

Toinggg: How Changes in Children's Activity Level Influence Creativity in Open-Ended Play

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Abstract. This paper describes an explorative study with an open-ended play environment called Toinggg that consists of three interactive trampolines and was developed for children aged 6-8 years old. Toinggg was used to evaluate the change of children's activity level on creativity in open-ended play. With this exploration, we aim to gain a better understanding of the balance between physical activity and creativity in play. In a user evaluation twenty-one children played in groups of three with Toinggg. Results show an increase in development of new game play and creativity after a moment of rest concerning the activity level of the interaction behavior.

Keywords: Open-ended Play, Physical Play, Creativity, Design Research.

1 Introduction and Related Work

Imagine yourself being a 7 year old child again for one day, playing around and exploring freely without any limits. Play is considered as an intrinsically motivated activity with no direct benefit or goal that is situated outside of daily life that triggers creativity [2]. In our research, we aim at designing interactive playful solutions with simple interaction rules that enable children to create their own play and games. We call this open-ended play [1]. In previous research we have focused on designing open-ended play objects that stimulate both social and physical play [1, 8]. We experienced that physical high active play has a possible negative effect on the creativity of the children. In this paper we therefore investigate the relation between physical play and creativity in open-ended play. How can we design for a proper balance between the right physical activity level and children still having enough energy to be creative? An open-ended play installation named Toinggg was developed, consisting of three interactive trampolines. A change in the interaction behavior of Toinggg is built in which should support moments of less active open-ended play to stimulate creativity. This leads to our research question: Can changes in children's activity level influence creativity in an open-ended play environment?

The research presented in this paper is related to open-ended and physical play. An example of free play is FeetUp [4], a playful accessory integrated in a pair of shoes. Children get audiovisual feedback whenever they jump or are off the ground. They

can freely play with FeetUp anywhere and anytime. It is however a wearable play object that does not specifically focus on the level of creativity. Concerning physical play, a related design is the Interactive Trampoline [3], which is a large trampoline with four satellites, sixteen LEDs build-in in the outer curve and a speaker. The interaction rules of these elements differ per game. Research with the trampoline studied physical activity, safety and technology to enrich the play value of the trampoline. The main differences between Toinggg and the Interactive Trampoline are the number of trampolines and their size. Instead of one large trampoline, Toinggg consists of multiple intelligent play objects that create a play environment.

2 Design

We applied a research through design process [9] consisting of several design iterations. In most of these iterations, children were involved in pilot tests and exploratory evaluations. The design developed in these iterations is called Toinggg. Toinggg is designed for children in the age of 6-8 years old. It consists of three small trampolines (96cm diameter) with three modules underneath that have integrated RGB LEDs and distance sensors that can detect a jump. The interaction rules of Toinggg are developed around four animals: a mouse, a cat, a dog and an elephant, represented by different sounds and colors of light. Jumping on a trampoline will trigger an animal sound, a color of light and the intensity influences the brightness. A child jumping on another trampoline gets a different animal. When children jump in the same rhythm, one animal will win (depending on the hierarchy of the animals) and replace the losing animal. In this way, all trampolines can be set to the same animal. After five minutes, all lights will fade out and the system will not react anymore to temporarily discourage high activity physical play. For one minute, a combination of snore and cricket sounds creates the experience of sleeping animals. The children can use this moment to review their acts and think of new playful solutions.

3 Evaluation and Conclusion

An explorative study was conducted to examine the influence of an intentionally activity output change on creativity in open-ended play. This user evaluation took place at a gymnastics room (10x10m) of a primary school. Twenty-one children aged 6-8 years old participated in the play sessions. For each session, three children (mixed in age and gender) were invited to play with Toinggg. Children were told that the animals can get tired for a short period of time but will be willing to play again afterwards. Each session took 15-20 minutes including some quick open questions at the end to reflect on children's play behavior. All sessions were video recorded.

Analysis of the sessions was done by coding the videos of each session per minute on number of new developed games, classified by four types of play [5]: Functional play (simple physical active play), Explorative play (play to explore), Dramatic play (play involving fantasy) and Games-with-rules (actual rule-based games). To measure

the level of creativity we scaled the three aspects Fluency (based on the number of interpretable, meaningful, and relevant ideas generated), Originality (based on the uniqueness, non-common way of thinking and level of detail) and Enjoyment (based on the enjoyment of the users during the test) on a scale from 0-7 [6, 7].

Results show that children played enthusiastically with Toinggg in various ways. They responded quickly to the sounds of the modules, both verbally: “I am an elephant”, or non-verbally by expressing a smiling face when an animal sound played. Sounds were interpreted in many ways and sometimes triggered the imagination of the children (e.g. the mouse sound was interpreted as a chicken or a Tyrannosaurus). After individual explorations, the children started to play together. This led to games-with-rules like changing trampolines and guessing which animal you are.



Fig. 1. Children playing with Toinggg during the evaluation sessions

The children tended to play very physical in the first minutes of the sessions. This could be related to Functional play. Regarding this type of play, the rest moment was necessary since the children became very tired. Earlier pilot tests showed that in this case, children tend to become less concentrated and inspired. As can be seen in Figure 2a, the games (specified in different types) changed clearly on the moment of activity output change. A peak in the amount of new created games can be found during the rest moment (minute 6) and even more right after it (minute 7). These are both situations in which the interaction rules changed. Overall the types of play appeared in the following order: Functional play, Explorative and Dramatic play and Games-with-rules and

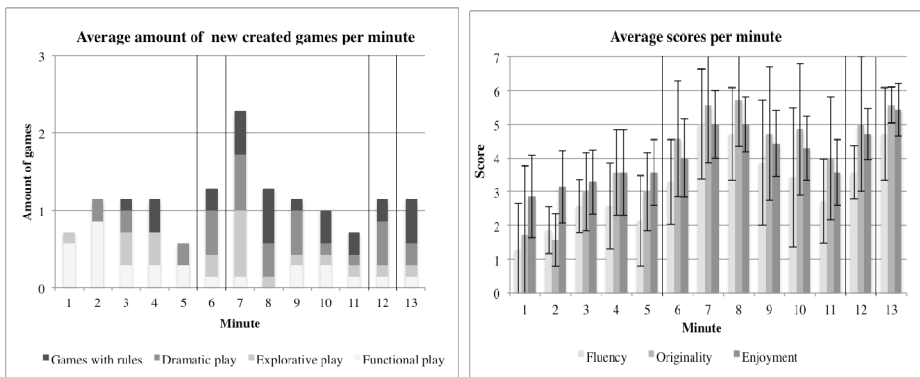


Fig. 2. These charts show (a) the average amount of new games created, divided in types of play (vertical), counted per minute (horizontal) and (b) the average scores and standard deviation rated per minute of the seven play sessions scored from 0-7. The vertical lines on the beginning and end of minute 6 and 12 show the sleep interaction moment.

Dramatic play. The second rest moment (minute 12) created less new games compared to the first rest moment. This can be related to the fact that the users became familiar with the interaction rules in both situations (rest and active).

The aspects Fluency, Originality and Enjoyment gave a good impression about the play behavior of the children. This analysis on the quality of gameplay showed a similar peak compared to the amount of created games. As can be seen in Figure 2b, the quality of creativity tended to remain after the rest moment. Observations showed that this occurred since the richness of the games was explored instead of creating a new game. Enjoyment seemed to grow even more every time the interaction rules changed which was visible during the sessions; the children understood the game better and better. The Originality in games slightly decreased over the rest moments, since the new situation needed to be explored again. This was for the children a moment to check if everything was still the same: "Let's check if the animals didn't change position during the night!"

Our results show a positive change in amount of creativity after a change of activity level. However, the actual peak can be found when the rest moment ends and the initial interaction rules start again. It seems like the rest moment created a 'reset button' for the children to rest and think about the situation. After the rest moment, the interaction rules were explored again and creativity of children increased. We believe these insights can help designers in developing engaging playful solutions.

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