by addressing the additional need to focus on subject variables in relation to orienting tasks (directions, instructions, etc.), criterial tasks (recall, recognition, etc.), and materials (psychological organization, psychological sequence, etc.) across similar problem-solving contexts. This need has also been touched on in discussion by Bransford (1979); Brown (1982); Hasher and Zacks (1979); Hunt (1978); Kahneman (1973); and Wellman and Somerville (1980).

Interest is only one of several subject variables to which Jenkins (1979) refers in his tetrahedral model. He also categorizes abilities, knowledge, and purposes as subject variables, and observes that investigators of subject variables have typically studied “a single paradigm of acquisition, a fixed body of material, a single dependent measure” (p. 432). The present conceptualization of interest is not intended to describe interest as a paradigm, as a fixed body of material, or as a single dependent measure. Instead, interest is conceptualized as reflecting the stored knowledge and value of an individual's prior engagements, and the representation requisite to this activity. Among adults, interests are thus assumed to take the form of a particular pattern of questioning or challenge setting which may but does not necessarily have to be described by a specific domain. With young children, on the other hand, it appears that the challenge setting and possibilities for action in which they engage are more readily identified with particular play objects. Thus, although train is the object with which interest is identified, it is not the object train that is “interest,” rather, train is the content of the activity. Interest is the individual's cognitive and affective engagement with intended objects of interest. It is thought to vary among individuals and to serve as an organizer of individual activity. As such, interest involves perception of possibilities for action, representation of these possibilities to the self, and the setting, resolving, and resetting of challenges with that object.

**Interest, as individually varying psychological state**

In this section, literature specific to the study of interest is reviewed briefly, to provide an understanding of the possibilities afforded by study of interest as a subject variable and as one approach to describing varia-
Interests, representation, and activity

Interests, representation, and activity. The study of interest has a long, if uneven, history in psychology. The importance of interest for study of attention and subsequent recall was noted at least as early as 1840 by Goethe (1914) in his classic analysis of color perception, and continued to be discussed among psychologists throughout the 19th and early 20th centuries. It virtually disappeared from the literature in the 1930s when “consciousness” and “attention” began to be eschewed as constructs relevant to psychological explanation and has only recently resurfaced as a “hot topic” for cognitive psychologists (Hidi & Baird, 1988). This renewed interest in interest appears to stem from at least four sources: increased attention to subject variables as potential influences on the way in which an orienting response is interpreted (Bransford, 1979; Brown, 1982; Jenkins, 1979); attention to individual differences across a variety of domains (Dillon 1985; Dillon & Schmeck 1983); detailing of task affordances (Gibson, 1979) and domain-specific knowledge (Chi, 1978); and a concurrent concern with identifying and understanding affect, emotion, and value in development (Mandler, 1975).

Generally speaking, conceptualizations of interest can be organized in terms of their orientation with respect to two characteristics: (a) focus on interests as a function of individual differences or on interest as a universal characteristic of human beings; and (b) conceptualization of interests as a trait or interest as a psychological state. Contemporary discussions have tended to focus on interest either as a trait stressing individual differences, or as a psychological state ignoring individual differences. Probably the most influential approach has been the individual difference-trait approach of psychometrics (Strong & Feder, 1961).

The psychometric approach, which uses quantitative indices to evaluate individual interest traits, evolved in the 1920s with the vocational-guidance movement. Within the context of this movement, employee-employment fit became the focus of study (see Fryer, 1931). Psychological research was oriented toward identifying personal traits through matching people to jobs that better suited their particular interests.

Another more recent approach to study of interest, exemplified by Izard (1977, 1979), has focused on observable behaviors characteristic of interest as a psychological state. This “interest expression” is identified through coding facial movement and is conceived of as a basic positive emotion presumed to provide motivation for facilitating cognitive and motor processes. In general, this approach has focused on the universal qualities of interest as a psychological state.

By contrast, early conceptualizations of interest focused on interest as a psychological state, which varied as a function of individual differences in experience. These conceptualizations first described interest solely in terms of experience and gradually became more elaborate, describing
interest in terms of individual knowledge and value, both of which were thought to be rooted in experience. Theorists involved in this development included: Baldwin (1897, 1906, 1911); Dewey (1913, 1916); James (1890); Thorndike (1935), Piaget (1940), and Vygotsky (1967).

James (1890) discussed interest in terms of the organization of experience:

Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no interest for me. My experience is what I agree to attend to. Only those items which I notice shape my mind — without selective interest, experience is utter chaos. Interest alone gives accent and emphasis, light, and shade, background and foreground — intelligible perspective, in a word. (vol. 1, p. 402)

James’s notions of perceptual learning foreshadowed the Gibsonian (Gibson, 1966, 1979) argument that practice schools attention to distinctive features. James’s view, however, was even broader than Gibson’s in that he felt not only practice, but interest, also improved a subject’s ability to discriminate. Thus, interest was described by James as “a sharpener of discrimination alongside of practice” (vol. 1, p. 515). The effect that James associated with interest was that of molding the individual’s experience.

Baldwin (1911) took a different approach in his discussion of interest. He described it in terms of the activities in which an individual engaged. Interest was described as a function of both knowledge of and involvement with an activity. Thus, for Baldwin, both cognitive structures that the child brought to activity in the world and the competence the child experiences in action and its accompanying affect characterized interest.

In his discussion of interests, Dewey (1916) elaborated on this relationship between interest and competence in action by suggesting that interest was in the material. He labeled the worth of materials in continuously engaging activity as their interest value. Dewey advised teachers to link new material with the child’s purposes, to “discover objects and modes of action, which are connected with present powers. The function of this material in engaging activity and carrying it on consistently and continuously is its interest” (p. 149).2

Thus, Dewey felt children could only act on tasks that were within their “present power,” which included both ability level and interests. The teacher who tried to create “an interest” in something which was not “of interest” to the child would probably be unsuccessful.

Thorndike (1935) expanded on these discussions. A student of James, he spoke of interest as the past experience of a person that acts as a tendency to “cause attention, practice, satisfaction or success, and so increased ability” (p. 45). For him both the motivational value as well as
the competence involved in sustained attention were important components of interest.

This affective aspect of interest was also stressed by Vygotsky (1967) in his critique of play theories. He described interest as a need of the child in activity and argued for more attention to subject variables generally and interest as a reflection of the child’s commitment in action more specifically:

... the trouble with a number of theories of play lies in their tendency to intellectualize the problem. ... I think that the mistake of a large number of accepted theories is their disregard for the child’s needs – taken in the broadest sense from inclinations to interest, as needs of an intellectual nature – or, more briefly, the disregard of everything that can come under the category of incentives and motives for action. (pp. 538–539)

Finally, Piaget (1940) brought the cognitive and motivational components of interest together while also linking interest to the acts of mental assimilation which construct experience.

Interest is the proper orientation for every act of mental assimilation. ... [It] commences with the beginnings of psychological life and plays an essential role in the development of sensorimotor intelligence. But with the development of intuitive thought interests multiply and differentiate and give rise to a progressive dissociation between the energizing mechanisms that imply interest and the values interest engenders. (p. 340)

Taken together, the early theorists suggest that interest organizes experience as a function of both knowledge and value. Embedded in these discussions are suggestions that: (a) interest schools attention; (b) interest organizes experience; (c) interest is reflected in the task (play object, idea, text, etc.); (d) experience gates information stored in memory; and (e) different types of experience gate what gets stored in memory. Underlying these discussions is an assumption that individuals vary in their experience and interest.

In contrast, most recent discussions of interest have tended to elaborate interests as universal psychological states. These discussions have primarily had two focuses: (a) interest as affect or emotion (e.g., Izard, 1977, 1979), and (b) the “interestingness” of the text (or, more generally, tasks) with which the subject engages. In his work on interest, Izard has been primarily concerned with the affective content of interest. Findings from his laboratory suggest that 2- to 8-month-old infants differentiate between stimuli as a function of interest, suggesting that interest is a significant predictor of visual fixation (Langsdorf, Izard, Rayias, & Hembree, 1983).

Research on interestingness, on the other hand, is focused on ways in which text can be modified to enhance interest. Findings from these
studies indicate that individuals will attend to (Garner, Gillingham, & White, 1989), and recall both narrative and expository text (Hidi & Baird, 1986; 1988) as well as sentences (Anderson 1982; Anderson, Mason, & Shirey, 1984) that create a positive valence for the reader. The aspects of context that have been manipulated to contribute to interestingness include: characterization, plot, theme, and setting (Anderson, Shirey, Wilson, & Fielding, 1986). In addition to manipulation of context, structural features of texts such as insertions, elaborations, and seductive details have been employed to increase the interestingness of text (Hidi & Baird, 1988; Garner et al., 1989).

Substantial effects of interest on both subject fixation and comprehension provide powerful arguments for continuing to research subject interest and the interestingness of text. Such research provides specific information about subjects and texts, respectively, and, as such, contributes to ways in which environments and texts can be organized. However, this research does not address the interdependence of the individual child’s response and features of the text or task. For purposes of application in particular, consideration of subject and task interdependence is important because it is this interaction that specifies the way in which information is processed by the individual. Such data are potentially useful in remediating children’s “faulty rules” (Ginsburg, 1977), mapping the range of individual variance in a variety of aspects of learning, and addressing individual variation in children’s development. Focus on particular subject–task interaction (system, or activity) that incorporates the individual subject’s understanding of task as a function of experience (Rogoff & Mistry, 1985) not only facilitates evaluation of contextual effects of both subjects and tasks as independent influences on learning, but provides a lens for understanding the respective contributions of each to the other as well.

One approach to the study of subject–task interaction involves controlling for individual differences between children with respect to the variables under study. In the present studies, differences between children with respect to the content of their interests was expected based on findings from psychometric studies of interest indicating that interests vary across individuals. On the other hand, that each individual could be identified as having an interest further suggested that the discussion of universal characteristics of interestingness as an influence on comprehension could be thought of as an alternate and complementary level of analysis. Thus, it was expected that although the impact of interest on cognitive functions might be universal, the specifics of what the individual child brings to his or her understanding of task affordances (Gibson, 1966) might well vary as a function of personal experience. Such an argument appears to have general support in discussion of cognitive
mapping (Neisser, 1976) and the child as craftsperson (Feldman, 1980); although these discussions do not focus specifically on differences between individuals in the way in which information from the environment is picked up and how it might impact on subsequent activity.

The present discussion of interest focuses on interest as an individually varying, but universal, psychological state. It draws on previous conceptions of interest to address three relatively applied aspects of child-task engagement. Specifically: (a) Do individual interests affect the way in which children engage and learn from tasks with which they do have experience? (b) Do children represent tasks (their demands and potentials) that are of interest to them differently than they do tasks that are not of interest to them? (c) What is the effect of identified interests on a child's subsequent task engagement or activity?

Such questions focus on the individual learner as co-constructing his or her understanding, or theory (Carey, 1985) about the world, in conjunction with the objects and others that make up that world. Because of the individual nature of this construction, it seems reasonable that although the underlying structures are probably universal, the particular content of engagement may provide a specific function for the individual in terms of determining the kinds of questions with which he or she has practice, the challenges he or she sets for him- or herself — in short, the way he or she understands what it is that a task represents as possibilities for action. Specifically, if the kinds of things to which an individual attends and the comprehension one has in attending are influenced by what Piaget (1940) referred to as secondary interests (e.g., attractions, novel learning), it seems reasonable to assume based on the work of early theorists and the applied success of the psychometric approaches in ascertaining particular differences in the content of individual interests, that individual differences in interest may well have implications for understanding how individuals engage (and learn from) tasks.

Discussions of experts and novices in particular content areas (e.g., Chi, 1978; Chi, Glaser, & Rees, 1982; Chiesi, Spilich, & Voss, 1979; Spilich, Vesonder, Chiesi, & Voss, 1979) have demonstrated the importance of domain-specific knowledge with respect to memory performance. These findings suggest that based on knowledge of a domain, it can be expected that experts and novices will differ in performance. Recent findings from Ericsson and Crutcher (in press) suggest, however, that experts and novices in a domain generally do not differ in aptitude or general reasoning. Rather than contradict each other, these findings suggest that what may differ between the performance of experts and novices in domains may not simply be knowledge. Instead, the difference may be explained by both the stored knowledge and value, or interest, that the subject has for a particular domain. In other words,
equating expertise with prior knowledge alone may be too simplistic an explanation for differences in expert and novice performance.

Findings from case studies of persons learning computers and music suggest that individuals who develop an interest in computers are more inclined to reengage with computer tasks, and to persevere longer in their task engagement than are those who do not report a developing interest (Prenzel, 1988). In other words, the task is represented to the self in such a way that an individual has predominantly positive emotions toward this task (whether computers or music, or some other domain), and if asked to compare this engagement with others in which the individual was involved, this task is ranked high in the individual hierarchy of values (Schiefele, 1987). In this conceptualization, interest is a specific “person–object relation” that includes an emotional as well as an affective component. The central feature of interest is its intrinsic character. Knowledge is understood to develop in coordination with the positive valence one holds for a particular object (task, etc.). With respect to subsequent action, interest is conceptualized as “a scheme within a structure of valences, linking a multitude of individual valences of actions, action outcomes, and consequences of action” (Schiefele, 1987). The questions that form the basis of this approach to the study of interest are questions of origins: how interest develops, and the characterization of progress in learning that leads to classification as an expert or novice relative to others working on the same task. Three aspects of the Educational Theory of Interest distinguish it from studies of experts and novices. First, this discussion of interest also includes a discussion of value. Second, this discussion identifies individuals as varying by domain with respect to the way in which knowledge emerges, rather than focusing on learning of the task domain per se. Third, this discussion suggests that individuals are reflectively aware of their interest(s).

In contrast, although the present discussion of interest focuses on interest as involving both stored knowledge and value, and on the individual as co-constructing his or her understanding of tasks, it does not address the way in which interests emerge, nor does it presume that individuals are always reflectively aware of interest as a psychological state. For the purpose of experimentation, the subject’s engagement with a task is considered to be reflected in individually identified objects of interest and noninterest. As such, this approach to the study of interest focuses on the role of interest (stored knowledge and value) and non-interest (knowledge and low value) in learning and subsequent task engagements. It assumes that the individual’s present task engagements reflect the way in which he or she has represented possibilities for action to himself or herself, the kinds of questions posed, and the challenges to which he or she responds.
There is some precedent for discussing interdependence of subject and task with respect to the way in which information is processed. Eckblad (1981), in particular, focuses on the importance of individual contributions to task engagement in her discussion of scheme theory, the relation between the schemes of a particular person and a set of stimuli. Eckblad reports that in all but one case, interesting stimuli were optimally arousing, being placed between complex and pleasant on a stimulus dimension. These findings build on those that established optimal levels of discrepancy in task presentation (e.g., Hunt, 1965) – that there are particular points in attending to tasks when attention is heightened because of the difference that exists between the task as previously experienced and the task as presented (or represented). If interest as psychological state can be characterized as reflecting the kinds of optimally discrepant possibilities for action, questions and challenges that individuals set for themselves in continued engagement with an identified object of interest, it seems reasonable to expect that studies where subjects received tasks that were personally interesting and noninteresting might significantly contribute to our existing understanding of child–task engagement, particularly individual differences in the processing of contents that children do learn. In addition, such findings would provide insights for facilitating children’s learning in domains (or aspects of domains), for which they do not have an identified interest.

To begin to map the role of interest in what might best be described as experimental learning (ongoing play with familiar play objects), the studies described here were designed to evaluate (a) subject–task engagement with respect to the effect of the individual's identified interests across tasks assessing three dimensions of processing: attention, recognition, and recall memory; and (b) the role of both individual interests and task affordances in representation of and activity with naturally occurring tasks.

The studies reported here were designed to evaluate interest conceptualized as both the stored knowledge and value an individual brings to subsequent engagement with a task. They focus on tasks with which the individual is already knowledgeable, and they do not presume that the individual is aware that interest is influencing performance. In fact, identification of interest is based on naturally occurring task involvements of each individual studied, and is determined relative to that individual’s involvement with every task in which he or she is involved.

Three-year-old children were selected as the focus of the studies because: (a) they are not able to feign interest and are not experimenter-wise; (b) they can follow directions necessary to follow up experimental tasks; (c) they accommodate easily to videotaping (so that identification of interest could be based on observed behaviors rather than self-
(d) competence was not acquired so quickly with any play object that it was not possible to study their actions in free play; and (e) the nursery setting afforded the possibility of studying children's actions in a contained environment.

Both studies being discussed were conducted using the same sample of 3-year-old children. The children were videotaped during free play at nursery school over the second term of their nursery school year. As such, each of the 16 children (8 males, 8 females) was as familiar with each of the 16 available play objects and each of his or her peers as could be expected. The videotapes were coded once to identify individual interests and noninterests for each child. These identified interests were then employed to construct stimulus sets in the first study and to evaluate the role of interest and noninterest in the children's actions in the second study.

Naturalistic identification of children's interests (and noninterests)

Procedures

Following procedures outlined in Renninger and Wozniak (1985), six videotapes, each 40 minutes in length, were made of each child in free play at nursery school. For purposes of data reduction, each 40-minute tape was divided into 2.5-minute segments and the child's activity during each segment was continuously coded in terms of the object, content, and interpersonal nature of play. Thus, interest for a play object was determined by the quality and quantity of sustained attention maintained by the child for 2.5 minutes or more across the videotaped play sessions.

For experimental purposes, children were identified as having an interest in a particular class of objects if, over the sessions of free play, they: (a) returned to that object repeatedly; (b) spent more time playing with that object than with other play objects; (c) would at times play with that object in solitary play; and (d) would at times play in other than manipulative play with that object.

Alternatively, play objects of the children were identified as noninterest if the child did have knowledge of the object but lacked value for that object relative to the value demonstrated for objects of interest. Thus, using the same procedure for data reduction as that used to identify children's interests, children were identified as having a noninterest in a particular class of play objects if, over the videotaped play sessions, they: (a) did spend time with these objects; (b) could use something other than manipulative play with the noninterest object; and (c) did not spend as much time with these play objects as they did with their identified objects of interest; and (d) did not play with the object in solitary play. (In instances where more than one play object could have been identified as
Interests, representation, and activity

Bear Doll Fire Horse Playdough Purse Rocket Submarine Train Truck

Total Number of Children

Older Children

Younger Children

Male Female

Bear Blocks Car Dishes Doll Fire Horse Puzzle Train

Figure 6.1 Children's interests by age and sex. (Reprinted from Renninger and Wozniak, 1985, by permission.)

Results and discussion

Two interests were identified for each child. Both of these were much stronger for that child than were other potential play interests present in the nursery environment. Findings regarding the content of children’s interests are presented in Figure 6.1. These findings indicate that: (a) children’s interests tend to be strong and relatively well focused; (b) between children interests vary widely; (c) by ages 2.9 to 4.2 years, the specific contents of the identified interests of boys and girls have almost totally diverged, boys' interests being in general more heterogeneous than those of girls; and (d) within this age range, older children as a group have somewhat different interests than younger children.

Although children do tend to maintain attention to certain classes of play objects in the environment longer and more frequently than they do with other objects, one child’s interests are not, as a rule, the interests of other children. In fact, interests appear to vary widely. This dual characterization of interest as a psychological state on the one hand, and an individual difference variable on the other, supports the early views of

a noninterest, a noninterest item was randomly selected from a pool of potential noninterests by an adult unfamiliar with the experiment.)

Only those objects continuously available to all children were considered potential objects of interest and noninterest. Therefore, interest is here discussed as being reflected in the experimental play behaviors of children with the play objects available to them in the nursery school setting.
interest viewed previously and suggests that intensity of individual interest for text topic may in fact be a useful consideration in subsequent studies of interestingness.

The variation in children's interests is even more striking when viewed in relation to the range and type of interests chosen as a function of the age and sex of the child. Among older children, males and females each had the same number (5) of interests. However, this pattern was not characteristic of younger children's interests. The group of younger boys had a larger number of interests (7) than did the group of younger girls (3), which suggests that older girls may be more responsive to new interests at this age and that boys may be solidifying their interest and thus focusing their attention more specifically than they had been previously. (These findings are cross-sectional and based on a limited sample of children, and thus need to be considered with some reservation.)

Although the girls in the older group had a few more interests than those in the younger group, only two of all of the girls' interests, horse and play-dough, are not sex-stereotyped. These interests were held only by older girls. A contrasting tendency is present with respect to age and type of boys' interests, however. The boys in the younger group were somewhat less stereotypical in their choice of interests (blocks, dishes, horse, and puzzle) than the boys in the older group, who all chose sex-stereotyped interests. Others such as Van Alstyne (1932) have noted similar patterns of sex-stereotyped interests among this age group.

In contrast to the differences in direction of interest among children, the relative strength of interest between children seems to be quite consistent. A little boy with an interest in trains may in general be expected to be neither markedly more nor markedly less strongly interested in his trains than a little girl with an interest in bears will be interested in her bears. From a constructivist perspective, interest could be said to reflect the child's differential experience with the environment, particularly experience involving action on objects. As the child engages in play, the possibilities of action that the particular play objects afford presumably become more clear. Differences between the affordances of different objects and events, then, may provide the basis for a greater differentiation of attention (Gibson, 1966, 1979; Gibson and Rader, 1979) and thus greater differentiation of interest. Individual differences in the direction of interest, then, reflect individual differences in the children's stored knowledge and value.

As both Piaget (1940) and Vygotsky (1967) have suggested, interest also reflects the child's values. Presumably, as the child engages in action with various play objects and develops feelings of competence (White, 1959) with those objects, and as the child encounters objects in social contexts that enhance their value (Lewin, 1935; Mead, 1934), the child
Interests, representation, and activity

comes to feel positively toward them. It appears that regardless of the particular direction (specific content) in which their interests take them, young children will probably be highly motivated to engage objects of interest in any situation in which they find them. This notion—that interest would impel children to engage actively with particular play objects—was a major premise of the two studies that follow.

**Interest, attention, and memory**

This study of the effect of interest on attentional shift, recognition, and recall memory is detailed by Renninger and Wozniak (1985). It was specifically designed as a multidimensional, multitask analysis in which the effect of interest would be assessed across three processing situations. The study was designed to assess the performance of young children across a set of related tasks that would permit evaluation of both levels of processing, as well as within and between child differences on tasks as a function of interest.

Based on the work of the early theorists, and in particular the work of Arnold (1910) and Bartlett (1932), it was expected that interest would affect attention and recall. Arnold argued that the relation between attention and interest was reciprocal. He maintained that sustained attention led to the development of interest, and interest, in turn would increase the likelihood of sustained attention. For the purposes of studying interest as a variable reflecting experience, however, it seemed reasonable to expect that attentional shifts might in fact reflect attention to objects of interest. Such a possibility was implied by Turvey (1973) in his discussion of the way in which individuals constantly monitor information being received in the peripheral visual field. Specifically, if individuals use that part of experience which is not focal to determine subsequent shifts in attentional focus, it might be expected that when the presence of an object of interest was indicated, attention would involuntarily shift in the direction of that object.

Bartlett (1932) makes a similar point in discussing primacy—recency effects in serial recall, stating that:

when material is arranged in serial order, items at the beginning and at the end occupy a favorable position so far as clearness in recall goes. It is of course no psychological explanation merely to refer to position as an objective factor, and to put the superiority down vaguely to greater expenditure of “attention.” There is no actual evidence, and there seems to be no way of obtaining any evidence, that in such cases a greater amount of “attention,” whatever this may be, is expended. . . . In fact, position function is probably of diminishing importance the further we get from the nonsense syllable type of memory work.

The primary determinant of relative clearness in this series was the functioning of preformed interests. (p. 56)
According to Bartlett, recall performance improves as a function of the meaningfulness of the stimuli to the subject. He also notes diminished effects of order as tasks reflected such meaning. Thus, the hypothesis that an identified object of interest placed in the middle serial position, that position least likely to be recalled (Murdock, 1962), might in fact be recalled by young children was suggested by his findings. The recall portion of this study also follows up on his suggestion that one might think about the range of stimuli on a continuum the endpoints of which might be labeled “nonsense” and “preformed interest.” The preformed interest of his study was a general group interest in World War II.

The present research extends Bartlett’s research on interest by specifying individually meaningful stimuli – interests as individually assessed based both on stored knowledge and on value. The hypothesis for this aspect of this study, then, is based on the notion that interest is a specifically directed psychological state whose direction varies among individuals on the basis of their particular knowledge and value systems.

On the other hand, findings from study of young children’s recognition memory suggest that because recognition memory is so well developed by 3 years of age, children typically reach a ceiling in recognition tasks. Thus, although interest might theoretically be expected to affect the way in which items presented for recognition were processed, it was also anticipated that such effects might be difficult to isolate experimentally. As such, it was anticipated that even if no effect of interest on recognition memory could be determined, this task would provide an instructive contrast to the children’s performance on the attention and recall tasks.

Procedures

Based on the naturalistic identification of interests, objects identified as interests were embedded in experimental tasks that assessed attentional shift, recognition, and recall. Objects of a given child’s interest were employed as that child’s target stimuli in each task. For that same child, the objects of every other child’s interest were employed as comparison stimuli. Thus, relative preference across children for objects of interest was not, in general, preference for the same objects and cannot therefore be attributed to variations in stimulus salience. In both the recognition and recall tasks, additional “filler” objects were also employed to provide context.

Because two objects of interest were identified for each child there were two sets of stimuli for each group of children studied. In addition, because there were two age groups involved in the study and these each had somewhat different interests, interest differed by age. Objects for the older group of children were: Set (1) horse, play-dough, purse, rocket, train, and water-toys; and Set (2) bear, blocks, doll, fire hat, truck,
and submarine. Objects for the younger group were: Set (1) bear, book, dishes, fire hat, horse, and train; and, Set (2) blocks, car, doll, paint-brushes, play-dough, and puzzle.

Two female adults, familiar to the children, collected all of the data. The attention task was administered first, followed by the recognition and recall tasks. The tasks were designed to evaluate whether the pickup as well as the retrieval of information presented to young children would vary as a function of individual differences in interest. Thus, the attentional shift task consisted of a series of “interest wheels” in which the experimenter presented pictures of identified objects of interest and noninterest to the children’s visual peripheral field. Shifts in eye gaze to these objects were then recorded and analyzed for the presence of interest effects.

The recognition task consisted of a “birthday game” in which drawings of interest and noninterest objects were shown to the children and then presented in a novel context for free-choice recognition. In this task, level of recognition and the order in which items were recognized were recorded and evaluated. Finally, a modified version of Perlmutter and Myers’s (1977) recall task was used to present nine play objects from the nursery school to the children for recall. The identified object of interest was placed in the middle position (Position 5) of a series of identified noninterest objects, and the children were asked to recall what they saw. Overall level and order of recall were recorded and analyzed for the presence of interest effects.

**Results and discussion**

Overall findings from this study suggest that: (a) Children’s individual interests exert a marked influence on shifts in focal attention to objects in their peripheral visual field; (b) children’s individual interests influence both the likelihood that an item will be correctly recognized when encountered again and the likelihood that an incorrect filler item will be falsely identified as previously encountered, at least within the particular task employed in this study; and (c) children’s individual interests powerfully influence level of recall. So marked is this effect that recall of an interest object placed in that position (middle) generally least likely to be recalled is (for older subjects) equal to or (for younger subjects) even greater than recall of objects in that position (final) generally most likely to be recalled.

More specifically, results of the task assessing attentional shift suggested that children are substantially more likely to shift fixation, and to shift fixation first to an interest object than to comparison objects that are of interest to other children. Moreover, no differences were found in performance between trials indicating that the children’s performance was remarkably even.
The potential implications of these findings are far-reaching. Processing of information from the peripheral visual field has been discussed as an important determinant of where the eye looks next (Turvey, 1973). There is, however, little research on the depth with which events in the periphery are processed as the eye is guided in its search for information necessary to adaptive action. The results of this portion of the study provide a foundation for arguing that shifts in attention are influenced not only by the perceptual characteristics of the peripheral objects or events, but by the value they have for the subject. This would seem to indicate that the children are processing peripheral stimulus information at a sufficient depth to be carrying out a process of evaluation, even if it is one of which they are not reflectively aware. Such a suggestion implies that although interest may influence the way in which knowledge develops, it is a psychological state of which the subject may not be aware. Finally, since no differences were found between the first and last trials of the interest wheel, it appears that the influence of interest on the direction of attentional shift is remarkably consistent phenomena. Interest, then, is not only a strong determinant of shifts in attention but also remains so over multiple encounters with the same situation.

Results of the recognition task mirror those of the attentional shift task. These findings suggest that children are more likely to recognize a given interest item and to choose a given interest item first than they are to recognize items of noninterest or to choose them first. Furthermore, when children make false positive recognitions, they are much more likely to involve items judged as related to their interests than would be expected by chance, or excitedly to mislabel objects as involving their identified object of interest. Thus, for example, a child identified as having an interest in trains, exclaimed, “What a long train,” when presented with a filler item depicting a fishing rod.

Presumably, when children are shown an interest item embedded in a context of other items, they are more likely to attend to it and, possibly, to attend to it more closely. On recognition trials, in which the same item is embedded in a different context, the close attention children have paid to the item during the original presentation may facilitate the likelihood that it will be recognized, that is, that the children will experience a sense of familiarity with it on the second encounter.

It should be noted, however, that given the nature of the recognition task, another alternative is at least conceivable. The task is constructed so that the children are asked to help another child choose those items from among a larger set that were the toys the other child had received for his or her birthday. If the children projected their own desires onto the task, the high rate of interest items selected might as much reflect personal desire for those items as it does recognition of the items as belonging to
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the original set. The tendency for false positive recognitions to be associated with interest items could also reflect such an effect. On the other hand, levels of recognition are generally high for this age group (Brown & Campione, 1972; Brown & Scott, 1971; Corsini, Jacobus, & Leonard, 1969; Perlmutter & Myers, 1974) and should limit this type of effect. In addition, the results of the recall task suggest that young children are capable of recalling the presence of an interest object from a set of comparison objects. Thus, it stands to reason that if recall is possible – particularly because this age group has been characterized as limited in recall (Perlmutter & Lange, 1978) – recognition as a perceptual judgment of familiarity is certainly possible. Taken together, the findings for the recognition task suggest that, like attentional shift, recognition is powerfully influenced by interest.

Results of the recall task demonstrated differences in recall with respect to serial position (interest and recency) and, to a much lesser extent, age. First, older children tended to have higher overall levels of recall than did younger children, although this effect did not quite reach statistical significance. Second, younger children manifested a considerably weaker recency effect than did the older children. Third, and perhaps most importantly, the interest effect manifested by the level of recall for objects in Position 5 was strong for all children. For younger subjects, Position 5 had the highest level of recall, greater even than the level of recall for Position 9, the recency position. For older subjects, the level of recall for Position 5 was roughly equivalent to that for Position 9, but recall for these two positions was superior to all other positions.

Because this study represents a variation on that of Perlmutter and Myers (1979), it is instructive to contrast these findings with those which they reported. The first finding of higher overall recall for older subjects is consistent with that of Perlmutter and Myers. The fact that this finding did not reach statistical significance in this study, whereas it did in the Perlmutter and Myers research, probably reflects the fact that Perlmutter and Myers studied two more widely separated age groups (2.9 to 3.1 and 3.8 to 4.8 years of age) than were involved in this investigation (2.9 to 3.5 and 3.6 to 4.2 years of age).

The second finding, that the recency effect for younger children was weaker than that for older children, does not parallel that of Perlmutter and Myers, who found no differences between age groups as a function of serial position. It seems possible that this difference may be explained by the relative strength of the interest effect for the younger group—younger children manifested the highest level of recall for interest objects, objects at Position 5. Under the assumption that younger children have an overall recall limitation of 1 to 3 objects (as is also indicated by these data), high levels of recall for Position 5 brought about by systemati-
cally introducing an interest object into that position may have directly reduced the capacity available for recall of objects in the recency position.

This line of reasoning is supported by the presence of an age difference in intrusions noted by the observer during the testing. Half of the older children mentioned that their identified object of interest was not in the box, while younger children typically included an interest object in their recall just as though the object had actually been present during the given trial—even when that particular interest object was not part of that stimulus set. Possibly, younger children, thinking globally in terms of “toys” when asked what was in the box, simply mentioned a favorite toy—namely their interest object. It is consistent with this that no objects other than objects identified previously as interest objects were observed to occur as intrusions.

The third finding, which recall of Position 5 was high and, for younger children, even higher than that for Position 9, is in marked contrast to that of Perlmutter and Myers’s finding that low levels of recall occurred for all except the recency position.

Clearly, children’s interest in the object of interest greatly influenced the likelihood that it would be recalled. Perlmutter and Myers have suggested that improvement in recall for serial positions other than the last requires the development of rehearsal strategy and increased general knowledge brought about by children’s expanding experience with the world. It seems reasonable that both of these factors do, in fact, contribute to improved recall as children develop. However, the results of the present study suggest that the development of rehearsal strategies may not be necessary for recalling an object in the middle serial position when the object in that position is an identified object of interest.

In this particular task, the presence of interest effects suggests that, by age 3, enough knowledge has been acquired with respect to a class of play objects that the potential actions and challenges particular to that class of play objects have begun to characterize individual children’s evolving knowledge structures and serve to differentiate the specific content of their knowledge base from that of other children. Thus, interest might be said to inform the differentiation of perception and, in turn, the quality of recall.

Furthermore, differential performance by the children with respect to identified objects of interest suggests that the experimental use of toys as stimulus objects for young children in recall needs to be reevaluated. Typicality of “toy” for a particular age group is not the same as interest in a given toy. Although a similar point has been made with respect to adult categorization (Malt & Smith, 1982), “toys” have generally been considered very appropriate and relatively similar stimuli for the study of young children.
Findings from this study of the effect of interest on attention and memory indicate that interest exerts a marked influence on attentional shift, recognition, and recall memory among young children. In fact, interest is so influential in the performance of children on these tasks that they shifted eye gaze to their identified items of interest first, and described these objects first on both the recognition and recall tasks. Clearly, if interest is such a powerful influence on performance, then it might be expected that study of these children's actions in free play would begin to provide insights about the way in which interest gates the kinds of possibilities for action these children represent to themselves and on which they subsequently act.

**Interest, representation, and action**

In the previous study, interest was employed as a dependent variable and its effect on attentional shift, recognition, and recall memory of young children was evaluated. Findings indicate not only that interest affects attentional shift, recognition, and recall memory, but that its effect is so overwhelming that no particular distinctions emerged between these three dimensions of children's processing. Thus, given observations of children's actions in free play that suggested there are substantial differences in their activity, it was anticipated that by specifying contrasts between interest and noninterest with respect to value, and by focusing on the structure of children's actions, it might be possible to evaluate further the role of interest (and noninterest) in children's task engagement.

To avoid conflation of knowledge and interest effects, noninterest was conceptualized as involving knowledge and low value. To avoid a confound between aptitude for performance with particular objects and identified objects of interest and noninterest, identified objects of interest and noninterest were individually identified for each child relative to that child's play with all available play objects, and were then studied relative to the mean proportion of their behaviors with these identified objects of interest and noninterest. Finally, to facilitate evaluation of child-task engagement as a function of interest and not simply the probability that some play objects actually afforded more possibilities for action than did others, a modal task affordance for each play object with respect to each of the variables studied was calculated based on all of the children's play actions. This rating was then employed as an independent variable in analyses. Thus, based on the assumption that children's actions in free play reflect their understanding of possibilities for action with those play objects (or at least the way in which they are able to carry out their understanding of these possibilities), the present study was designed to address the way in which different types of experience gate
the content that children represent to themselves through evaluating children's play actions with those objects as a function of interest, task affordance, and gender.

In discussing current work on event presentation, Nelson (1986) notes that one of the assumptions underlying this research has been that “differences in initial perceptual representations imply differences in derived structures as well as in cognitive performance” (p. 17). She continues to suggest that because “schemas in part guide perception, perceptual representation of the same event may differ for children to the extent that their schemas for that event differ” (p. 17). In other words, Nelson suggests that there are individual understandings of events that deviate from the event representations the individual eventually will develop. Given that interest appears to affect attention and memory of young children powerfully, and that the specific contents of children's interests vary as they do, it seemed reasonable to suggest that in addition to the similarities that characterize the development of young children's understanding of “events,” there may be some fairly systematic differences in this development as well. In order to investigate the possibility that children's interests might differentially influence their representation of tasks (and subsequently their activity), this study was designed to evaluate children's play across objects available in their nursery school classroom.

**Procedures**

The videotaped free play of each of the 16 children (8M, 8F) who were subjects of the previous study was independently reanalyzed to identify each child's actions with each of 16 play objects continuously available to the children. Following this, children's actions with those objects identified previously as interests and noninterests were evaluated as a function of value (interest and noninterest), task affordance, and gender.

Identification of children's actions with objects involved continuous coding of all tapes of each child in free play. Coding consisted of: (a) identifying the object of play, (b) the type of play, as well as (c) the particular action (within type of play) as these occurred. All data including duration of each data point were recorded by computer.

Although the specific actions with which children engage with discrete play objects may vary, observation of children's behaviors indicate that it is possible to describe the type(s) of play in which the child is engaged and types of play to which a child might shift in play across their play with each of the available play objects. To facilitate comparison of children's play across play objects (trains, dolls, etc.), a taxonomy of play types was developed, based on observations conducted using another sample of children playing in the same classroom with the same play objects as those employed in this study. The taxonomy identifies the structural features of
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children’s actions with play objects. The types of play described by this taxonomy include: investigative, functional, operational, transformational, and facilitative play (Renninger, 1984). Each of these types of play is thought to reflect the child’s exploration of challenge-setting, and as such different dimensions of child–task engagement.

In investigative play, children’s actions are described as reflecting exploration of the physical attributes of an object. Thus, for example, in investigative train play a child might drop the train, push it sideways, or play with the coupler. The kinds of challenges with which the child is thought to be engaging in investigative play, then, involve exploration of new options for play with the object, features with which the child has not previously been engaged. In functional play, children are described as continuing to explore the properties of a class of objects, but this exploration reflects convention. Thus, in functional train play a child might hook cars together, push the train (engine first), or load and unload the train. In functional play children demonstrate a culturally consistent understanding of what is and is not a train. The kinds of challenges with which children are thought to be engaging include mimicking and making connections between their play and the functional uses of these objects in the larger world in which they live.

In operational play, children’s actions are sometimes described as exploration, but this exploration is generally described as reflecting preoccupation with relations such as: counting, dividing, ordering, and so on. Superficially, children’s play may appear to be either investigative or functional; however, continuous monitoring of the play often reveals repetition of sequencing, counting, dividing, adding, subtracting, balancing, or attention to regularities of motion. For example, in operational train play the child might: connect and disconnect cars repeatedly, get down to eye level with the train, and pull it forward and backward while focusing on the wheels; or order the cars by size, color, and the like. Thus, the kinds of challenges with which the child is thought to be engaging include exploring and developing an understanding of systematic or programmatic action.

In transformational play, children’s actions are described as reflecting the use of one object to represent another object. In transformational train play, a child might make tickets out of paper, use a line of chairs to denote a train, or step out of a large rocking boat and announce, “We’re at the train station, Bill.” Train is the object of play even though there are no trains or model trains being used. The challenges the child is thought to be engaging in transformational play involve maintaining the flow of an image in play. This requires substituting something else as the “object” when it is not available.

Finally, in facilitative play, the object is generally described as supporting children’s actions in other play areas. In facilitative train play, the
train might be carried to the easels and placed on a nearby window ledge. A child might paint, and when finished pick up the train and move with it to another play area. The challenges for the child in facilitative play are thought to include the ability to divide attention between objects, and separating from an object that provides security (Gay & Hyson, 1976).

Identification of particular actions within each type of play refers to what the child was doing. Thus, one child's investigative play with trains might involve holding the engine upside down and spinning one wheel and then another wheel, whereas another child's investigative play with trains might include pushing a train with one car sideways, stopping the pushing motion, pushing again, and then reorganizing the way the train was connected so that the wheels would allow the train to be pushed more smoothly.

All shifts in action were also coded, so that it was possible to evaluate the sequence of the child's actions both between and within play objects. Thus, for example, "pushing the train" and "stopping the pushing motion" would count as two actions. An action sequence might include: "pushing the train," "stopping the train," "pushing the train," "reorganizing the connections," and would be considered a repeated action sequence if it were employed by the child more than once.

This coding of children's play actions contrasts with that for identification of interests and noninterests in which the only play evaluated was that with objects that lasted for 2.5 minutes or longer. It further contrasts with the identification of objects of interest and noninterest in that it focuses on the process of the child's engagement with each play object. In this way it is possible to compare, for example, the individual child's investigative play with one play object with his or her investigative play with another play object.

Results and discussion

Children's actions in free play with each play object were evaluated with respect to each of the following variables: frequency and duration of play; number of types of play; shifts between types of play; number of shifts in action within each type of play; number of shifts between actions within level for each type of play; and repetition of action sequences. For the purposes of analysis, these data were employed in two ways. First, modal scores of all children's play with each play object were determined. On the basis of these scores each object was rated high or low on affordances for each of the variables under study. Then, based on the individually identified objects of interest and noninterest reported earlier, a score for object affordances specific to the identified object of
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interest and the identified object of noninterest for that child was entered into analyses as an independent variable. Following this, and independent of the identification of each child’s interest and noninterest, scores for each variable were calculated for each child’s play with his or her identified objects of interest and noninterest.

Results from 2 (value: interest or noninterest) × 2 (object affordances: high or low) × 2 (gender: male or female) repeated measures analyses of variance reveal that: (a) children are no more likely to play with objects identified as interests than noninterests, although they are more likely to play for longer periods of time with objects identified as interests than those identified as noninterests; (b) children are more likely to use more types of play with objects identified as interests than they are with objects identified as noninterests. Additionally, children are more likely to use more varying types of play with those objects affording more varying types of play (e.g., play-dough) than they are on those objects which were rated low on the possibility of employing a lot of different actions in play (e.g., trains); (c) children are more likely to shift between types of play with objects identified as interests than with those identified as noninterests; (d) children are more likely to employ more actions in play with objects of interest than with objects identified as noninterests; (e) children are more likely to employ more shifts in actions with objects identified as interests than with objects identified as noninterests; (f) children are more likely to repeat particular sequences of action with their identified object of interest than with objects of noninterest; (g) children who shared the same identified object of interest did not necessarily share the same action sequences in play with their identified object of interest; (h) children in play with objects identified as noninterests are more likely either not to repeat prior action within play types or only to repeat prior actions with no incorporation of change in their action sequences.

In general, then, findings from this study suggest a powerful and consistent effect of interest on children’s play actions. That children were not engaged in play with their identified objects of interest any more frequently than they were with their identified objects of noninterest further corroborates that noninterest reflects a variation of the quality of children’s engagement with play objects and is not simply reflecting a lack of knowledge for that play object. On the other hand, it is interesting that although the children are playing no more frequently with objects of interest, they are in fact playing with identified objects of interest for longer periods of time than with identified objects of noninterest. This suggests that the children may see more possibilities for action with their identified objects of interest and that they are better able to recall prior actions with these objects and in engagement are in
fact setting challenges for themselves that vary from those they set for themselves with their identified objects of noninterest.

Clearly, main effects that indicate interest is a determinant of the number of types of play, shifts between types of play, number of shifts in action within each type of play, number of shifts between actions within level for each type of play, and repetition of action sequences all suggest that the children are in fact engaging differently with their identified objects of interest than with their identified objects of noninterest. If we can assume that the children's actions reflect what they re-present to themselves as possibilities for actions, then it seems reasonable to argue that the content of representation not only varies between individuals but does so in a consistent and reliable way across several types of children's play actions – at least with respect to individually identified objects of interest. In fact, differences in the quality of children's repeated actions with objects identified as interests and noninterests, as well as the finding that suggests that children who shared the same interests did not necessarily share the same repeated sequences of action, further suggests that individual interests may guide and regulate the individual's subsequent representation and activity.

In order to study further the role of value, affordance, and gender in children's actions, analyses specific to each identified play type were conducted as well. Findings from study of children's actions in investigative play (focus on an object's physical attributes) reveal: (a) females are most likely to re-engage in investigative actions and to shift actions with their identified objects of interest – these objects of interest also are most likely to be objects which afford the most possibilities for actions and shifts of action in investigative play; (b) all children spend the most time in facilitative play with identified objects of interest that are also objects affording possibilities for the longest actions. In addition, females are most likely to play the longest with objects which are identified as objects of interest – and females are most likely to play the longest with objects that afford possibilities for actions that last the longest; and (c) all children have more different types of investigative actions with objects identified as interests than those identified as noninterests. In addition, females are more likely to play with objects that afford the most possibilities for investigative play.

Given that the kinds of challenges with which children engage in investigative play include exploration of new options for play with the object, physical characteristics of the object with which the child has previously been engaged, the present findings can be interpreted as suggesting that in investigative play all children are employing more different types of actions or more different types of challenges and questions, and they persevere with these challenges longer when playing with objects identified as interests than when playing with objects identified as non-
interests. However, these findings further suggest that females may be more disposed both to play with objects that afford novel challenges and to set novel challenges for themselves in free play than are males.

In contrast, findings from study of children’s actions in *functional play* (focus on conventional use of the object) suggest: (a) all children have the most repeated engagements, lasting the longest periods of time, and the most shifts in action in functional play with their identified objects of interest; (b) males are most likely to have the most different types of actions in functional play with their identified objects of interest, which also are most likely to be objects that afford the most possibilities for action in functional play.

Given that the kinds of challenges with which children engage in functional play include exploration of relations between their play and the functions of their play objects in the larger world, the present findings can be interpreted as suggesting that in functional play children are more likely to have picked up on the cues provided by their environment about typical uses of their identified objects of interest than of their identified objects of noninterest. In addition, male children are more likely to incorporate actions that mimic those of the larger world in their play with identified objects of interest, and their identified objects of interest afford more possibility of conventional play than do those of female children. Taken together with findings from study of children’s investigative play, it appears that, at least in the sample studied, female children are more likely to engage in and to play with objects that provide novel challenges, whereas male children are more likely to engage in and to play with objects that provide more opportunities for mimicking the larger world.

Findings from study of children’s actions in *operational play* (focus on such relations as counting, sequencing, etc.) suggest further that: (a) all children re-engage with objects and shift actions most frequently to objects identified as interests during operational play. In addition, those objects most frequently engaged in operational play are most likely to be objects that afford the most possibilities for action and the most possibilities for shifts in action in operational play; (b) all children engaged in the longest periods of play in operational play with their identified objects of interest; (c) females are most likely to have the most different types of actions in operational play with their identified objects of interest, which also are most likely to be objects that afford the most possibilities for different actions in operational play.

Given that the kinds of challenges with which children engage in operational play include exploring and developing an understanding of systematic and programmatic action, findings from the present study can be interpreted as suggesting that in operational play children are most likely
to re-engage objects identified as interests, and to do so for longer periods. In addition, female children are more likely to employ more different kinds of relations in their operational play than are male children and are more likely to play with objects that provide more possibilities for exploring these relations. Not only are these females more inclined to engage in novel challenge setting, as suggested by their investigative play, but they are also likely to explore the possible relations in play with their identified object of interest, and they seek out objects that enable them to have more possibilities for such engagement.

Findings from study of children’s action in transformational play (focus on representation of the object) suggest: (a) females are most likely to have the most repeated engagements in transformational play with their identified objects of interest, which also are most likely to be objects that afford the most repeated engagement in transformational play; (b) all children have the longest engagement in transformational play with their identified objects of interest, all children have the longest engagements in transformational play with objects that afford the most possibilities for long engagements; (c) males are most likely to shift actions within level in transformational play with identified objects of interest, which also are most likely to afford the most likelihood of shifts in action within transformational play; (d) all children use the most different types of actions in transformational play with their identified object of interest, which are also the most likely to be objects that afford the most different types of action in transformational play.

Given that the kinds of challenges with which children engage in transformational play require maintaining the flow of an image in play through substituting another object for the “object” when it is not available, findings from the present study can be interpreted as suggesting that children are most likely to image or transform objects to represent their identified objects of interest. In particular, females are most likely to have the most repeated engagements in transformational play and to play with objects that facilitate the most possibilities of repeated engagements. Males, on the other hand, are most likely to shift actions in their transformational play with objects identified as interests, and these objects afford the most possibilities for shifting of actions in transformational play. That the females in this sample are able to have the most repeated engagements in transformational play and to select objects for play that permit more repeated engagements suggests that the females in this sample may generally be more focused on repeated opportunities to image than are the males, although the males, when in transformational play, are more likely actually to engage in more different kinds of actions. These findings complement those indicating that male children also engaged in more different kinds of functional play than did the
female children. It appears that because the males engage in a greater range of actions in functional play and seek out objects that facilitate a greater range of actions in functional play, in transformational play their shifting actions reflect this repertoire of functional actions in the possibilities they have for play with objects in transformation. The females, on the other hand, with their tendency to explore novel challenges (investigative play) and types of relations (operational play) may repeatedly engage in transformational play as another challenge but do not bring an established repertoire of particular actions to their transformational play behavior.

Findings from study of children’s actions in facilitative play (focus on the object as supporting play with another object) reveal: (a) all children engage in facilitative play most frequently with identified objects of interest; (b) children do not differ in the time they allot to facilitative play with identified objects of interest and noninterest; (c) all children are most likely to shift between actions in facilitative play with identified objects of interest, which are also most likely to be objects that afford the most possibilities for shifting of action in facilitative play.

Given that the kinds of challenges with which children engage in facilitative play include the ability to divide attention between objects and to separate from an object that provides security, findings from the present study suggest that children in facilitative play with their identified objects of interest are most likely to engage objects of interest and to employ a range of actions in their play with these objects in facilitative play, even though they do not engage in facilitative play with identified objects of interest for longer periods of time than they engage identified objects of noninterest. It appears that although the children have more capacity to engage in facilitative play with objects of interest and do so more frequently than with objects of noninterest, they do not actually engage in facilitative play for longer periods of time with their identified objects of interest because their value for these objects may actually distract them from the other objects with which they have been occupied.

In summary, findings from this study of children's actions in free play indicate that children's interests influence their representation of possibilities for action, and presumably their subsequent activity because this activity in all likelihood will also reflect their interests. Leont’ev (1981) observed that activity serves “to orient the subject in a world of objects . . . activity is . . . a system with its own structure, its own internal transformations, and its own development” (p. 46). In the present study, children’s actions with respect to their own identified objects of interest and noninterest indicate that interests serve to increase the likelihood of particular engagement and the kinds of challenge setting such engagement makes possible. These findings further suggest that differences in
the specific content of interest may in fact be influencing the aspect or affordances of play objects to which the child attends, with which the child engages, and what the child does in play with that object in subsequent activity. Thus, at least for children at 3 years of age, the activity of particular engagement may have a unique structure that reflects individual interests.

In his discussion of the development of representational competence, Sigel (1986) notes that children need first to conserve the meaning of the object to be represented, and following this they develop the capacities to make a plan (anticipate), to use hindsight (hindsight), and to go beyond present action (transcendence). Findings from the present study indicate that children as young as 3 years of age are developing abilities to repeat challenges for themselves, through the types of play in which they engage. Specifically, they are exploring manipulable aspects of the object's physical properties (investigative play); connections between their play and actions of their milieu (functional play); possibilities for systematic action (operational play); substituting one object for another (transformational play); and dividing attention (facilitative play). That these children distinguish between interest and noninterest objects in their engagement in each type of play suggests that these children are making choices (anticipating); drawing on experience (hindsight); and considering alternative possibilities for action (transcendence) in their play — at least with identified objects of interest — regardless of whether these actions are reflective or not. Their ability to represent to themselves information that subsequently influences activity requires a general ability to think about an object in two different ways at the same time. This ability appears to emerge first in play with identified objects of interest.

Furthermore, it appears that children are equally flexible with respect to their actions in play with objects identified as interests and equally inflexible with respect to their actions in play with objects identified as noninterests. Such findings provide a complement to those of Nelson and Gruendel (1986), who found in their study of 4- to 8-year-olds that older children were more likely to evidence both increased structural complexity in scripts and flexibility in describing strategies. The present study suggests that at least with respect to individual interests and noninterests, the actions of children differ between domains as a function of value and in some instances as a function of what the possibilities for action with that play object may be. Whatever the specific content of representation, it varies in a consistent way such that there is increased structural complexity in their play with objects identified as interests. What is less clear is the extent to which such actions have been internalized as procedural responses to particular objects and as such reflect unconscious reactions rather than emerging planfulness in children's activity.
Findings that suggest that children in play with identified objects of interest repeat patterns of action and incorporate new actions into these patterns indicate that children probably are not simply reacting to objects identified as interests but are evidencing an emerging planfulness. That children continue to re-engage their identified objects of interest, to repeat particular patterns of action that also incorporate systematic variations in these actions, and that these actions vary even when children share the same identified objects of interest, further suggests not only that the children are responding to the challenges the play object affords, but that they are setting challenges for themselves with these play objects that build on prior activity.

On the other hand, findings that indicate differences between children with respect to their actions in play as a function of gender, suggest that the specific form of their activity is probably a response to the others in their class, as well as the larger system of social relations of which they are also a part. What is of particular importance to the present discussion is the role of interest in the development of children's understanding. That systematic differences emerge between children with respect to the content of their interests, and then again with respect to the structure of their play with their interests when analyzed by play type, indicates that the influence of gender might be best understood as embedded in, rather than causally connected to, the content of individual interests. At very least, such differences suggest that there may be several kinds of "interests" that might be usefully studied.

Conclusions

There are probably more similarities than there are differences in the way in which individuals process information. However, differences that do exist between children in the way they understand the tasks with which they are presented and how they then proceed to accomplish these tasks are major stumbling blocks for both the child and those with whom they work. The literature is replete with findings suggesting the importance of meaningfulness, typicality, centrality, familiarity, and the like for the way in which individuals perform. These studies all attest to the importance of the tasks with which subjects are presented, although most such studies have grouped subjects together in order to describe individual contributions to subject-task engagement. In the present studies, by controlling for differences between children with respect to the content of their individually identified interest, and by employing mean proportions to evaluate differences between children in their actions with both interest and noninterest objects, it was possible to begin to evaluate the role of interest in the development of children as individuals. Findings
from these studies indicate that individually identified interests and noninterests do affect the way in which children engage and perform on tasks requiring attention and memory, the way in which children represent the demands and potentials for tasks that are of interest to them, and what the child stores in the way of information for subsequent activity.

Furthermore, it appears that in experimental play (ongoing play with familiar objects) children have the most access to and more likelihood of storing information pertaining to objects identified as interests. The patterns of these children's activity between domains suggests an individual organization of activity that is guided and regulated by interest. To the extent that action outcomes, such as focus, type, and shifting of play actions, can be construed as evidence of an emerging planfulness, young children's specific organization also might be conceptualized as schematic. Whether such a scheme would take on a "structure of valences" as Schiefele (1987) suggests, is a question that the present studies only begin to address.

Krapp and Fink (1986) have reported that the pattern of children's actions with their interests, conceptualized as preferred person–object relationships, is maintained during the transition from the family into kindergarten, although which actions will be observed across time is not predictable. Rather, they find a high probability of determining reliable post hoc connections between present and past patterns of actions on a case-by-case basis. Such findings, together with those of the present studies suggesting that interests might be considered to reflect the kinds of questions and challenges the individual represents to himself or herself in engagement with an object (task, etc.), suggest that interest might be most appropriately conceptualized as embedded in the way in which the individual engages subsequent activity. This would explain why simple correspondences between patterns of action across environments are not easily made, and why two children in play with the same object are not necessarily involved in the same actions even when observed for long periods, over the course of an entire term at nursery school.

In discussing scene schema, Mandler (1979, 1983) notes that they are integrated into the knowledge structure and inform what it is that comes to be expected. In particular, what is known about the schema and what is anticipated "provide a great deal of economy in our processing of the surround [meaning] that much of what we think we have actually seen, we have only inferred" (1983, p. 454). This echoes James's (1890) discussion of interest and suggests an extension that includes information that is presumed or inferred, information that informs (whether accurately or not) subsequent activity.

In the attentional shift task reported in the first study, children were
more likely to shift their gaze toward an object identified as an interest when it was projected in their peripheral visual field. Findings from this study were discussed as reflecting the perceptual characteristics of the peripheral objects as well as the value of these objects for the child. Together with findings from study of children’s actions in play, it appears that the children in the present studies have internalized a process of evaluating the objects available to them in nursery school and this influences their subsequent engagements, whether these are explicit tasks of recognition and recall, or more implicit tasks involving subsequent action in free play.

Findings from the present studies further suggest that in addition to access of information that interests provide children, information stored about identified objects of interest and its concomitant influence on the process of children’s representation for subsequent activity should be acknowledged as well. Although train play, for example, involves many actions shared across children, it also varies between children. In fact, the kinds of actions in which a child engages in train play are not necessarily the same actions as those of the next child, even if the train is an identified object of interest for both children.

Findings from the studies presented appear to suggest that the kinds of play objects for which children have an interest influence the kinds of possibilities for subsequent action, or challenges that the children set for themselves in response to these possibilities. They also suggest that children seek out play objects that match the kinds of challenges with which they feel comfortable. An important question for the present discussion is whether the challenges being posed by two children in play with trains are qualitatively different, and what the implications of such differences might be for thinking about the role of specific content in representation and the implications of individual variation in interests for understanding children’s development.

Based on the present findings, it might be expected that two children in train play would engage qualitatively different kinds of challenges if train play were an identified object of interest for one child but not for the other child. Whether the child for whom train play was not an identified interest might be expected to be exploring similar challenges in play with his or her identified object of interest is another question. Findings from the second study presented suggest this is probably the case. On the other hand, given findings that suggest that particular play objects afford more possibilities for some actions than others, it may be that the specific class of objects of interest to children do influence the kinds of challenges with which they engage. It should be pointed out, however, that children in the present study are engaging on a regular basis with their identified interests and noninterests, along with a variety
of other play objects. Thus, if they are limited in the challenges with which they engage, this is not because of a lack of alternate sources of possibilities and challenges in the environment and can be attributed to self-imposed constraints.

At present, interest as an individually varying, psychological state can be said to account for and may well contribute to differences between young children in both representation and subsequent activity. It appears there is an individual quality to representation involving both the kinds of possibilities that are more characteristic of an object and the process of representing and re-presenting information about a class of objects. Whether children’s interests influence only the content of information that is processed, or whether interest might be more appropriately considered to have schemelike properties that influence the representational process, clearly needs further research. From either of these perspectives, interest appears to be an important reflection of, and source of, individual differences in task engagement.

However, some basic questions about the role of interest in the development of children need to be addressed. Interest appears to serve a particular function for young children by focusing, developing skills, schooling attention to particular features of tasks, and on the basis of these facilitating the setting of challenges for the child that are optimally discrepant. However, interest does not appear to have such a pervasive effect on information processing among older children. Findings from studies of fifth- and sixth-grade students’ task engagement in reading and mathematics tasks (where the context of passage and word problem interest and noninterest was manipulated), for example, suggest that interest serves to influence comprehension of the task but not the skills requisite to such tasks (Renninger, 1988). Furthermore, it seems reasonable that once a student is more metacognitively able, and can acknowledge the influence of interest on activity, it may be possible for him or her to develop strategies to overcome the influence of interest (and noninterest).

Clearly, longitudinal evaluation of individual children’s actions in free play should further knowledge about the importance of particular content and specific configurations of possibilities (Piaget, 1987) or challenges that characterize children’s task engagement and the extent to which they could be said to vary as a function of interest. It would also permit evaluation of shifts in interest over time and determination of whether they are most appropriately identified with objects or perhaps more appropriately identified with possibilities afforded by particular engagements. On the other hand, case studies and protocol analyses of individuals on tasks allowing manipulation of interest and noninterest would offer additional insights about access to, and storage of, information that characterizes individual performance across tasks.
The present findings provide strong support for the influence of identified objects of interest on the way in which young children subsequently re-engage them. The implications of such representations for children’s development longitudinally is a topic for further research. At this time, it appears that both researchers and practitioners can benefit from recognizing the power of young children’s interests with respect to task engagement, appreciating that the task with which individual children may understand themselves to have been presented may not have been the task that was intended. As such, programs involving either research on or practice with young children would do well to account for and accommodate to the role of individual interests in children’s representation and subsequent activity.

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1 Play object or simply object is used throughout this manuscript to refer to the class of objects or events with which children might engage in a nursery school class. Thus, object could refer to a doll, dramatic play, play-dough, or trains, among other objects.


4 This list is not, however, considered to be an exhaustive list of possible play types.

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