

Emotional Synchrony Effects on Team Design Outcomes

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ABSTRACT

Design is a creative activity which benefits from individual skills and cooperative efforts. Empathy, or understanding each other feelings, is considered a fundamental capacity for cooperation. When groups of children design a new product together, how cooperative do they behave, what is the role of empathy, and what are other possible predictors of their design success? Part of a technology-based summer program, in the following study we have performed a 5-days design workshop where children aged 7 to 12 y/o were divided in small teams to design new playground concepts. Three main design classes and tasks were performed: Sketching; modelling; and presentation. Each activity was followed by self-reports to obtain participant's individual task and group impressions, as well as their emotional synchrony (how accurate participants were evaluating their teammates emotions). Empathetic disposition was pre-evaluated one month prior to the workshop, and we evaluated design outcomes through a six-members school-staff jury. Our results indicated that, more than task or group satisfaction, accurate impressions of team members' happiness positively affected the group's design outcomes. Although empathy itself was not sufficient to predict the design success of groups, together with emotional synchrony, both were positive predictors. Overall, children on the winning design groups were reporting more fun and sharing their feelings more easily, in a similar flow-like state. We believe emotion synchronization to be an important factor for sharing joy when cooperating, and future studies should further observe its effects and mechanisms on different cooperative situations.

1. INTRODUCTION

Cooperation is the act of working together to reach a common goal. Although it starts developing from early childhood, it is not usual for children to cooperate at the same level as adults, being important to properly motivate them in pursuing cooperative decisions (Olson, Spelke, 2008). When working together, how do children visualize cooperation, what motivates teamwork, and how to evaluate it? Being the focus of our laboratory, Kansei is a Japanese field and term that describe how impressions and affective states can influence our relationship with artifacts and with others. Also related with affection, empathy, or the capability to detected and understand each other's emotions in different contexts, is strongly related with cooperative behavior (Hart, 2017). If we can understand each other better, teamwork becomes easier. Therefore, from their affective impressions, can we understand children's internal motivations of cooperation?

For developing new products together or understanding children's social dynamics, different studies focused on the establishment of dedicated design workshops (Malinverni, Burgues, 2015). Design tasks are relatable with team building tasks, as they need groupwork, discussion, and consensus for the achievement of a goal (Mechelen, Zaman, 2015). In this study, under a summer program in Tsukuba city, Japan, from July 24th to August 11th, 2017,

we organized a one-week design workshop for elementary school children. In this workshop, we observed the affective impressions that children aged between 7 and 12 y/o shared of their tasks and of their group members. Seeing also how accurate they were predicting their friend's happiness level during groupwork, we related these factors with how well children performed as a group when presenting their final designs.

2. METHOD

“*Techno World: Design the Future*” was a school program of Liberty International School, Tsukuba. In there, children explored and created with new technology, such as robots, sensors, or 3D modelling tools. In the third week, we performed an interactive workshop entitled “*let's create the Playground of the future*”, where children worked together in same-grade groups to develop new playground ideas for their school field.

2.1 Workshop Procedure

In this five-day's workshop, participants performed three design tasks in alternate days:

- Sketching: Drafting ideas on paper and discussing with group;
- 3D Modelling: Crafting a mock up of their designs with simple materials; and
- Presentation: Presenting their final design in front of a school staff jury.

With introductory classes, each session took around 90 minutes. Groups were made in the first session according to the participants own affinity. After each session, children would fill a self-report paper regarding their impressions of it and how happy they perceived their team-members to be. In the final day, children presented their ideas to a 6-member school staff jury, who evaluated how good was the presentation, the idea, and the teamwork.

2.2 Participants

For the workshop, we have counted with the participation of 29 students (11 male and 18 female) aged between 7 and 12 y/o ($M=9.03$, $SD=1.77$). The students were divided in nine groups according to the age range and enrolled number of students. For not filling the self-report properly, 10 cases were excluded of the impression analysis.

2.3 Evaluation tools

For this study, we worked with the three following tools, each with a different goal:

- **the KEDS empathy scale** (Reid, Davis, 2013): to pre-evaluate children's empathy;
- **Impressions self-reports**: to evaluate participants impressions and for them to evaluate their team members' feelings; and
- **Design evaluation scale**: for the jury to evaluate the participants' presentations. The scale has five items: Aesthetic, viability, originality, presentation dynamic, and effort, generating a total score which ranges from 0 to 5 points. The top scorers of each grade were awarded with school prizes.

2.3.1 Happiness Impression Scale - HIS

Related with empathy and team synchrony, two questions of the self-report tool were aimed to measure how well children could evaluate each other's happiness during the task. In this

version, also called “happiness subtraction equation”, children had to evaluate how happy they were on a 5-degrees ranging scale starting from “not so much” until “super happy” and evaluate each of their team members under these same criteria. Individual scores were given based on the perceived happiness of their team members subtracted by the member’s own reported happiness level. The closest to 0, the better the accuracy of a team member individual impression. A group with consistent accuracy, is emotionally synchronized.

3. RESULTS AND DISCUSSION

The goal of this study is to observe how children’s impressions affect their cooperation and design outcomes in a team design workshop. Averaging the three tasks reports, we have considered: individual conditions such as age, gender, and assessed empathy; task and group satisfaction; Member’s happiness impressions; and accuracy of member’s impressions with the HIS Scale. individual linear regression results are presented in table 1 below:

Table 1: Linear Regression of different variables on Design Score

Source	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Age	0.10	0.03	.53	3.04	.005**
Gender	0.32	0.13	.45	2.45	.02*
Empathy Score	0.01	0.00	.44	1.79	.09
Task Satisfaction Report	0.17	0.11	.37	1.51	.15
Team Satisfaction Report	0.10	0.10	.25	1.01	.25
Happiness impression Report	0.10	0.09	.24	1.12	.27
Happiness impression accuracy	-0.29	0.09	-.59	-3.07	.007**

We initially correlated individual conditions which are commonly associated with cooperation outcomes. Considering gender effect in design scores, an independent-samples t-test was conducted. There was a significant difference in the scores for female (M=4.22, SD=0.37) and in male participants (M=3.9, SD=0.20) conditions; $t(25) = 2.66, p = 0.013$. Among the four winner groups, three were female. Regarding age effect in design outcome, a significant regression was found ($F(1,25) = 9.23, p = .0058$) With a R^2 effect of .28. Higher empathy, however, was not necessarily related with high design scores, and a significant linear regression was not found ($F(1,14) = 3.20, p = .096$).

We proceeded by observing the influence of individual report evaluations on the design score. As seen on table 1, significant linear regressions were not found for task satisfaction, team satisfaction, and team member’s happiness impressions. A significant regression was found, however, on the happiness impression accuracy ($F(1,18) = 9.40, p = .007$). With a R^2 effect of .35, Children who evaluated their members happiness accurately had more chances of achieving higher group design evaluations. Consequently, groups whose members were more accurate in perceiving each other’s emotions were more likely to achieve higher design evaluations ($F(1,9) = 11.69, p = .01$).

Finding no correlation between empathy and happiness Impression accuracy, to observe if both have an effect in children’s cooperative design outcomes, a multiple linear regression was calculated. A significant regression was found ($F(3,11) = 22.30, p = .0002$), with an R^2 of .88. Participants predicted Design score, which ranged from 0 to 5 points was equal to $2.04 - 0.29(\text{HIA score}) + 0.02(\text{Empathy score})$, where empathy score is measured from 71 to 128 points (M=103), and HIA Scores decreased from 2.5 to 0 points (M=1.03). Design

score increased 0.02 points for each empathy point and decreased 0.29 points for each point above 0 in the happiness impression accuracy scale. Both Empathy score ($P=.0002$) and impression accuracy ($p=.0008$) were significant predictors of the design score. Although The model becomes more complete when you consider age and gender effects, due to high correlation, its effects are difficult to isolate.

4. CONCLUSIONS

Considering the self-report and the group design score, we found that the team members happiness impression accuracy was a strong predictor of design outcomes. With Age and gender also being contributive variables for higher design scores, empathy seemed to affect the design scores only when considering the happiness impression accuracy. Although empathy is an important ability to have in teamwork situations, our observations indicates that other variables can affect how well a team will work together and synchronize their feelings. Friendship level, familiarity, or shared joy with task, for example, could play a big role in how well teams were working together, needing better elucidation in future studies.

It is important to reinforce that through design evaluations, we were observing children's cooperative display and outcomes. Identifying impression accuracy and group synchrony as a significant predictor of teamwork is an important step for future studies and dynamics with children. Considering we can replicate or design situations with children where team member's impressions are easily identifiable, and all members work together in a "same page" or "flow-like" state, we can find ways to keep motivating children's cooperation.

Part of a bigger research, our future studies will focus in understanding if, and how, group game situations contribute to children's emotion identification accuracy, and if these can be predictors of cooperative behavior. In that sense, we can ultimately design games which can intrinsically motivate children to cooperate.

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