Engaging Preschoolers in Food Tasting and Movement Activities Using Mobile Applications

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INTRODUCTION

The ubiquity of mobile devices and their use in daily life create new paths for health promotion interventions, such as promoting healthy behaviors among families.1,2 The preschool years are an important stage of development when children begin displaying independence while still requiring guidance to help them develop healthy eating and physical activity (PA) behaviors.3,4 At the same time, preschoolers are engaging with screens, with 98% of young children having access to digital devices and 42% owning a tablet.5 The increase in the use of technology can pose both challenges and opportunities, particularly for parents who must define time limits and the type of media children access (ie, educational vs entertainment) while also balancing screentime with other activities, such as developing literacy skills (both reading and numeracy), engaging in play (active, dramatic, social, etc), and developing social-emotional skills, all of which are essential for healthy growth and development. Mobile applications (apps) can serve as tools that help parents positively engage with their children and assist them in developing skills needed for optimal development, including eating and movement skills.6 Digital strategies, such as mobile apps, can substitute some of the time spent engaging in entertainment with education about foods and eating while also potentially replacing some sedentary screentime with active screentime, thus, moving children closer to respective recommendations.

The effectiveness of digital strategies for nutrition and PA-related behaviors focused on children is emerging, with 2 recent systematic reviews offering evidence for their potential. First, a review by Zarnowiecki et al,7 suggests that digital efforts promoting nutrition behaviors to parents can achieve small to moderate changes in fruit and vegetable intake and nutrient-poor foods and drinks in children. Secondly, a review examining PA apps designed specifically for preschool-aged children revealed that of the interventions with activities were used, and those that used parent-directed digital interventions alone were ineffective for improving PA.8 These reviews present the promise of using digital applications to improve nutrition and PA behaviors in children.

The HEalthy EnviRONments study (HEROs) was a 6-week intervention with digital strategies to improve preschoolers’ eating and PA behaviors.9 The intervention was implemented with 33 mother-child dyads in 2 cohorts during 2019–2020. Participants were mothers of a child aged 3–5 years who was enrolled in 2 rural Head Start/ preschool centers, serving families with limited resources, and were able to communicate in English. This study was reviewed as an expedited protocol and approved by the Institutional Review Board at Colorado State University. Baseline data revealed that preschoolers exceeded screentime recommendations of <60 min/d (97.8 ± 95.8), were below daily PA recommendations of 60 minutes (13.3 ± 7.6), and less than half (45%) were willing to try new foods when given the opportunity (A. Lieb, unpublished data, 2021). As part of the HEROs intervention, 4 custom mobile apps were developed to enhance behavioral capability (Social Cognitive Theory) of trying new foods and movement skills. During in-person workshops, the apps were introduced to preschoolers on case-protected iPads (Apple, Inc, Cupertino, CA). At the start of the study, each dyad was provided with their study-issued iPad, including the HEROs apps. Parents brought these iPads to each workshop while preschoolers played on other iPads used only in child workshops. This aspect of the HEROs study aimed to assess parents’ subjective quality and perceived behavioral benefits of 4 mobile apps developed to engage preschoolers in trying new foods and PA in the home environment.

HEROS INTERVENTION MOBILE APPS

The 4 HEROs apps—Tasting Party Express, Jungle Gym 1, Jungle Gym 2,
and Spin-n-Move (Figure)—aimed to build food- and movement-based vocabulary, encourage new foods, support the progression of movement skills, and offered opportunities for PA. The apps included 2 animated preschool-aged characters who introduced 10 other characters of 6 colorful monster creatures, intended to be neutral in observable characteristics such as gender and ethnicity/race and 4 preschool-aged characters with diverse characteristics. Although preschoolers were the primary target, parents were also an important audience to support positive parent-child interactions. Pretesting was conducted with preschoolers and parents to assist designers in the number of activities within the apps, duration of app activities, character preferences, visual cues (eg, scenery, colors), and overall acceptability of the apps.\(^\text{10}\)

### Description of the Apps

Tasting Party Express invited children to offer animated characters foods via a drag-and-drop action to build familiarity with food-based vocabulary and encourage trying new foods. The app paired characters’ reactions to the foods with vocabulary that described food tastes (eg, sour), textures (eg, crunchy), and characters’ reactions (eg, mmm) to

<table>
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<th>Activity Selection</th>
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<td><img src="image2" alt="Tasting Party Express Guided Activity" /></td>
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**Figure.** HEalthy EnviRONments (HEROs) intervention mobile applications to encourage preschoolers to try foods and engage in physical activity.
Participant Engagement With the Apps

Each app was introduced to children and parents weekly via parallel program workshops to promote the usage of the apps. In the children’s workshops, led by a researcher, each app was introduced individually in weeks 1–4 by projecting the app on a wall (Jungle Gym 1 and 2 and Spin-n-Go) or giving children individual time to play on the iPad (Tasting Party Express app). In weeks 1–4, researchers went through the app with the children, whereas in weeks 5 and 6, children played the apps of their choosing for 15 minutes. To promote app usage at home, all apps were preloaded on iPads provided to parent-child participants at the start of the study. After each weekly parent workshop (weeks 1–4), participants were provided with a description of the app children were introduced to that week, shown the app’s location on their study-issued iPad, and given guidance on how to use the apps to help their children engage with the apps in the home environment. In weeks 5 and 6, parents were encouraged to continue to co-play the apps with their children, and connections between the apps and behavioral objectives presented in the parent workshops were reiterated. Although the apps were designed to be used by low-technology users (ie, preschoolers), it was important to dually introduce the apps to parents and children to ensure understanding of the platform used in the study (ie, Apple iPads). For parents, demonstrating the apps’ features and purpose provided an awareness of the apps and their contents, whereas for children, the introduction engaged children in fun, silly activities to harness pester power for continued use of the apps at home.

EVALUATION

Parents’ subjective quality and perceived behavioral benefits of the 4 mobile apps to engage preschoolers in trying new foods and PA was assessed postintervention using an 8-item questionnaire with 5-point (7 items) and 3-point (1 item) Likert response options. Items were adapted from the Mobile Application Rating Scale, a reliable tool for assessing the quality of mobile health apps, including 4 items from the app subjective quality section (4 items) and a behavior change question (repeated 4 times for each app) from the app-specific section. Specifically, the questionnaire, administered postintervention (in-person for cohort 1; electronically for cohort 2), inquired about the perceived behavioral benefits of each of the 4 apps in helping children with target behaviors (1, strongly disagree; 5, strongly agree; 4 items), frequency of continued use in the next 12 months (none, 0 times; rare, 1–2 times, low, 3–10 times; moderate, 10–50 times; high, >50 times), likelihood to recommend (1, very unlikely; 5, very likely), rating of each app (1–5 stars) and would you pay for this app (no, maybe, yes).

Twenty-seven parents completed the questionnaire (82% response rate). For perceived behavioral benefits related to food, 63% of parents agreed or strongly agreed (A/SA) that Tasting Party Express was likely to help children try new foods. For perceived behavioral benefits with target PA behaviors, nearly all parents (93%) A/SA that Jungle Gym 1 and 2 were likely to increase their children’s PA. For Spin-n-Move, 77% of parents A/SA that the app was likely to increase PA. The frequency of continued use over the next 12 months of the apps combined varied, with 8% of parents indicating none and rare use, 33% low use, 24% moderate use, and 34% high use. More than 80% of parents reported that they were likely or very likely to recommend each of the apps to others who might benefit. Most parents rated the 4 apps for app rating: 4 stars (35% to 59%) or 5 stars (37% to 42%). A small proportion of parents indicated that they would pay for the apps (11% to 22%).

DISCUSSION AND IMPLICATIONS

Parents’ ratings of subjective quality and perceived behavioral benefits
related to the 4 HEROs apps were high, particularly in the perceived behavioral benefits for children and the likelihood of continued use at home. These findings are consistent with existing evidence that parents are more accepting of children’s technology use when its purpose is educational instead of exclusively for entertainment. Preschoolers are growing up in a rapidly digitizing world, which has implications for their digital literacy given early-life exposures to digital devices. Mobile apps provide opportunities for young children to engage with technology, and considerations of parents’ and preschoolers’ roles and skills in the technology design are critical. Preschoolers need their parents’ assistance to understand the content and monitor the quality of the content to which they are digitally exposed, parents need digital literacy to optimize their children’s learning opportunities, and technology needs to be sufficiently adapted to the specific needs of its audience to foster acceptance.

This interaction between parents and preschoolers is important to understand in developing and evaluating mobile apps. In the HEROs study, the apps were presented to both parent and child participants, with the child as the primary user and the parent as the evaluator. By capturing only parents’ perceptions of the apps, we may not fully understand the app’s acceptability among the primary user (children). For instance, the simplicity of the HEROs apps’ behavioral focus was favorable for preschoolers (eg, repeatedly dragging and dropping foods onto a plate), but may have seemed boring to parents, and thus resulted in a lower perceived rating of the Tasting Party Express app by parents. Ideally, it would be advantageous if preschoolers’ cognitive abilities would allow them to give reliable responses about the app qualities; however, the cognitive abilities of children aged 3–5 years are limited.

The HEROs suite of 4 mobile apps was customized for preschoolers, but parents’ high subjective quality and perceived behavioral benefits of the apps were critical as they are primary gatekeepers in the home environment. These ratings could represent experiences through parent-child interactions or child-only play with the apps. The high ratings of these educational apps from parents support the possibility that mobile apps may help parents promote healthy behaviors that guide new skills and knowledge in fun and engaging ways for young children, which may also help displace sedentary screen time with active screen time.

**NOTES**

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**REFERENCES**


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