



The Role of Children's Emotional Engagement in At-Home STEM Activities

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This material is based upon work supported by the National Science Foundation under Grant No. 1906839/1906940/1906808

Thank you to our collaborators Kim Koin, Tsivia Cohen, and Natalie Bortoli at Chicago Children's Museum and Dr. David Uttal at Northwestern University

Introduction



- We examined how children's emotional engagement during an at-home tinkering activity may promote their STEM talk and relate to different tinkering approaches.
- Tinkering is a playful problem-solving activity that can support children's STEM learning outside of school (Resnick & Rosenbaum, 2013).
- Positive emotions have been linked to positive learning outcomes (Status & Falk, 2017), as well as creativity and problem solving (Fredrickson, 2001).

Methods & Participants

- 61 parent-child dyads met with a researcher on Zoom and participated in a hands-on problem-solving challenge to create a playground ride for a toy friend.
 - Children were 4-10 years old ($M = 8.10$, 30 girls and 31 boys)
 - 59% White, 15% Black, 8.2% Asian, 6.6% Latine, and 9.8% Mixed
 - Parental education, $M = 18$ years, $SD = 2.60$ years

Emotion Coding

Code	Example
Talking about wants, likes and dislikes, emotions	"I don't want it to be a baby swing, she is not a baby!" "Today is so fun!" "I really hope it works"
Asking to make more or to keep tinkering after session	"Can we make more even after we are done?" "Are we allowed to make more than one?"
Demonstrating frustration or excitement	"Yay!!" and "whohoo!" "Argh, stop it!" "This is too short!!" Clapping, jumping, dancing, laughing

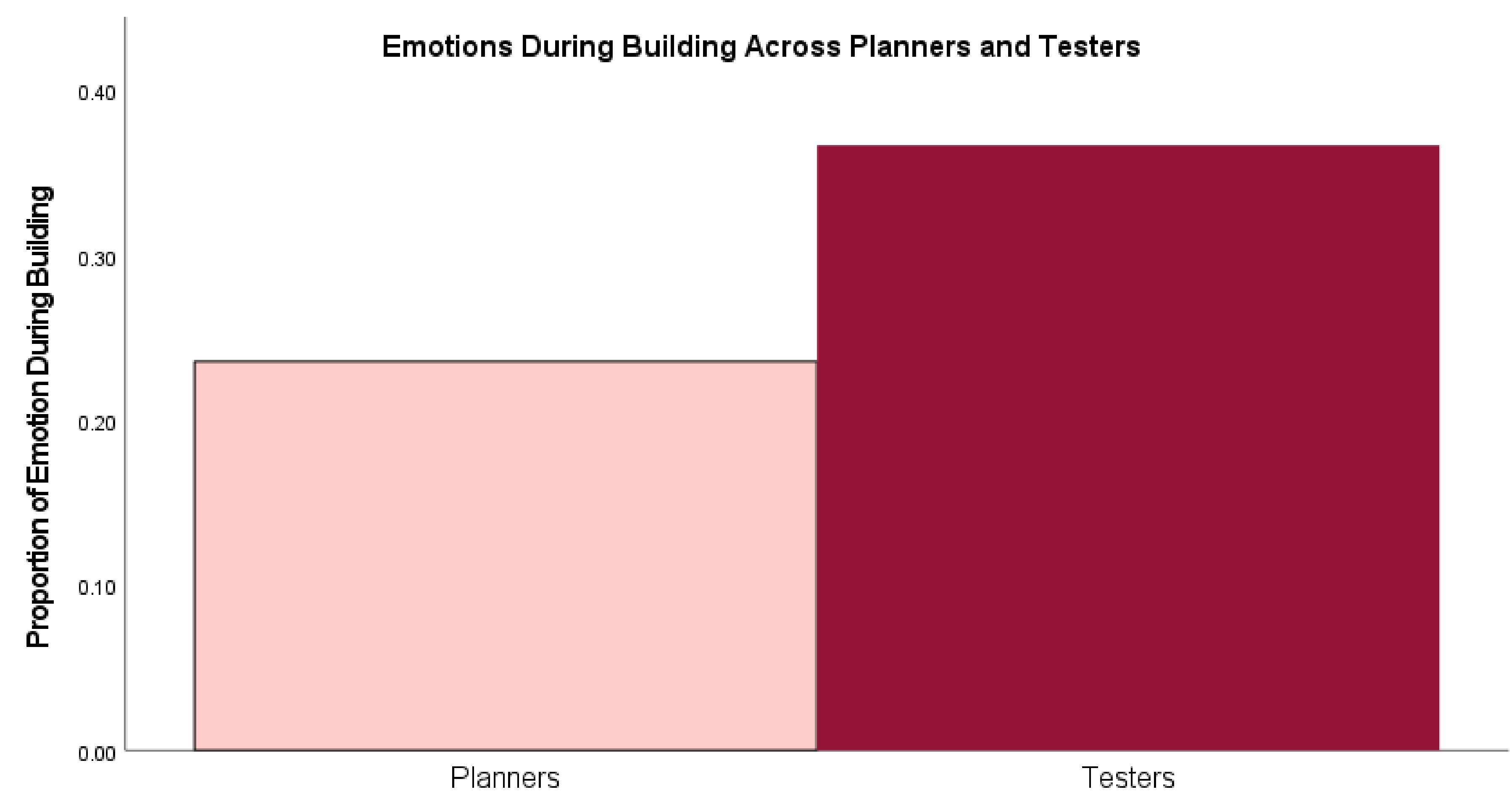
STEM Coding

Code	Example
Project Name	"We made a swing."
Function	"And then I glued it to secure it."
Engineering	"I tested it out on the short one and it went far."
Math and Fit	"We made the straws at an angle."
Future Scenarios and Associations	"I would use like foam and a marble instead." "Because I've tried that out before with my class."

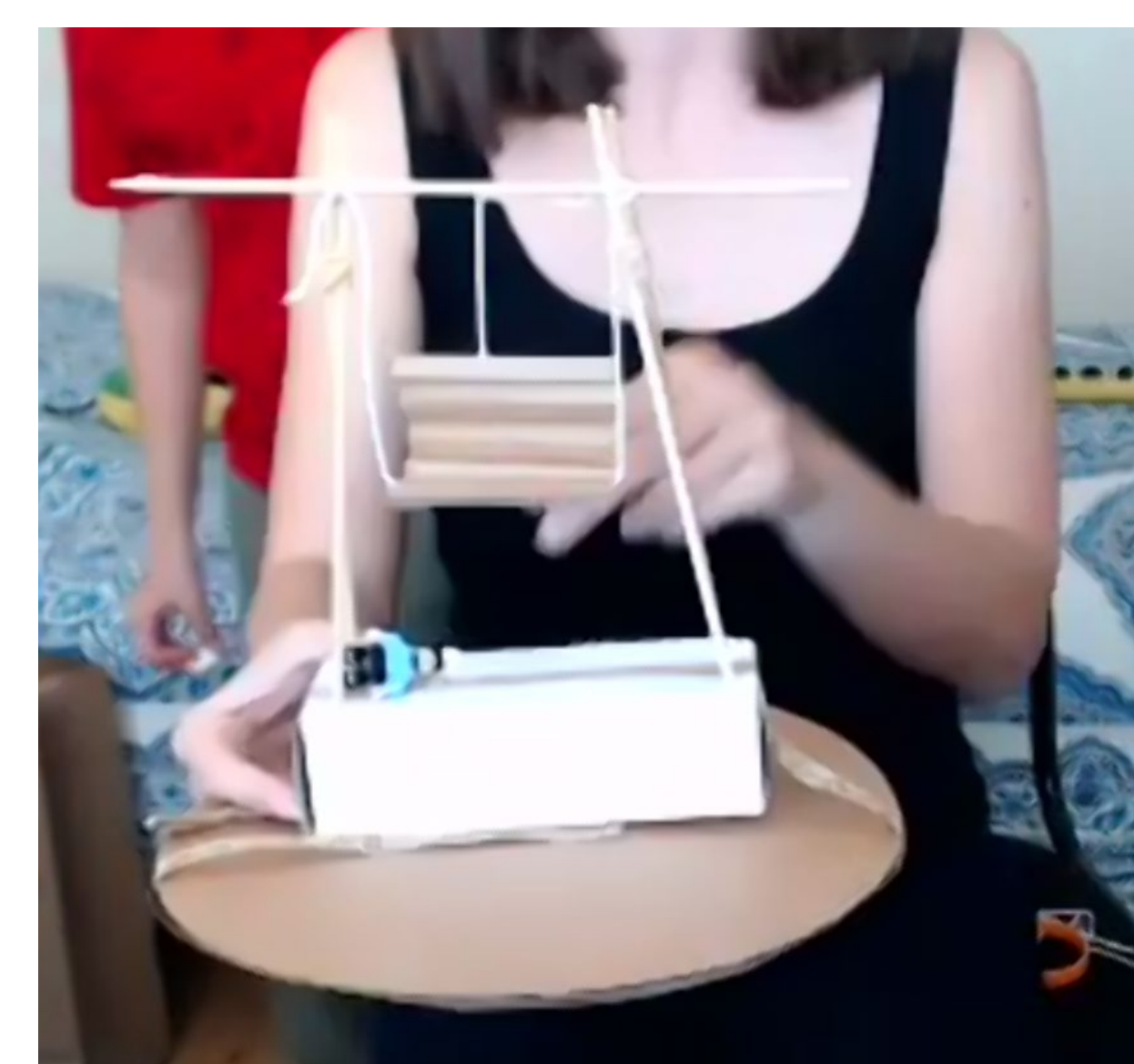
Tinkering Approach: Tinkering sessions were split into planning and building, and testing phases. "Planners" ($n = 32$) were children who spent the most of their time planning and building. "Testers" ($n = 29$) were children who spent most of their time testing and redesigning.

Results

- Children displayed significantly more positive emotions ($M = 9.87$, $SD = 8.55$) than negative emotions ($M = 2.00$, $SD = 3.88$) while tinkering.
- Children's emotional engagement was a significant predictor of STEM talk during tinkering, $B = 0.44$, $SE = 0.13$, $p < .01$.
- Logistic regression analysis, $B = 1.70$, $SE = 1.00$, $Wald = 2.90$, $p = .045$ (one-tailed), showed children with higher emotional engagement during the planning and building stages were more likely to be categorized as "testers" than "planners".



Discussion



- Overall, early emotional engagement seems to support rich engagement in engineering practices such as testing and redesigning.
- Our study suggests that children's emotions support their engagement in STEM conversations and engineering practices during informal learning.
- The study highlights the value of designing activities that elicit children's emotional engagement to advance opportunities for STEM learning.

