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## Investigating the development of creativity

### The Sahlin hypothesis

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# Investigating the development of creativity: The Sahlin hypothesis

INGAR BRINCK

## *Abstract*

How should the development of creativity be approached? Many accounts of children's creativity focus on the relation between creativity and pretend play, placing make-believe and the mental exploration of possible scenarios about the world at the fore. Often divergent thinking and story-telling are used to measure creativity with fluency, originality, and flexibility as indicators. I will argue that the strong focus on conceptual processes and higher-order thought leaves procedural forms of creativity in the dark and hinders a proper investigation of the development of creativity. Creativity involves both strategic and procedural elements and the mental and physical manipulation of ideas are equally important. Sahlin's notion of rule-based creativity might serve as the starting-point for an approach to the development of creativity that is neutral as to the underlying nature of creativity and that permits investigating creativity independently of language. On this approach, creativity is characterized by the violation and subsequent replacement of a rule or norm that underlies a given activity with a novel strategy or procedure. When, where, and how children will manifest creativity is conditional on the kind of rule or norm that is violated.

## *1. Introduction*

Discussions of children's creativity tend to become polarized. Are children naturally creative, or on the contrary, do they need to be educated in creative thinking? Roughly, those who favour the view that children are naturally creative think of creativity as a social and cultural phenomenon that involves imagination and play and starts to develop in the pre-school years (e.g., Garaigordobil & Berruero, 2011). Those who hold that creativity requires education think of it as a cognitive phenomenon, a property of the individual, that emerges later in childhood and requires training of divergent thinking and logical reasoning (cf. Russ & Fiorelli, 2010). Related but not identical to the second view are the conceptions of creativity as a gift to the happy few and of the creative individual as a genius. These conceptions will not concern us here.

Glăveanu (2011) notices that the first view considers children active and interactive, while the second one pictures them as passive and receptive. A more nuanced understanding of the development of creativity will position itself somewhere in between the two extremes. There is no real contradiction between imagination and cognition; creativity relies on both. Likewise, thinking of creativity as a biological function of the brain similar to memory, attention, inhibition, and anticipation does not rule out that socio-cultural factors influence its functioning or that it may benefit from practice.

## *2. The relation between creativity and play*

To understand children's creativity it is common to study play. Pretend play in childhood has been shown to affect creativity in adulthood (Russ & Wallace, 2013). Children continually engage in everyday creativity also outside the context of play, e.g., when figuring out a way to train the dog or finding a faster way to get home from school (Russ & Fiorelli, 2010). A major reason why play is considered of central importance to creativity concerns pretend play that involves make-believe and encourages exploring a variety of possible scenarios about the world, such that

build on re-arrangement of known events as well as such that are completely new or novel to the child. Novelty is essential to creativity.<sup>1</sup>

Longitudinal studies reveal that pretend play increases cognitive flexibility in a longer perspective (Russ, 2004). Russ, Robins, & Christiano (1999) found that quality of fantasy and imagination in early pretend play predicted creativity operationalized as divergent thinking over time, independent of IQ.<sup>2</sup> A study by Singer & Lythcott (2004) suggests that when pretend games are encouraged in school as part of the curriculum or during play time this leads to enhanced imaginativeness and, indirectly, creativity.

The experience of free or unstructured play has been demonstrated to have positive effects on originality in subsequent activity, but less on fluency or flexibility as measured by the Torrance Tests of Creative Thinking (Beretta & Privette, 1990). In a study on 6–7 year-old-children, 52 children were split in two groups (Howard-Jones, Taylor, & Sutton, 2002). One group played with salt-dough, the other one did a structured exercise that involved copying text from a board. Then all children were asked to make a collage of a creature with a range of tissue-paper materials. After a few days the experiment was repeated with the groups' changing tasks. Analyses of the children's results by teachers revealed a significant positive effect of preceding tasks upon creativity.

Creativity does not only entail novelty, originality, flexibility, and divergent thinking (cf. Brinck, 1997; Sahl-in, 2001). The research on creativity in adults stress that

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1. Boden (1991) makes a useful distinction between person-related and historical novelty. The former kind concerns novelty in relation to the person (persons) who has generated the idea. Then the idea is known by otherpeople and does not appear creative from their perspective. Everybody can be creative in the person-related sense. The latter kind concerns novelty in a larger context, where the outcome is truly novel and of historical importance. It requires expert knowledge in the field to which the idea pertains.

2. Divergent thinking is the elaboration of ideas in many different directions. It is used in brain-storming, a technique or method for the free generation of alternative ideas.

creative ideas also are productive: Once generated, ideas are evaluated according to how likely they are to result in a proper solution or answer, one that actually will work. Evaluation involves refinement of the idea along different lines (Brinck, 2003). There is no reason to demand less from children. Creative ideas that emerge during play often are produced under pressure to maintain play in the face of unexpected difficulties, and must be adequate to do their job. The problem has to be addressed on the fly or play comes to an end. One example is when the children who are playing are of different ages and therefore have different understanding of what is going on, another when too many repetitions within the same group of children has made the theme of the play (say, to play doctor) predictable and boring, fostering negative emotions and attitudes. In a group of children that play together often, conventions (Lewis, 1969) emerge for how to deal with such interruptions. In contrast, a situation that is new to the children and they don't know how to deal with, calls for creativity.

Mottweiler & Taylor (2014) notice that although elaborated role play (pretending in which children imagine and act out the part of another individual on a regular basis) is considered an early indicator of creativity, there is a lack of evidence of a relation between it and performance on creativity tasks during the preschool years. They maintain that the measures of creativity that are commonly used such as divergent thinking tasks are not appropriate for young children, because generating multiple solutions to the same problem is unfamiliar and cognitively challenging for them. This remark points to the importance of developing tests that have ecological validity. Accordingly, Mottweiler & Taylor developed two new measures of creativity based on a storytelling task, in which 4- and 5-year-old children were asked to complete a story, and a drawing task, in which the children were asked to draw an imaginary person. They showed that the children who engaged in elaborated role play had higher creativity scores on both measures (controlling for age and language ability).

Glăveanu (2011) argues that children develop creativity in interaction with adults and through play and experi-

mentation with cultural artefacts. He highlights that creativity develops over time, and that how it is expressed depends equally on the socio-cultural environment and the particular scaffolding of the individual child.<sup>3</sup> This means that children who grow up in same socio-culture in the end may display different forms of creativity and to different degrees. The education and pedagogy they receive most likely will differ between individuals, as will the socio-economic status (SES) of their families (SES is measured as a combination of education, income, and occupation). These factors tend to influence children's possibilities to engage in free play, e.g., their motivation and preparedness as well as the amount of time they are allowed for it. However, we cannot draw the conclusion that children from families with low SES will not be creative. There may be other ways to develop creativity than in free, imaginative play, ways that reward originality and novelty in the concrete, so to speak. In the next two sections, I will present a broader conception of creativity than found in much of the research on children's creativity.

### *3. Creativity is procedural and strategic*

Mottweiler's & Taylor's (2014) object to the use of the divergent thinking paradigm for testing creativity in pre-schoolers. Yet it is not certain that measures of creativity that rely on story-telling or narrative will do better. The younger the children, the less reliable their narratives will be as indicators of creativity, because young children have not yet acquired sufficient linguistic proficiency for expressing their creativity verbally in a consistent and reliable way. Furthermore, not all forms of creativity depend on language, which means that measures that rely on verbal reports may overlook subjects who are creative

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3. The term "scaffolding" means there is a single more knowledgeable person, usually a parent, who helps the child to develop new skills by giving the support the child needs to perform a certain task or reach a goal (Wood, Bruner, & Ross, 1976). Once the child has learnt how to perform the behaviour, the scaffolding is removed.

but whose linguistic skills are less than average (e.g., for socio-economic reasons, or because they have an impairment that affects language use). Finally, certain forms of creativity may be difficult to express and analyse verbally. Skill-based creativity that relies on knowhow and bodily experiences is not readily accessible by verbal means (Brinck, 2007). Brinck (1999) refers to such forms of creativity as procedural and describes them as embodied, situated, and interactive.

Procedural creativity makes use of contextual information for taking cognitive short-cuts. Strategic creativity is conceptual and context-independent, and therefore can release the subject from states that hinder free association and fluency, e.g., functional fixedness. Brinck (1999) maintains that creativity contains both procedural and strategic elements. In this respect, creativity seems similar to expertise. Höffding (2014) observes that the skilled coping of experts such as chess players, musicians, and athletes is phenomenologically complex and spans both absorption and reflection. Höffding bases his argument in an extended case-study of the expertise possessed by the members of a string quartet.

A large part of the creative process takes place in the external world and consists in thinking with external models (Brinck, 2003, 2007; Fioratou & Cowley, 2009). Evaluative judgments are prompted directly by perceptual information and visuo-spatial reasoning (Weller, Villejoubert, & Vallée-Tourangeau, 2011). The information that moves the creative processes in one direction as opposed to another may not reach conscious awareness. Except for perception and sensory-motor information, affect plays a central role for procedural creativity. Rietvald (2008) explains the unreflective skilful action of expert craftsmen in terms of the notion of situated normativity. He argues that a particular type of affective behaviour is essential for evaluation without reflection (for “getting things right”), described as a reaction of appreciation in action. To conclude, while it would be wrong to contest the value of narrative as a tool for investigating creativity, in certain circumstances a measure of creativity that does not rely on language may be more appropriate.

Conceiving of creativity exclusively along the lines of make-believe or pretence and the capacity for exploring a variety of possible scenarios about the world suggests that it is essentially conceptual or representational and involves a more or less deliberate or conscious ‘juggling’ with alternative realities. Such a conception of creativity has been related to capacities for theory of mind and thinking about other people’s ‘inner worlds’.

It is hard to deny that imaginative play that involves social role-taking depends on understanding that people can take different perspectives and that their thoughts and experiences may differ (Singer & Singer, 2005). This does not prove that creativity depends on theory of mind. Perhaps both creativity and play depend on some other more general function that supports flexibility. Moreover, it is not clear that all forms of pretence involve role play. Pretence does not always concern living (or phantasy) creatures. Equally, it is uncertain that creativity as a rule comprises perspective-taking in the sense in which the research on theory of mind defines perspective-taking.

Physical play, e.g., ball play, hide and seek, and building castles in the sand, huts in the wood, or towers and cities with Lego or other kinds of physical objects, also depends on imagination and on envisaging alternative, sometimes quite complicated scenarios. Physical exploration and the trying out of possible or alternative actions in contexts of instrumental action contain the playful manipulation of ideas – not conceptually, but as embodied in or exemplified by artefacts. Because the result of physical manipulation reveals itself directly to the senses and feedback is immediate, the actions of idea generation, exploration, testing, and evaluation tend to co-occur or overlap. Certain problems are better dealt with in physical space than conceptually in imagination, and the testing and evaluation of ideas then can be over in a few seconds. Software designers, architects, craftsmen, developers (and players!) of computer games, and fashion designers are just a few examples of professionals who organize the creative process around the manipulation of objects (and ideas) in space and time, physically or virtually, and let it be guided by sensorimotor processes rather than conceptually (Brinck,

2007; Gedenryd, 1998; Kirsh & Maglio, 1994; Wynn, 1993).

There is a test that acknowledges that creativity can be processed and expressed by bodily actions and movement: Torrance's Thinking Creatively in Action and Movement (TCAM). It uses movement and manipulation exercises to test creativity in children age 3 to 8 years and comprises four activities. Three of these consist in generating alternative ways of performing an action. The test is designed to measure fluency, originality, and imagination. Because the subjects are not asked to express their creativity verbally, the test has the advantage of being independent of the verbal skills of the subjects. However, like many other tests of creativity, TCAM conceives of creativity as a form of divergent thinking that involves perspective-taking and perspective change. It is questionable that creativity boils down to the capacity for seeing things from different perspectives. The central thing is to see or do things in a novel way – not in an alternative way.

#### *4. Approximate problem-solving*

Sahlin (2001) gives numerous real life examples of creativity that together demonstrate the complex character of creativity and that creativity occurs in quite diverse situations. I will present four instructive examples. The first example concerns Admiral George Rodney. He defeated the French in the battle of Les Saintes 1782 by deliberately neglecting certain of the British army's Fighting Instructions that regulated how to perform a battle at sea. This unexpected strategy was inspired by a book on naval tactics based on the author's experiments as a boy with toy boats in the garden pond.

Second, the artist Dan Wolgers had been booked to have an exhibition at Gallery Lars Bohman in Stockholm. He came up with the idea of delegating the task of producing the exhibition to an advertising bureau instead of doing it himself. He showed up at the opening to see his work for the first time. Wolgers' behaviour caused a big scandal that reached far beyond the usual art crowd. In breaking the rules for how to prepare an exhibition and

what it means to exhibit art, Wolgers raised fundamental questions that rarely are addressed about what art is and what an artist is and should do. For instance, in what ways can the assistants (that many contemporary artists have) help the artist in creating his works of art and how much can they do while remaining assistants?

Third, Richard Fosbury won the Olympics in high jump in 1968 using a new way of jumping that came to be known as the Fosbury flop. Instead of running towards the bar, jumping with his front facing it, Fosbury turned his back towards the bar before jumping. It took him 5 years to develop his style to perfection and win the Olympic Gold medal. Already 4 years later at the next Olympics a number of athletes copied his way of jumping. Nowadays almost everybody jumps with the back towards the bar. The Fosbury flop originated partly by chance. Fosbury had difficulties with the prevalent technique. He felt that he needed to raise his hips not to knock down the bar. When he did so, he automatically started to drop his shoulders and lay back. The resulting flop was as a consequence of how the human body is built.

The final example concerns Theresa Berkley who ran a flagellatory brothel in England in the beginning of the 19th century. She is famous for the invention of the “Berkley Horse”, a triangular frame to which a person can be tied in any desirable angle for flogging. It was a great success. Sahlin (2001) describes Berkley’s capacity to change her expectations about what flogging means and break with the values of her time as typical of creative people.

Sahlin’s examples illustrate that creativity is deliberate and purposive and that it requires quite extensive knowledge or skills in the field it concerns. The chance that a mere guess will be creative is next to zero. More importantly, they draw our attention from divergent thinking and imagination to problem-solving. In all four cases, there is a problem to be dealt with, or, what amounts to the same thing, a question to be answered: How can the French be defeated? How can I make an exhibition that is not conditioned by contemporary theories and norms about art? What other ways are there to improve my results in high-jumping than quantitatively (by increasing

my training)? How can I improve the competitiveness of my business by meeting the demands of the buyers?

I suggest that we conceive of creativity as problem-solving – in a broad sense. As opposed to regular problem-solving that is exact and fixed, creative problem-solving is approximate. That it is approximate means that it is unclear how the problem can be solved and what the solution might be. Conceiving of creativity as approximate problem-solving minimizes the risk for making premature or arbitrary assumptions about its nature, e.g., by defining it in terms of behaviour that presupposes certain types of cognition and hence by definition confines creativity to agents that have the required cognitive capacities. This gives the present suggestion an advantage over views that conceive of creativity in terms of divergent thinking or imagination.

Whenever a question needs answering, an issue needs to be sorted, a goal needs to be reached, a task needs to be performed, or an idea needs to find an expression, and the subject does not know how to do or even what to do, then the situation calls for creativity – whether in the domains of science, art, culture, sport, or of any everyday activity such as cleaning, cooking, gardening, or shopping (Brinck, 1997). In principle, any issue can be a problem in the broad sense (as you may have experienced in daily life) – how to graft fruit in the absence of the right material, how to build a hut for your kids in the woods without the proper tools, how to account for the origin of life, or how to get to a meeting in time in a foreign city when facing a wild strike in the public transportation system.

Creativity is an open-ended process that is useful when a method or procedure for solving the problem is unavailable. It is unclear what your options are. You don't know how to proceed or go about and, moreover, cannot anticipate the result of your inquiries. Consequently, creative problem solving is not algorithmic or guaranteed to lead to a solution, but makes use of 'informed guesses' and heuristics or rules of thumb that often are implicit.

*5. Rule-based creativity:  
The Sahlin hypothesis*

I have argued that creativity is not limited to certain domains, activities, or behaviour, and that it comprises both conceptual and sensorimotor processes. This must be taken into account when investigating its development. But if creativity is pervasive and comes in a wide variety of guises, what unites it? What does it consist in? Sahlin (1991) provides a simple and ingenious answer to these questions. He distinguishes between two fundamental types of creativity. Concept-based creativity consists in inventing new concepts that change our perception and understanding of a phenomenon. Rule-based creativity consists in breaking the rules that underlie an activity and inventing new strategies or procedures for how to approach it.

In the rest of the article I will briefly outline how Sahlin's notion of rule-based creativity may be spelt out to serve as the basis for empirical investigations of the development of creativity in children and adolescents, alongside other techniques that tap into verbal and conceptual skills such as narrative, divergent thinking, and free association. One important advantage of Sahlin's definition of creativity is that it emphasizes a central characteristic of creativity: novelty. The ability to generate a great number of alternative ideas (and see things from different perspectives) is of less significance to creativity than the ability to invent novel ways of perceiving or acting. It is enough to produce one novel idea. Number does not count.

The rule-based approach to the development of creativity takes for granted that children are sensitive to norms and rules and the ways that norms and rules simultaneously circumscribe and enable behaviour in daily life. These assumptions are uncontroversial, but need to be made more specific to permit working out how the notion of rule-based creativity can be used in empirical work. For instance, we need to determine what it means to be sensitive to a rule or norm and what the behavioural criteria are.

It is possible to discern a few trends in the research on children's understanding of rules and norms in develop-

mental psychology. For instance, it has been shown that before the age of 4 years, children have difficulties following abstract rules and more easily get distracted by features that are irrelevant for performing the task. They can know a rule but be unable to apply it (Towse et al., 2000; Zelzo, Frye, & Rapus, 1996). The executive function and capacities for perspective-taking of preschool children are not yet fully developed, which hampers abstract reasoning and cognitive flexibility. Other studies show that 3–6-year olds can endorse a norm of fairness verbally but neglect it in practise, because although they understand its appropriateness, they are not personally motivated by it (Smith, Blake, & Harris, 2013). Furthermore, there is evidence that younger children use rules for predicting others' behaviour but by 8 years, like adolescents and adults, they tend to base their predictions on the individual preferences of others (Kalish & Shiverick, 2004). Finally, it has been shown that 3-year-olds understand the nature of constitutive rules, which define and support arbitrary social activities (games of chess and monopoly, or sports like ice-hockey and tennis) as well as social institutions and functions (the government, church, school, police, queen, etc.) (Rakoczy, 2006; Rakoczy, Warneken, & Tomasello, 2008).

Children operate with a number of more or less distinct concepts of rule and norm. The data suggest that there is not one single developmental path for the understanding of rules and norms, but several different paths that each roughly corresponds to a particular type of rule or norm. As a consequence, granted that creativity consists in the breaking or violation of rules and norms, it can be expected to emerge at distinct points in development depending on what kind of rule or norm is violated. That is, on the Sahlin hypothesis, although rule-based creativity consists in the same type of behaviour across contexts and ages, performance and quality is conditioned by whether it involves the violation of, e.g., moral or social norms, conventions, rules of logic, or constitutive rules. Children develop an understanding of rules and norms piecemeal, certain types being mastered at an earlier age than others. Thus it seems that this view would allow for precise pre-

dictions of when in development creativity will emerge relative to the particular type of norm or rule the transgression concerns. To exemplify, creativity in domains that require using abstract rules or logical reasoning to solve a problem might be expected to occur in middle or late childhood.

The present approach has several advantages. First, the focus lies on novelty as opposed to variation of ideas, hence on quality, not quantity. Second, in testing whether the subject actually can provide a new strategy or procedure for solving the problem, it puts the weight on the result of the creative process. This stands in contrast to approaches that test whether the subject would be able to provide alternatives, i.e., whether the subject has the capacity for generating many ideas or, say, for divergent thinking. That a subject has imagination does not imply or guarantee that she can come up with an idea that works. This means that the present approach examines whether subjects in fact are creative as opposed to examining whether they have the capacity for being so. Third, rule-based creativity can be conceptual or representational as well as experiential or sensorimotor, and so explains creativity globally, whatever the domain (theoretical physics, engineering, chess, sports, craft, cooking, et cetera). Forth, the rule-based approach acknowledges that both bodily and psychological processes can generate creative ideas and so agrees with recent data that suggest that sensorimotor and cognitive processes interact in the creative process. Five, the rule-based approach can be used to explain creativity in subjects of any age and in any context.

#### *6. Identifying creativity: behavioural criteria*

Empirical investigation of creativity presupposes that there are objective criteria that make it possible to decide whether certain behaviour is creative or not. To establish such criteria, we first need to clarify what it means to break a rule (violate a norm) in the present context. Obviously, mere neglect or disregard of a rule is not creative. The point is to break the rule for a purpose, i.e., to replace it

with behaviour that may contribute to solve the problem. Doing so involves recognizing that the existing rule is wrong and that it needs replacement by another behaviour that is at least more likely than not to solve the problem. This raises the further question whether the new behaviour must be successful to be creative.

The definition of rule-based creativity does not mention that the novel behaviour must be successful to be creative. Yet, it is possible that at a certain age children consistently will display the required behaviour, viz., they invent new strategies for approaching the activity, but nevertheless they fail to solve the problem. They then would be expected to produce strategies that lead to positive results only later in development. This would mean that the behaviour is complex and that it comprises something more than the mere ability to break rules with the goal of improving one's strategy or heuristics. I suggest that this 'something more' concerns the ability to replace the rejected rule with an *efficient* action or set of actions. Most probably, doing so would comprise evaluating the action(s) relative to the estimated end state while working it (them) out, something that seems to require at least roughly anticipating the consequences of the action(s). Such a procedure would sort out inefficient actions, but it cannot guarantee that the remaining action(s) actually will be successful.

We have reached the point where we can formulate four behavioural criteria that permits identifying a subject as creative according to Sahlin's definition of rule-based creativity:

- (1) the subject does not engage in the expected behaviour A
- (2) the subject produces another behaviour B
- (3) the subject has not engaged in or encountered behaviour B before (at least not in similar circumstances)
- (4) behaviour B can lead to (or: leads to) a solution to the problem

Behaviour A = a rule or norm

The third and fourth criteria each have a weaker and a stronger reading and further analysis would be needed to settle which readings are correct. Subjects that satisfy all four criteria are creative. In contrast, a subject that satisfies the first, second, and third criterion has limited understanding of the behaviour that underlies creativity, and does not know how to produce a strategy or procedure that is both novel *and* successful. An alternative interpretation is that (given that she satisfies the first three criteria) the subject might in fact be able to solve the problem, and therefore is creative, but her behaviour is not reliable (over time). She cannot be relied upon to provide strategies or procedures that lead to a solution (but she may do so once in a while). I will leave it to the reader to decide which interpretation (if any) is preferable and why.

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SCIENCE

AND ETERNAL LIFE

TO NILS-ERIC SAHLIN

ON THE OCCASION

OF HIS 60TH BIRTHDAY

EDITED BY

JOHANNES PERSSON

GÖRAN HERMERÉN

AND EVA SJÖSTRAND

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