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COMMENTARY

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Why play equals learning: Comparison as a learning mechanism in play

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Abstract

Play is an essential component of childhood, but parents and educators sometimes view it as an optional add-on, which gets in the way of learning. This view persists in spite of evidence that play is helpful and sometimes critical to learning in multiple domains, perhaps because precise mechanisms whereby play occasions learning are not well understood. Here, I propose a new research perspective on playful learning, which might fill this gap, and solidify our understanding of both play and learning: a focus on comparison and structural alignment. Comparison (and structural alignment, which highlights useful comparisons) is a well-studied learning mechanism, and it occurs often during free and guided play. Do we learn through play because we compare during play? I briefly summarize the learning benefits of comparison and sketch the ways in which play may trigger comparison. I then list several concrete research questions, through which we may inspect the role of comparison in mediating between play and learning.

KEYWORDS
comparison, learning, play, structural alignment

1 | INTRODUCTION

What is the value of play? While educators and parents often think that play is not as valuable as didactic instruction (Pellegrini & Bohn, 2005; Zigler & Bishop-Josef, 2009), evidence from developmental science shows that play is critically valuable for cognitive development—precisely because play results in learning (Hirsh-Pasek, Hadani, Blinkoff, & Golinkoff, 2020; Sahlberg & Doyle, 2019; Yogman et al., 2018). Studies have shown that children as young as 3 years of age learn from free play equally well as they do from explicit instruction (Sim & Xu, 2017), sometimes even better (Sim, Mahal, & Xu, 2017). Similarly, a large body of research shows that guided play—one scaffolded by adults, but giving agency to the child—is comparable to didactic practice in producing good learning outcomes (Hirsh-Pasek et al., 2020; Hirsh-Pasek & Golinkoff, 2011; Weisberg, Zosh, Hirsh-Pasek, & Golinkoff, 2013; Zosh et al., 2017).

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Whether free or guided, play brings about many learning benefits, such as creativity (Evans, Todaro, Schlesinger, Golinkoff, & Hirsh-Pasek, 2021), mathematics (Seo & Ginsburg, 2004), and language learning (Roskos & Christie, 2013; Toub et al., 2018). But despite this abundance of evidence, it is fair to say that the public is still sceptical about the value of play. In this brief piece, I offer one mechanism that may explain not only why play results in learning, but critically, why play offers a unique learning opportunity. This mechanism is comparison. By using the lens of comparison, we are able to characterize the *value added* of play: It is mostly during play, not during didactic practice, that children actively generate alternatives and compare them, resulting in learning. Viewing play as a generator of comparisons allows us to concretely measure the process of playing-learning—for example, by charting the types and tokens of comparative acts that a child does during play. It also allows us to anticipate when learning will happen, offering a paradigm of predictability that can be employed in future studies.

2 | COMPARISON FOSTERS LEARNING

There is abundant evidence from many domains—language learning, spatial cognition, number knowledge, and social cognition—that comparison results in learning. Comparison is a structural alignment process (Gentner, 1983) whereby two or more events are aligned, resulting in the abstraction of common relations or structures. Prior to comparison, children (or other novice learners) may not see common relational structures, which the alignment process brings to the fore. For example, four-year-olds asked to match a bicycle standard to either a skateboard (same relational category) or a pair of glasses (matching in perceptual features—round shapes), overwhelmingly chose the glasses (Namy & Gentner, 2002). However, if they were given an opportunity to compare two standards (a bicycle and a tricycle), they selected the skateboard. The important bit here is that comparison results in deep learning—understanding of abstract, common structures—as opposed to memorization of facts. This deep learning outcome is generalizable: Learners can use the common structures they have gained to make sense of newly encountered things.

Because learning in many domains—whether language, mathematics, or social cognition—necessitates understanding of common structures, comparison is an important, domain-general learning mechanism that learners can use in all areas of learning (for a review see Christie, 2020). Indeed, preschoolers learn novel verbs after seeing a comparison of events (Childers, 2020; Childers et al., 2015; Imai et al., 2008), and comparison has been shown to play a significant role in language acquisition (Gentner & Namy, 2004, 2006). There is extensive evidence that children's number and mathematics learning is aided by comparison (Mix, Smith, & Crespo, 2019; Thompson & Opfer, 2010, see reviews by Richland & Begolli, 2016; Richland & Simms, 2015). In the domain of social cognition, recent work shows that children's false belief understanding is facilitated by comparison (Hoyos, Horton, Simms, & Gentner, 2020; see Christie, 2017 for a review). A recently published edited book highlights the importance of comparison in many domains of learning (Childers, 2020).

3 | COMPARISON DURING PLAY

Since comparison is prevalent in learning and development, it is probably also common during play. If so, this may explain the learning benefits of play in many domains. To evaluate this, I chart the types of comparison that happen during play and their resulting learning outcomes.

3.1 | Social comparison in play

Children often play with others—with peers, older or younger children, or with adults. In this social context, social comparison occurs naturally, for example, when a child spontaneously compares who runs the fastest or who climbs

the highest in the playground. Such social comparison results in the evaluation of self, just as it does in adult settings (Festinger, 1954; see recent reviews Gerber, Wheeler, & Suls, 2018; Baldwin & Mussweiler, 2018). But beyond self-evaluation and/or self-identity, comparison among social agents—either between self and others or among others—may also result in learning about the social world, including learning about social relations and roles (for review, see Christie, 2017). For example, a recent study showed that four-year-olds had a better Theory of Mind understanding after comparing others' thoughts (Hoyos et al., 2020). In this study, four-year-olds who had compared two thought scenarios—Andy thought the crayon box contained crayons, while Nancy thought the crayon box contained candies—performed better in subsequent false belief tasks compares to those in the control (no comparison) condition. Such comparison of thoughts may occur naturally during play, for example, when a child realizes that her idea about using the swing—who's pushing and who's sitting—does not match her friend's idea. This can give the child a better understanding that others may hold thoughts different from her own and from reality.

Comparison is also likely to occur during pretend play, where children take up imaginary roles different from those they usually occupy. In pretending to be a doctor or a mom, children implicitly compare these roles to their usual self-role. The comparison could also be explicit, for example, when a child assigns a doctor's role to herself and a patient's role to her friend. These comparisons, whether implicit or explicit, may result in abstraction of social relational structures—of roles, relations, social rules, and norms—which is crucial for the child's understanding of the social world (Christie, 2017; Tomasello, 2020).

3.2 | Comparison of events and objects during play

In a game of Congklak (a traditional game in Indonesia), players have to compare the numbers of beads held by the two sides to balance their distribution. Given laboratory evidence that comparison improves preschoolers' understanding of numerical concepts (e.g., Mix et al., 2019; Thompson & Opfer, 2010), we may infer that a similar benefit is enjoyed by real-life Congklak players: Comparison highlights the relational character of mathematical and numerical problems. In line with this proposal, growing evidence from play research shows that play benefits mathematics learning (Ginsburg, 2006; Perry & Dockett, 2008; Zimmermann, Foster, Golinkoff, & Hirsh-Pasek, 2019; Zippert, Eason, Marshall, & Ramani, 2019). For example, Seo and Ginsburg (2004) showed that preschoolers' play during recess correlates positively with their mathematics performance in class. Comparison may underlie the link between play and math performance: children who play more compare more and perceive common mathematical structures more readily.

Children may also compare objects during play because they are keen in aligning items that *look* similar (Christie, 2020, 2021). For novice learners, first comparing similar-looking items results in better abstraction than right away comparing different-looking items (Loewenstein & Gentner, 2001). During pretend play, children may create and seek perceptual similarities—for example, taking a banana as a telephone, which is afforded by shape similarity. Play is an important catalyst for comparison because it, more than other activities, gives children impetus and opportunities to *seek* similarities in the world.

3.3 | Language comparison during play

Language invites comparison because when children hear two (or more) things named the same way, they may be invited to think about their commonalities (Christie & Gentner, 2014; Gentner & Namy, 2004, 2006). During play with others, children may encounter many common labelling events, which prompt them to compare. For example, children may hear "let's *stack* the blocks" and "can you *stack* one more block?" Even if children do not understand the meaning of "stack," hearing the verb multiple times invites them to compare and subsequently to learn the verb. Indeed, there is plenty of evidence that comparison aids verb learning (Childers, 2020; Childers et al., 2015).

Usage of comparative language occasions many types of comparisons during play. For example, prompts and questions during *guided play* (Hirsh-Pasek et al., 2020) such as "which tower is *taller*, yours or mine?" or "are there *more* red blocks or blue blocks?" explicitly asks children to compare events and/or items. It is easy to see how these kinds of comparison result in learning; in this specific example, hearing *more* may lead to number and math learning, consistent with evidence found in the play literature (e.g., Seo & Ginsburg, 2004).

4 | VIEWING PLAY AS COMPARISON GENERATOR: PREDICTIONS AND QUESTIONS FOR FUTURE RESEARCH

Having established that comparison is likely to occur during play, the next logical step is to understand how comparison compares to other mechanisms and characteristics of play. Can the comparison perspective advance our understanding of play?

4.1 | Active learning

Many theorists have suggested that play showcases children as active learners: During play, children act as self-motivated agents that seek and determine their interactions with the external world (Piaget, 1952; Vygotsky, 1962). Indeed, this characterizing of play as active, as opposed to passive, was the original foundation for thinking that play occasions learning. However, to date, it has been relatively difficult to measure the activeness of learning during play—what exactly is active learning and how to quantify it? I propose that viewing play as a generator of comparisons can partially solve this problem. Comparison gives a framework for encapsulating who an active learner is: someone who generates alternatives. During play, these alternatives can be measured and quantified. For example, when children build different things from blocks or try different actions with a play-drum, they are generating quantifiable alternatives.

Comparison framework also gives predictions about the *kind* of alternatives that may be generated during play. Comparison research shows that novice learners prefer to compare similar-looking over different-looking things (Christie, 2020, 2021). As such, new players—whether they are new in the "game" or simply never played before—are more likely to generate similar-looking alternatives. This may manifest in young children liking to play with similar-looking items or doing similar actions again and again with a toy. As players progress, they may expand the similarity range, resulting in wider generalizations—predicted by the comparison learning account. That is, the similarity of play alternatives can be an indicator of the development of play. This idea is intriguing, because to my knowledge, despite the active nature of play, the field has not considered play as something that is dynamically developing. But just as we believe that learning progresses, there is good reason to think that play can also progress.

4.2 | Hypothesis testing

An important mechanism in exploratory play is hypothesis testing (Gopnik et al., 2017; Schulz & Bonawitz, 2007). When children explore, they are testing various hypotheses, resulting in learning (selecting the correct hypothesis). One challenge to the hypothesis testing account, however, is how to explain where learners/players have hypotheses in the first place. Comparison complements the hypothesis testing account by providing new hypotheses. For example, in Christie and Gentner (2010) 4-year-olds learned new relational hypotheses (e.g., symmetry—new for 4-year-olds) from just a single comparison.

Comparison research has explained how comparison happens in the first place: invited by common labels (Christie & Gentner, 2014; Gentner & Namy, 1999) and object commonalities (Christie, 2020, 2021; Gentner &

Medina, 1998). As such, the comparison account makes it feasible to understand play as *active* (self-generated) hypothesis testing. If one of these two factors is present—common labels or common objects—comparison is likely to happen, resulting in new hypotheses, which can then be used in hypothesis testing.

4.3 | Guided versus free play

There are debates in the literature about what kind of play gives the best learning benefit: is it free play or guided play? (Ferrara, Hirsh-Pasek, Newcombe, Golinkoff, & Lam, 2011; Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, 2013; Hirsh-Pasek & Golinkoff, 2008). The structural alignment lens can predict differential learning outcomes from different types of play. For example, one reason why some studies have found that guided play is better than free play may be a difference in comparison: Children in guided play have more comparison opportunities (e.g., through language invitation, parents' prompts), while free-playing children may not generate as many comparisons by themselves.

The comparison framework also offers prediction about how different kinds of prompts and questions during guided play may result in learning (or not). Prompts and questions that catalyse comparison should result in deep learning, while prompts that tell children what to do result in shallow learning at best—knowledge of facts limited to that particular context. Relatedly, there is evidence that a complete explanation to a question does not necessarily generate further learning, whereas an incomplete explanation induces curiosity (Danovitch, Mills, Sands, & Williams, 2021).

What, then, is the added value of play? Simply put, play is a natural catalyst of comparison. When children play, they generate alternatives, either spontaneously (in free play) or guided by adults (in guided play). Aligning these alternatives results in deep learning in many domains. While comparison can happen during didactic practice—indeed, teachers' use of comparison in mathematics classrooms positively correlates with student performance (Richland, Zur, & Holyoak, 2007)—such comparison learning is dependent on the teacher. Play, on the other hand, offers greater independence. Through play, children may get the knack of independently and habitually generating alternatives, then comparing and testing them.

Could reduced play opportunities bring out negative impact on cognitive development? The comparison account predicts so, particularly in connection to curiosity and creativity—two things that are believed to be related to play. From a comparison perspective, children who play less may be less curious—due to a less developed habit of spontaneously aligning. Alignability prompts people to look for more and more meaningful differences—that is to say, it aids their curiosity. For example, people produce more differences when they contrast two things that are distinct yet alignable (e.g., differences between motels and hotels) than when they contrast non-alignably different items (e.g., motels and cats; Sagi, Gentner, & Lovett, 2012). Likewise, preschoolers could find more meaningful differences between alignable items such as forks and spoons than they could between the non-alignable forks and cats (Gelman, Raman, & Gentner, 2009).

Children who play less may also less likely to generate alternatives. This directly connects to creativity, as an important construct in creativity is divergent thinking, often measured by the number of alternative functions one can generate for one object (Bijvoet-van den Berg & Hoicka, 2014; Guilford, 1967). Indeed, there is research demonstrating a link between analogical thinking (which directly involves comparison) and creativity (e.g., see review by Green, 2016). Conceptualizing play as a generator of alternatives may allow us to better chart how play nurtures creativity.

I hope that seeing play through the lens of comparison and structural alignment gives new, fruitful research directions on playful learning. Comparison is ubiquitous and play dominates children's activities; understanding a connection between the two will be a major step in mapping out children's learning and development.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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