Psychological Approaches to the Study of Play

Doris Bergen

In this survey of the research on psychological approaches to play, the author outlines its various focuses on the similarities and differences in the thinking and behavior of individuals and groups in relation to play and on the environmental factors that influence these. She notes that although psychologists often use standard experimental research methods to study play, they also conduct studies based on direct observations, interviews, and other qualitative activities. These researchers, she notes, have been particularly interested in testing theories of play, developing systems to explain playful behavior, and understanding how play influences education and child rearing and their effect on development and learning. The author also surveys researchers from other disciplines, such as philosophy, ethology, anthropology, linguistics, and education, who have studied the psychology of play. They, she concludes, often employ research methods similar to those used by psychologists, and thus their work, too, has contributed to a psychological understanding of the thinking and behavior related to play and the environments that encourage it. **Key words:** play and child development; play studies; psychology of play; research and play

Psychological Methods for Studying Play

Psychologists have used a wide array of methods to study the play phenomenon, and they have drawn on research methods from many disciplines. Because play takes many forms, researchers often find it difficult to define, and this has led to ongoing controversies about the appropriate methods to study such an elusive subject. In particular, psychologists have long disputed the characteristics of play they can usefully study. As a consequence, Schlosberg (1947) once declared that play was not even a researchable phenomenon.

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Although most psychological researchers do not share his view, nevertheless the methods they have chosen to study play remain tied to the different ways they define it. Play can be viewed as an individual or a cultural phenomenon, a phenomenon defined by a particular theory, a specific phenomenon governed by motive or content, or a rule-governed behavioral phenomenon; and each of these viewpoints elicit a different research methodology (Sponseller 1982). Rubin, Fein, and Vandenberg (1983), for example, defined the researchable aspects of play as including psychological dispositions, observable behaviors, and contexts of occurrence. More generally, a number of theorists and researchers have agreed that play includes qualities such as self-imposed motivation, control, goals, and rules, as well as active engagement and nonliterality (see Hutt 1971; Krasnor and Pepler 1980; Lieberman 1977; and Neumann 1971 for further discussion of these variables.)

The major studies of play have included naturalistic observations in various settings (parks, playgrounds, homes, and schools); experimental studies in controlled-laboratory or school settings; clinical observations in therapeutic settings; and the collection of questionnaire or test data from children, teachers, or parents. Each of these methods differs in regard to types of hypotheses investigated, subjects observed, settings for data collection, procedures for data collection, methods of analysis, and venues for reporting results.

Classic examples of observation studies include time samples of social play of young children in preschool classrooms (Rubin and Maioni 1975); outdoor play of elementary-age children on playgrounds (Eiferman 1971); elementary play fighting in public parks (Aldis 1975); animal play fighting in natural settings (Schaller 1972); parent-infant play in homes (Bruner 1982: Bruner and Sherwood 1976); and toddler social play with peers in child-care centers (Mueller and Lucas 1975).

Examples of experimental, controlled-setting studies of the second type include investigations of toddlers' level of object transformation in pretense (Fein 1975, 1979); elicitation of preschoolers' exploratory versus play behaviors with objects (Hutt 1971); kindergartener's problem solving in play or nonplay conditions (Sylva, Bruner, and Genova 1976); and toddler social play and language during pretense (Garvey 1977).

Clinical examples of play's therapeutic effects include analyses of child scenarios during play with "small worlds" (Lowenfeld 1935); block constructions of children who have family relationship problems (Erikson 1977); dollhouse play as preparation for hospitalization (Axline 1947); and reworking traumatic

events through play elaborations (Rothenberg and Schiffer 1976).

Examples of research using self-report or parent-teacher report instruments include studies of game preferences of elementary-age children (Sutton-Smith and Rosenberg 1961); adult retrospective accounts of childhood play (Bergen, Liu, and Liu 1997); and parent reports of child imaginative play predispositions (Singer and Singer 1976, 1978).

Although the studies reported in the literature vary widely in hypotheses, methodology, and analysis, although they focused on different aspects of the play phenomenon, and although the emphasis given to each of these research directions differs at various times, the following four overarching research questions have been examined in the psychological study of play.

First, why does play occur in humans and many animal species? This question was of great interest during the early part of the twentieth century and has regained a place in scientific inquiry in recent times as brain research has expanded. Researchers studying this question usually have investigated hypotheses about the purposes of play in both animals and humans and explored whether play provides adaptive behavioral strength that contributes to evolutionary success.

Second, what is the course of play development? This question was especially fostered by theories of child development that became prominent in the mid-twentieth century, and researchers exploring this question often have focused on identifying the structures and functions of human play as it develops over childhood and on the environmental conditions that support play development.

Third, what is the role of play in fostering learning and development? In the latter half of the twentieth century and first part of the twenty-first century, this question has gained a prominent place in play research, and many play-related studies have examined how various types of play may contribute to learning and development in cognitive, language, social, academic, and other domains. These psychologists primarily are interested in other domains and use play as a medium through which they can observe how various types of learning and development are exhibited. Their focus is less on describing aspects of play and more on understanding what behaviors may be observed through the play medium.

Fourth, what are cultural differences and similarities in play? Psychological researchers have drawn on the methods of ethologists, who have investigated this question by observing cultural variation in children's play experiences and not-

ing differences in the value placed on play by adults of different cultural groups. The study of play as a cultural phenomenon began during the mid-twentieth century and continues to be of great interest in the twenty-first.

Recently an additional research question has emerged: How is play related to brain development, technology use, and other dynamic human systems? This research emphasis has emerged from neuroscience and dynamic-systems theory and from the changing toy and other media landscapes that more recently have influenced children's play experiences. Researchers concerned with these issues are beginning to investigate aspects of play from a neurosystemic perspective and to investigate the effects of technology on play.

These various psychological approaches to the study of play have provided rich but sometimes contradictory databases of information. The following sections provide the background for each approach, offer representative examples of the topics that have been the focus of study, and discuss the methods used in the study of play from psychological perspectives over time.

Play as an Adaptive Behavior

A long-standing psychological interest attends the question of why humans and many other animals are such playful creatures. Since play does not seem to serve some obvious goal, early observers of children and animals pondered this question and advanced many theories regarding its purpose. During the late nineteenth century, philosophers and scientists influenced by Darwinian theory began to ponder what the evolutionary significance of play might be.

For example, Groos (1898, 1901) suggested that for both humans and other animals play served an adaptive purpose. He stated that it is both an instinctive practice behavior that prepared individuals for needed adult skills and a means of gaining relief from the stresses of life (called "recreation theory"). Other theorists and researchers at that time offered hypotheses about the purpose of play, including Schiller (1875), who thought play allowed the expenditure of exuberant extra energy; Spenser (1873), who proposed that play offered immediate gratification; and Seashore (1913), who suggested play's purpose was the pleasure gained in self-expression. These hypotheses led researchers to begin observing both animal and child play to answer the question of why play exists. In recent years, this question has been explored through both observational and experimental methods.

Play as Adaptive Behavior in Animals

Early twentieth-century studies of animal play included those by Mitchell (1912), in which he concluded that play helped socialize young animals and develop the skills needed by adults of the species. Kohler (1931), who also studied the play of animals, concluded that their play enabled young animals to develop behaviors essential for their success as adults of the species.

In a comprehensive book primarily about animal-play research, Fagen recommended that researchers focus on the varieties of animal play (playfighting, locomotor rotational exercise, diversive exploration) and the evolutionary aspects of such play, because he believed play is essentially "a biological adaptation for producing novel behaviors" (1981, 36), and he cited many studies supporting this conclusion. However, he also stated that "play research is the ugly duckling of behavioral science" (33).

This comment reflects how the purposes and adaptive meanings of both animal and human play became less interesting to psychologists in the United States as behaviorist ideas grew more prominent in psychological theory. Behaviorism, which asserts that all behavior can be explained as a result of reinforcement of operands that animals (including the human animal) possess, did not encourage research about the reasons play occurred, since all behaviors, including play, were assumed to be explained by behaviorist theory. Millar stated that the effect of behaviorism on the psychology of play was to label it a vague, useless concept and therefore, "the subject as such no longer exists" (1968, 37).

However, in their behaviorist-oriented experimental studies of animals, some psychologists began to note that animals exhibited certain apparently "playful" behaviors and that these behaviors did not require reinforcement. For example, the American experimental psychologist Harry Harlow and his colleagues (1950) observed that the rhesus monkeys he studied did not need food reinforcements when they were given puzzles to manipulate. Harlow hypothesized that they had a "manipulation drive" that was present along with homeostatic drives. He and Stephen Suomi (Suomi and Harlow 1972) reported that rhesus monkeys raised in social isolation in the laboratory could recover socially appropriate behaviors when they were allowed to engage in play with younger monkeys. As they conducted more research, Suomi and Harlow (1976) concluded that these playful behaviors enabled the monkeys to practice adult social functioning and helped them control aggressive impulses.

Working from an ethological perspective, Lorenz (1971), who also studied a variety of animal behaviors in natural settings, observed that playful behaviors served adaptive purposes. He concluded that playful curiosity was a source of new behaviors that could be demonstrated in other settings, and he suggested that childhood play served a similar purpose.

These research directions proved to be the forerunners of present-day neuropsychological research on brain and play development in animals.

Play as Adaptive Behavior in Humans

In regard to the adaptive purposes of play in humans, Johann Huizinga (1950) also emphasized the idea that play is tied to human survival. Although later research questioned some of his conclusions, the evolutionary importance of play has been supported more recently by some psychologists and educators. For example, Ellis asserted that play is "a biological system for promoting rapid adaptation to threats to survival that cannot be predicted" (1998, 30). In *Why People Play,* he discussed his research and that of others and concluded, "Play behavior has adaptive significance for the individual by broadening the breadth of experience the individual has to draw on in meeting the challenge of change. The animals that survive to breed tend to pass on their inherited predispositions to play, thus influencing the playfulness of the species" (1973, 115).

Support for this role of play in animals has been fairly well documented (e.g., Fagen 1981), but longitudinal psychological research testing whether highly playful children or adults are more likely to survive in changing environmental conditions remains sparse. Perhaps the study to come closest to looking at this question was by Csikszentmihalyi (1975), who has investigated the adaptive quality of "flow" behaviors. Herron and Sutton-Smith, who defined play as "an exercise of voluntary control systems with disequilibrial outcomes" (1971, 344), contend that although play exists throughout life, it has different forms. This view is shared by Freysinger (2006), who asserts, "Play across the life-span is very much situated in a specific historical time and the economic, political, religious, and social reality of the day" (60).

More psychological research is needed, however, to investigate how play may serve adaptive functions in the human species throughout the life-span.

Play as a Developmental Construct

A wide range of methods have been used to study issues related to the trajectory and developmental meaning of the changes in play behaviors that have been observed over the course of the life-span, including observational, experimental, and clinical methodology.

Typical Developmental Course of Play

While researchers concerned with the evolutionary purposes of play have outlined some broad categories of play behavior and suggested some of the reasons play existed, other researchers have been concerned with the specifics of play development through the years of childhood and adolescence. This research emphasis was spurred by the work of psychologists such as Hall (1920), Piaget (1945), Erikson (1963), and Anna Freud (1928).

Many view Hall as the founder of the field of child development. He discussed play in the context of Darwinian theory, proposing that children's play gave evidence of "recapitulation" of the stages of human evolution. He described play as, first, object manipulation, then, pretense replicating activities needed for survival, and finally, practice of game skills and behaviors required in advanced civilizations. Although later research has not supported this recapitulation theory, Hall's idea that children's play develops over time continues to be of research interest. The "child study" movement initiated by Hall (1920), Dewey (1916), Gesell (1925), McGraw (1935), and others was very influential in encouraging research on play. For example, Gesell described the developmental course of play behaviors in his exhaustive studies of children, and McGraw conducted research comparing the development of twins, one of whom had the opportunity to engage in active play while the other did not.

John Dewey's laboratory school at the University of Chicago spurred the establishment of many university laboratories that conducted research on play. During the 1920s, researchers identified the different types of play prevalent at various ages and charted the developmental trajectory of such play. Researchers such as Bott (1928), Bridges (1927), and Farwell (1925) studied in laboratory settings the various environmental factors affecting the quality of play. A laboratory-developed coding scheme by Parten (1932) to measure play-related social interactions has continued to be used in numerous later psychological studies (e.g., Rubin 1985).

Jean Piaget, the Swiss philosopher and developmental psychologist (1945, 1965) who observed the play of children from infancy to school age and described the most prevalent types of play at each of those age levels, strongly influenced psychologists to study how play develops in childhood. Based on his observations of his own children's play in infancy (1945) and his study of older boys' marble game play (1965), Piaget both proposed stages of play development and theorized about their meaning as developmental constructs. Piaget suggested that children used play to assimilate their everyday experiences into their existing cognitive schema. He characterized infant play as *practice* play, which involves repeating similar playful actions, with gradual elaboration of these actions. Piaget observed that *pretense* became the dominant mode of play during early childhood, and he identified *games with rules* as the common type of play for elementary-age children. His observational research gave impetus during the latter part of the twentieth century to many studies of play development.

Some of the experimental research done later by psychologists was generated to test whether Piaget's reported results were valid, reliable, and generalizable. For example, Bruner and Sherwood (1976) observed the play interactions of mothers and babies and concluded that one-rule games such as peek-a-boo existed long before peer-generated games with rules occurred. They theorized that these early parent-child games were precursors of communication turn-taking patterns. Fein (1975) reported that her experimental study of children's transformation of objects in their pretend play showed that toddler-age children's ability to transform objects in pretend varied as a function of the number of substitutions required. Bretherton (1984) described how early mother-child symbolic play leads to understanding the young child's social world, and Singer (1973) outlined the course of pretense development in preschool children. DeVries (1970) and DeVries and Fernie (1990) investigated how young children learn games with rules, and Sutton-Smith and Rosenberg (1961) reported on the changing nature of games of school-age children.

The study of children's pretend and game play development has continued to be a theme in both observational and experimental psychological research. For example, Nielsen and Dissanayake (2004) conducted an experiment on the emergence of pretend play in children from twelve to twenty-four months and found that deferred imitation was a prerequisite to the emergence of pretense behaviors, but mirror self-recognition and synchronic imitation were not related to pretense ability. Meire, in a review of qualitative research on children's play,

reported that although children often still play the way they played in earlier times, they incorporate new content into their games. He also indicated that the games have become more "institutionalized and diversified" (2007, 35).

The development of play with construction materials has also been a topic of psychological research (Forman 2015). According to Forman, this type of play involves making patterns with materials, building structures with blocks or other materials, and making elaborative systems that can work such as connecting gears that spin. Constructive play now uses electronic technology (see Kafai 2006). Forman indicates that this type of play has been studied with checklists and other observational methods. He urges microanalysis, which involves observing not only finished structures but also the process of building. The developmental stages of this play have been reported and compared to Piagetian stages of logicomathematical thought (Kamii, Miyakawa, and Kato 2004).

Another strand of research on play development has focused on children's active physical play and the rules that govern such play. Blurton-Jones (1972) was among those who observed the "rough-and-tumble play" of preschool children, which is similar to the play of many other young animals. He theorized that this behavior served a social function and might occur in a critical period. Aldis (1975) provided an exhaustive study of this "play fighting" and gave a comparative analysis of animal and child play. He indicated that the laughter and screams of children are similar to the play signals of other animals, that playful competition for objects appears in both animal and human play, and that chasing play and wrestling occurs in all species. However, he found that human children engage in more play fighting in water, enjoy more vestibular stimulation, and explore more objects in their active play. Peter K. Smith (1989 also studied this phenomenon and theorized on the developmental purposes of such play. He suggests that this play may enhance social competence, especially for boys.

Finally, extensive study of this play phenomenon has also been conducted by Pellegrini (2002, 2015). His research methods include on-site observation, questionnaires, and analysis of videos, and his findings indicate that rough-and-tumble play differs from aggression in regard to the behaviors observed, the consequences of these behaviors, the self-handicapping of stronger or bigger players, and the environments in which they occur. There are both gender differences and individual differences in this type of play, and its occurrence diminishes in early adolescence. Rough-and-tumble play has positive implications for social development at early ages, but if it persists after early adolescence, it often becomes a means for bullies to victimize weaker peers.

Therapeutic Developmental Effects of Play

Anna Freud (1925) initiated another psychological brand of play research. She studied how play helped children develop the ability to face the reality of various types of trauma (e.g., war, parental separation), and her work inspired others to study the emotionally therapeutic aspects of play.

Erik Erikson (1963, 1977), who studied with Anna Freud and others at the Vienna Psychoanalytic Institute, focused on the importance of the "Play Age" (three to six), during which children take on the roles of strong imaginary characters (e.g., superheroes) or of adults who are powerful in their lives (e.g., doctors). In these roles, he asserted, children experience the leadership and power position of these individuals. They also create block-construction "worlds" that allow them to deal with emotional and behavioral dilemmas they encounter in the "real world." Erikson reported his research in therapeutic sessions with children who illustrated emotional themes important in their lives through their block constructions, and he concluded that young children can "project a relevant personal theme on the microcosm of a play table" (130). His work and Freud's inspired many others to investigate the therapeutic powers of play.

Play therapy has produced a wide range of therapeutic methods to assist emotional development. Early proponents include Axline (1969), Isaacs (1933), Klein (1932), Lowenfeld (1935), Moustakas (1974), and Winnicott (1953). More recently, play therapy has expanded into many versions, including child centered (Landreth 1991), filial (Guerney 2000), and prescriptive (Schaefer 2001). (See Gitlin-Weiner 2015 for a comprehensive account.) Greenspan (1990) has theorized that young children with autism spectrum disorders can be helped with therapeutic adult-child play interactions. He has conducted extensive research using his model of play-based therapy and described effective results with children diagnosed as autistic (Wieder and Greenspan 2003).

In spite of the strong psychological support for play therapy, the efficacy of such therapy often has been questioned. Recently, however, Bratton, Ray, and Rhine (2005) conducted a meta-analysis of ninety-three controlled-outcome research studies published between 1953 and 2000 and reported that children who received play therapy performed significantly better on outcome measures than children who did not receive therapy. Although all the types of play therapy studied were deemed effective, humanistic versions worked best. Both individual and group play therapies were reported as effective, although therapy that involved families produced the most significant outcomes. The authors thus dispute critics of play therapy, but they do caution that length of treatment, type

of treatment, and family involvement are factors that influence its effectiveness. They conclude that "play therapy demonstrates itself to be an effective intervention for children's problems, one that is uniquely responsive to children's developmental needs" (2005, 385).

Both the studies of typically developing children's play and the studies of therapeutic play development offer strong evidence for the psychological value of play. Thus, the strand of psychological research that investigates the developmental trajectories of play has provided many contributions to the psychological research base. It continues to do so, although the emphasis in psychological research has shifted more to considering play as the medium for studying other areas of learning and development.

Play as a Medium for Learning and Development

Instead of focusing on the developmental aspects of play, another group of researchers have investigated the types of learning or development that can be demonstrated in play or in "play-like" settings, and these researchers have typically used observational and experimental methods. For example, one body of research has investigated the ways that cognition and language can be facilitated through play (Bergen 2002). This is not a new idea: ancient Greek philosopher Plato in his *Laws* mentioned that play can be a medium for fostering various types of learning. In making a case for the importance of play as a medium through which children learned, he argued that children's play (*paidia*) was important in helping children develop basic habits of character (*paideia*). Plato suggested that the correct way to educate children—both boys and girls—was to allow them to engage in play that promoted the growth of their abilities, and he suggested various types of toys that could aid their play and learning (see Morris 1998 for details of Plato's view). Early educators also advocated play as a medium for learning (e.g. Froebel 1887; Montessori 1914), but like Plato they did not conduct rigorous psychological research to support their views.

One researcher who gave impetus to this perspective was Lev Vygotsky (1963, 1967), a Belarusian developmental psychologist of the Soviet era. With his colleagues and students, he investigated how play fostered children's learning of their cultural language and suggested ways adults could help children use objects symbolically in play. Vygotsky believed that children's play fostered their development of "spontaneous" concepts, and he emphasized that as children

take various roles in pretense, they learn self-regulation. Vygotsky observed that in play thought becomes separated from objects and actions and that the spontaneous speech accompanying play becomes internalized (Vygotsky and Luria 1994). Vygotsky also discussed "director's play," in which children often develop scripts, build settings, and give characters voice (Bodrova and Leong 2015). This view of play as a medium for learning and development has generated much psychological research in recent years.

Observing Play

There are two major ways that psychological researchers have used play settings to investigate play learning and development relationships: they have observed behaviors of interest occurring in environments that encourage child play, and they have designed experiments using play activity as the venue to observe the demonstration of particular skills or concepts.

In regard to the observation of behavior, Elkonin, for example, investigated how symbolic language and thought develop and reported that in adult-facilitated pretense, toddlers use pretend objects as specific to the situation, but, by age three and four, children symbolize during activities, use language symbolically, and separate activities from actual events and things. He states that "In play there occurs the emancipation of the word from the thing" (1966, 41). Bodrova and Leong (1996, 2006, 2011) have designed early-childhood settings that follow Vygotsky's theory, and they observed that, in such play settings, children learn how to set limits on behavior, use symbolic thinking, and practice planning and self-regulation.

Research conducted with observational methods in preschool and home settings has provided some evidence related to the ways play may aid learning. For example, in a study based on Vygotsky's views, Krafft and Berk (1998) compared the private speech of preschool children in Montessori and traditional play-oriented programs and found that more private speech occurred in the play-oriented setting, especially during pretend play with fantasy characters. They concluded that, as Vygotsky asserted, pretense serves as a context for developing self-regulation. Winsler and Diaz (1995) found less private speech during unstructured nonpretense play and suggested that social pretense provides more opportunities for self-regulating private speech.

Kavanaugh, Eizenman, and Harris (1997) found that in pretend-play situations with parents children at two-and-a half years show independent agency (making replica persons do pretend actions) and intersubjectivity (having a shared understanding with another in a common activity). Sinclair (1996), using

naturalistic examples, asserted that young children's ability to deceive indicates they have a theory of mind (TOM) at an earlier age than four.

Recent observational studies also have provided some evidence for play environments as facilitators of learning concepts and self-regulation. For example, in longitudinal studies, Jenkins and Astington (2000) observed children's joint planning and role assignments during social pretense and found that their level of theory of mind predicted the extensiveness of these abilities. And Bergen and Mauer (2000) found that children who had high levels of play with literacy materials in preschool were likely to be spontaneous readers of place signs and have greater pretend verbalizations in a "town-building" activity at age five.

Roskos and Christie (2001) also confirmed that play can serve as a medium for literacy development. In a review of twenty research articles making such claims, they found that twelve of them had strong evidence for literacy growth in environments focused on playful opportunities for literacy development.

Cook (2000) found that play delivered similar benefits for developing numeracy. He noted that in pretend-play settings enriched with artifacts emphasizing number symbols the preschoolers in the math-enriched setting engaged in more talk and more activity related to mathematical concepts; however, the effects did not extend to more mature conceptual forms.

Experimental studies have also attempted to investigate the role of play in supporting learning. Early experimental studies linked play to young children's mathematics readiness (Yawkey 1981), linguistic and literacy abilities (Pellegrini 1980), cognitive functioning and impulse control (Saltz, Dixon, and Johnson 1977), representational competence (Pederson, Rook-Green, and Elder 1981), and problem-solving skills (Smith and Dutton 1979).

In a study designed to explore cognitive change underlying pretend play and understanding of narrative structures, Kim (1999) compared four- and five-year-old children in conditions involving the pretend-play enactment of stories to conditions using storytelling only and found that children in the pretend-play conditions used more elaborative narratives and had higher levels of narrative structure. Dunn and Hughes (2001) investigated themes of play of children from lower socioeconomic backgrounds and found they had a high content of violence.

However, in a recent review of research reporting how pretense facilitated other types of learning, Lillard et al. (2012) cite a number of problems with the extant literature on the research methods used in studies of pretense as a medium for learning. Flaws they identify include correlational findings dis-

cussed as causal, failure to replicate, experimenter bias, nonrandom assignment, confounding of implementer with intervention, differing control and experimental conditions, confounding of content with pretense, and unsound statistical practices. These authors critiqued studies of pretense facilitation of creativity, language, conservation, literacy, social skills, emotion regulation, and intelligence, and they concluded that few published studies met all the criteria for high quality research. They wrote, "The methodological problems must be remedied with sound experiments and longitudinal studies" (2012, 27).

None of these authors addressed in their critiques whether the studies purporting to measure the learning effects of play used a "real pretend-play" context for their experiment. In describing pretense observed in preschool settings, Trawick-Smith (2006) reported that, when children are in natural or preschool settings, they usually take much time just to set up the "play frame" (see Bateson 1956) and that their elaborative pretend play requires long time periods. Because of very short "play" periods and the presence of adults prompting some of the characteristics of the play, many studies failed to provide a play setting similar to the kind of play that children initiate. Thus, in both experimental and training studies, the activity labeled play often may not have been characteristic of genuine pretense (Bergen 2012).

An analysis by Cheng and Johnson (2010) of fifty-seven articles published between 2005 and 2007 that included the word "play" in the titles suggests that presently much psychological research focuses on play as a medium for investigating cognitive or social variables rather than on the study of play development itself. They found that only nineteen of the fifty-seven articles had any in-depth focus on play, and of those, eleven discussed literacy or other academic areas. None of the articles in psychologically focused journals placed an emphasis on play. Rather, these studies concentrated on other learning and cognitive variables and used a setting that they characterized as play for collecting their data. It appears that at the present time, psychological research often does not focus on the processes by which play develops. It primarily concentrates on other areas of learning or development, using play as merely a context for investigating these other variables.

Play as a Cultural Phenomenon

Researchers who have studied the practices of various cultural groups brought initial attention to the varied types of play of children in such cultures. They have

primarily used observational and interview methods. Culturally based studies of play were initially done by anthropologists such as Schwartzman (1979), who studied organized games in different cultural settings. An observational study by the British folklorists Iona and Peter Opie (1969) of the games school children played in England suggested that this type of research could give psychologists insights into the culture of childhood.

Eiferman (1971) and Smilansky (1968) both studied play in Israel. Eiferman reported on the development of game rules, while Smilansky focused on increasing sociodramatic play among children from low income families. A prominent study by Whiting and Edwards (1988) reported that, in various cultures, boys and girls often felt social pressure to engage in differing types of play. In further analysis of this set of data by Edwards in (2000), she reported that play differed in the various cultures depending on whether adults encouraged work versus play, whether children had freedom for exploration and motivation to practice adult roles through play, and whether the environment provided easy access to models and materials for creative and constructive play. Blurton-Jones and Konnor (1973) also reported that the activities of boys and girls from London and Africa reflected cultural differences in their expectations.

Psychologists and anthropologists have typically studied different aspects of play, however. The focus on social-cultural meanings of play was not strongly represented in psychological research until more recent times. Three major strands in this research have been of interest to psychologists: play of boys and girls, play of children in differing ethnic and socioeconomic groups in the United States, and play of children in various world cultures.

Play of Boys and Girls

In a recent review of the influences of race, culture, social class, and gender on children's play, Ramsey (2015) asserts that we still know little about these play interactions, except for the role of gender, which has been studied extensively.

Research on gender commonly reports the differences in play of boys and girls. For example, Maccoby and Jacklin (1998) discussed many studies showing that boys and girls use different materials and themes in their play. According to Fagot (1987), this pattern apparently starts very early, even during toddler age, and Wolfgang (1985) reported that preschool children strongly prefer gender-stereotyped play materials. More recent research has continued to show this pattern. For example, Fabes, Martin, and Hanish (2003) reported that same sex groups tend to play more stereotypical male or female roles in their play

than when in mixed gender groups. MacNaughton (2000) observed that boys dominated in cross-gender play and that girls did not protest this domination, which he called evidence of an accepted norm in cross-gender play.

Play of Children of Different Ethnic and Socioeconomic Groups

Ramsey (2006) states that often children of differing racial and ethnic or socioeconomic backgrounds do not even have opportunities to play together and, when they do, their different experiences may make their play behaviors unsynchronized. She cites the example of an unsuccessful play interaction between a child who did not watch television and a child who used TV characters in his play. There is still little rigorous research in this area, but the few reported studies have found instances of the exclusion of racially or socially different children in play (e.g., VanAusdale and Feagin 2001). On the other hand, much research commonly details gender differences in play.

Play of Children in Various World Cultures

Interest in observing differences in play patterns across various world cultural settings presently affects a number of psychologists, who have studied these patterns in detail. In a review of many of these studies, Roopnarine and Krishnakumar state "play participation in different cultural communities depends, in part, on the adjustments children make to accommodate the childrearing beliefs, goals and expectations of their parents" (2015, 284).

From questionnaire data, Tobin, Wu, and Davidson (1989) reported that, although 70 percent of Japanese parents considered opportunities for their children to play with other children important, only 42 percent of U.S. and 25 percent of Chinese parents agreed. Gosso, Morais, and Otta (2007) found that Brazilian children from various cultural groups engaged in pretend play, but those with a higher socioeconomic status (SES) and urban children engaged in more pretending. Another study reported great variation in how teachers from different countries view the importance of including play in the curriculum (e.g., Ishigaki and Lin 2000).

Much cross-cultural psychological research has focused on parent-child pretend and game play, and the evidence finds different types of such play in many cultures. However, Roopnarine and Krishnakumar (2015) state that in many cultures, siblings provide the entry into play rather than parents. The strong differences in gender play discovered in U.S. studies appear to be even stronger in many other cultures.

Play as a Complex System

Psychological research on play has been influenced recently by brain research, dynamic systems theory, and technology play environments using neuroscience research techniques and computer analyses of large sets of data.

Neuropsychological Study of Animal Play

Experimental study using neuroscience methodology already enhances the study of animal play, and researchers now routinely incorporate information gained from neuropsychological methods. They are beginning to report that play seems essential to the brain development of many animal species. For example, Iwaniuk, Nelson, and Pellis (2001) indicated that the size of the brain was proportionate to the amount of playful behavior they observed. They studied the brain size of fifteen different orders of mammals and found that those with a greater proportion of the body devoted to the brain have more extensive and longer lasting play behaviors. This research, therefore, implies that the relationship of brain size to play also explains the high level of playfulness in the human species because the human brain comprises so high a proportion of a young child's body.

Byers and Walker (1995) compared the timing of brain development; observed play in cats, rats, and mice; and they reported that all of these species showed the most playfulness during the peak synaptic growth period of the cerebellum, which controls fine motor skills. Siviy (1998), who studied the rough-and-tumble play of rats, found that their play increased neurochemical production, which may stimulate nerve cell growth. Gordon and colleagues (2003) suggest that play might help program the higher brain regions involved in emotional control because play elevates the neurotrophic factor BDNF in the amygdala and dorsolateral frontal cortex. Although psychological researchers have proposed a number of hypotheses regarding the purpose of play in animal species, they continue to ponder how the playful brain evolved both in animal and human species. (See Iwaniuk, Nelson, and Pellis 2001 for more discussion of this research direction.)

Play as a Nonlinear Dynamic System

Despite the limited research so far in the psychological field of complex systems, play development and brain development both exemplify many of the characteristics of nonlinear dynamic systems. Psychologists who study complex phenomena like play may gain new insights into its development because

theories based solely on linear thinking do not understand such phenomena as well (Van Geert 2000). Living systems show complex nonlinear dynamics and interact with other dynamic processes, resulting in complex interactions (see Guastello 1997). Thelen and Smith, psychological pioneers in the use of nonlinear dynamic systems theory to study physical and cognitive infant development, have stated that human development must be studied within the paradigm of systems, because development is "modular, heterochronic, context dependent, and multidimensional" (1994, 121).

There are many aspects of play that meet dynamic-systems criteria (see VanderVen 2015, for detailed discussion). Play is a self-organizing system that may appear chaotic but moves toward order, involving spontaneously emerging patterns of attractor (stable) states. Play involves phase shifts, which are abrupt changes in play patterns that lead to higher levels of play; but the play state also shows disequilibrium, because it is always capable of change. Play usually has recursive elements with elaborations and self-similar patterns within each developmental age. These systems of repeated patterns may often be characterized as practice play. Play also exemplifies the characteristic of sensitive dependence on initial conditions, because small inputs into play situations may cause disparate results—for example, the types of materials, the time available for play, the settings in which it can occur, and the materials available all influence the character of pretense. Play demonstrates openness because the players continue to receive energy from sources outside the "play frame" (Bateson 1956). It also involves control parameters such as differences in play patterns due to age and skill of players, limitations on experience, and types of settings available for play. Play shows interdependence because all levels of play are interrelated, and children often move back and forth between types of play and levels of difficulty, as we often see in games with rules. Because of its soft assembly, play has both stable and dynamic alternating periods and thus is not "hard wired." Play epitomizes plasticity because capacity for change is present.

Thus, play appears to be truly a nonlinear dynamic system that future psychological researchers can address in studies of the dynamics of play.

Technology Play Environments

Because playthings evolve as the culture evolves, toys and play activities reflect technological change at all age periods. For example, toy truck and train play and play with toy telephones became popular as technology created such devices. Television was a major change in children's lives, and researchers have conducted

some research on how viewing affects play (e.g., Singer and Singer 1978). During the last ten to twenty years, however, technological changes in toys and other play materials have been extensive.

In the past, the context for play has involved concrete manipulation of play materials and social face-to-face interactions in home, school, neighborhood, playground, and other venues. The advent of technology-augmented toys and virtual play experiences on computers and other electronic devices produces new venues for play, which creates a new environment for the psychological study of play. For example, video modeling has been used to teach pretend-play behaviors to children with autism (MacDonald et al. 2005) Even young children are being exposed to technology-augmented toys enhanced with computer chips that enable the toy to "talk" and "act" and thus direct a child's play actions rather than having a child direct the toy's actions (Bergen 2001).

More recently, very young children are manipulating the "apps" on a range of technological devices, and devote much of their playtime to these forms of play. According to Shuler (2009), 35 percent of cell phone apps now are focused on young children. Older children's play also has been greatly affected by video game and Internet play (Funk 2005; Kafai 2006). Although these changes in play materials for children, adolescents, and even adults may have both positive and negative outcomes, psychological research in this area is presently quite limited.

There has been some research on the influence of technology-augmented toys (e.g., Bergen 2004; Bergen et al. 2010) and on video games, which have many play qualities such as internal motivation, player control of action, and nonliteral dynamic qualities (Bergen and Davis 2011). Some games resemble director's play, but in other cases they also make a child a reactor rather than an actor. Research remains relatively limited regarding play in the virtual world, although Kafai (2006) indicates that it can display many positive qualities. Future research involving the measurement of event-related potentials during video game play or the use of other methods involving techniques from neuroscience offer psychologists additional tools to use in the study of play. See Bergen, Davis, and Abbitt (2015) for further discussion of technology play effects.

Conclusion

In a recent review of play theory and research, Göncü and Gaskins (2007) stated that the complexity of the play phenomenon has often made it difficult to find

an integrated perspective on the subject. Their claim is certainly relevant for the psychological study of play, because psychologists have drawn from many disciplines and many perspectives in their conduct of research on play. The complexity of play, while often making it harder for psychologists to define play clearly, to agree on methodology, to accept the reliability and validity of results, and even to agree on what aspects of play are worthy of research, ultimately has resulted in a rich body of evidence.

Present-day psychologists may be primarily interested in studying what adaptive purposes play serves, how play develops over childhood and adolescence, whether play is a useful medium for academic learning and cognitive or social development, what characterizes play diversity across cultures, or how methods drawn from neurodynamic systems theory may be used to understand technologically driven changes in play. They may prefer experimental methods that elicit specific play behaviors to test well-defined hypotheses. They may use naturalistic or clinical observation to validate aspects of a range of play behaviors. They also may use mixed methods that incorporate interviews or surveys with experiments or observations.

In every case, however, psychological researchers have demonstrated that play is a researchable phenomenon, in all of its various manifestations. At the present time, one of the major limitations on psychological study—the ability to observe brain activity during play—is beginning to be surmounted. The neuropsychological methods may still be limited to ERP or MRI observations of brain activity during playful thought or quiet physical activity, but as these methods continue to become more accessible, the psychological study of play will provide an even deeper understanding and greater appreciation of the enduring phenomenon of play.

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