Joint Media Engagement between Parents and Preschoolers in the U.S., China, and Taiwan

KATE YEN, Department of Sociology, University of Washington, USA
YEQI CHEN, Department of Electrical Engineering, University of Washington, USA
YI CHENG, Information School, University of Washington, USA
SIJIN CHEN, Human Centered Design and Engineering, University of Washington, USA
YING-YU CHEN, Human Centered Design and Engineering, University of Washington, USA
YIRAN NI, Information School, University of Washington, USA
ALEXIS HINIKER, Information School, University of Washington, USA

Global app marketplaces make families in foreign countries easily accessible to developers, but most scholarship on joint media engagement (JME) between parents and children reports on data from participants in Western contexts. We conducted an observational lab study to examine how preschoolers (age 3-5) and parents (N=74) from three different regions of the world (communities in China, Taiwan, and the United States) engage with two types of tablet games: an instructional game with goals and an exploratory, open-ended game. We found systematic differences among groups and between games. For example, parents from China and Taiwan frequently picked up their child's hand and used it as a tool to engage with the screen, a practice parents in our U.S. sample did not employ. Dyads from all three samples exhibited more warmth when playing an instructional game than an exploratory one. Our results suggest that characteristics of the populations we sampled interact with design features, that is, the same design prompted opposing behaviors in different groups. We conclude that it may be useful to examine goal-free and goal-oriented JME as separate constructs, that design choices influence the roles parents adopt during JME, and that the range of behaviors we observed complicate the prevailing research narrative of what positive and productive JME looks like.[1]

CCS Concepts: • **Human-Centered Computing → Collaborative and Social Computing**; Empirical Studies in Collaborative and Social Computing

KEYWORDS

Joint media engagement; child-computer interaction; preschool; game design; mobile computing

ACM Reference format:

Kate Yen, Yeqi Chen, Yi Cheng, Sijin Chen, Ying-Yu Chen, Yiran Ni, and Alexis Hiniker. 2018. Joint Media Engagement between Parents and Preschoolers in the U.S., China, and Taiwan. In Proceedings of the ACM on Human-Computer Interaction, Vol. 2, CSCW, Article 192 (November 2018). ACM, New York, NY. 19 pages. https://doi.org/10.1145/3274461

INTRODUCTION

Joint Media Engagement (JME) [43] refers to the practice of people—often parents and children—sharing media experiences together. Prior work has shown that JME improves children's comprehension of digital content [34] and makes these experiences more enjoyable [37]. This is particularly true for very young children [34], who are still developing digital literacy and competence with interactive media. As a result, a

2573-0142/2018/November – ART192...$15.00 DOI: https://doi.org/10.1145/3274461

growing body of work seeks to understand how to design digital experiences for children that invite adult participation and promote collaborative parent-child play (e.g. [4,21,28]).

Creating digital experiences that parents and children both enjoy is challenging. A number of barriers, such as the differences in parents' and children's interests, difficulty sharing control over an interface, and both on-screen and off-screen distraction can all make it hard for designers to create content that families adopt collaboratively [43]. Thus, providing a situated understanding of how parents and children use digital media together offers to improve designers' ability to target this scenario.

The way in which parents and children use digital media together across countries and cultures is not robustly understood. Parents' interest in playing together with children varies across communities [10,33], and parents' attitudes and parenting styles vary in systematic ways from one country to another [9,32]. As app marketplaces make it increasingly easy for developers to reach users around the globe, it is useful for them to understand how the design choices they make will influence parent-child JME, not just in their own community, but in diverse cultural contexts as well.

In this paper, we explore JME between parents and preschoolers in three different locations: a wealthy urban area in the United States, a historic town in Taiwan, and a moderately sized port city in mainland China. None of our small samples are representative of their greater geographical regions, nations, or cultural contexts, and it is important to interpret this study as a comparison of three small qualitative samples and *not* a comparison of three larger cultures. However, these samples are drawn from three distinct, globally distributed populations, offering the opportunity to examine how diverse groups of families engage with the same materials.

We conducted an observational lab study in all three locations in which parents and children played with two games: a structured, goal-oriented game designed to train executive function through a series of increasingly difficult levels, and an open-ended, exploratory game with no explicit goals. We examined parents' and preschoolers' patterns of engagement with each game and with each other, and we examined how their responses and behaviors differed between games and across these three locations.

We found that parents from this particular subpopulation in the U.S. were more likely to step back and observe when children played the structured game with goals and more likely to participate as partners during open-ended exploration. Among participants from China and Taiwan, this pattern was reversed and the structured, goal-oriented game prompted parents to engage as teammates together with their children. While parents in the U.S. sample were slow to intervene physically, parents in the samples from China and Taiwan would often use their child's hand as a tool, taking hold of their child's wrist and using the child's fingers to touch or drag objects on screen. And dyads from all three locations displayed more warmth and encouragement playing the structured game than the exploratory one.

This work documents distinct patterns of JME in each of these three groups and in response to each of these games. As the majority of work examining JME in families has been conducted in Western contexts (e.g., [3,21,24,40,43]), our study calls for a broader, more culturally sensitive, understanding of how families use media together, complicates the notion that specific patterns of JME are best for families, and presents detailed empirical data about how two different design paradigms prompt parents and children to co-engage with technology.

RELATED WORK

Designing for Joint Media Engagement

The design of children's media can have a dramatic influence on the extent to which parents participate. For example, television programming that can be appreciated on multiple levels is more likely to hold the interest of a preschooler and an adult simultaneously [43]. Tablet games that are symmetric and can be accessed from all sides are more conducive to parents and children playing together [21]. Parent-infant communication patterns change when infants play with toys that provide digital feedback [26]. Thus, a growing body of work in HCI and CSCW seeks to model how specific design decisions influence parent and child behaviors and how to create digital experiences for children that will draw parents in and hold their interest.

In addition to exploring the design of experiences that encourage parent involvement, studies of JME often explore the specific ways in which parents participate. Not all joint experiences are considered equally valuable, and prior work distinguishes productive and unproductive JME [43]. Productive JME requires thoughtful design that prompts adults to engage in a way that scaffolds children's knowledge and enables them to grow and learn through the experience. Co-creation, in which parents and children create together, and boundary crossing, in which an experience spans time and space and incurs sustained engagement over many sessions, are just two indicators of productive JME [43]. These complex processes are not likely to occur without designed support.

Thus, a growing body of work examines the patterns of behavior that emerge as parents and children engage together with experiences like Pokemon GO [40], eBooks [24], and novel research prototypes [46] and the extent to which these behaviors reflect productive JME. Here, we build on this history to examine the types of JME that families from diverse communities engage in when presented with the same designs. The overwhelming majority of design research on JME draws insights from families in the United States [1]; here, we explore how we might increase our understanding of the relationship between design decisions and behaviors by including a broader set of families drawn from globally diverse communities.

Structured and Exploratory Games

As digital games for preschoolers have become widespread, a number of studies have looked at the relationship between design decisions and children's experiences. Prior work has found that computer games can improve learning [36] and, games can, for example, improve young children's early numeracy skills through explicit exercises [29]. These types of instructional games display explicit structure (such as a series of levels with multiple problems to solve in each level), and usually have right and wrong answers and clear learning objectives [13] (see Figure 1, left). Past research has shown that instructional games can increase the learner's motivation and interest more effectively than classroom lectures and improve the retention of learned skills and knowledge [6,31].

However, a structured game with a precise learning objective is not the only type of game that offers opportunities to learn. Prior work has also suggested that exploratory gameplay can support the development of creative process, self-determination, and autonomy [36]. Compared to instructional games, exploratory games are less structured and goal-oriented, and they instead provide players with the opportunity to explore various possibilities within a game without following specific rules or competing with others to win [5] (see Figure 1, right).

In this study, we examined parent-child engagement with two different types of games for preschoolers: "*Explore Daniel Tiger's Neighborhood*," an open-ended, exploratory game, and "*Cookie Monster's Challenge*," a highly structured instructional game, to compare families' JME in response to these two different design paradigms. Although a number of studies have examined games that happen to be exploratory or structured (e.g., [8,38]), to the best of our knowledge, this is the first study to directly compare preschoolers' reactions to these two different formats. By conducting a within-subjects examination of the way in which the same dyads respond to two different game design paradigms, we hope to contribute added nuance to the ongoing effort to model how very young children engage with games and use media together with their families.

Cross-Cultural Studies in Human-Computer Interaction

Finally, research in HCI and CSCW has historically over-sampled WEIRD (western, educated, industrialized, rich, and democratic [20]) populations [42]. However, a number of researchers have explicitly worked to study technical systems across multiple countries and cultural contexts, for example, examining usability and aesthetic preferences for websites around the world [35] or documenting how security behaviors vary by country [39]. A literature review synthesizing cross-cultural comparison studies in HCI conducted from 2010 to 2015 found that these studies consistently report that cultural differences are a significant impediment to adoption and usability [25]. Other work proposes that, given the importance of respecting cultural differences across a user base, interfaces should be culturally adaptive and adjust to meet the cultural expectations of their users [35].

Other scholarship has critiqued cross-cultural studies in HCI, drawing on postcolonial studies and STS to illustrate that static notions of culture and a fixed taxonomy of cultural buckets fail to account for the fluid way in which cultures are constructed and continually shifting [22]. As a result, *Postcolonial Computing* pushes researchers to adopt a generative understanding of culture and to recognize that the ways in which individuals respond to technologies cannot be explained with a simplistic mapping from fixed cultural differences to behaviors [30]. Studies building on this foundation have, for example, examined design insights from mobile phone repair workers in Kenya and the skilled labor they perform [45], and reimagined the design of Wikipedia such that it might live up to its potential of truly decolonizing knowledge and specifically that it might promote indigenous epistemologies [44].

We leverage this past work by recognizing both, 1) the importance of looking across cultures and countries to examine sociotechnical systems in their situated context of use [25], and 2) the problematic and hegemonic history of researchers taking a static, simplistic, and othering view of cultural groups [30]. We do not claim that our participants are representative of particular cultures or that fixed notions of cultural groups are an accurate representation of how people experience the world. And we do not make any causal claims about broad cultural differences driving the behaviors we report. We instead hope to contribute to and broaden the research community's understanding of JME by reporting empirical data from diverse contexts in a space that has historically been over-representative of American families.

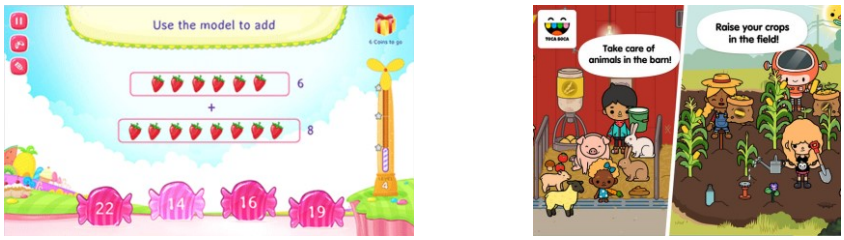

Figure 1: Examples of commercially available structured and exploratory games. Left: "Splash Math," aims to teach math content through exercises organized into structured levels. Right: "Toca Life, Farm" enables children to explore objects and animals on a farm without fixed goals or "correct" interactions.

METHOD

This study is part of a larger research project to evaluate *Cookie Monster's Challenge* (CMC). CMC is a tablet game published by Sesame Workshop and PBS Kids to support the development of preschoolers' self-regulation and executive function [47]. In this study, we conducted a one-hour play session with 37 preschooler-parent dyads (N=74) from the United States (U.S., 15 dyads, N=30), mainland China (10 dyads, N=20), and Taiwan (12 dyads, N=24).

Participants

In the U.S., participants were recruited through an institutional database that maintains contact information for families interested in participating in research. As the institution is located in an urban area, participants were recruited from the surrounding area and lived in urban or suburban communities. In Taiwan, participants were recruited through postings on online forums. In China, we recruited families through an online bulletin board associated with a local company. All child participants were between the ages of 3 and 6 years old (inclusive) at the time of the study.

Detailed participant demographics are shown in Table 1. As part of our screening, we asked parents to complete The Parenting Scale [2] to capture differences in parenting style. Average overall scores among the parents from China and Taiwan were above the clinical cut-off used in the United States to measure dysfunctional disciplinary strategies, while average scores among parents from the U.S. sample were below this threshold. This suggests differences in the parenting styles among these three groups of parents. These differences also suggest that the scale, developed and evaluated in communities in the United States, may not be well-suited to diverse contexts and may pathologize parenting practices that are standard elsewhere.

Table 1: Demographic variables

	US	CHN	TWN
Child Gender	M=10, F=5	M=7, F=3	M=6, F=6
Age, M(SD)	4.1(0.8), range=3-5	4.4(1.1), range=3-6	3.7(0.7), range=3-5
Household Income	<$25K (2), $25-75K (3), $75-100K (4), $100-125K (2), >$125K (3), Prefer not to say (1)	¥90-110K (3), ¥130-150K (1), ¥>150K (6)	<$30K (2), $30-70K (3), $70-110K (2), $110-150K (1), >$150K (2), Prefer not to say (2)
Parent Education	Some College (3), Associate Degree (2), Bachelor's Degree (4), Master's Degree (5), Prefer not to say (1)	High School Diploma (1), Bachelor's Degree (9)	Bachelor's Degree (9), Master's Degree or Professional Degree (3)
Parent Marital Status	Married or partnered (14), Divorced (1)	Married (10)	Married (11), Single (1)
Parent's English Proficiency	N/A	Simple words (2), Simple sentences (2), Basic listening & speaking (3), Basic communication ability (1), Adept communication ability (2)	Simple words (1), Basic listening & speaking (3), Basic communication ability (4), Prefer not to say (4)
Child's English Proficiency	N/A	Simple words (5), Simple sentences (1), Basic communication ability (1), Prefer not to say (3)	Simple words (7), Simple sentences (1), Prefer not to say (4)
Parenting Scale [Mean (sd)]			
Laxness	2.33 (0.79)	2.90 (0.53)	3.04 (0.56)
Over-reactivity	2.63 (0.54)	3.49 (0.66)	3.57 (0.52)
Verbosity	3.59 (0.83)	4.41 (0.56)	4.60 (0.33)
Overall	2.82 (0.52)	3.47(0.38)	3.67 (0.27)

Materials

Families engaged with two different games during the study sessions: CMC (the structured game), and an exploratory game called, *Explore Daniel Tiger's Neighborhood* (DT). CMC provides a series of leveled mini-games that draw on components of children's executive function. According to their official website, the CMC app includes: ten mini-games that challenge children to practice their self-control, focus and memory ability; twelve levels of increasing difficulty; and a cookie-making game to make cookies for the character Cookie Monster [47]. These mini-games include activities like matching similar items, selecting items that match specific characteristics, and remembering where items have been placed. The game is narrated by the Sesame Street character, Cookie Monster. See Figure 2.

DT is an open-ended, exploratory game designed for children age 2-5 [48]. In the game, the child can visit stores and streets based on the storyline of the cartoon series Daniel Tiger's Neighborhood. Within these settings, the child can engage in open-ended play activities with no time pressure or correct or incorrect answers, performing tasks like planting seeds in a garden or decorating a cake in a bakery.

Figure 2: Screenshots from Cookie Monster's Challenge (CMC). Left: structured levels organize the game. Middle: Children must complete fixed tasks under time pressure, like completely cleaning the monster's teeth. Right: A Rube-Goldberg machine is assembled bit by bit, with each piece of the machine marking progress made by the child.

Figure 3: Screenshots from Explore Daniel Tiger's Neighborhood (DT). The game is open-ended and the child can explore without fixed goals by going into a shop of their choosing (left), meandering the store (middle), or zooming into small tasks, like scanning items at the grocery store check-out (right).

Procedures

All families participated in a two-part observational lab study, in which parent and child played each of the two tablet games described above (CMC and DT). Before the session began, all parents completed the survey of parenting style and a demographic questionnaire. Parents in Asia also completed a survey of English proficiency.

All families played each game for 15 minutes, with game-order counterbalanced across participants. Families in Asia played the two games during the same session, while U.S. families played during two different sessions spaced two weeks apart. In the larger, unrelated, study of CMC (of which only U.S. children were a part), we asked half of the children to play CMC during their initial lab session, while the other half played DT as an active control. When families returned for a follow-up session two weeks later, they tried the game they had not seen originally, so that we could compare their interaction with the two game designs. Because of resource constraints, we were unable to replicate the larger study with families in China and Taiwan or maintain the two-week gap between sessions. Yet, despite this limitation, we still felt it would be worthwhile to examine responses to the two games in diverse settings. As a result, U.S. families engaged in a systematically different procedure, with their two game sessions spaced two weeks apart. Although we hope that counterbalancing minimizes this confound to some extent, the difference in session timing remains a limitation of our study and results should be interpreted in light of that fact.

All sessions were audio and video recorded. After the play session, a researcher conducted an interview with the parent asking about the child's media habits and the parent's attitude toward children's media. Families from China and Taiwan received the local equivalent of US$25 as a thank-you for their participation. U.S. families all participated in the larger two-week study, for which they received US$50 and a tablet computer.

Data Analysis

Prior to analysis, the research team transcribed video recordings of all 74 play sessions (two per family) into detailed field notes [11]. Field notes captured parents' and children's postures, movements, interactions with the screen, interactions with each other, instances of eye contact, and non-verbal communication, such as smiling or laughing. They also included all dialog verbatim with notes about tone and emphasis. At least two individuals compared each transcript in its entirety against the original video, and any missing or

inaccurate details were corrected. After transcribing videos into field notes, we assigned each transcript to two researchers to analyze independently. Using an inductive approach [41], we performed multiple rounds of analysis, meeting to discuss emerging themes as a team between each round. As part of this process we developed and evolved a hierarchical codebook using a grounded theory approach [41]. In keeping with Glaser's conception of grounded theory [14–16], we did not engage deeply with related literature until after identifying our first round of emergent themes. The final codebook included the augmentation strategies parents used to enhance children's play, types of verbal and physical guidance parents used, actions to support or undermine the child's autonomy, collaborative play, and expressions of warmth between parent and child. After analyzing the data, we recruited a volunteer with expertise in interaction analysis and qualitative research who is fluent in both Mandarin and English to review the codebook and discuss themes with the lead researcher. The volunteer then coded a randomly selected 15% of snippets from a randomly selected transcript, and we compared these codes with those of the lead researcher. Pooled Cohen's κ was 0.83.

RESULTS AND ANALYSIS

Parents' Use of Physical Intervention

Playing an Instructional Game

We saw that parents took physical steps to influence their child's game play, and that the way they did so varied systematically by group and by game. These physical actions clustered into three types of behaviors, which we called, "interrupting," "leading," and "hijacking" (see Table 2). Interrupting occurred when parents physically stopped a child who was currently performing an activity, for example, pulling a child's hand back from the interface as they touched the screen (see Figure 4). Leading occurred when the parent physically took hold of the child's hand, often by the wrist, and used the child's hand as a tool to complete an action on the screen (see Figure 5). Hijacking occurred when the parent stepped in and completed an action without the child's involvement (see Figure 6).

Across both games, we observed that parents in the U.S. sample rarely used physical intervention to guide their children, and all three forms of physical intervention were more common among the parents we sampled from mainland China and Taiwan. In the instances when a U.S. parent did physically intervene, they usually coupled this intervention with verbal encouragement to pause and think, and physical intervention acted as a way of slowing the child's response rather than guiding the child to a specific action. For example, in one instance, "*Mom gently moves his hand away from the screen. 'Just watch,' she says*" (US11). In another instance, "*The child tries to tap…before receiving any instruction from Dad. Then Dad holds her back and says, 'Oh, do you see those two?'*" (US13). In a third instance, we saw that, "*The child begins tapping different things on screen. Dad pulls the child's arm back and says 'Listen, listen'*" (US03).

In contrast, parents from both mainland China and Taiwan used all three physical intervention strategies frequently. And where parents in the U.S. sample encouraged children to pause and listen when they intervened, parents from mainland China and Taiwan coupled physical intervention with directed questions and explicit instructions. For example, parents from China physically interrupted the child while

Table 2: Examples illustrating the three physical intervention strategies

Physical Intervention	Example
Interrupting	"*Every time the child tries to tap the red button, mom uses her hand to stop him*" (CH02).
Leading	"*The child does not respond, and mom grabs onto the child's arm and says, 'Come, [draw] the bear's arm.' Mom uses the child's hand draw a bear's arm*" (TW12).
Hijacking	"*The app says, 'tap what you heard.' Dad taps on the correct instrument*" (TW06).

Figure 4: *Interrupting*. The child is about to tap the screen; dad reaches out to stop the action and pulls his hand away.

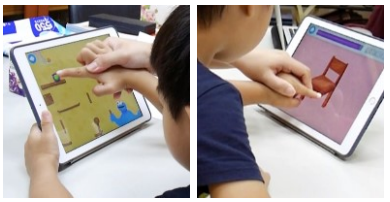

Figure 5: *Leading*. Parents use the child's hand as a tool to complete a task.

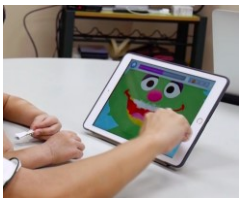

Figure 6: *Hijacking*. Parents take over and dominate game play.

also asking questions: "*Before the child moves, Mom says, 'Stop! Let me have a look. How many arms does the monster have?'*" (CH06) or, "*The father stops him by saying, "Stop. First, which one should it be wearing?*" (CH01). Similarly, when parents from Taiwan physically interrupted, they gave explicit instructions, such as: "*The child tries to tap the red button but mom stops her and says, 'Blue, blue,'*" (TW09) or, "*Mom holds her hand back and says, 'Tap the blue button only when you see the cat,'*" (TW09). In a third instance observing a family in Taiwan, we saw, "*Mom urgently blocks the child's hand from tapping and says, 'Don't touch it, don't tap it'*" (TW12).

When they employed the leading strategy, parents from China and Taiwan took their child's hand without hesitation and used it to quickly complete the required in-game task. The ease and frequency with which parents performed this action suggests this intervention approach may be one they use frequently. We observed, "*Mom then grabs the child's hand and uses it to help her drag the dog to the house*" (TW04). In other instances, we observed Dad say, "'*Let's play together.' Dad then grabs his daughter's hand and drags the spoon into the bowl*" (CH03), and "*Mom grabs her hand to swipe on the screen: 'It's brush teeth game again…. Quickly! We don't have enough time'*" (CH06). In contrast, only two of the 15 U.S. parents employed the leading strategy and neither parent used this strategy heavily.

Every parent we observed from China and Taiwan used the hijacking strategy at least once when playing with the child and on average did so 7.4 times during the 15-minute session. In comparison, only three of the 15 U.S parents ever used this strategy and those who did only did so 1.3 times on average. When parents from China and Taiwan used the hijacking strategy, they often did so in response to a prompt from the game and stepped in to perform the task before the child had a chance to react or respond. In these instances, the parent acted as the main player, and the child took a passive role as an observer. For example, "*Mom quickly drags the correct shirt to the monster, and the child just sits watching*" (TW10), or "*The app says, 'Listen closely; tap what you heard,' and Dad taps on the correct instrument*" (TW06). In another instance, "*The app says, 'Give monster clothes that fit,' and Mom immediately puts the correct shirt on the monster*" (TW11).

Playing an Exploratory Game

When playing the exploratory game with no structure or specific goals, all parents consistently engaged in less physical intervention overall and in less of each of the three types of physical intervention. Parents in the U.S. sample displayed almost no instances of physical intervention. Parents in China and Taiwan intervened only occasionally; when they did so, they most often hijacked the game play and performed actions directly. On average, these parents hijacked the child's play 2.6 times during the exploratory sessions. When parents did physically take over, it was usually when the child had been engaged in a specific activity or stayed at one of the five shops within the game for quite some time and served to move the child on to something new.

Parents' Use of Instructions and Suggestions

Playing an Instructional Game

Parents from both mainland China and Taiwan provided intensive hands-on guidance when their children played Cookie Monster's Challenge. As they spoke to children, parents emphasized the idea that the parent

and the child were a team and frequently used the words "we" and "let's" to describe their interactions. For example, "*Mom says, 'okay, in a bit we are going to break through [and] overcome level three.'*" (TW12). In another instance we observed, "*Dad says, 'Ah! He's missing an arm! Let's help him draw an arm'*" (TW02). In other cases we saw, "*Dad then tells the child, 'Press this; we need to pass those levels,'*" (CH08) and "*The father says 'Let's look for the next cookie!'*" (CH01). In all of these instances and many others, the parent's language implied that the child and the parent would work through each challenge in the game together.

In contrast, parents in the U.S. provided little verbal guidance when children played CMC, often sitting back as passive spectators. The only place where parents in our U.S. sample consistently provided verbal guidance and instructions was in setting up the game, where they instructed the child to tap the play button to begin and supported the child in taking a photo to create a new player profile. Across all sessions, we saw, for example, twice as many instances of verbal guidance and instructions from Taiwanese parents as from U.S. parents. Occasionally, parents in the U.S. sample gave instructions about specific game mechanics or interaction techniques, such as, "*Mom says, 'move your finger to brush the teeth. Maybe stick your finger on the teeth'*" (US02). However, children from the U.S. sample predominantly played through the game independently as they performed the tasks presented by the app.

Parents from mainland China and Taiwan tended to give instructions continuously, repeating the same words over and over again, even as the child successfully performed the desired behavior. Parents frequently said "*quick!*" and provided urgent and continuous guidance, as in, "*Mom says, 'Help him brush teeth. Wow, wow, wow. Quick, quick, quick. Must be quick and brush it clean before time runs out'*" (TW07), "*Mom says, 'quick, quick, quick, quick. Draw quickly, draw quickly, draw quickly, draw quickly'*" (TW01), or "*Quickly! We don't have enough time'*" (CH06). Parents gave these repetitive instructions without providing any new information to the child, and this repetition appeared to serve the purpose of emphasizing the urgency of the task.

Thus, when children played this highly structured, goal-oriented game, we saw consistent differences among the three groups we sampled. Parents in the U.S. engaged minimally with the game and rarely provided direct instructions, only providing guidance for specific tasks in the beginning as the child set up the game. Parents from both mainland China and Taiwan placed themselves in the center of the action and took on the role of active player, ensuring the child passed each challenge, liberally offering instructions and guidance, and using continuous, repetitive instructions to urge the child forward.

Playing an Exploratory Game

Different patterns emerged when families engaged with an exploratory game. Here, parents in the U.S. participated more actively by constantly pointing out different opportunities within the game for the child to explore. For example, "*Mom says, 'there was a train table, did you see it? Do you want to play with the train table?'*" (US08), and "*Mom points to one of the musical instruments and says, 'do you want to press the instrument and play it?'*" (US14). Parents in the U.S. frequently described the interface in the exploratory game and provided suggestions to guide the child.

Parents from both China and Taiwan did just the opposite. When playing the exploratory game, they took a more passive role than they had when playing a structured game. They often sat back and observed their child's play, and when they did provide instructions, they were often vague and served primarily to encourage children to explore different shops within the game. Parents said things like, "*[We] don't like the hospital, let's go to the garden*" (CH01), "*Let's see what's inside these rooms*" (CH02), and "*Go in here; you haven't gone here yet*" (TW11). Similarly, among Chinese and Taiwanese parents, the most common type of instruction was a generic statement to try things out, such as, "*You try it out*" (TW06), "*I don't know either; try tapping it*" (TW05), "*You can tap everything! Try them if you want*" (CH07), and "*This is the bathroom. Let's try [to] tap around*" (TW09). In these examples, children were encouraged to try out anything on the interface. Thus, although parents in China and Taiwan still provided guidance and instruction in this context, they did so infrequently and with less focus and intent than they did when children played the structured, goal-oriented game.

Guiding Children through Questions

Playing an Instructional Game

When playing CMC together with their child, parents from all three groups continuously asked questions to guide their child's play. However, there were distinct differences in the types of questions asked by parents from different regions. Parents from both Taiwan and mainland China most frequently asked narrow, focused questions, such as, "*Which cat had stripes?*" (TW03), "*Should he wear this shirt or this shirt?*" (TW04), or "*What's missing that's circular?*" (TW07). These questions appeared to serve the purpose of providing the child with a direct path toward a specific, correct answer. In contrast, parents in the U.S. sample asked high-level, open-ended questions encouraging the child to think for himself, such as, "*What's the next step?*" (US04), "*What can we do to make it so that it gets to him?*" (US01), or "*What's missing?*" (US13). Although these questions also nudged children toward success, they were less direct and demanded more problem solving from the child.

Further, when playing this structured game, parents from Taiwan and China often followed their questions with specific instructions, rather than pausing and giving the child time to answer the question or make progress in the game. For example, parents said things like, "*Where is the chicken? Touch it*" (TW02), or, "*Which leg is it missing? This one right? This one is missing a leg, right? So let's add one for it. Here,*" (CH01). In these instances, parents asked questions to guide children, but they coupled these questions with direct instructions to make their guidance (and the child's ensuing response) exact. Parents in the U.S. sample rarely did this and often paused after asking question, appearing to wait to see how the child would make use of the question. In these cases, parents provided less precise guidance, requiring the child to do more of their own thinking and leaving more room for the child to fail.


Figure 7: Parents in China and Taiwan leaned in when playing the instructional game with the child.

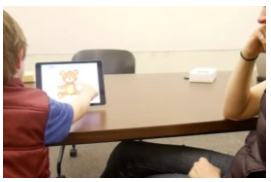
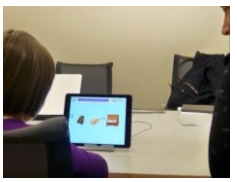

Figure 8: American parents sat back, away from the child, when playing the instructional game.

Playing an Exploratory Game

When playing the exploratory game with their child, parents from all three groups continued to raise questions, but the nature of their questioning changed. Parents in the U.S. sample asked more specific questions to highlight and label options on screen. For example, "*Do you wanna put any of those things in your cart?*" (US04), or "*Do you think you can touch the drum, the guitar or the other instrument?*" (US05). Parents from the U.S. routinely used the phrase, "*what happens*" as they played with their child, showing curiosity and suggesting the child explore. For example, they asked questions like, "*What happens when you touch the door?*" (US11), "*What happens if you poke the cake?*" (US04), "*What's that? Oh, decorations! So what happens if you put that on? [points at the decoration]*" (US14), "*What happens when you touch the tigers on the top?*" (US01), or "*What do you think happens if you click on one of the instruments?*" (US07). These statements were much more detailed and direct than the questions U.S. parents posed when their child played CMC. Yet, despite the direct nature of these questions, they also left the decision-making power in the hands of the child and allowed parents and children to play together as teammates, with parents collaboratively offering suggestions and ideas but not demanding specific patterns of interaction.

Conversely, parents in China and Taiwan used pointed questions to guide their child when playing CMC, but when they played the exploratory Daniel Tiger game with their child, their questions became much broader and undirected. Parents asked open-ended questions about the child's interests and intentions, saying things like, "*What else do you want to play?*" (TW03), "*Which one do you want to go [to]?*" (TW05), or "*Where do you want to check out? Which room do you want to go [to]?*" (TW06), and "*Where do you wanna go?*" (CH05). Unlike the questions that parents from China and Taiwan asked when playing CMC (which

served to narrowly direct the child to the correct action), these questions appealed to the child as the authority on which interaction should come next. Although parents did not appear to try to influence the child's choice of action, they did frequently prompt the child to keep moving in the game, rather than persisting in a single repetitive activity. Parents in China and Taiwan often asked their child questions like, "*Wanna go check out the other places? We can leave. Do you want to leave?*" (TW05). Although parents from both China and Taiwan primarily sat back and observed their child's play during the exploratory game, they also queried the child about their intentions and asked about what might come next.

Enhancing Game-Play with Augmentation

In addition to directing children's experiences through intervention, instruction, and questioning, we observed that across families, parents engaged in a common set of behaviors that served only to augment the child's play experience (rather than to direct it). These acts of augmentation clustered into three different categories. First, we saw that parents would at times label and describe what was on screen. In these instances, they did not provide specific guidance, but simply described or named what they saw and then passively left the child to decide for herself what to do with this information. Second, we observed parents adding narrative enhancements to the scene on screen. In these instances, parents would make up stories, invent dialogue for the characters on screen, connect on-screen items to objects or experiences in the child's real life, or add sound-effect enhancements. Third, as children played, parents often made noises of discovery, surprise, or excitement that appeared to reinforce the child's behavior.

Although most parents engaged in all three types of augmentation behaviors, the situations in which they used them differed by group. Here, we describe instances of these recurring behaviors, as well as the ways in which parents' approaches and intentions differed across cultures and by game.

Playing an Instructional Game

Parents engaged in relatively little augmentation when playing CMC with their child (compared to the exploratory game), and across all three groups, most interactions were instructional or goal-oriented. In both cases—instructional and exploratory—parents' most common augmentation strategy was to label or to state facts about the game without suggesting any action or explicit expectations for the child. Across all participants, 81% of parents used labeling and describing when playing the instructional game and 97% of parents used this strategy when playing the exploratory game.

We also saw that parents in all three groups augmented their child's play with noises of excitement or sound effects as children engaged with the instructional game. In the U.S., parents did so in reaction to the child's successes and failures and demonstrated both emotion and (feigned) surprise as the child saw the results of her choices manifest in the game's responses. In most instances, the parent reacted to the app's response rather than the child's behavior or choices. For example, "*The child taps two dogs with blue hats, then incorrectly taps a dog with a red hat and fails the game. Mom says, 'uh-oh!'*" (US06). In this case, the parent did not show excitement or make sounds of support when the child performed the first two interactions correctly. Instead, she responded with a negative sound when the game declared the sum of the actions incorrect. In other instances, we heard parents say, "*'Whoa!' with excitement*," as a child received a cookie (US09), or groan as a child lost a game (US01).

Parents from Taiwan augmented their child's instructional game play by imitating and adding sounds to the game itself. In many cases, parents imitated sound effects from animal characters and other non-verbal noises, as in, "*Mom pretends to be surprised and says, 'oh!' and imitates the penguin sound effect,*" (TW12) "*Mom imitates the sound of the cookie falling,*" (TW11) or "*Dad imitates the penguin's sound effect and smiles at the child*" (TW02). We did not see this imitation augmentation in the other groups when children played the instructional game.

Playing an Exploratory Game

Parents in the U.S. sample engaged in dramatically more augmentation when playing the exploratory Daniel Tiger game than when playing CMC. Parents in the U.S. sample continuously labeled and described what they saw on screen and responded to these stimuli by connecting them to the physical world. For example,

"*That's the bakery where they make cupcakes*" (US06), "*Dad points to the hat on the door, 'Do you see that hat? It's a bakery'*" (US13), and "*Dad gestures in the area of the scale and says, 'Do you know what this is? This is a scale. That lets people know how much they weigh'*" (US03).

Parents in the U.S. sample often supportively expressed excitement and made exclamations of discovery as the child engaged with the exploratory game. Parents' excitement was not primarily about what the app presented, but about the child's choices, behaviors, and on-screen creations. They said things like, "*Oh, you made it nighttime!*" (US08), or after a child had put star decorations on a cake in the bakery, "*Mom pretends to be surprised and says, 'wow, cool!'*" (US14).

Finally, we saw that parents in the U.S. sample added narrative and dialogue to the exploratory game, overlaying their child's play with additional story. They would pretend to eat cake together with the child, commented that the child was "*wasting water*" even though the water was digital, and talked about helping the characters wash themselves. As parents engaged in imaginative narrative with the child, they said things like, "*Okay, check-up's all done. Everyone's healthy. Thank you doctor!*" (US03) at the virtual doctor's office, augmenting the child's digital activities by treating them as acts of pretend play and acting as if they were real.

Parents in the samples from China and Taiwan also engaged in these behaviors, but they did so less than half as often as U.S. parents. When parents in the sample from Taiwan labeled and described what they saw on screen, they used it as an opportunity to expose and teach the child English words (despite the fact that there was no dialogue or speech in any language built into the game). Here, words in square brackets represent words spoken in English: "*Mom says, 'wow! This is a* [bakery]," (TW05) "*as music starts playing Mom says,* '[Daniel Tiger's Neighborhood]. *Tiger,*'" (TW03) and "*Dad says,* '[strawberry], *strawberry. This is strawberry isn't it?*'" (TW02).

Warmth and Encouragement

We observed all parents across the sample give positive feedback to the child during game play as a way to enhance the playing experience, provide support, or to demonstrate they are actively participating and paying attention. We observed three recurring forms of positive feedback: verbal reassurance, physical reassurance, and non-verbal reassurance, such as smiling and laughing. Verbal reassurance refers to instances where parents verbally praised the child to acknowledge the child did something well within the game. Physical reassurance refers to instances when the parent used physical touch to show encouragement or acknowledge an achievement, such as giving a high-five, patting a child on the shoulder, or rubbing a child's back. All three forms of reassurance coupled a display of affection with a sign of praise and positive feedback.

Playing an Instructional Game

We saw that parents from all three contexts showed more warmth and reassurance when the child played an instructional game (see Figure 9). Particularly among families from the U.S. and Taiwan, parents consistently showed approval and praised the child when she passed a mini-game or received a cookie (the on-screen reward for successfully completing several games). In the U.S., parents celebrated by saying things like, "*'Whoa! You got cookie,' the mom says with excitement,*" (US09) or "*The parent says, 'Good job!' with a rising tone when the task is completed*" (US01). In Taiwan, parents showed a similar pattern: "*Dad says, 'Whoa, you got a cookie!'*" (TW06), "*A cookie shows up and mom gasps and says, 'You got another cookie!'*" (TW12), and "*Mom says, 'Yay, got cookie!'*" (TW07)

Parents from China praised children and gave positive feedback less often than parents from either of the other two cultural contexts we observed. There were no instances where parents in China celebrated the child for receiving a cookie. When they did give verbal reassurance, it was usually after passing a mini-game and included comments like, "*Wow, you are so great! You put it into the bowl didn't you?*"(CH06), "*Yeah! We are right!*" (CH07), and "*You are so good!*" (CH08).

Playing an Exploratory Game

When playing an exploratory game, parents in the U.S. gave verbal reassurance in instances when the child did something new. In one instance, the parent said, "*Good job! Oh! You lit it back on fire*" (US01). In another instance, the parent praised the child by saying, "*Oh, good job! That's where it goes. Nice work*" (US03). In these examples, parents in the U.S. encouraged children's exploration and discovery. On the other hand, parents from Taiwan and China very rarely used verbal and physical assurance when playing the exploratory game. Only three of the 12 parents from Taiwan and two of the 10 parents in China made a positive comment at any point during the child's engagement with the exploratory game. None of the parents from China or Taiwan displayed physical reassurance during the exploratory game.

Parents from the U.S. employed all three types of positive feedback noticeably more frequently than parents from both Taiwan and China. For example when playing an instructional game, parents from the U.S. sample, on average, smiled or laughed with the child 10.6 times while parents from Taiwan demonstrated the same behavior, on average, five times during a session. We observed that parents from all three groups gave positive feedback more frequently when the child played the instructional game than when the child played the exploratory game.

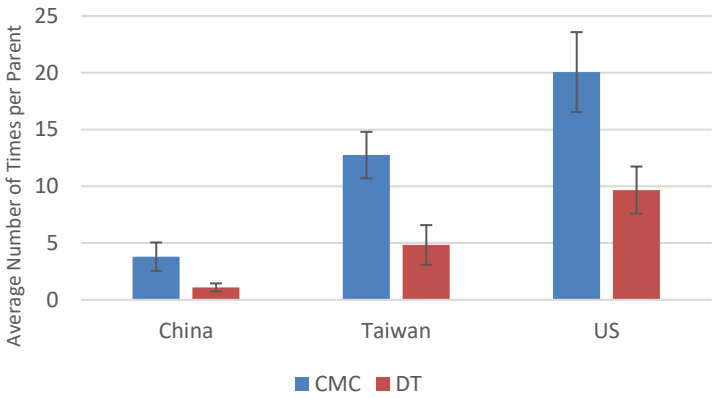

Figure 9: Frequency of parents displaying warmth or encouragement. Across all groups, parents gave their child more positive feedback when playing the instructional game.

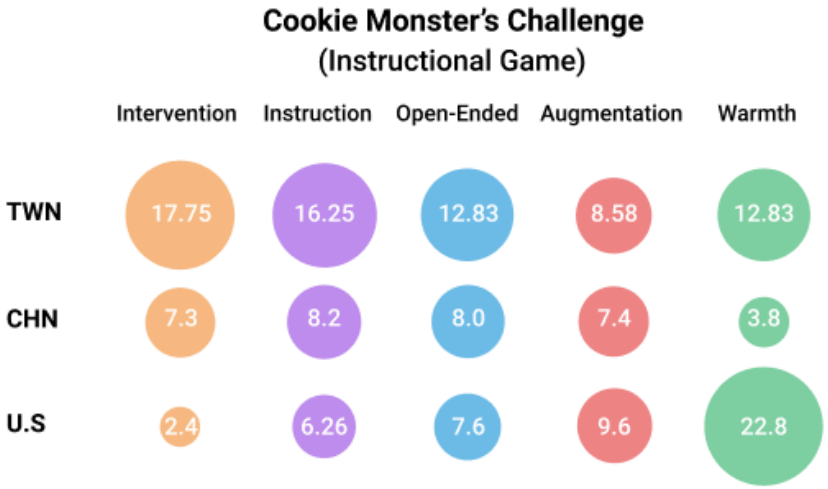

Figure 10: The average number of times each parent displayed each form of JME during the CMC session.

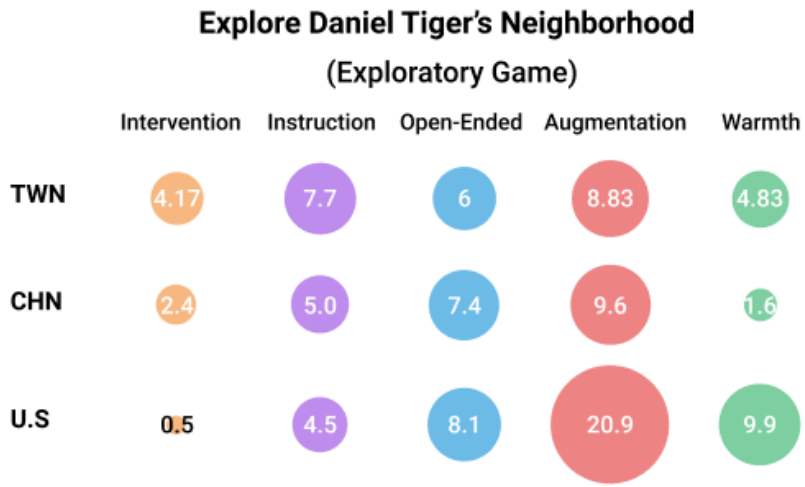

Figure 11: The average number of times a parent displayed each form of JME during the DT play session.

DISCUSSION

Our results provide empirical evidence of distinctions in patterns of JME across these three samples and two game designs. Parents in our U.S. sample were less directive when their child worked toward a goal than during the exploratory game and offered more explicit ideas and suggestions when their child explored. Conversely, parents in our samples from China and Taiwan were more likely to involve themselves as teammates in the child's instructional gameplay but sit back and observe when their child explored. Parents from Taiwan and China continuously reinforced the urgency of completing tasks in the instructional game, and they regularly picked up their child's hand and used it as a tool, a practice parents in our U.S. sample did not enact. All parents displayed increased warmth and encouragement when their child played the instructional game than they did when children explored. Here, we discuss these patterns in more depth.

Goal-Directed vs. Goal-Free JME

We observed a number of ways in which the structured game design and the open-ended, exploratory game design prompted different patterns of behavior. For example, parents in all three groups responded to the demanding tasks of the structured game with increased warmth and praise for their child, relative to the exploratory game. The explicit hurdles that children had to clear to be successful in the structured game prompted parents to offer support in the form of hugs, high-fives, cheers, words of praise, smiles, and laughter. This trend emerged in all groups, suggesting it may apply across a variety of diverse contexts. Prior work in non-digital settings has shown that parents' praise of children's goal-directed behaviors causally influences children's reward frameworks later in life and the development of fixed or growth mindset [18]. As our results suggest that design choices can influence the way in which parents praise and encourage children, and the way in which parents praise and encourage children can shape children's reward frameworks, it is possible that designers can influence this pathway. Future work remains to map this design space and to evaluate whether designs intended to shape reward frameworks through JME are able to do so in practice.

We also observed that parents in the U.S. sample became much more engaged when their child played with the exploratory game, and they used the exploratory world as a springboard for dialogue, added narrative, and other augmentation and collaborative play. Parents were less likely to intervene or direct the action when their child worked toward a specific goal, and they were more likely to make suggestions or add a storyline to the play experience when the in-game choices were no longer "correct" or "incorrect." As prior work has documented the value of collaborative and engaged discussion between parents and young

children through dialogic reading and other forms of media engagement [19], it is possible that the exploratory design prompted U.S. parents to engage in more useful JME behaviors.

These examples, along with the other differences we observed in parents' responses to the instructional and exploratory game, suggest that *goal-oriented JME* and *goal-free JME* may be distinct constructs within the broader space of children's and parents' joint experiences with media. As literature examining how families enact JME continues to grow, our findings indicate it may be useful to examine goal-oriented and goal-free JME independently and to formalize models of each.

Parent Roles

Prior work examining JME in the U.S. has shown that parents enact common roles as they share media experiences with their children. These include *bystander* (maintaining physical presence during a child's use of media without actively observing or participating in any way), *spectator* (actively watching as children use media), *coach* (guiding children without participating directly), and *teammate* (using media together in partnership with the child) [21]. Our findings were consistent with these themes, and they link specific design choices to specific roles. Among parents in the U.S. sample, the structured design encouraged parents to act as spectators, watching their children and cheering for them, with occasional coaching suggestions. In contrast, the exploratory design encouraged parents in our U.S. sample to act as teammates who played collaboratively with their child.

These links did not hold up, and were in fact inverted, in the other two groups we sampled (see Figure 12). Parents in China and Taiwan did not have the same reaction to the exploratory game and did not appear compelled to participate without explicit goals. While structure prompted parents in our U.S. sample to disengage, parents from China and Taiwan responded to the explicit goals of the instructional game by jumping in and working collaboratively with their child to ensure success. Although these parents sometimes allowed their child to take action independently, they were quick to step in and correct mistakes, asked directed questions, gave explicit instructions, proactively took over the interaction before the child

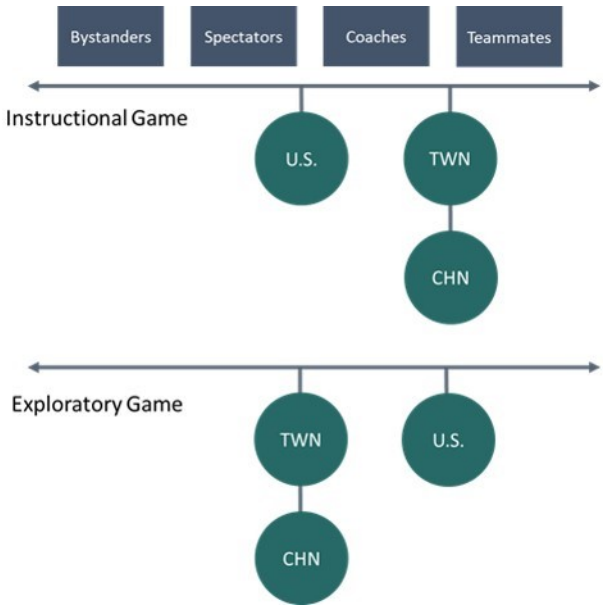

Figure 12: Prior work documents common parent roles during JME (bystanders, spectators, coaches and teammates) [21]. Our results indicate that the two designs we examined prompted parents to take different roles, but that these differences were inverted across the three populations we sampled.

even had a chance to try for himself, and made regular use of the word "*we*" to describe the parent and child as a team.

Thus, our results indicate that designers may have the power to shape the roles that parents take on as they use digital media together with their child. But these findings also show that this relationship is complicated by other moderating factors, and that a systematic relationship that holds for one group of parents can be flipped in another. This speaks first to the importance of taking a global perspective in understanding how parents and children use technology together, and second, to the importance of modeling JME with nuance, as a number of factors besides the ones we consider here likely shape the path from design decision to parent response.

Conceptions of JME

Scholarly conceptions of JME currently divide these behaviors into "productive" and "unproductive" forms of shared engagement, where productive JME includes, for example, parent-child dialogue around media, and unproductive JME includes, for example, wrestling for control over an interface [43]. But our findings did not always fit neatly into this dichotomy; is a parent's use of a child's hand as a tool to interact with a touchscreen productive or unproductive?

The differences we observed in families' behaviors and perspectives suggests a need to consider the goals that JME serves in different contexts. What might be a productive behavior in one context could be counter-productive in another context, where families' goals are different. If a parent sees media as a tool for helping a child to develop as an independent individual, positive JME experiences will look very different than if a parent sees media as a tool for facilitating shared experiences and reinforcing a child's position within a family unit. We observed parent engagement practices in Taiwan and China that a westerner might view as intrusive or problematic because they undermine the child's autonomy and opportunities for individual growth. But such a conclusion would discount goals like building an interdependent community, reinforcing a hierarchy that the family values, or bonding through shared achievement. Our work suggests that expanding the JME framework to include the variety of goals and values that families hold across cultures would be useful. Designers seeking to promote JME may want to consider not only how their design decisions can influence productive JME, but what productive JME means to their users in the first place.

Prior work has shown that western institutions, like medicine and education, at times embed culturally specific parenting norms into policies that are then imposed on diverse families with non-western conceptions of parenthood and family life [23]. Differing cultural ideologies around community, togetherness, bonding, and wellness can translate into fundamentally different practices around feeding, eating, sleeping, and other core concerns of family life and early childhood. Here, we show the potential for designers to fall into similar cultural silos. Should designers promote JME in which parents hijack children's actions? Are interactions where parents lead children more or less valuable than interactions where parents ask open-ended questions? We do not claim that designers should seek to support any one set of goals, but by understanding the range of goals parents might have, designers will be better positioned to understand how their design decisions are likely to influence behavior.

Limitations and Future Work

There are a number of limitations to the work we describe here. Most importantly, each of our three samples is drawn from a single community and is by no means representative of the larger country or culture in which it is situated. For example, parenting practices have been shown to vary dramatically along racial and socioeconomic lines in the United States [7,17,27], and our results should not be interpreted as representative of JME across the broader U.S. population. All three samples represent middle-class subpopulations and their behaviors should not be considered normative, even within their own communities. It is entirely plausible that a follow-up study examining differences in behavior within a given country would yield differences at least as striking as the ones we observed. We also did not attempt to experimentally validate any of the design factors that we describe, and the links we report between regional groups, design, and behavior are all descriptive and observational. It is entirely possible that other factors we did *not* uncover influence the

relationships we observed. Our results should be interpreted as suggestive guidance for modeling this space experimentally in the future rather than as causal claims.

Our methods introduce potential confounds in that children in the U.S. did not play the two games on the same day, and in all instances, a researcher was present during the study sessions. The researcher's presence may have led to Hawthorne effect confounds, and results may reflect the behaviors parents felt they should perform rather than those they would perform in a more naturalistic setting. Prior work has shown that parent-child interactions in the lab approximate interactions at home and that the presence of an observer does not necessarily alter these behaviors [12]. However, it is still possible that our methods biased participants' actions and our results should be considered at best a partial view into families' behaviors.

The games that we evaluated were created by American developers and included characters that American children [17,27] are likely to be familiar with. Although these brands are global and Sesame Street and Daniel Tiger's Neighborhood are available in other countries, they are not pervasive in China and Taiwan. The structured game also included English prompts, which were more accessible to children in the U.S. and may have prompted differences in the types of support parents provided.

In the future, it would be useful to examine these questions in the context of the development rather than the testing of a product. Using participatory or co-design practices, future studies might solicit design insights from diverse communities and explore how parents and children with different cultural values create products that serve their own ideas of what JME can or should be.

CONCLUSION

We saw that parents' patterns of engaging with technology together with their young child differed across samples drawn from three diverse regions. In all three groups, the design of the interface shaped families' responses, indicating that designers' choices will systematically influence JME. While some of these mechanisms applied across all groups (e.g., all parents displayed more warmth and encouragement when their child was faced with a challenging, goal-directed task), other patterns were inverted (e.g., the roles parents chose to perform in response to each design). Our work suggests a need for a theoretical model of JME that distinguishes goal-directed and goal-free JME. And it indicates that conceptions of productive and unproductive JME will be more complete if they are developed using empirical data from a global user base that reflects the diversity of ways in which families engage in shared life together.

ACKNOWLEDGMENTS

We are grateful to Sesame Workshop for their support and to all of the families who participated in our study. This study was approved by the University of Washington Institutional Review Board.

REFERENCES

[1] Meryl Alper, Vikki S. Katz, and Lynn Schofield Clark. 2016. Researching children, intersectionality, and diversity in the digital age. *Journal of Children and Media* 10, 1: 107–114. https://doi.org/10.1080/17482798.2015.1121886

[2] David S. Arnold, Susan G. O'Leary, Lisa S. Wolff, and Maureen M. Acker. 1993. The Parenting Scale: A measure of dysfunctional parenting in discipline situations. *Psychological Assessment* 5, 2: 137–144. https://doi.org/10.1037/1040-3590.5.2.137

[3] Rafael Ballagas, Thérèse E. Dugan, Glenda Revelle, Koichi Mori, Maria Sandberg, Janet Go, Emily Reardon, and Mir Spasojevic. 2013. Electric agents: fostering sibling joint media engagement through interactive television and augme reality. *Proceedings of the 2013 conference on Computer supported cooperative work*: 225–https://doi.org/10.1145/2441776.2441803

[4] Rahul Banerjee, Andrew J. Ko, Zoran Popovic, Leanne Liu, Kiley Sobel, Caroline Pitt, Kung Jin Lee, Meng Wang, Sijin Chen, Lydia Davison, and Jason C. Yip. 2018. Empowering Families Facing English Literacy Challenges to Jointly Engage in Computer Programming. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*, 1–13. https://doi.org/10.1145/3173574.3174196

[5] Eva Brandt and Eva. 2006. Designing exploratory design games. In *Proceedings of the ninth conference on Participatory design Expanding boundaries in design - PDC '06*, 57. https://doi.org/10.1145/1147261.1147271

[6] Mary E. Bredemeier and Cathy Stein Greenblat. 1981. The Educational Effectiveness of Simulation Games. *Simulation & Games* 12, 3: 307–332. https://doi.org/10.1177/104687818101200304

[7] Gene H. Brody and Douglas L. Flor. 1998. Maternal Resources, Parenting Practices, and Child Competence in Rural, Single-Parent African American Families. *Child Development* 69, 3: 803–816. https://doi.org/10.1111/j.1467-8624.1998.tb06244.x
[8] Suzanne. De Castell and Jennifer Jenson. 2007. *Worlds in play : international perspectives on digital games research*. Peter Lang.
[9] Charissa S. L. Cheah, Christy Y. Y. Leung, Madiha Tahseen, and David Schultz. 2009. Authoritative parenting among immigrant Chinese mothers of preschoolers. *Journal of Family Psychology* 23, 3: 311–320. Retrieved March 20, 2018 from http://psycnet.apa.org/buy/2009-08598-005
[10] Allison DiBianca Fasoli. 2014. To Play or Not to Play: Diverse Motives for Latino and Euro-American Parent-Child Play in a Children's Museum. *Infant and Child Development* 23, 6: 605–621. https://doi.org/10.1002/icd.1867
[11] Robert M Emerson, Rachel I Fretz, and Linda L Shaw. 1995. *Writing Ethnographic Fieldnotes (Chicago Guides to Writing, Editing, and Publishing)*. Retrieved from http://www.amazon.ca/exec/obidos/redirect?tag=citeulike09-20&path=ASIN/0226206815
[12] Frances Gardner. 2000. Methodological Issues in the Direct Observation of Parent–Child Interaction: Do Observational Findings Reflect the Natural Behavior of Participants? *Clinical Child and Family Psychology Review* 3, 3: 185–198. https://doi.org/10.1023/A:1009503409699
[13] Hedwig Gasteiger, Andreas Obersteiner, and Kristina Reiss. 2015. Formal and Informal Learning Environments: Using Games to Support Early Numeracy. In *Describing and Studying Domain-Specific Serious Games*. Springer International Publishing, Cham, 231–250. https://doi.org/10.1007/978-3-319-20276-1_14
[14] Barney Glaser. 1978. Theoretical sensitivity. *Advances in the methodology of grounded theory*.
[15] Barney G Glaser. 1998. *Doing grounded theory: Issues and discussions*. Sociology Press.
[16] Barney G Glaser. 2005. *The grounded theory perspective III: Theoretical coding*. Sociology Press.
[17] Leilani Greening, Laura Stoppelbein, and Aaron Luebbe. 2010. The Moderating Effects of Parenting Styles on African-American and Caucasian Children's Suicidal Behaviors. *Journal of Youth and Adolescence* 39, 4: 357–369. https://doi.org/10.1007/s10964-009-9459-z
[18] Elizabeth A. Gunderson, Sarah J. Gripshover, Carissa Romero, Carol S. Dweck, Susan Goldin-Meadow, and Susan C. Levine. 2013. Parent Praise to 1- to 3-Year-Olds Predicts Children's Motivational Frameworks 5 Years Later. *Child Development* 84, 5: 1526–1541. https://doi.org/10.1111/cdev.12064
[19] Anne C Hargrave and Monique Sénéchal. 2000. A book reading intervention with preschool children who have limited vocabularies: the benefits of regular reading and dialogic reading. *Early Childhood Research Quarterly* 15, 1: 75–90. https://doi.org/10.1016/S0885-2006(99)00038-1
[20] Joseph Henrich, Steven J. Heine, and Ara Norenzayan. 2010. The weirdest people in the world? *Behavioral and Brain Sciences* 33, 2–3: 61–83. https://doi.org/10.1017/S0140525X0999152X
[21] A. Hiniker, B. Lee, J.A. Kientz, and J.S. Radesky. 2018. Let's play! Digital and analog play patterns between preschoolers and parents. In *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3173574.3174233
[22] Lilly C. Irani and Paul Dourish. 2009. Postcolonial interculturality. In *Proceeding of the 2009 international workshop on Intercultural collaboration - IWIC '09*, 249. https://doi.org/10.1145/1499224.1499268
[23] Laura Johnson, Jenny Radesky, and Barry Zuckerman. 2013. Cross-cultural parenting: reflections on autonomy and interdependence. *Pediatrics* 131, 4: 631–3. https://doi.org/10.1542/peds.2012-3451
[24] Marina Krcmar and Drew P. Cingel. 2014. Parent–Child Joint Reading in Traditional and Electronic Formats. *Media Psychology* 17, 3: 262–281. https://doi.org/10.1080/15213269.2013.840243
[25] Leantros Kyriakoullis and Panayiotis Zaphiris. 2016. Culture and HCI: a review of recent cultural studies in HCI and social networks. *Universal Access in the Information Society* 15, 4: 629–642. https://doi.org/10.1007/s10209-015-0445-9
[26] Jennifer L. Miller, Amanda Lossia, Catalina Suarez-Rivera, and Julie Gros-Louis. 2017. Toys that squeak: Toy type impacts quality and quantity of parent–child interactions. *First Language* 37, 6: 630–647. https://doi.org/10.1177/0142723717714947
[27] Gina E. Miranda. 2006. Unequal childhoods: Class, race, and family life. *Children and Youth Services Review 28*, 96–99. https://doi.org/10.1016/j.childyouth.2005.02.002
[28] Catalina Naranjo-Bock and Jennie Ito. 2017. Playing Together. In *Proceedings of the 2017 Conference on Interaction Design and Children - IDC '17*, 749–752. https://doi.org/10.1145/3078072.3081310
[29] Neil Peirce. 2013. Digital Game-based Learning for Early Childhood: A State of the Art Report.
[30] Kavita Philip, Lilly Irani, and Paul Dourish. Postcolonial Computing: A Tactical Survey. https://doi.org/10.1177/0162243910389594
[31] David A. Pierfy. 1977. Comparative Simulation Game Research. *Simulation & Games* 8, 2: 255–268. https://doi.org/10.1177/003755007782006
[32] Christian L. Porter, Craig H. Hart, Chongming Yang, Clyde C. Robinson, Susanne Frost Olsen, Qing Zeng, Joseph A. Olsen, and Shenghua Jin. 2005. A comparative study of child temperament and parenting in Beijing, China and the western United States. *International Journal of Behavioral Development* 29, 6: 541–551. https://doi.org/10.1177/01650250500147402
[33] Thomas G. Power. 1995. Parent—child Play: Evolutionary and Cultural Perspectives. *Psyccritiques* 40, 2: 149–151. https://doi.org/10.1037/003416
[34] Eric E Rasmussen, Autumn Shafer, Malinda J. Colwell, Shawna White, Narissra Punyanunt-Carter, Rebecca L.

Densley, and Holly Wright. 2016. Relation between active mediation, exposure to *Daniel Tiger's Neighborhood* , and US preschoolers' social and emotional development. *Journal of Children and Media* 10, 4: 443–461. https://doi.org/10.1080/17482798.2016.1203806

[35] Katharina Reinecke and Abraham Bernstein. 2011. Improving performance, perceived usability, and aesthetics with culturally adaptive user interfaces. *ACM Transactions on Computer-Human Interaction* 18, 2: 1–29. https://doi.org/10.1145/1970378.1970382

[36] Judy Robertson and Cathrin Howells. 2008. Computer game design: Opportunities for successful learning. *Computers & Education* 50, 2: 559–578. https://doi.org/10.1016/J.COMPEDU.2007.09.020

[37] Gavriel Salomon. 1977. Effects of Encouraging Israeli Mothers to Co-Observe "Sesame Street" with Their Five-Year-Olds. *Child Development* 48, 3: 1146. https://doi.org/10.2307/1128378

[38] Juan Carlos Sanchez-Lozano. Exploratory Digital Games for Advanced Skills. In *Design and Implementation of Educational Games*. IGI Global, 92–107. https://doi.org/10.4018/978-1-61520-781-7.ch007

[39] Yukiko Sawaya, Mahmood Sharif, Nicolas Christin, Ayumu Kubota, Akihiro Nakarai, and Akira Yamada. 2017. Self-Confidence Trumps Knowledge. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 2202–2214. https://doi.org/10.1145/3025453.3025926

[40] Kiley Sobel, Arpita Bhattacharya, Alexis Hiniker, Jin Ha Lee, Julie A. Kientz, and Jason C. Yip. 2017. It wasn't really about the Pokémon. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 1483–1496. https://doi.org/10.1145/3025453.3025761

[41] Anselm Strauss and Juliet M Corbin. 1990. *Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications, Inc.

[42] Christian Sturm, Alice Oh, Sebastian Linxen, Jose Abdelnour Nocera, Susan Dray, and Katharina Reinecke. 2015. How WEIRD is HCI? In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '15*, 2425–2428. https://doi.org/10.1145/2702613.2702656

[43] Lori Takeuchi, Reed Stevens, and others. 2011. The new coviewing: Designing for learning through joint media engagement. In *New York, NY: The Joan Ganz Cooney Center at Sesame Workshop*.

[44] Maja van der Velden. 2013. Decentering Design: Wikipedia and Indigenous Knowledge. *International Journal of Human-Computer Interaction* 29, 4: 308–316. https://doi.org/10.1080/10447318.2013.765768

[45] Susan Wyche, Tawanna R. Dillahunt, Nightingale Simiyu, and Sharon Alaka. 2015. "If god gives me the chance i will design my own phone" In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing - UbiComp '15*, 463–473. https://doi.org/10.1145/2750858.2804249

[46] Svetlana Yarosh, Anthony Tang, Sanika Mokashi, and Gregory D. Abowd. 2013. almost touching: parent-child remote communication using the sharetable system. *Proceedings of the 2013 conference on Computer supported cooperative work*: 181–192. https://doi.org/10.1145/2441776.2441798

[47] Cookie Monster's Challenge Mobile Downloads | PBS KIDS. Retrieved April 19, 2018 from http://pbskids.org/apps/cookie-monsters-challenge.html

[48] Explore Daniel Tiger's Neighborhood Mobile Downloads | PBS KIDS. Retrieved April 19, 2018 from http://pbskids.org/apps/explore-daniel-tigers-neighborhood.html

Received April 2018; revised July 2018; accepted September 2018