

Chapter 12

Smart Phone Video Game Simulation of Parent– Child Interaction: Learning Skills for Effective Vegetable Parenting

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ABSTRACT

Higher levels of vegetable intake have been associated with decreased risks of heart disease, diabetes, stroke, several cancers, and possibly obesity, but vegetable intake is generally low. Preference is an important determinant of vegetable intake, and food preferences are initiated early in life, but parents of preschoolers commonly report difficulties in getting their child to eat, or even taste, vegetables. What parents do to get their child to do something in a specific context (such as eating, homework, or chores) has been labeled “parenting practices.” Based on research on parenting practices (effective and ineffective) related to preschoolers’ vegetable consumption (hereinafter called vegetable parenting), a smart phone application (app) game prototype was developed to help parents of preschool children use effective vegetable parenting practices. This chapter presents the extensive formative research, describes the game app, and explains the behavioral science foundation.

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INTRODUCTION

Child vegetable consumption has been related to a variety of child and adult health outcomes (Andres, Abraham, Appel, & Lampen, 2011; Bendinelli, et al., 2011; Esposito, Kastorini, Panagiotakos, & Giugliano, 2010; Ledoux, Hingle, & Baranowski, 2011). Parents can have an important influence on young children's dietary intake (Birch & Fisher, 2000), but parents of young children commonly report difficulties in getting their child to eat, or even taste, vegetables (Cullen, Baranowski, Rittenberry, & Olvera, 2000). Since the common behavior change methods involving parents (e.g. newsletters, small group discussions) have had weak or no effects (Hingle, O'Connor, Dave, & Baranowski, 2010), innovative intervention procedures are needed both to obtain changes, and to reach larger numbers of parents who may not wish to attend face-to-face education sessions.

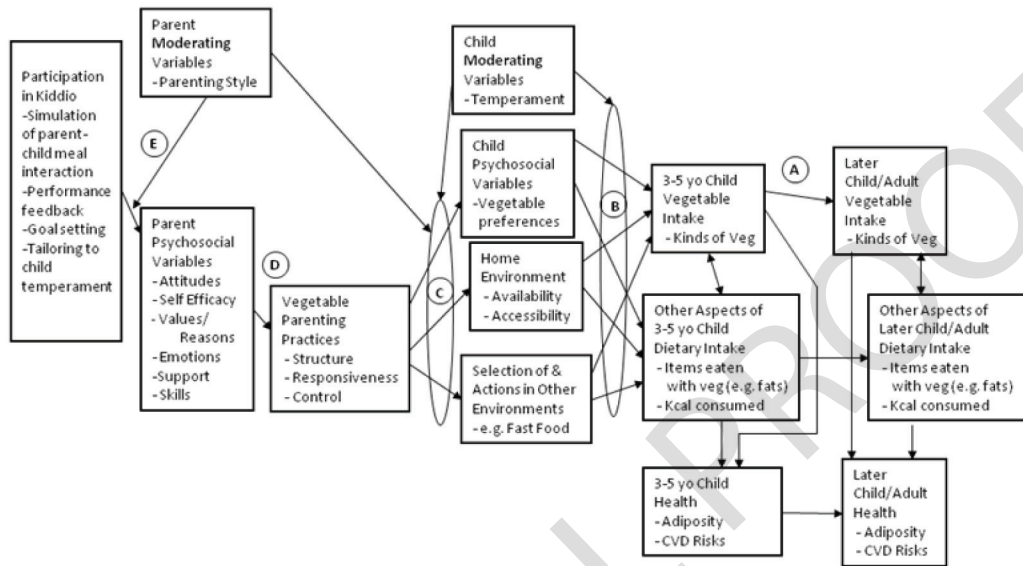
"Serious video games" are an emerging genre which combine behavior change intervention procedures (e.g. goal setting, tailoring, reinforcement in the form of points) with entertainment, to provide an engaging medium which can produce health behavior change (Baranowski, Buday, Thompson, & Baranowski, 2008). Serious video games changed psychosocial constructs related to diet (Peng, 2009); increased fruit and vegetable (FV) intake by one serving/day among 4th grade children (Baranowski, et al., 2003); and motivated 10-12 year old players to significantly improve their diet (Baranowski, et al., 2011). Thus, video games can change diet related behaviors. Video games on smart phones can easily reach large numbers of parents at times convenient to them. Casual video games (i.e. have simple rules and require 10 minutes or less of game play) are particularly appropriate for smart phones.

"Kiddio" is a casual video game played on a smart phone platform to help parents adopt behaviors likely to influence their 3-5 year old (yo) child's short and long term vegetable intake. The mediating-moderating variable model (MMVM)

provides a framework for elucidating the design of an intervention (Baranowski, 2011). Kiddio was designed using a multiple mediation framework (see Figure 1). MMVM assumes strong and causal effects among variables going from left to right. The effects or relationships must be strong and causal at each step, otherwise attempts to change variables earlier in the chains of effects would have no or weak effects on child behaviors and health status (Baranowski, Lin, Wetter, Resnicow, & Hearn, 1997). Moderating variables identify subgroups among those targeted for intervention for whom the relationships depicted in the left to right arrows may vary (Yildirim, et al., 2011).

MMVM logically organizes the design of an intervention. Relationships under A (in Figure 1) indicate that a variety of early child diet and health characteristics influence later childhood and adult diet and health characteristics. For example, children who began eating FV early in life were more likely to eat more FV in later childhood (Coulthard, Harris, & Emmett, 2010), and child dietary intake tracked into the adult years (Craigie, Lake, Kelly, Adamson, & Mathers, 2011; Lake, Mathers, Rugg-Gunn, & Adamson, 2006). Relationships under A also specify that aspects of a young child's dietary intake (e.g. vegetable intake, sodium intake) influence a child's health status/ chronic disease risks. For example, higher vegetable intake has been related to lower risk of diabetes (Esposito, et al., 2010), cardiovascular disease (Bendinelli, et al., 2011), several cancers (Andres, et al., 2011), and possibly obesity/adiposity (Ledoux, et al., 2011) later in life. Overweight or obese children who remained overweight or obese as adults had increased risks of adult type 2 diabetes, hypertension, dyslipidemia, and carotid-artery arteriosclerosis in adulthood (Junonala, et al., 2011). Yet, children are consuming vegetables well below recommended amounts (Baranowski, Smith, et al., 1997), especially preschool children (Fox, Condon, Briefel, Reidy, & Deming, 2010).

Figure 1. A double, sequential mediating, moderative variable model of a video game intervention to influence parenting behaviors to influence child vegetable intake, with resulting effects on immediate and longer term health



The relationships under B (in Figure 1) identify influences on 3-5 yo child diet. Food preferences begin early in life and are a primary determinant of intake (Birch, McPhee, Shoba, Steinberg, & Krehbiel, 1987). Higher levels of home availability and accessibility of vegetables have led to higher child vegetable intake in a number of studies (Jago, Baranowski, & Baranowski, 2007). Alternatively, more frequent visits to fast food establishments have been associated with lower vegetable consumption (Ho, et al., 2010).

Moderating variables influence relationships among other variables. Child temperament is a personality characteristic which differentiates children into three very general types: surgency/extraversion (often considered too active), negative affectivity (who easily show frustration and sadness), and effortful control (who are considered internally controlled) (Rothbart, Ahadi, Hershey, & Fisher, 2001; Sladdens, et al., 2012). Child temperament (Horn, Galloway, Webb, & Gagnon, 2011) may moderate both the selection of parenting

practices (i.e. parents attempt to manage different children in different ways) and the influence of these practices on child behavior. For example, a parent may have to be forceful to influence assurgency/extraversion child, but only have to provide the slightest reprimand to influence an effortful control child.

A conceptual model of family relationships posited that aspects of parenting were a primary determinant of youth health behavior (Kitzman-Ulrich, et al., 2010), suggesting that changes in parenting can have positive impact on child health behaviors. The relationships at C (in Figure 1) concern what parenting practices influence mediating child psychosocial and environment variables. Food “parenting practices” identify categories of specific procedures parents use to maximize the likelihood their child will consume a healthier diet (i.e. effective food parenting practices), or will not (i.e. ineffective food parenting practices) (O’Connor, Hughes, et al., 2010). Food parenting practices influence child behaviors

through some psychosocial aspect of the child (e.g. learned preferences (Birch, et al., 1987)) or the child's food environment (Ho, et al., 2010; Jago, et al., 2007). Parent consumption of fruit (modeling) is a parenting practice that mediated the influence of socioeconomic status on child fruit intake (Rodenburg, Oenema, Kremers, & van de Mheen, 2011).

Research indicates "general parenting", or parenting style, can be conceptualized as an attitude and context in which parents emotionally relate to their child (Baumrind, 1971). Parenting style is often defined across two dimensions: responsiveness and demandingness (Maccoby & Martin, 1983), resulting in four parenting styles: authoritative (high responsiveness and high demandingness), authoritarian (low responsiveness and high demandingness), permissive (high responsiveness and low demandingness), and uninvolved (low responsiveness and low demandingness). Children raised in authoritative parenting homes consumed more vegetables (Sleddens, Gerards, Thijs, de Vries, & Kremers, 2011) and were less likely to be obese (Gerards, Sleddens, Dagnelie, de Vries, & Kremers, 2011; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). General parenting can moderate the influences of parenting practices on child health behavior (Darling & Steinberg, 1993; Sleddens, et al., 2011).

The influences on vegetable parenting practices (relationship D in Figure 1), i.e. why would a parent want to practice effective vegetable parenting practices, are not frequently studied and thereby not well understood. An intervention targeting parenting support increased use of effective food parenting practices and lower child adiposity (Burrows, Warren, & Collins, 2010). An intervention targeting parent skills and confidence (self efficacy) in managing children's dietary behavior resulted in lower body mass index (BMI) z-score and less frequent use of inconsistent or coercive parenting (West, Sanders, Cleghorn, & Davies, 2010). In-depth interviews with parents of 3-5

yo children revealed that their motivations to use effective vegetable parenting practices were adequately captured by variables in the Model of Goal Directed Behavior (MGDB) (e.g. attitudes, social norms, emotions) (Hingle, et al., 2012; Perugini & Bagozzi, 2001). Values, an aspect of the "relatedness" need in Self Determination Theory (Ryan & Deci, 2000), have been associated with behavior (Resnicow, et al., 2002). Basic values have been related to behavior through "reason statements" (i.e. rationales tying the value to a behavior) (Thompson, et al., 2010) and incorporated into serious video games (Baranowski, et al., 2011). Value related reason statements have been proposed as motivational messages to promote effective vegetable parenting practices (Beltran, et al., 2012).

Some parents may need help to learn how to increase their use of effective, and decrease their use of ineffective, food parenting practices. The relationship under E (in Figure 1) concerns the selection and use of intervention principles and procedures. A home visit from a female community health worker (i.e. a promotora) resulted in significant changes two years post intervention on parenting strategies, parental support, and family meals (Ayala, et al., 2010). Simulation of experiences in a low risk environment with feedback has been an effective behavior training procedure (Cook, Erwin, & Triola, 2010; Koonce & Bramble, 1998); and thus, offers an intervention mechanism for helping parents learn parenting skills (Baumrind, 1971). Tailoring (i.e. individualizing an intervention to a characteristic of the targeted individual) has been an effective strategy for changing diet (Enwald & Huotari, 2010).

Different parents may need different types of intervention. For example, parents with a more strict authoritarian style may respond differently to an intervention compared to permissive parents. Little data exist on interventions for parenting styles.

Background: Serious Video Games for Changing Behavior

Nutrition video games are an intervention channel that can incorporate behavior change procedures, have been demonstrated to change dietary intake, and appear to be most effective when based on relevant behavioral theory (Papastergiou, 2009). Video games have been extensively used to increase knowledge (Kirkland, Ulicsak, & Harlington, 2010), but behavior change requires more than increasing knowledge (Contento, et al., 1995). Behavioral theory has been used to guide the design of an action adventure game with at least six hours of game play (Thompson, et al., 2010), but no research has been reported on how to design casual serious games. Alternatively, video games have delivered simulated experiences in a fun, engaging manner, and appear to be most effective when they involved a story (also called a narrative) (Baranowski, et al., 2008). The telling of narratives, any two events arranged in a chronological or causal sequence (Rimmon-Kenan, 2002), is one of the distinctive characteristics of human social groups (Barthes, 1982; Jameson, 1981; Lyotard, 1984), and a basic form of human communication (Fisher, 1985). Narratives have significant impacts on cognition, affect, and possibly health behaviors (Escalas, 2004; Green & Brock, 2000; Kreuter, et al., 2007). Transportation, narrative's unique capacity to immerse a reader in the story (Green, et al., 2000), works across multiple modalities (Kreuter, et al., 2008; Slater, Rouner, & Long, 2006), allows the suspension of disbelief (Coleridge, 1967), translates into vivid personal experiences (Epstein, 1998; Fazio & Zanna, 1981; Green, 2006), and helps create deep affection for game characters (Oatley, 2002; Polichak & Gerrig, 2002). For example, "Escape from Diab" is a serious video game attempting to change child diet and physical activity behaviors to prevent obesity. It tells the story about DeeJay, an athletic boy who accidentally falls into a nightmarish world called Diab, where he and his newly found

friends must escape by adopting a healthier lifestyle. Engaging plots were created throughout its 9-episode gameplay. After the opening episode, each subsequent episode started with the resolution of the cliffhanger scene from the end of the previous episode. Narrative transportation, or story immersion, in Diab correlated significantly with several health outcome variables (Lu, Thompson, Baranowski, Buday, & Baranowski, 2012). The similarity of the phenotypic characteristics between the protagonist and the child players may have enhanced the level of immersion (Lu, Thompson, et al., 2012).

Narratives could also foster strong intrinsic motivation (which influences behavior (Ryan, et al., 2000)) to play video games by reducing cognitive load (Forrester, 1996; Pillay, 2002); engendering attention (Slater, 2002), and character identification (Cohen, 2001); absorbing players in an immersive fictional world (Lu, Baranowski, Thompson, & Buday, 2012; McLellan, 1993); and facilitating change being perceived as necessary (Laurillard, 1998; Mandler & DeForest, 1979; Plowman, 1992). Narratives also provide intriguing incentives for players, who as characters in a game feel encouraged to perform behaviors to seek narrative closure (Carroll, 2007). Well-constructed immersive narratives encourage active audience participation (Cruz, 2008). While narratives have been investigated in violent video games (Hartmann & Vorderer, 2010; Lee, Park, Jin, & Kang, 2005; Schneider, Lang, Shin, & Bradley, 2004; B. P. Smith & Vorderer, 2006; S. L. Smith, Lachlan, & Tamborini, 2003), narratives also offer a pathway for change of health behaviors (Baranowski, et al., 2008). Thus, a video game attempting to influence parenting of preschoolers would benefit from an interesting story with characters attractive to parents of young children.

Performance feedback with goal setting is a critical component of adult learning (Sachdeva, 1996), and can be woven into game play narratives. Video games for parents that simulate interactions with a child using a narrative, with feedback on pa-

rental performance, and goal setting for changing parenting practices, may elicit desirable cognitive, affective, and behavioral outcomes.

Based on operant theory (Shahan, 2010), “gamification” has been applied to changing a variety of behaviors and has become a common marketing tool (Bunchball, 2010). Gamification involves points, levels, challenges (goals that lead to “achievements” which can be rewarded), virtual goods, competition, and leader boards, and enables players to satisfy desires for reward, status, achievement, self-expression, competition and altruism (Bunchball, 2010). Tailoring (individualizing) messages can also be implemented within video games and has been shown to enhance behavior change by providing more personally relevant messages, that are more likely to be attended (Noar, Harrington, Van Stee, & Aldrich, 2011). Since the average game player is 37 years old (Education Software Association, 2011), a casual video game focused on effective vegetable parenting practices with tailored feedback messages should be attractive to parents of 3-5 yo children (almost all of whom will be in the game player age range). A prototype video game, Kiddio-Episode 1: Food Fight, simulates parent-child feeding interactions (for parents of 3-5 yo children) with a narrative, performance feedback and goal setting, thereby helping parents use effective vegetable parenting practices to get their child to taste a vegetable (one of 24 barriers parents reported facing to get their child to eat vegetables (Hughes & Shewchuk, 2012)).

MAIN FOCUS OF THE CHAPTER

Issues, Controversies, Problems

While the conceptual rationale for using casual video games to change vegetable parenting practices is strong, many details needed to be addressed. Extensive formative research was conducted, including: specifying effective and ineffective

vegetable parenting practices; testing these parenting practices in a family based behavior change intervention; assessing the feasibility of a smart phone app with parents; testing alternative story lines with parents; testing a single item measure of child temperament; creating one episode of Kiddio-Episode 1: Food Fight; and alpha testing the prototype with prospective users.

Solutions and Recommendations

Three of our research studies were informative for specifying the effective and ineffective vegetable parenting priorities for inclusion in Kiddio.

Fruit and Vegetable (FV) Parenting Practices in Houston and Rural Alabama

Thirty-three FV parenting practices were identified among Head Start parents (O'Connor, Hughes, et al., 2010) organized into factors and clusters. The non-directive food parenting cluster (i.e. used more home availability and teachable moments, and less firm discipline) was positively associated with children's FV intake, even after controlling for other characteristics (O'Connor, Hughes, et al., 2010). This study was also the source of the 24 problems parents faced in getting their child to eat FV (Hughes, et al., 2012).

International Survey of FV Parenting Practices

Because health professionals and dietetics practitioners work with parents to increase children's FV intake, they were invited to assess the 39 FV parenting practices (an enhanced list from O'Connor, et al. 2010). Professionals (researchers and providers) from six countries (to cover diverse English and Spanish speaking cultures) were contacted to determine their opinions of whether these FV parenting practices posed any risk of adverse emotional or behavioral conse-

quences to the preschool child, and were likely to lead to shorter and/or longer term child FV intake (O'Connor, Watson, et al., 2010). A total of 889 participants (55% United States, 22.6% Mexico, 10.9% Australia, 4.4% Spain, 3.3% Chile, 2.2% United Kingdom, and 1.6% other countries) completed the survey. The FV parenting practices items were categorized into three dimensions (structure, responsiveness, and control) based on parenting theory, and dichotomized as effective or ineffective based on professional perceptions. FV parenting practices that provided external control were perceived as ineffective or counterproductive, whereas practices that provided structure, nondirective control, and responsiveness, were perceived as effective in getting preschool-aged children to consume FV (O'Connor, Watson, et al., 2010). These FV parenting practices were targeted for change in the casual game.

Helping Hand: Obesity Prevention through Parenting Practices in Pediatric Primary Care

Helping HAND was an obesity intervention for 5-8 yo children in primary care clinics emphasizing changing parenting practices. A 6-month randomized controlled pilot study of Helping HAND targeted children with a BMI between the 85-99th percentiles, and their parents. Intervention Group parents attended monthly sessions and self selected child behaviors and parenting practices to change. The pilot study demonstrated that Helping HAND change procedures (e.g. goal setting) resulted in clinically relevant improvements in the parenting practices used in the casual game (O'Connor, Hilmers, Watson, Baranowski, & Giardino, 2011).

Two formative studies were conducted to refine mediators of the intervention's influences on parenting practices.

Values and Behavior Reasons

We generated and tested parents' understanding of values and associated reason statements to encourage effective vegetable parenting practices (Beltran, et al., 2011). Using a cross-sectional design, 16 parents from different ethnic groups (African American, white and Hispanic) living with a 3-5 yo child were recruited. Interested parents were directed to a website where they provided screening information and informed consent. Two types of telephone interviews were conducted: semi-structured intensive interviews (to assess prevalence of values and reasons) and cognitive interviews (to assess wording in reasons statements). The most common values were religion/spirituality, family, and health, which were invariant across parent ethnicity. Parent responses enabled rephrasing of statements that were not well understood, and the lists of values and reasons statements were increased to cover the spectrum cited by parents. These values and reasons statements were used to tailor intrinsic motivational messages for effective vegetable parenting practices (Beltran, et al., 2011).

Story/Narrative

To identify the most preferred narrative for Kiddio (to connect all the expected 25 episodes), we created three different stories: 1) an "app" providing suggestions for the parent's child (i.e. no narrative); 2) a good friend, named Dottie, providing helpful suggestions; and 3) an alien space ship beaming up the parent and child, and providing analysis of their relationship. Participants (15 parents of preschoolers: five from African American, Hispanic, and white) clearly preferred getting advice from a good friend (i.e. Dottie in the Kiddio app).

Abbreviated Measures of Child Temperament

To create a child character that would behave similarly to the game player's preschool child, the player needed to specify their child's temperament. Since employing a 36-item questionnaire (the length of the "very short form" of the Children's Behavior Questionnaire (Putnam & Rothbart, 2006)) to assess the child's temperament on three dimensions would detract from immersive gameplay, we created three statements that embodied the three major temperament dimensions measured (Sleddens, et al., 2012). The three temperament dimensions and corresponding descriptive statements included: 1) this child has lots of energy, is easily excited, and often goes fast on the playground; this child enjoys meeting new people and going to new places (Surgency/Extraversion child); 2) this child often shows their frustration or discomfort, and easily becomes sad when not able to finish a project; this child is often afraid of the dark, and when upset may be difficult to calm down (Negative Affectivity child); and 3) this child likes to listen to rhymes and songs; when working on a project this child can concentrate deeply and carefully follows rules and instructions; and when something changes, this child quickly notices (Effortful Control child). To validate these three temperament statements, 237 parents completed the 36-item questionnaire in an on-line survey and then selected one of the three statements to best describe their child. The single-item three-response category temperament measurement scale correlated with the three dimensions from the 36 item questionnaire as expected (Sleddens, et al., 2012), thereby validating this simplified approach to identify dominant child temperament for use in a simulation video game.

Description of Kiddio-Episode 1: Food Fight

Kiddio-Episode 1: Food Fight is a "casual" video game (i.e. a session is 10-min or less) offered as a mobile phone app played on a smart phone targeted by parents of 3 to 5 yo children. The vegetable parenting problem addressed by this episode is getting Kiddio (a 3-5 yo child) to taste a vegetable at home. The player selects the child's gender, identifies the child's temperament (using the empirically validated procedure described earlier), and selects her personal value and reason for getting Kiddio to taste vegetables (used later as a motivation statement) (Beltran, et al., 2011). The narrative tells how Dottie, a close friend of the player's, has a slightly older child of the same temperament. Dottie has faced and learned to overcome, many of the same challenges in getting her child to taste vegetables, and, thereby, can help the player get her child to taste the vegetable. The player communicates with and gets feedback from Dottie. As problems are encountered, the player can ask Dottie for guidance. See Figure 2 for a frame in which Dottie asks the player to specify her most important value.

Episode 1: Player calls Kiddio to dinner from the backyard (see Figure 3). When the player offers a vegetable (selected from among several), Kiddio refuses (see Figure 4).

The facial features and intensity of the refusal vary by Kiddio's temperament, attempting to replicate the player's experience with her child. The player is offered a selection of vegetable parenting statements or manipulations of the environment (i.e. turning off the TV, taking the toys off the table, using a time out) to control the situation and to encourage the child to taste the vegetable (see Figure 5).

Figure 2. Dottie asks player to specify most important value from a side scrolling list (Archimage, Inc., used with permission)

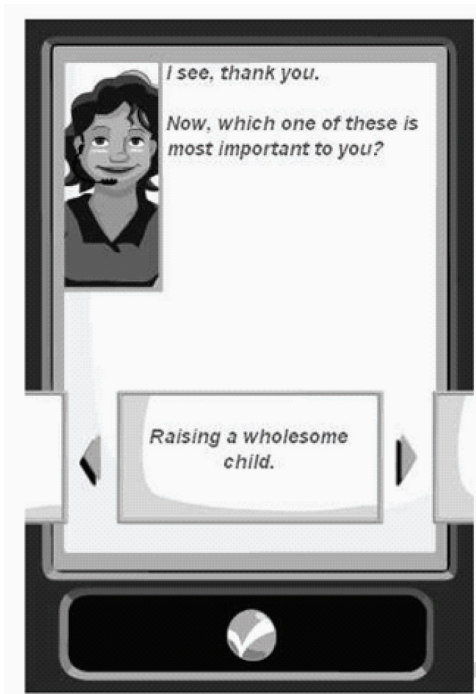


Figure 3. Player calls Kiddio in from playing in the backyard (Archimage, Inc., used with permission)



The player starts the game at the midpoint of seven stages. Effective vegetable parenting selections move the player one stage closer to a win, i.e. getting the child to taste the vegetable (three stages from neutral to a win). Ineffective parenting selections move the player one stage closer to a loss (three stages from neutral to a loss). Combinations of effective and ineffective selections move the player up and down the seven stages. The player is allowed two minutes to win the game (i.e., move to the win position at the positive end of the seven stages). A win is rewarded with Kiddio tasting the vegetable (see Figure 6). A loss is capped by an abrupt end, Kiddio crying, throwing a tantrum, or running out the door into the backyard (depending on her child's temperament).

Immediate visual feedback to the player on their parenting choices is delivered by the facial and physical reactions of Kiddio to the parenting

selection. Feedback at the end of the episode (based on self-regulated learning (Butler & Winnie, 1995) and adult education theory (Sachdeva, 1996)) is brief and provided in "Oreo" fashion: i.e. a statement on parenting practices needing improvement, sandwiched between two positive statements, and identifies the parenting principle underlying the selected statements.

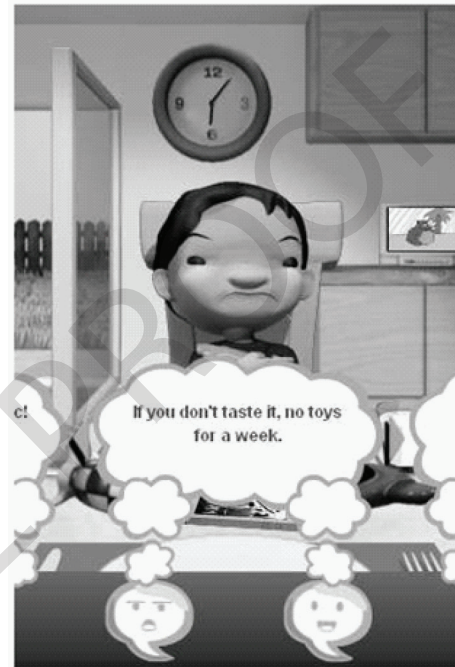
At the end of feedback, the parent is offered the opportunity to play the episode again, or set a goal to implement one of the effective vegetable parenting practices with their real child at home. Setting a goal and making an action plan entails selecting a parenting practice to change, and a day, meal, the vegetable and how much of the vegetable to be consumed on that occasion. To "automate" the goal attainment process (Hassin, Bargh, & Zimerman, 2009), the parent is asked to identify what problem or barrier (from a menu) is likely to occur, and then asked to select a solution (from a menu) that might best enable them to

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Figure 4. Child refuses initial offering of a vegetable (Archimage, Inc., used with permission)



Figure 5. The parent is offered parenting practice statements from a side scrolling list; this is an example of an ineffective parenting practice statement (Archimage, Inc., used with permission)



overcome that problem (also called a coping plan). At the end of goal setting the parent receives their previously selected reason statement (Beltran, et al., 2012) from Dottie as a motivational message to try that vegetable parenting practice.

When the parent returns to play the game after a goal was set, they are asked to report whether they were successful, or not, in getting their child to taste the vegetable. Success is greeted with congratulations from Dottie. Failure is greeted with empathy from Dottie, and questions on whether the parent faced the previously identified problem when attempting the goal. “Oreo” feedback is again provided, followed by an offer to play another episode of the game. It is expected that players will play the same episode multiple times, since each play will be a somewhat new experience leading to learning. Some players, who compete against themselves, will likely play an episode multiple times to do better on each play

of the episode. The player can elect to see their position on a leader board at the end of a game, but not required to do so.

Only methods directly involving parents over longer periods have been shown to effectively engage parents in child dietary change programs (Hingle, et al., 2010). Thus, playing one episode cannot be expected to lead to change in the player’s vegetable parenting practices. However, playing 25 episodes, each multiple times, over several months with real life feedback after attempting and hopefully implementing effective vegetable parenting principles at home, should positively impact vegetable parenting practices and child’s vegetable consumption. The 25 Kiddio episodes will be organized into five levels of difficulty (five episodes per level of difficulty). Each level of difficulty will be in a different location where

eating occurs (e.g. Level 1: at home; level 2: at a grocery store; level 3: in a car; level 4: at grandma's home; level 5: at a fast food restaurant) to sample issues in vegetable parenting practices. Each level of difficulty will present different temptations for the child (e.g. tasty non-vegetable offerings) and barriers to effective vegetable parenting practices (e.g. an indulgent grandparent saying it's not necessary to eat vegetables at their house). For episode 1, within level 1, the player can win by selecting effective vegetable parenting practices within a two-minute interval. For episode 2, the player wins by selecting effective vegetable parenting practices from another set of possible vegetable parenting practices, but also must turn off the TV within a two-minute interval. For episode 3, the player wins by selecting effective vegetable parenting practices from another set of possible vegetable parenting practices, but also must turn off the TV and remove the toys from the table.

Alpha Testing of Kiddio-Episode 1: Food Fight

A preliminary version of Kiddio-Episode 1: Food Fight was tested with parents of 3-5 yo children (six African-American, five Hispanic, five white). The sample was equally divided between those reporting being frequent video game players, versus not. Each parent played the game at least three times in sequence, and then completed an intensive qualitative interview covering all aspects of game play. Most parents reported they enjoyed playing the game, felt the Kiddio character was like their child, and felt they learned important new ways of encouraging their child to taste vegetables, and perhaps enhanced other domains of parenting (e.g. general parenting) (Beltran, et al., 2012). They said they would play such a game if more episodes were offered; had multiple levels of difficulty; and performance feedback was provided. There were no differences in comments by ethnic group of the parents. Parent feedback will help revise our original approach: i.e. need for feedback during

Figure 6. Child responds to a player "win" by tasting the vegetable offered



and right after the game (but the parents did not want detailed feedback on a web page); need for more detailed Kiddio facial expressions to provide enhanced feedback during game play; need to use a real voice for parent statements (rather than text bubbles with a horn sound simulating verbal tone, similar to the tone used to represent "mother" in Charlie Brown TV shows); an interactive tutorial that explains options of strategically important game play mechanisms; need to abbreviate the values and reasons statements; and an unnoticed performance bar could be eliminated. A revised "lite" version of Kiddio-Episode 1: Food Fight will be commercially released as a mobile app to elicit feedback from a broad group of players.

FUTURE RESEARCH DIRECTIONS

Twenty-five episodes across five levels of difficulty of Kiddio are planned. Five different

problems that parents commonly face in getting their child to eat vegetables in each environment (Hughes, et al., 2012) will be targeted within each game level.

CONCLUSION

Kiddio is innovative as a behavior change intervention targeting parents for better child outcomes. Video games are an engaging technology that captures player's attention, into which theory based behavior change procedures can be inserted to maximize effect. There are no video games for training parents in effective vegetable parenting practices. While simulations have influenced medical care practices (Sachdeva, 1996), no simulation of parent-child interactions have been reported. We are in the early stages of learning how to design video games in general, and simulation games in particular, to be maximally effective in promoting health behavior change. What will be learned can be used to generate an even more effective second generation simulation video game for parenting behavior change, and even extended to other domains (e.g. general parenting). The smart phone parenting app could be easily, inexpensively, and widely distributed to large numbers of parents to maximize its public health effect. These are important innovations to advance intervention design using video games, promote change in effective parenting, and possibly increase child vegetable intake, or even decrease child obesity.

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KEY TERMS AND DEFINITIONS

Casual Video Game: Game that can be played on a cell phone in 10 minutes or less

Formative Research: Research conducted to inform the design and function of a product

Parenting Practices: Behaviors used by a parent of a child to influence a specific child behavior

Reasons: Beliefs that are justifications for action, linked to the values

Simulation: Creation of an experience that has key elements of a real world experience, from which one can learn, but not be exposed to risk

Temperament: Aspects of personality (i.e. general emotional, attitudinal and behavioral response patterns)

Values: Ideas that identify broad preferences concerning appropriate courses of action, reflecting a deep inner sense of right, wrong, or “ought”