ASSESSING FUN IN SERIOUS GAMES: FORMATIVE EVALUATION OF GAMES FROM TWO DIABETES PREVENTION INTERVENTIONS

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DEDICATION

This thesis is dedicated to my husband and my parents who have supported me throughout.

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THESIS

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ASSESSING FUN IN SERIOUS GAMES: FORMATIVE EVALUATION OF GAMES FROM TWO DIABETES PREVENTION INTERVENTIONS

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Purpose: To determine the usability of two video games to prevent type 2 diabetes and obesity among youth through analysis of data collected during alpha-testing.

Subjects: Ten children aged 9 to 12 were selected for three 2-hour alpha testing sessions.

*Methods: "*Escape from Diab" and "Nanoswarm" were designed to change dietary and physical inactivity behaviors, based on a theoretical framework of mediating variables obtained from social cognitive theory, self-determination theory, elaboration likelihood model, and behavioral inoculation theory. Thirteen mini-games developed by the software company were divided into 3 groups based on completion date. Children tested 4-5 mini-games in each of three sessions. Observed game play was followed by a scripted interview. Results from observation forms and interview transcripts were tabulated and coded to determine usability. Suggestions for game modifications were delivered to the software design firm, and a follow-up table reports rationale for inclusion or exclusion of such modifications.

Results: Participants were 50% frequent video game players and 20% non game-players. Most (60%) were female. The mean grade (indicating likeability as a subset of

usability) across all games given by children was significantly greater than a neutral grade of 80% (89%, $p < 0.01$)) indicating a positive likeability score. The games on average also received positive ratings for fun, helpfulness of instructions and length compared to neutral values (midpoint on likert scales) (all $p < 0.01$). Observation notes indicated that participants paid attention to the instructions, did not appear to have much difficulty with the games, and were "not frustrated", "not bored", "very engaged", "not fidgety" and "very calm" (all $p < 0.01$). The primary issues noted in observations and interviews were unclear instructions and unclear purpose of some games. Player suggestions primarily involved ways to make on screen cues more visible or noticeable, instructions more clear, and games more elaborate or difficult.

Conclusions: The present study highlights the importance of alpha testing video game components for usability prior to completion to enhance usability and likeability. Results indicate that creating clear instructions, making peripheral screen cues more eye-catching or noticeable, and vigorously stating the purpose of the game to improve understandability are important elements. However, future interventions will each present unique materials and user-interfaces and should therefore also be thoroughly alpha-tested.

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RESEARCH GOAL

This study is the secondary analysis of a previously collected data set to determine the usability of two video games to prevent type 2 diabetes and obesity among youth. The study examines the results of qualitative and quantitative data gathered during three rounds of alpha-testing of the interventions, as well as reporting the game refinement outcomes that occurred as a result of this research. The primary focus of the study is to examine the usability of the games through observed game-play and structured interviews with a sample of 10 middle school students. Thirteen game components were evaluated through testing of three sets of mini-games selected from the two video games interventions.

INTRODUCTION AND PUBLIC HEALTH SIGNIFICANCE

Type II Diabetes in Youth as a Public Health Problem

The occurrence of type 2 diabetes mellitus in children and adolescents is increasing at an alarming rate (Callahan & Mansfield, 2000) (Hussain, Claussen, Ramachandran, & Williams, 2007). Incidence of type 2 diabetes has risen from 2-4% of all diabetes cases to 30-45% over the past decade (Quarry-Horn, Evans, & Kerrigan, 2003). While type 2 diabetes was historically considered an adult-onset disease, usually appearing after the age of 30 with the average duration of hyperglycemia prior to diagnosis lasting 8 to 10 years, adolescents now display the fastest growing incidence of type 2 diabetes, with the average adolescent at just 13.5 years old at time of diagnosis (Quarry-Horn et al., 2003). African American, Hispanic American, Native American, and Asian American youths are at elevated risk of developing type 2 diabetes in childhood. Over the course of the decade, the

number of African American children aged 10-19 who were diagnosed, increased 10-fold from 0.7 per 100,000 in 1984 to 7.2 per 100,000 in 1994. Between 1990 and 1994, the prevalence rate of type 2 diabetes among Hispanics youths (0 to 17) was 45 per 1,000. With half of the nation's adolescents projected to be part of a minority group by the year 2030, the risk continues to increase (Quarry-Horn et al., 2003). As these children become adults over the next several decades, diabetes is poised to become epidemic with the WHO predicting as many as 200-300 million worldwide cases by the year 2025 (Hussain et al., 2007).

As the prevalence of type 2 diabetes rises among children, so does the concern that they will develop complications at far younger ages (Quarry-Horn et al., 2003). Already, among young adults who developed type 2 diabetes as children, a high prevalence of microvascular and macrovascular complications has been observed (Fagot-Campagna, 2000). Living complications of diabetes can include eye, kidney, heart and nerve diseases, blindness, end stage renal failure, and amputations. Diabetics are at four times the risk for heart attack and stroke (Quarry-Horn et al., 2003). Diabetes ranked 6th among leading causes of death based on the U.S. death certificate report in 2002, revealing the severity of the condition (Hussain et al., 2007). Apart from the physical consequences of diabetes, there are also financial consequences. While annual costs for medical care related to diabetes mellitus and its complications already exceeds $100 billion, this number is expected to radically increase as today's teenagers become young adults (Quarry-Horn et al., 2003).

Risk factors for type 2 diabetes, include race/ethnicity, family history, pubertal age, genetic predisposition, insulin resistance, and being overweight (Fagot-Campagna, 2000) (Quarry-Horn et al., 2003). Obesity is the only one of these risk factors

that can be altered and thus is a prime target for an intervention to prevent this disease. Obesity, however, remains a rapidly increasing health problem in the U.S.

Pediatric Overweight in the US

The common referral to the U.S. childhood obesity problem as an "epidemic" is supported by recent data from the National Health and Nutrition Examination Survey (NHANES) showing a dramatic and continuing increase in overweight among this population. NHANES data uses the gender specific BMI-for-age growth charts created by the Centers for Disease Control to define overweight (Ogden et al., 2006). Because a child's weight changes rapidly as they grow, BMI-for-age is used instead of simply BMI. A BMI-for-age of greater than or equal to 95th percentile is considered "Overweight" for children, ages 2-19, and BMI-for-age between the 85th percentile and the 95th percentile is considered "At Risk of Overweight" (Ogden et al., 2006). The prevalence of overweight among children and adolescents (ages 6-19), as calculated from past results of the NHANES, shows that from the NHANES 1971-1974 to the NHANES 2003-2004, the percentage of children aged 6-11 considered overweight has grown from 4% to 18.8%, while the prevalence among adolescents aged 12-19 has increased from 6.1% to 17.4% (Ogden, Flegal, Carroll, & Johnson, 2002) (Ogden et al., 2006). This tripling of overweight among youths is a cause for concern, particularly when it is noted that obese children are likely to become obese adults, perpetuating the vicious cycle. One study showed that 75% of children aged 10-14 years found to be obese or very obese, were obese adults at 25 years of age (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

The severity of the obesity epidemic is one of the most important health issues the U.S. is facing, exemplified by its selection as a Leading Health Indicator of the Healthy People 2010 (U.S. Department of Health and Human Services, November 2000). The Healthy People 2010 initiative lays a foundation of 467 objectives broken down by 28 focus areas encompassing all realms of human health, additionally selecting 10 Leading Health Indicator which represent the primary public concerns of the nation. The Healthy People 2010 initiative has 18 objectives dealing with improving nutrition and overweight, and another 15 objectives aimed at improving physical activity and fitness, substantiation of the Nation's drive to decrease levels of obesity.

"Objective 19-3: To reduce the number of overweight or obese children from a baseline of 11% (from NHANES 1988-94) to a target of 5%" (Neumark-Sztainer, Story, Hannan, & Croll, 2002) (U.S. Department of Health and Human Services, November 2000).

Unfortunately, by comparing baseline numbers to more recent trends, it becomes apparent that the U.S. has moved away from the targets of the Healthy People 2010 initiative, instead of towards them (Neumark-Sztainer et al., 2002).

This increased incidence of overweight does not come without consequence. The risk of having high fasting blood insulin levels, a risk factor for type 2 diabetes, is 12.6 times greater for overweight children than normal weight children (Freedman, Dietz, Srinivasan, & Berenson, 1999). Thus, considering this strong parallel between obesity and diabetes (Callahan & Mansfield, 2000) (Hussain et al., 2007) (Quarry-Horn et al., 2003), the complications of diabetes could become problematic for the overweight population.

However, early detection and intervention can help delay or avoid type 2 diabetes and its consequences indicating the importance of prevention (Quarry-Horn et al., 2003).

Behavioral Factors Influencing Childhood Adiposity

When attempting to prevent diabetes by intervening on child weight, one must consider the factors that contribute to childhood overweight. Both dietary habits and physical activity have a relationship with weight status (Hussain et al., 2007) (Quarry-Horn et al., 2003).

Dietary Habits

Excessive energy intake contributes to adiposity. Factors contributing to this excessive intake of calories include poor food choices, increased portion sizes, sweetened beverages, excess snacking and fast food consumption (Quarry-Horn et al., 2003). Current child and adolescent diets also do not include enough fruits and vegetables (Quarry-Horn et al., 2003). Diets high in fruit and vegetable intake are associated with lower risk of obesity (Haire-Joshu et al.). This association also applies specifically to child weight status. Several studies have shown that children who eat at least 5 servings of fruits or vegetables per day were less likely to be overweight or obese than those who did not (Shields, 2006) (Aranceta et al., 2007). Studies have also shown that increasing fruit and vegetable consumption in children can demonstrate a greater decrease in overweight or BMI than can be demonstrated by decreasing high energy-dense foods (Epstein, Paluch, Beecher, & Roemmich, 2008) (Epstein et al., 2001).

Over the past few decades, daily caloric intake has increased by 150-300 kcal, with roughly 50% of this increase due to consumption of sweetened beverages (Popkin et al.,

2006). Soft drinks comprise the primary source of added sugar in adolescents' diet, with each serving of sweetened beverage significantly increasing the risk of overweight in this age group (Quarry-Horn et al., 2003). The Beverage Guidance System developed by the Beverage Guidance Panel in the US recommends significantly reduced intake of calorically sweetened beverages, while promoting water as the number one beverage choice, encouraging 20-50 fluid ounces of water per day (with additional fluid intake from food and other beverage sources) (Popkin et al., 2006). A study of data from the National Health and Nutrition Examination Survey (NHANES) 1999 to 2001 showed that water consumers drank fewer soft drinks and fruit drinks than their counterparts and consumed 194 fewer calories per day (Popkin, Barclay, & Nielsen, 2005). Thus the introduction of sufficient water consumption into adolescents' dietary habits could impact caloric intake and thus impact adiposity.

Activity

Being physically active (e.g. sport activity ≥ 2 days per week) has been shown to protect against overweight in young children while low physical activity levels (such as spending ≥ 3 hours per day watching TV) increased the risk for obesity (Aranceta et al., 2007) (Kirk, Scott, & Daniels, 2005) (Hussain et al., 2007). However, over one third of students in grades 9 through 12 do not regularly participate in vigorous physical activity (Department of Health and Human Services, 2006). Additionally, participation in daily physical education classes in schools had declined from 42% in 1991 to 29% in 1999 (Quarry-Horn et al., 2003). Meanwhile, physical activity interventions have been shown to

be successful in reducing both visceral fat and total adiposity among obese adolescents (Hussain et al., 2007).

Just as evident as the need to promote physical activity is the need to reduce physical inactivity. Screen time, including television, computer use, and video games, has been positively correlated with the likelihood of being overweight (Shields, 2006) When it comes to television, multiple studies have shown a direct positive association between number of hours spent watching television and prevalence of overweight in children (Quarry-Horn et al., 2003) (Aranceta et al., 2007). In one study with low-income Native Canadians, five or more hours of television viewing per day was associated with a greater risk of overweight than two hours of television viewing or less per day(Hanley et al., 2000). While physical activity has decreased, these sedentary behaviors are increasing in the youth population allowing possibility for even greater risk of obesity. Fifty-three percent of US children now have television sets in their bedrooms, and 26% of children aged 8 to 16 watch four hours or more of television daily (Quarry-Horn et al., 2003). The Kaiser Family Foundation (2005) reports that 8 to 18 year olds use media an average of 6 hours and 21 minutes per day (Rideout, Roberts, & Foehr, 2005). This includes exposure to over 3 hours of television viewing, 1 hour 11 minutes of movie/video/DVD viewing, 1 hour 44 minutes of audio media, over 1 hour of computer time, and 49 minutes of video game time (multitasking allows for some of these media to be experienced at the same time) (Rideout et al., 2005). Reduction of physical inactivity has been shown to be an effective component of youth weight loss interventions (Fulton, McGuire, Caspersen, & Dietz, 2001). In summary, the literature suggests that decreasing physical inactivity, increasing physical activity, and

making dietary modifications such as increasing consumption of fruits and vegetables, and water, may decrease children's risk of becoming overweight.

Role of Theory

In order to develop an effective intervention to modify diet and activity behaviors, research has shown that use of behavior change theory is highly valuable (Hochbaum, Sorenson, & Lorig, 1992) (Jackson, 1997). Behavioral theories provide information on why people behave the way they do and how to modify this behavior, and it is beneficial to take advantage of this information when developing a program. Additionally, theory assists program developers in creating cohesive and comprehensive interventions by providing guidelines for the formation of program goals and components (Hochbaum et al., 1992) (Jackson, 1997). Several theories that have shown promise in changing behavior include: Social Cognitive Theory (SCT) (Bandura, 2004), Self Determination Theory (SDT) (Ryan & Deci, 2000), Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986a), and Behavioral Inoculation Theory (BIT) (McGuire, 1961). While alone each provides insight into limited aspects of behavior change, together they provide a more comprehensive framework within which to develop a behavior change intervention.

Social Cognitive Theory

The social cognitive theory (SCT), created by Alfred Bandura and named as such in 1986 (Bandura, 2004), appears to be a prolific choice for a theory-based obesity prevention intervention based on literature (Baranowski, Perry, & Parcel, 2002). SCT is very flexible because of its many constructs. Core determinants of SCT related to promotion of healthy behaviors include: *knowledge* of health practices and risks, *perceived self-efficacy* or

confidence that one can perform the health behavior, self-regulatory skills such as *problem solving* and *goal setting* and specific strategies to realize these goals, and perceived environmental facilitators and impediments to making health behavior changes (Bandura, 2004). Additionally, SCT cites *modeling* as a method to increase knowledge and skills, which could then in turn enhance self-efficacy (Thompson, Baranowski, Cullen, & Baranowski, 2007). Interventions aimed at changing youth diet and physical activity behavior have employed these constructs with some success (Thompson et al., 2007) (Baranowski et al., 2003) (Baranowski et al., 2000) (Evans et al., 2006).

SCT is considered an interpersonal theory because its constructs reach not only within the individual but also into interpersonal relationships through factors like role-modeling and external reinforcement (Baranowski et al., 2002). These multiple levels of constructs allow for the unique and useful SCT concept of reciprocal determinism, the notion that change within a person, behavior or environment, can further affect any level and reverberate to have continuing effects (Baranowski et al., 2002). This has relevance for obesity prevention interventions in that changing behavior in a child can have a further impact on the parents and vice versa, creating more avenues for change than just the target population.

Self Determination Theory

Self-determination theory divides a person's motivation to perform a behavior into two categories: intrinsic motivation and extrinsic motivation (Ryan & Deci, 2000). While extrinsically motivated behaviors are motivated by some outside source such as reward or pressure, intrinsically motivated behaviors are instead self-motivated (Thompson et al., 2007). A continuum exists between extrinsic motivation that is entirely motivated by

external causalities (such as rewards or punishments), to extrinsic motivation that is *internally* motivated, to complete innate *intrinsic* motivation where behavior is performed only for enjoyment. While intrinsic motivation is not goal-directed, fostering internal motivation on the other hand, can aid in achieving goal behaviors. SDT posits that certain conditions can promote, not undermine, this internal motivation. The three factors that facilitate internally motivated behaviors are: competence (confidence and skill to perform the behavior), autonomy (feeling that one has control or choice over performing the behavior) (Ryan & Deci, 2000), and relatedness (personal importance of the behavior and outcome) (Thompson et al., 2007). According to SDT, feedback and communication that support an individual's belief that they are competent and have choice in their behavior can foster internal motivation. However, feedback such as threats or deadlines, or rewards (including expectation of monetary rewards), can cause the individual to perceive an external causality for the behavior and lose internal motivation (Ryan & Deci, 2000). Consequently, interventions based on SDT should promote competence through encouraging feedback, presenting choices that allow the individual to feel in control of their decisions, and allowing individuals to attach values to their goal behaviors to develop personal importance for such action. Studies in youth nutrition and physical activity have successfully employed and validated concepts from SDT (Gillison, Standage, & Skevington, 2006) (Resnicow et al., 2008) (Standage, Duda, & Ntoumanis, 2005).

Elaboration Likelihood Model

The ELM is a model of how attitudes are formed based on persuasive messages. Persuasive messages can be evaluated (or elaborated) by an individual through a *central*, or

highly cognizant, route requiring much thought and scrutiny about the message (Petty & Cacioppo, 1986a). Alternatively, they can be elaborated through a *peripheral* route in which the individual only notices environmental characteristics of the message, such as its attractiveness or source credibility. Attitudes that are produced by elaboration via the central route are stronger than those formed by the peripheral route (Petty & Cacioppo, 1986a). There are two factors that influence an individual's ability to follow the central route of high elaboration: ability (such as comprehension and freedom from distractions) and motivation (such as personal relevance of message topic and accountability) (Thompson et al., 2007) (Petty & Cacioppo, 1986a). Therefore, for messages to create strong attitudes about behaviors, they should be both at the comprehension level of the viewer and personally relevant. ELM theory has been used as a framework for health behavior message design in varied audiences (Thompson et al., 2007) (Alcalay, Ghee, & Scrimshaw, 1993) (Withers & Wertheim, 2004).

Behavioral Inoculation Theory

Behavioral inoculation theory (BIT) suggests that individuals can be pre-treated to refuse to accept persuasive arguments against a behavior or belief that they previously held true. In order to "inoculate" against temptations to not perform the proposed behavior, first present the potential threat or argument against the sought behavior, then refute this argument, by offering a solution or counter-argument confirming the benefit of the behavior (McGuire, 1961). By providing the knowledge and resources to resist the temptation, the individual's attitude and strength to perform the behavior is enhanced (Thompson et al., 2007). Use of inoculation theory has shown some promise in studies with youth (McAlister,

Perry, & Maccoby, 1979) (Duryea, 1984). Thus, by presenting children with temptations against healthy dietary and physical activity practices that they may face, then providing them with counter-arguments, they may be better prepared to overcome these temptations if they occur.

Mediating Variables

While, historically, many studies based in behavioral theory have chosen to employ exclusively the constructs of one theory, recent research has shown that such interventions may not be resulting in the desired outcome (Calderon & Varnes, 2001). Of 23 physical activity studies reviewed in 1998, a considerable number had little or no affect on physical activity behavior (Baranowski, Anderson, & Carmack, 1998).

Mediating variables are intervening causal variables on the pathway between intervention exposure and program outcome. There can be a single mediator or series of mediators on a causal pathway (Bauman, Sallis, Dzewaltowski, & Owen, 2002). The broad foundation of behavioral theory provides many shared constructs that can be proposed as mediators (Calderon & Varnes, 2001). The mediating variable framework argues that interventions based on one specific theory can be limited because current theoretical models may account for only a small percentage of the variance in targeted outcomes, illustrated by the fact that current interventions have not been shown to produce desired change. Thus, the mediating variable framework proposes that research instead focus on the relationship between common mediating variables and outcomes, and the effect of interventions on these mediating variables (Baranowski et al., 1998).

Mediators for Youth Obesity Interventions

Possible mediating variables for children's physical activity and dietary change include self-efficacy, knowledge, and self-regulatory skills such as goal setting (see Table 1). These mediators come from Social Cognitive and Self Determination Theories.

Self-efficacy is the confidence that one can perform a certain behavior (Bandura, 2004). Both personal mastery of the behavior through practice, and observation of others successfully performing the behavior may increase self-efficacy (Thompson et al., 2007). Many studies have tested self-efficacy as a mediator of both physical activity behavior change and dietary change in youth and many have shown a positive association (R. K. Dishman et al., 2004) (Lubans & Sylva,) (K. D. Reynolds, Yaroch, Franklin, & Maloy, 2002) (see Table 1). Thus, by targeting intervention activities at increasing self-efficacy through modeling the goal behaviors and allowing children to practice the goal behaviors, we may be able to affect a greater ultimate behavior change. Knowledge has been tested as a mediator more with dietary change than with physical activity change. Some studies have shown knowledge to be a mediator for dietary change, often with increasing consumption of fruits and vegetables (K. D. Reynolds et al., 2004) (Lytle et al., 2003). Therefore, interventions promoting nutrition and eating behavior knowledge may show greater success in changing dietary behaviors.

Self-regulatory skills facilitate an individuals control over their behavior through skills such as goal setting, problem solving by overcoming barriers, and the use of implementation strategies (Thompson et al., 2007). Both SCT and SDT exert that this personal regulation of behavior and control over ones actions is important for behavior

change. SDT posits that control, or choice, fosters the individual's internal motivation to perform the behavior and thus make the individual more likely make the behavior change (Ryan & Deci, 2000). Goals influence behavior by calling an individual to action, giving them direction towards this action and encouraging persistence of effort, as well as by assisting in the development of newfound implementation and behavioral strategies to realize the goal (R. K. Dishman et al., 2006). Studies have proposed that goal setting, and other self-regulatory skill such as overcoming barriers and creating implementation strategies, can mediate physical activity and dietary change in children with some association found (Lytle et al., 2003) (Wilson et al., 2005). Thus interventions should allow participants to have control and feel they have choice by allowing them to select goals, create implementation strategies, and problem solve overcoming barriers.

Table 1. Mediating Variables in Diet and Physical Activity Studies with Youth

Study	Study Sample	Target	Mediating Variables	Outcomes
Davis, et al. 2003 Pathways (Davis et al., 2003)	1704 3rd-5th grade American-Indian students, 41 schools	3-year school based intervention to lower body fat by promoting physical activity and healthy eating	Knowledge, values about PA and nutrition, personal control, skills for PA and food selection, self-monitoring, goal-setting and reinforcements, role-models, barriers, peer support	Increases in knowledge, self-reported healthy eating and physical activity. No change in body fat.
Dishman, et al., 2004 LEAP (R. K. Dishman et al., 2004)	24 high schools: 2087 African American and white adolescent girls	Identify mediators of PA in a school-based intervention to increase physical activity in girls	Self-efficacy, goal setting	Self-efficacy partially mediated physical activity.

Study	Study Sample	Target	Mediating Variables	Outcomes
Dishman, et al., 2005 (R. K. Dishman et al., 2005)	605 6th and 8th grade girls	Examine whether self-management strategies mediate the relationship between self-efficacy and physical activity.	Self-efficacy, self-management strategies (goal setting and implementation strategies)	Self-management strategies mediated the relationship between self-efficacy and physical activity.
Dishman, et al., 2006 (R. K. Dishman et al., 2006)	431 African American and white girls (at end of 9th and 12th grade)	Investigate mediators of physical activity	Goal Setting, Satisfaction, Intention, Self-efficacy, perceived behavioral control, attitude	Goal setting and intention mediated the relationship between self-efficacy and physical activity change. Perceived behavioral control is directly related to physical activity change.
Edmundson, et al., 1996 CATCH (Edmundson et al., 1996)	5106 3rd – 5th grade students, 96 schools	School-based, cardiovascular disease risk factor intervention, aiming to reduce sodium and fat intake, increase physical activity. (Luepker et al., 1996)	Dietary knowledge, self-efficacy	Knowledge self-efficacy both increased. No effects on body size.
Haerens, et al., 2007 (Haerens, Cerin, Deforche, Maes, & De Bourdeaudhuij, 2007)	804 adolescent girls	Mediation analysis of a 1-year school-based fat intake intervention	Self-efficacy, barriers	Intervention group reduced fat intake by 9 g/day more than control, however no reliable mediating effect of the examined psychosocial variables was found.
Lubans, et al. 2007 (Lubans & Sylva,)	78 senior school students	Identify mediators in a physical activity intervention for senior school students	Self-efficacy	Exercise self-efficacy satisfied 3 of the four criteria (Baron and Kenny criteria) for mediation among females.

Study	Study Sample	Target	Mediating Variables	Outcomes
Lytle, et al., 2003 (Lytle et al., 2003)	16 public schools: 3878 7th grade students	Discover predictors of adolescent fruit and vegetables intake	Knowledge, barriers	Knowledge and barriers, were significantly predictive of FV intake.
Reynolds, et al., 2002 (K. D. Reynolds et al., 2002)	1,676 4th-grade children	Identify mediators of a school-based nutrition intervention to change fruit and vegetable consumption	Knowledge, Self-efficacy	Self-efficacy and knowledge satisfied 3 of 4 criteria for mediation.
Reynolds, et al., 2004 (K. D. Reynolds et al., 2004)	4th graders in two interventions (Alabama, n = 1584; Minnesota, n = 522)	Identify mediators of two school-based nutrition interventions to change fruit and vegetable consumption	Knowledge, availability	Knowledge satisfied all four criteria necessary to establish mediation in Alabama. No variables satisfied all 4 criteria in Minnesota.
Rinderknecht, et al., 2004 (Rinderknecht & Smith, 2004)	Urban Native-American children (ages 5 to 10 years) and adolescents (ages 11 to 18 years) 104 children	7-month after-school nutrition and physical activity intervention for Native American children to improve dietary self-efficacy (Rinderknecht & Smith, 2004)	Dietary Self-Efficacy	Self-Efficacy was significantly improved among children, but not among adolescents.
Strauss, et al., 2001 (Strauss, Rodzilsky, Burack, & Colin, 2001)	92 children aged 10 to 16 years.	Discover correlates of physical activity in children	Self-efficacy, health beliefs, sedentary activity	High-level physical activity was positively associated with self-efficacy, but it was not associated with health beliefs or sedentary activity.

Study	Study Sample	Target	Mediating Variables	Outcomes
Wilson, et al., 2005 (Wilson et al., 2005)	48 students, 10 to 12 years old	Intervention to increase physical activity in underserved adolescents through use of Intrinsic motivation	PA motivation, PA self-efficacy, behavioral skills self-efficacy, self-concept for PA	The intervention group showed increase in both moderate and vigorous physical activity. Control group showed no increase in PA. Intervention group showed significant increase in PA motivation compared to control group.

Value of Computer-Based Interventions

While traditional school and community-based interventions have shown some success, their ability to deliver child intervention messages tailored to needs and characteristics is limited due to the size of the population to be reached. Thus, messages delivered are often "one-size-fits-all" (i.e., generic). In recent years, popularity of computers as a tool to change behavior has grown, thanks in part to the computer's ability to disseminate interventions to many people with much more cost effectiveness than an intervention delivered through interpersonal methods (Kroeze, Werkman, & Brug, 2006) (Bandura, 2004).

Tailoring

The attractiveness of computer-based intervention also lies in their ability to input information about an intervention participant and then deliver a personally "tailored" message to many people at one time. "Tailoring" involves retrieving construct information

from a subject, and using their responses to create and deliver messages that are personally relevant,(Brug, Campbell, & van Assema, 1999).

Tailoring had been well established by several theories as valuable to behavior change (Petty & Cacioppo, 1986a) (Bandura, 2004). SCT purports that tailoring can not only increase the scope and impact of programs, but that by tailoring to factors that are known to better affect health behaviors, interventions can also be more effective (Bandura, 2004). ELM proposes that by tailoring messages so that they are more personally relevant and understandable to the individual, they will be more deeply processed (less peripheral), and therefore foster stronger attitudes towards the behavior (Petty & Cacioppo, 1986a). For these reasons, tailored messages are more likely to be read and remembered, and appear to have a greater impact in motivating people to change dietary habits, than the use of generic education materials (Brug et al., 1999). Computer-based interventions involving tailoring may also be especially beneficial to promotion of physical activity and nutrition behavior change specifically, because participants often lack understanding of their personal performance level for these behaviors. Tailoring allows individuals to assess their own performance and better understand the changes they need to make to move towards recommended levels (Kroeze et al., 2006).

Appeal of Video Games

A novel approach to computer-based intervention design is the video game. Games can not only reach large populations of children and be tailored to these children, but also enhance the element of fun. Fun is a facet of intrinsic motivation, and thus according to SDT, fun will foster motivation which will then enhance behavior change (Baranowski,

Buday, Thompson, & Baranowski, 2008). Video games can also be designed to promote high levels of autonomy, connectedness, and control, thus promoting intrinsic motivation towards that behavior (Baranowski et al., 2008) (Ryan & Deci, 2000). Incorporation of tested theory into the storylines and game-play of the videogames increases the likelihood of developing a game that targets factors associated with behavior change (Baranowski et al., 2008).

Video Games and Youth

Video games are especially appealing for targeting youth populations due to the prevalence of game-play among this group. The Kaiser Family Foundation reports that 8 to 18 year olds media use includes exposure to over 1 hour of computer time, and 49 minutes of video game time on average per day (Rideout et al., 2005). Among those with access, girls play video games for approximately 23 minutes and boys for about 60 minutes a day. Eighteen percent of youth reported playing games for over 4 hours per week (Marshall, Gorely, & Biddle, 2006). Additionally, almost one-third of 8 to 18 year olds have computers in their bedrooms (Rideout et al., 2005). Their obvious interest in and access to video games, combined with the benefits of this media for motivating and holding player attention, illustrates why games present a promising avenue for reaching children to change behavior.

Changing Child Behavior with Video Game Interventions

The increase in computer use among youth and the understanding of computers a valuable tool in interventions has led to the development of numerous computer-based interventions for youth behavior change in recent years. Table 2 below lists some of

computer-based interventions aimed at changing diet and/or physical activity behavior in youth.

Table 2. Computer-Based Interventions Promoting Healthy Diet and/or Physical Activity Among Youth

Intervention Title	Theory Applied	Population Description	Intervention Summary	Outcome
"Fit For Life" Boy Scout Badge	SCT, ELM	Boy scouts aged 10-14 years; 42 troops; 473 Boy Scouts	Nine-week program involving troop activity and internet game program aimed at increasing physical activity skills, self-efficacy and goal-setting (Jago et al., 2006).	Spring intervention group showed a significant 12 minute increase in light intensity activity and a 12 minute decrease in sedentary activity. (Jago et al., 2006)
"5 A Day" Boy Scout Badge	SCT, ELM	Boy scouts aged 10-14 years; 42 troops; 473 Boy Scouts	Nine-session troop activity and internet game program aimed at increasing fruit, juice, and lowfat vegetable consumption, self-efficacy, and home-availability. (Thompson et al., unpublished)	Intervention group showed a significant 1 serving per day consumption increase for FJ but not LV at P1 compared to control. Self-efficacy for both FJ and LV showed significant increase for intervention group compared to control at P1. (Thompson et al., unpublished)
The (GEMS) Food Fun Fitness Project	SCT, ELM	Eight-year-old girls and their caregivers, from Houston, TX; 35 girl/caregiver pairs	Four-week summer day camp for the girls, followed by 8-week web-based intervention for the girls and their caregivers (Baranowski et al., 2003).	Substantial, though not significant change in BMI between treatment and control groups (Baranowski et al., 2003).
Fun Food Fitness Internet Program for Girls	SCT, ELM	Eight to ten year old African American girls; 80 girls	Eight-week internet based program promoting fruit, juice, vegetable, and water intake adapted from GEMS program. (Thompson et al., 2008b)	Significant differences were observed between pre and post-tests for: fruit, juice, and vegetable consumption and self-efficacy, and physical activity (yesterday and usually). (Thompson et al., 2008b)

Intervention Title	Theory Applied	Population Description	Intervention Summary	Outcome
Hipteens	None specified, but used a family-based approach.	Overweight African-American adolescent female/parent pairs; 57 pairs	Web-based interactive program, delivered over 2 years, targeting diet and physical activity modification through quizzes, lessons, goal setting, and clinic appointments aimed at reducing adiposity (Williamson et al., 2006).	During the first 6 months, the treatment group lost significantly more body fat than the control. However, after 2 years the groups did not significantly differ (Williamson et al., 2006).
IMPACT	SCT	Fourth-grade ethnically diverse children from Los Angeles, CA; 4 schools; 209 students	Eight-week interactive multimedia obesity-prevention intervention aimed at promoting physical activity through use of an interactive CD-ROM program of 8 animated lessons, along with four classroom lessons and four family-based assignments. (Goran & Reynolds, 2005)	Improvement in BMI/body fat for girls, but not boys. Marginal improvements in self-efficacy, social norms, and outcome expectancies. (Goran & Reynolds, 2005)
Metakenkoh	None specified	77 children ages nine to eleven have completed baseline and week one of the study at interim report; 120 eventual total children	Internet-enable futuristic game in which intervention group children wear a pedometer and take steps in order to earn "ergs", or energy, to power their player in the game. In the game, the children can also earn powers by playing knowledge type games. Children will wear pedometers and play the game for 4 weeks in this study (Southard & Southard, 2006).	Increase in steps for underweight and normal weight intervention group children versus drop in steps for similar control group children. Overweight and at-risk children showed an increase in steps in both intervention and control groups. (Southard & Southard, 2006)
Squire's Quest	SCT	Fourth-grade ethnically diverse children from Houston, TX; 26 schools; 1578 students	Ten-session educational multimedia game delivered over 5 weeks aimed at increasing FJV consumption by increasing preferences, asking behaviors and preparation skills for FJV. (Baranowski et al., 2003)	Children in treatment group increased consumption by 1.0 servings more than control group participants. (Baranowski et al., 2003)

One such study, called the Baylor GEMS pilot study, utilized a mixed methods approach. The 12 week program began with a 4 week summer day camp, followed by an 8 week internet based program; its goal was to influence energy balance (Thompson, Baranowski, Cullen, & Baranowski, 2007) (Baranowski et al., 2003). The behavioral focus was to increase fruit and vegetable consumption to 5 servings per day as well as increase water consumption to 5 or more glasses per day, thus displacing alternate high-calorie foods and beverages. The study also had participants aim to achieve 12,000 pedometer counts per day. The researchers randomized 35 eight-year old African-American girls and their caregivers from Houston, TX who had internet available at home, into a two group design (19 treatment, 16 comparison) (Baranowski et al., 2003). Self-regulatory skills were emphasized. For instance, when children logged in to the internet program, they would first view a comic, followed by a problem solving segment in which the participant helps the comic character by identifying the problem, then generating and implementing possible solutions. Next, the participant would review goals from the previous week, and then set new goals for the following week. Elaboration Likelihood Model guided the design of the characters and information delivered to ensure it was personally relevant. Cliffhangers, where the comic characters experienced a problem left unsolved, also helped hold attention (Thompson, Baranowski, Cullen, & Baranowski, 2007). Following the 12-week intervention, though there was no significant difference in BMI change between treatment and control groups, among girls heavier at baseline there was a trend ($P<.08$) toward lower BMI compared with similar control group girls, and there were substantial differences in the hypothesized directions between treatment and control groups. Logon rate to the internet

games was low and could have affected outcome (Baranowski et al., 2003). The same researchers also then converted the original GEMS program to a standalone web-based program and tested this new program with 80 8-to-10-year-old African American girls at-risk of obesity (Thompson et al., 2008b). The eight-week study followed a two-group pre-post measurement design with groups differing on incentive schedule only (immediate vs delayed). This study had a log on rate of 74.5% and low attrition (<10%) (Thompson et al., 2008a) and was able to significantly increase fruit, juice, and vegetable consumption and self-efficacy, as well as physical activity ("yesterday" and "usually") (Thompson et al., 2008b).

Another multimedia software intervention aimed at altering nutrition and physical activity behavior in youth, and also based on Social Cognitive Theory, involves a game called Squire's Quest (Baranowski et al., 2003). Squire's Quest uses 10 25-minute sessions of interactive multimedia education to increase Fruit Juice and Vegetable (FJV) consumption among children by increasing preferences, asking behaviors, and preparation skills for FJV. Like the GEMS Study, in this game, SCT was also implemented through the self-regulatory skills of goal-setting and problem solving. Towards the end of each session, the child sets two goals: to make the FJV (Fruit, Juice, or Vegetable) recipe that they prepared in the game's virtual kitchen at home, and to eat a serving of a specified FJV at a selected meal at home or school. At the following episode, the child reviews the goal and inputs goal attainment results (Baranowski et al., 2003). They then follow a problem-solving procedure to aid them in overcoming barriers with solutions to improve future goal attainment. Tailoring of goals to the child's preferences provides the child with the feeling of control

over their actions which is important for internal motivation to attempt such goals. The game also involves knowledge games, and problem solving to teach and encourage asking behaviors. A randomized two-group implementation of Squire's Quest among 1578 fourth-graders, successfully resulted in a one serving difference between treatment and control group at the end of the 10 sessions (Baranowski et al., 2003).

The Interactive Multimedia for Promoting Physical Activity in Children (IMPACT) intervention, a computer-based intervention delivered over 8 weeks to children and their families, attempted to increase levels of physical activity and decrease physical inactivity, limit increases in BMI, as well as alter psychosocial variables related to physical activity. The program included an 8-session multimedia game component. The software portion incorporated theory, specifically the Social Cognitive Theory, into its modules through the integration of the following constructs for behavior change: outcome expectancies, behavioral capability and modeling, goal-setting, self-monitoring, reinforcement, and self-efficacy. After the 8-week period, analyses found that it was successful decreasing BMI and percent body fat for girls but not boys, and successful in increasing self-efficacy, social norms, and outcome expectancies in both groups (Goran & Reynolds, 2005).

Thus, video games for youth nutrition and physical activity behavior change have shown promise, though further research is needed to discover which components are most successful to aid in intervention design.

Usability Testing of Computer Based Interventions

While the findings above indicate that using a computer-based approach to intervention to tailor the messages directly to participants could prove effective, there are

also risks associated with using computer technology to deliver messages instead of personal interaction. When implemented, if an aspect of the software intervention fails, or is too difficult to understand or use, there will be no one present to assist the users with solving these problems (Vandelanotte, De Bourdeaudhuij, & Brug, 2004). If the user interface is too complex or unintuitive, the child's compliance with the intervention may be reduced due to unrealistic cognitive demands (Stinson et al., 2006). Additionally, errors in software programming or design that are found late in the product lifecycle can be very expensive to fix after development has been completed (Balentine, 2001). For these reasons, early and thorough testing of the *usability* of the intervention is of the utmost importance. Usability is how effectively a given software interface performs when a typical user interacts with it (Balentine, 2001). Parameters of usability include ease, understandability, acceptability, credibility, likeability (Shegog et al., 2006), attractiveness and relevance of the educational media with the target group, which have been shown to be necessary for attitude and behavior change (Vandelanotte et al., 2004). Testing the usability of a software program can help to identify both cognitive and psychomotor problems associated with its use, providing insight into modifications that need to be made to maximize benefit (Zimmerman, Akerekrea, Buller, Hau, & LeBlanc, 2003). Usability testing asks questions like:

- Is the technology easy to learn?
- Is it efficient to use?
- Is it easy to remember?
- Do users encounter few errors in its use?
- Is it subjectively pleasing?
- What are the users' attitudes toward the product?
- Do users like it?

(Zimmerman et al., 2003)

The three most commonly measured components in usability testing are effectiveness, efficiency, and satisfaction (U.S. Department of Health and Human Services). Effectiveness asks if users are able to successfully use a program and can be measured by task completion success. Efficiency questions how quickly users are able to accomplish tasks and can be measured by time on task. Satisfaction is how much users like using the program. Likeability is a measure of satisfaction and can be gauged by preference ratings or user comments (U.S. Department of Health and Human Services).

Alpha-testing is the phase of software product development during which usability testing often takes place (Vandelanotte & De Bourdeaudhuij, 2003) (Serrano & Anderson, 2004). Alpha-tests are typically performed on a functional prototype, but not necessarily a fully completed model of the intervention. During alpha-testing, users interact systematically with the software, under controlled conditions (Stinson et al., 2006), while being observed and studied for trends. Studies have shown that one-on-one testing is more effective at achieving this goal than focus groups (Balentine, 2001). To ensure a usable system is being built, an iterative process is used, of testing and then employing these results to refine the software intervention to better meet the users' needs (Stinson et al., 2006). Government agencies such as the National Institute of Standards and Technology (NIST) and the National Cancer Institute (NCI) now stress the importance of usability testing (Zimmerman et al., 2003). Although usability testing of computer-based interventions (CBIs) is becoming more prevalent (Stinson et al., 2006) (Vandelanotte & De Bourdeaudhuij, 2003) (Vandelanotte et al., 2004) (Serrano & Anderson, 2004) (Pearce, Williamson, Harrell, Wildemuth, & Solomon, 2007), few usability tests of CBIs have been undertaken with children in the area

of physical activity and nutrition education systems, and this area requires further research to assist in building the most efficient and productive programs (Thompson et al., 2007).

Specific Aims

Specific aims of this study were to:

1) Examine the data resulting from usability testing of two computer-based interventions to prevent type II diabetes and obesity among youth. Data were obtained from observation forms and verbatim interview transcripts from alpha-testing of among a sample group of ten 9-12 year old children.

2) Examine the association between the demographic variables (age, gender) and usability parameters (body language, fun, difficulty).

3) Report how testing influenced game design decisions by identifying changes that were made to the games as a results of testing.

METHODS

Study Design

This is a secondary analysis of pre-existing quantitative and qualitative data collected during the alpha testing phase of an NIH-funded study entitled "Computer Based Intervention for Prevention of Type 2 Diabetes in Youth", PI Buday; subcontract PI, Baranowski, funded by a grant from the NIDDK (U44 DK66724). The data were collected between March and May of 2007 with a cohort of ten 9-to-12-year-old child subjects, and analyzed between December and March 2009. Quantitative data includes information

collected on observation forms, rating scale data collected during child interviews, and demographic information collected during recruitment. Qualitative data includes interviewer/observer written comments obtained during child observation and from verbatim transcripts of child interviews.

Human Subjects Considerations

The aforementioned data collection were collected under the IRB approval of Baylor College of Medicine [H-19495]. The study was originally approved in May of 2006. The present study is a secondary analysis of pre-existing data; therefore, written informed parental consent and child assent were not needed for these analyses.

Study Sample

Ten ethnically diverse subjects, aged 9 to 12 were recruited to participate in each of three separate game testing sessions. The cohort included 6 girls and 4 boys. Recruitment was through the Children's Nutrition Research Center at Baylor College of Medicine's (CNRC) database of past research participants. Table 3 displays the demographic breakdown of the study participants:

Table 3. Study Population Demographics

Game Sets A,B,C	**African-American**		**Hispanic-American**		**Euro-American**		**Asian-American**		**Totals**
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	
9 Years old						1			**1**
10 Years old		2	1						**3**
11 Years old			1						**1**
12 Years old	1				1	2		1	**5**
Subtotals	**1**	**2**	**2**	**0**	**1**	**3**	**0**	**1**	
Totals	**3**		**2**		**4**		**1**		**10**

Nine to twelve year olds were chosen for the cohort because this is the target age of the video games. This age range is targeted, in part, because of the high level of risk for overweight observed among early adolescents. The National Health and Nutrition Examination Survey (NHANES), shows that from the NHANES 1971-1974 to the NHANES 2003-2004, the percentage of children aged 6-11 considered overweight has grown from 4% to 18.8% (Ogden et al., 2002) (Ogden et al., 2006). This increase represents a larger change (to a higher prevalence) than the other child age groups (under 6 or over 11 years old), indicating that this middle school age group is an important target audience (Centers for Disease Control and Prevention, 2007). By intervening in a group at risk of becoming obese, it may be possible to delay or avoid type 2 diabetes and obesity. Additionally, it is at approximately this age when children might begin to take on more responsibility for their food choices (Bassett et al., 2008) (Neumark-Sztainer, et al., 1999), as well as physical activity (Kelder et al., 1994); thus intervening at this age may have a greater impact on behavior.

The sample size of 10 subjects was chosen because the primary data collected were qualitative, for which statistical significance is not required. The goal was to obtain theoretical saturation, which can be achieved with a small sample (Auerbach & Silverstein, 2003). In addition, in usability testing, the best cost-benefit ratio can attained with 3-5 users from each representative group (Nielsen, 1993). Thus, ten subjects representing one target group should be more than adequate.

Interventions

The present study reports on the results of the alpha-testing of two computer-based interventions to prevent type 2 diabetes in youth aged 10-12. The two interventions were designed using various behavior change theories and concepts to promote healthy diet and physical activity behaviors in the game player. The interventions are both 9-episode videogames that guide the player to set goals; review these goals; acquire and test functional knowledge; and solve problems. Though similar in many ways, the interventions differ in story line, graphics, and behavior change techniques.

These two games were designed as a series, with *Escape from Diab (Diab*) to be played first and *Nanoswarm: Attack from Innerspace (Nanoswarm)* second. Diab delivers the behavior change knowledge information at a more basic level, explaining the nutrition and physical activity needs information separately; whereas Nanoswarm delivers this information as the combined, and more advanced, concept of Energy Balance.

Storyline and Character Overview

Escape from Diab uses high level animation to tell, from a third-person perspective, the story of a boy named Deejay, a soccer star from the urban Golden City, who tries to save a wild soccer ball kick and falls through a door in an abandoned building into the underground city of Diab. Diab is ruled by the tyrannical King Etes who forces the city's population to be unhealthy. King Etes provides free junk food in vending machines throughout the city, but bans healthy fruits, vegetables, water, and physical activity. Upon his arrival in Diab, Deejay immediately makes friends with a group of youth and assists them in carrying out a plot to "escape from Diab" and travel to the Golden City where they believe

rescue from King Etes tyranny awaits. His friends include: Delinda, the Diab group's leader who embraces healthy changes, Dagan, who is resistant to change but comes around in the end, as well as Mayza, and Bearspaw who gradually but surely learn to incorporate new healthy behaviors into their daily life. Together the group finds ways to get healthy foods and be physically active. They eventually realize their goal and leave for the Golden City. The game has two endings, one where the group succeeds in their mission, and one where they do not. Which ending the player views, depends on how many of their personal goals they report completing during the 9 episodes of the game. If the player receives the "unsuccessful mission" ending, they are notified that the alternate "successful mission" ending is available for viewing after they have completed the game.

The second intervention, Nanoswarm, utilizes live actors, video clips, and blue screen technology. The futuristic story is told in the first person, following the character Wings, who represents the player, as he joins the team at the MECHs lab, a "nanobot" research facility, under the supervision of Dr. Gunderson. Nanobots are tiny robots programmed to help people in this futuristic world by cleaning floors and carpets, and fighting disease, among other things. Unfortunately, as the game begins, the nanobots appear to be attacking people, launching a worldwide epidemic of what is thought to be a nanobot infestation illness. Thus, the MECHS lab team embarks on a mission to discover why the nanobots are attacking people and put and end to this unexpected turn of events. As one of their first clues, Fred, one of the lab members, falls prey to the illness. To discover why the nanobots have turned on people, they must travel inside Fred's body to retrieve a nanobot for inspection. In order to stay healthy for their missions, the team must stay in energy balance

through healthy eating and physical activity. There are two endings, one in which the team solves the problem to save their friend Fred, and one in which they do not. The ending the player views first is dependent on the number of personal goals they meet. However, the player is given chances to complete a behavior change game that allows them to view the "good" ending regardless.

Intervention Goals

As a result of the nine episodes of game play, the interventions aim to increase the player's daily consumption to 3 to 5 servings of fruits and 100% fruit juices, 4 to 7 servings of vegetables, 5 to 8 glasses of water, as well as increasing moderate to vigorous physical activity to at least 60 minutes per day, while limiting physical inactivity (sedentary behaviors such as watching TV or talking on the phone) to no more than two hours per day.

Theoretical Framework

To reach these goals, Social Cognitive Theory (SCT), Self-Determination Theory (SDT), the Elaboration Likelihood Model (ELM) and Behavioral Inoculation Theory (BIT) were used to create the design framework for the game.

Mediating Variables

The interventions attempts to change selected mediating variables, which in turn change nutrition and physical activity behaviors. Mediating variables were selected from the aforementioned theories. They include: knowledge, self-efficacy, preferences, self-regulatory skills such as goal-setting and problem solving, and internal motivation to perform the health behavior goals (Thompson et al, 2008c).

The variable knowledge , taken from SCT, is conveyed first through mini-games that teach nutrition or physical activity concepts such as the "What is an aerobic activity?" game, where the player selects the aerobic activities (e.g. jumping rope) by rolling a ball around the screen trying not to hit the non-aerobic activities (e.g. reading or weight-lifting), or the "What is a fruit?" game, in which the player travels around a warehouse picking all the foods that are fruits (e.g. cherries), while avoiding the foods that are not fruit (e.g. cherry gelatin). Knowledge is also delivered through characters modeling ideas in video or animation "cutscenes". These cutscenes serve multiple purposes, providing both entertainment and an opportunity for characters to model skills and convey knowledge through dialogue (Thompson et al., 2007). For example, in one Diab cutscene, Deejay explains "why eating breakfast is important" and later Dagan is viewed enjoying trying vegetables for the first time.

Self-regulatory skills such as problem solving and goal setting are included in every episode. For example, the child must select a goal with a specific fruit, vegetable, water or physical inactivity selection and date to perform (e.g. to eat a portion of banana for breakfast on Tuesday), and report back in the following episode whether they met this goal or not. This gives the player practice setting and attempting to achieve small specific goals and creating implementation intentions (i.e. specific plans) which may enhance self-efficacy through personal mastery. With each goal selected, the player goes through a problem solving process in which they are able to select a possible problem they may encounter in meeting this goal (e.g. "Fruit or juice are not always available at home.") and then select a solution for this problem (e.g. "Write your favorite fruit on parent/guardian's shopping list.").

This selection of an implementation intention strengthens likelihood of goal attainment (SCT).

The concept of creating internal motivation from SDT is present throughout the goal setting and goal review components as well. Prior to selecting a goal, the game asks the player to select the value that they find most important to them (e.g. "Getting Good Grades") and the reason that meeting their goal would help them achieve this value (e.g. "Drinking water keeps you healthy so you miss less school"). By adding to the personal relevance through this value selection, as well as allowing the player to select their own specific goal from a list of goals that are tailored to their personal characteristics, the player can experience autonomy and relatedness, leading to greater internal motivation to complete the goal, than if goals were selected for them (SDT).

During the "Good Guy/Bad Guy" segment of the goal setting process, the player is presented with a "bad" argument against why they should make the healthy change of meeting their goal, and then provided a "good" response to select, arguing why they should in fact meet their goals. By inoculating the player against possible temptations and problems and then refuting them, the game strengthens the likelihood of goal attainment (behavioral inoculation theory (BIT)) (McGuire, 1961). If the player reports not meeting the goal they selected, they are given the opportunity to retry this goal, and if they choose to, they then repeat the problem solving process for this goal.

ELM suggests that attitudes formed under high elaboration are more predictive of behavior. In order for elaboration to be high, the person must be motivated to process the message. Personal relevance of the message delivered contributes to this motivation (Petty &

Cacioppo, 1986b). Nanoswarm and Diab achieve this personal relevance through tailoring the messages to the player based on height, weight, dietary and physical activity practices, and values, and by presenting the player with characters and information that were formed to be understandable and relatable for them.

One problem solving behavior that Nanoswarm addresses which Diab does not is negotiation skills. Nanoswarm incorporates into the video clips three Negotiation Segment "games" where the player is presented with a video segment in which the character Wings is asked to help solve a problem. The player then must select from lists of answers to questions and are repeatedly given further problems until they can finally negotiate a solution. The games provide the child with many solutions to overcoming common barriers to nutrition and physical activity problems, and allow the child to see how they can negotiate with an adult to solve these problems. For example, in one negotiation segment the child must find a solution to a situation where a parent has prepared an unhealthy meal by finding a way to work healthy vegetable and desserts into the meal.

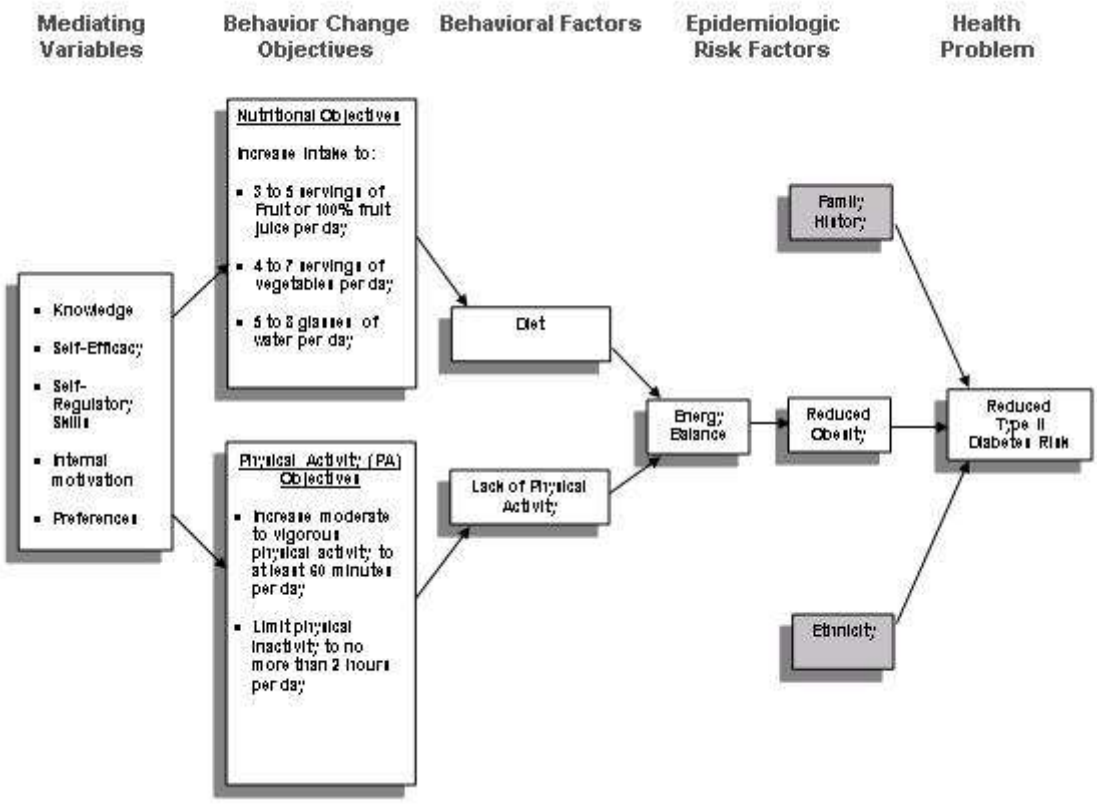
The logic model below (Figure 1.) illustrates the pathway between the mediating variables described above, which the intervention is designed to affect, and the health problem of type 2 diabetes. Thus, changes in the mediating variables should drive the healthy behavior changes which should in turn lead to better diet and increased physical activity, thus improving health.

Intervention Structure

The Diab and Nano interventions follow a very similar structure in each of the 9 episodes, each weaving together cinematic video clips with mini-games and goal setting

procedures. In each intervention, Episodes 1-4 deal primarily with nutrition behavior change, and episodes 5-8 handle physical activity behavior change. The first episode begins with the child setting up a profile and then answering questions about their dietary habits. This information is used to calculate their caloric intake level which is then used in energy balance and nutrition games, as well as to set portion requirements of fruits and vegetables. This portion information aids the goal setting game in selecting goals to offer to the player that will benefit them, e.g., if a participant is already consuming sufficient portions of fruits every day, the game will offer vegetable and water goals instead.

Figure 1. Logic Model



Sources: (Fagot-Campagna, 2000) (Quarry-Horn et al., 2003) (Hussain et al., 2007) (Thompson et al., 2007) (Baranowski et al., 2003)

Following the questionnaires, the game blends cinematic video or animation clips with behavior change mini-games and "just-for-fun" games. Mini-games were designed to take approximately 2-10 minutes each. Each episode contains approximately two behavior change mini-games and two "just-for-fun" mini-games. The goal of the behavior change mini-games is to provide behavior specific knowledge to support the goal setting and problem solving behavior change components (Thompson et al., 2007). For example, the "Portion Size of Fruit" game would teach proper portion sizes of fruit so that when the player sets a fruit goal, they understand the proper portion to eat to meet their goal. The "just-for-fun" mini-games are not aimed at increasing knowledge, but only included to add to the element of fun, which is a component of intrinsic motivation. Thus, by enhancing motivation through fun, we may also enhance behavior change (Baranowski et al., 2008).

Goal setting is merged somewhere into each episode so that it fits with the story line. Goal setting begins with asking the players important value (i.e. getting good grades), then the reason setting a health goal will help them reach this value, and next selecting the actual goal. Subsequently the child selects a problem and solution, and then encounters the "Good guy/Bad guy" refutation preemption. Goal review follows goal setting in Episodes 2-9. Goal review first asks the player whether they have met their goals, and then allows them to retry those they have not accomplished, going through problem solving again for these "retry" goals.

Every episode is finished with a "cliffhanger", or an ending in which characters are left with an unsolved problem, designed to keep the player interested in what happens next in the story line. In episode 9 of the interventions, players can first receive one of two endings:

a “good” ending if the player has met most of their goals throughout the episodes, or a “bad” ending if they have not. In either event, the player can view the good ending as well by either selecting it later from the game menu or, in Nanoswarm, retrying a game that allows them to see the “good” ending.

Procedures

Recruitment

A phone list of possible participants was requested and received from the CNRC recruitment coordinator. Inclusion criteria for this list consisted of the following: children ages 9 to 12, so that the male to female ratio is approximately 5:5 and the group is ethnically diverse. Parents of possible child participants were contacted for scheduling. Written parental consent and child assent were obtained prior to testing sessions. The same 10 subjects were able to participate in all 3 testing sessions.

Scheduling

During this study, alpha-testing of the two computer-based interventions followed a cohort through three separate testing sessions. Behavior change mini-games from various sessions of the two 9-session interventions were divided into 3 game sets. Estimated completion date for behavior change mini-games was given to the researchers by the video game developers. This game arrival date information was then used to divide the games into 3 sets, with the first set consisting of the earliest available games. Games were also divided so that each set consisted of several games that would constitute approximately one hour or less of observed game play time, to allow for one hour of interview time during the two hour

testing time period. Though the intervention consists of "behavior change" mini-games as well as "just for fun" mini-games, only behavior change mini-games were tested as they were deemed critical to intervention success (i.e., behavior change). Children were first scheduled to test Game Set A, followed by Game Set B a few weeks later, and lastly Game Set C. The games were divided into game sets and played as follows (see Table 4 for descriptions of the games):

Game Set A : 3/12/07 – 3/28/07
- Goal Setting Game
- Scheduling Tangram Game
- What's an Aerobic Activity?
- What's a Strength Activity?

Game Set B : 4/4/07 – 5/2/07
- Mix and Match at the Lifepad Snack Bar
- Objects to Exercise with Inside the Home
- Episode 3 - Negotiation Segment
- Episode 6 - Negotiation Segment
- Episode 8 - Negotiation Segment

Game Set C : 4/24/07 – 5/7/07
- Fruits and Veggies at a Fast Food Restaurant
- What's a Vegetable
- Portion Size of Fruit
- Decreasing Physical Inactivity

Testing Sessions

During testing sessions, one researcher conducted observations and interviews for the cohort for all 3 rounds of testing, assuring consistency of interview techniques and observation ratings. The researcher was a current CNRC employee and graduate student in public health. This interviewer was trained in observation and interview techniques by a

specialist in the field. Observations used a checklist; interviews followed a scripted interview. See the *Data and Measurement Instruments* section for a description of each.

Each testing session was conducted in a private office space with one child observed and interviewed by one researcher. Mini-games were loaded on the computer prior to the child arriving for testing. Testing sessions involved the child playing a prescribed game set uninterrupted, while the researcher observed and recorded results and behaviors on a predetermined checklist. Duration of game play varied based on child ability and speed at passing the games, but lasted approximately 30-60 minutes. Observed gameplay was followed by a scripted interview with the child about the game and observed behavior. Interviews were audio recorded using digital recorders (recordings were later transcribed verbatim). The interview duration varied based on the extent to which the child decided to elaborate on their answers to questions, but also lasted approximately 30-60 minutes. The child alternated playing one mini-game with a short interview following immediately after, until all games were played and discussed. This was to ensure the child's memory of the game was fresh, and that they had not forgotten details of it while playing the next game. At each testing session, each child played 4-5 mini-games totaling 13 mini-games across the 3 sessions. Each testing session lasted no longer than 2 hours. If at the end of two hours the child had not completed all games and/or all interviews, interview or gameplay was terminated, and the child was still compensated (incomplete data was included in analysis). After the session, the child signed a compensation form and received $25 for their study visit, before being returned to their parent.

Table 4. Mini-Game Measurement Overview

			Measurements					
Game Title	**Game Play Description**	**Time on Task**	**Attention**	**Difficulty**	**Emotional Measures**	**Performance**	**Performance**	**Technical difficulties**
Game Set A								
Nanoswarm: Goal Setting Game	The player uses a ship to shoot floating asteroids to select from sets of values, reasons for these values, goals, barriers, and solutions. This data then generates their goal statement, after which the player recommits to setting this goal.	Time on task	Attention paid to selecting various choices (value, etc.) (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of choices (value, etc.) player looked at before selecting one.	Which choice (value, etc.) the player selected.	Technical difficulties
Nanoswarm: Scheduling Tangram Game	The player must first arrange tangram puzzle pieces into a shape to decode their schedule. Then the player must fit 60 minutes of PA into their schedule by replacing PI pieces with PA pieces.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Rating of child's understanding of the game (See Figure 2 for measure of Understanding)	List activities removed and replaced to win the game	Technical difficulties
Escape From Diab: What's an Aerobic Activity	The player rolls a ball around the screen attempting to collect 20 aerobic activities while avoiding non-aerobic activities.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of tries it took the player to win the game	Number of aerobic and non-aerobic items collected	Technical difficulties
Escape From Diab: What's a Strength Activity	The player rolls a ball around the screen attempting to collect 20 strength activities while avoiding non-strength activities.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of tries it took the player to win the game	Number of strength and non-strength items collected	Technical difficulties
Game Set B								
Nanoswarm: Mix and Match at the Lifepad Snack Bar	The player must solve a tile slide puzzle, by sliding the one healthy food from a selection of unhealthy foods to the bottom right corner.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Rating of child's understanding of the game (See Figure 2 for measure of Understanding)	Number of correct and incorrect choices the player made in each game attempt	Technical difficulties

			Measurements					
Game Title	**Game Play Description**	**Time on Task**	**Attention**	**Difficulty**	**Emotional Measures**	**Performance**	**Performance**	**Technical difficulties**
Escape From Diab: Objects to Exercise with Inside the Home	The player must use the character Bearspaw to push household furniture and objects around room obstacles and deliver them to Dagan so that he can demonstrating the exercise with this object before the time runs out.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of tries it took the player to win the game	Number of items the child successfully delivered in each game attempt	Technical difficulties
Nanoswarm Episode 3: Negotiation Segment	The player is presented with text messaging dialogue from another character and responds to this dialogue by selecting answers to solve the characters problem.	Time on task	Attention child paid to answering questions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of incorrect choices the player made	N/A	Technical difficulties
Nanoswarm Episode 6: Negotiation Segment	The player is presented with text messaging dialogue from another character and responds to this dialogue by selecting answers to solve the characters problem.	Time on task	Attention child paid to answering questions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of incorrect choices the player made	N/A	Technical difficulties
Nanoswarm Episode 8: Negotiation Segment	The player is presented with text messaging dialogue from another character and responds to this dialogue by selecting answers to solve the characters problem.	Time on task	Attention child paid to answering questions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of incorrect choices the player made	N/A	Technical difficulties
Game Set C								
Nanoswarm: Fruits and Veggies at a Fast Food Restaurant	The player tries to remove all the unhealthy food and drink choices from the menu by shooting the food icons as they float across the screen. The player can only make 5 incorrect choices before having to restart.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Rating of child's understanding of the game (See Figure 2 for measure of Understanding)	Number of correct and incorrect choices the player made in each game attempt	Technical difficulties

			Measurements					
Game Title	**Game Play Description**	**Time on Task**	**Attention**	**Difficulty**	**Emotional Measures**	**Performance**	**Performance**	**Technical difficulties**
Escape From Diab: What's a Vegetable	The player runs through a maze and at each turn is present with two path choices. The correct path is marked with a vegetable and the incorrect path is marked with a non-vegetable. The player must make all correct choices to find their friends at the end of the maze.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of tries it took the player to win the game	Number of vegetable and non-vegetable items collected for each game attempt	Technical difficulties
Escape From Diab: Portion Size of Fruit	The player uses a spinner to select a fruit. Then they must pick the correct portion of this fruit from a portion size wheel. The player must pick the correct portions of five fruits to pass the game.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Number of correct and incorrect choices the player made total throughout all game attempts	N/A	Technical difficulties
Escape From Diab: Decreasing Physical Inactivity	In a courtyard, the player must identify characters who are not being physically active and tag them to turn them active. The player must fill an energy meter by keeping 6 characters active at once.	Time on task	Attention paid to instructions (See Figure 2 for Attention scale)	Rating of Difficulty child had with game/ List problems child had (See Figure 2 for Difficulty scale)	Body Language - Emotional Measures (See Figure 2 for measures)	Rating of child's understanding of the game (See Figure 2 for measure of Understanding)	N/A	Technical difficulties

Data and Measurement Instruments

Results of the alpha-testing include observation form data and interview transcripts.

Observation

While alpha-testing participants played each mini-game from the intervention, the researcher took handwritten notes on an observation form. The observation form was designed based on the game components of the specific game set (See Table 6 for an example of this observation form). Questions were modified to fit the specific game components from an existing form designed by Thompson et al. (Thompson et al., 2007) for prior testing game testing. There was a different observation form for each mini-game tested. Contents of observation form data collected included information on the length of time the participant required to play a game segment and the number of correct or incorrect choices the participant made or the specific choice made (e.g. "Value selected" in "Goal Setting Game"). Observations recorded also include a rating of observed amount of attention that the participant paid to game instructions and a rating of observed amount of difficulty the participant had with the game (see Table 5 for measure scales). These measures were recorded to identify areas of the game that seemed to be too confusing, too difficult, or too easy for the participant as recorded by the researcher. Additionally, ratings of the following emotional measures were recorded for each player during different game segments: frustrated, bored, engaged, fidgety, and calm (see Table 5 for measure scales). These measures were recorded to ensure participants were not exhibiting a negative emotional response to the video game intervention that might impede productive learning.

Additionally, any technical problems with the games were recorded (i.e. “computer crashed during game play” or “text within game was missing”).

For the present study, the observation measures are all defined as dimensions of usability. Specifically, the “body language” measurements are used as a measure of satisfaction (one component of usability), while “difficulty with the game” and “attention paid to instructions” act as a measure of effectiveness (a second component of usability) (U.S. Department of Health and Human Services). “Time on task” is a measurement of efficiency (a third component of usability) (U.S. Department of Health and Human Services). Figure 2 shows an example of an observation form used in the study.

Figure 2. Observation Form Example.

GAME SET B - OBSERVATION FORM

In this round, the child will play the game uninterrupted and the interviewer will only observe and take notes as the child plays the game.

Nanoswarm Episode 2: "Mix and Match at the Lifepad Snack Bar"

Start Time: _____ End Time: _____ Total Time:_____

Rate how much attention the child paid to the instructions:
SCALE: 1 = paid no attention *NOTES:*
2 = paid a little attention
3 = paid close attention

Did the player seem to understand what they were supposed to do? ? YES
If no, explain why:

ROUND 1: How many correct choices? _____ How many incorrect choices? ____
ROUND 2: How many correct choices? ____ How many incorrect choices? ____
ROUND 3: How many correct choices? _____ How many incorrect choices? ____

Rate the difficulty the child had with this game:
SCALE: 1 = no difficulty *NOTES:*
2 = a little difficulty
3 = a lot of difficulty

Check any problems the player had to explain the above rating:
Player did not seem to understand what they were supposed to do.
Player had trouble maneuvering the tile to the bottom left corner.
Player repeatedly selected "unhealthy" foods.
Other; Explain:

Rate the player's body language during this game:

___	Frustrated	(1 = not frustrated,	2 = a little frustrated,	3 = very frustrated)
___	Bored	(1 = not bored,	2 = a little bored,	3 = very bored)
___	Engaged	(1 = not engaged,	2 = a little engaged,	3 = very engaged)
___	Fidgety	(1 = not fidgety,	2 = a little fidgety,	3 = very fidgety)
___	Calm	(1 = not calm,	2 = a little calm,	3 = very calm)
?	Check if player had other facial expression. Explain:			

Other comments:

Record any technical problems:
Clicking a button on the controller did not do what it was supposed to do
Missing data (Something that was supposed to be included was missing)
Program froze
Program moved very slowly
Other; Explain:

The body language measures listed on the present study's observation form above, bear much similarity to the observation scheme that Barendregt et al. (Barendregt & Bekker, 2006) developed to code usability and fun problems in computer games for children. Much like the observation tracking form developed for the Diab and Nanoswarm alpha-testing, Barendregt et. al (2006) divide the observations into two main groups "Indication Types

Based on Verbal Utterances or Nonverbal Behavior" and "Indication Types Based on Observed Actions With the Game". The emotional measures from the present intervention's observation form (frustrated, bored, engaged, fidgety, and calm) would coincide with the category "Indication Types Based on Verbal Utterances or Nonverbal Behavior". For example, a problem indicator within this category from Barendregt's scheme is titled "doubt, surprise, frustration" in which the user would verbally or nonverbally indicate that they do not understand an action or its effect, or that they are frustrated by the effect of an action. This idea of frustration as an indication of a game "breakdown", or problem point, is also recorded on the Diab and Nanoswarm observation form as simply "frustration", while lack of understanding is recorded as a Boolean answer to the question "Did the player seem to understand what they were supposed to do?". Barendregt also stresses the importance of "Bored" as a breakdown indicator, because this can indicate a departure from *challenge* and *curiosity* which Malone and Lepper (Malone & Lepper, 1987) state are necessary for fun intrinsically motivating educational environments. "Bored" was also included as a measurement on Diab and Nanoswarm observation form. One measure from Barendregt's scheme called "Help", an indication of the game player verbally asking for the researchers help or the researcher giving help to prevent a serious problem, is not actually a category on the present study's observation form, but was instead regularly recorded by the researcher in a box titled, "Other Comments". The action-oriented indicators of Barendregt's scheme called "execution/motor skill problem" and "wrong action" are also contained by the Diab and Nanoswarm observation form as indicators of specific difficulties the children could have within the game play, in usability items noted in Table 5 such as "How many incorrect

choices?" (Barendregt & Bekker, 2006). Barendregt's proposed scheme showed some success in reliability testing with an any-two agreement of .92 for a fixed list of observation points, indicating that the distinction between the available codes in this scheme is clear to most evaluators.

Interview

After observation of game-play, the researcher collected further data through a semi-structured interview with the participant (see Table 7 for an example of an interview script). Interview scripts were adapted from scripts used by Thompson et al. in previous game testing (Thompson et al., 2007) to fit the specific game components to be tested. The interviews contained open ended questions about the games played, such as, "Tell me about the game you just played.", "How did you decide which answer to select?" and "What changes, if any, do you think we need to make to this game segment?" to allow children to note anything they were thinking that would aid in increasing game usability and fun. The interviews also contained questions utilizing 3-point and 5-point rating scales, such as, "For this question, use this scale: 1 is very easy, 2 is a little easy, 3 is not sure, 4 is a little hard, 5 is very hard. On a scale of 1 to 5, how easy or hard was this segment?" The use of scales allowed researchers to retrieve more concrete quantitative data regarding usability of game segments. During rating scale questions, children were shown cards displaying the scale to aid the child in processing the question being asked and allow them to better consider all of their answer choices. Rating scale answers were followed by researcher using probes (e.g. "What made you decide to give this game a grade B?") and prompts (e.g. "What changes could we make

to make this segment more interesting?") to retrieve further information about the reason for the child's scale selection.

For the present study, the interview rating scale measures are all defined as dimensions of usability. Specifically, the "grade" given to the game by children is used as a measure of likeability (a component of usability) (Shegog et al., 2006), while other ratings (those of difficulty, fun, length, and helpfulness of instructions) are used as measures of general usability. Table 6 shows an example of an interview script used in the alpha testing of the interventions.

Figure 3. Interview Script Example.

GAME SET B – INTERVIEW SCRIPT

CHILD INTERVIEW CODE: _____ **AGE:**
INTERVIEWER (print first/last name): _____ **GRADE:**
INTERVIEW DATE: _____ **ETHNICITY:**

GENERAL GAME TESTING INTERVIEW QUESTIONS SCRIPT

Nanoswarm Episode 2: "Mix and Match at the Lifepad Snack Bar"
(Use observations notes to probe the player about this game.)

How often do you play computer or video games? *(Asked only once during any one game testing and interview session.)*

Tell me about the game you just played.
Probe to understand, clarify, and expand responses.

Prompts (only ask if the child does not mention these):
Tell me what you think about this game.
Probe to determine underlying reasons for their answer.

What was the purpose of this game?
Probe to determine underlying reasons for their answer.

What did you need to do to win this game?
If they did not understand how to win this game, explain to them, then ask:
How could we help players understand that this is how to win this game?

What, if anything, did you learn from playing the game?
If the child didn't seem to understand the game was about making healthy diet choices, probe to understand if they learned anything about eating healthy. If yes, probe to understand what they learned.

What did you think about the choices of foods in this game segment?
Probe to see if the foods shown were those they liked, disliked. Probe for foods to add to the game.
Prompts: **Which of your favorite snacks were in this game? Which of your favorite snacks were missing? What other healthy snacks do you think we should add?**

Now let's rate this game:

If you had to give this game a grade (A, B, C, or D–like in school), what would you give it? *Probe to determine underlying reasons for their answer.*
FOLLOW-UP QUESTION if they give it a "C" or "D":
How could we change the game to make it an A or B?

For this question, use this scale: 1 is very easy, 2 is a little easy, 3 is not sure, 4 is a little hard, 5 is very hard. *(Show them index card with rating scale on it.)* **On a scale of 1 to 5, how easy or hard was this segment?**
Probe to determine underlying reasons for their answer.
FOLLOW-UP QUESTION:

Interviews were recorded on two digital recorders, so that one recorder acted as backup if the other failed. Recordings were transcribed verbatim after data collection of each game set was completed. All observation forms and interview scripts were approved by Baylor College of Medicine's Institutional Review Board prior to the testing sessions [protocol number H-19495].

Data Management

A file for the participant, including the completed observation form, interview script, consent form, and compensation form was then locked by key in a storage cabinet. Interview recording files were immediately copied to a password protected computer for storage and deleted from the digital recording devices.

The participant's name and identifying information was not included on observation forms nor mentioned during recorded interviews. Instead, participants were assigned a participant ID number and this number is the only identifier listed on the observation form. The interview files were labeled by the participant ID number for identification. These de-identified recording files were then sent to a service for transcription. When transcripts were received they were similarly labeled by participant ID number and stored on a password protected computer.

Analysis

This study analyzed the data found in the observation forms and interview transcripts to discover usability trends, and also followed the recommendations made based on the alpha-testing to see which changes were incorporated into the game.

Specific Aim 1

Interviews contained quantitative rating scale answers from children (e.g. "On a scale of 1 to 5: how easy or hard was this segment?"). Participant answers to these questions were assigned a number (e.g. if a child stated that a game was in between a little easy (2) and very

easy (1), this would be marked as a 1.5), and then all interview rating scale data were entered into a spreadsheet. Tables were created from this data to compare participant answers and means by ID or mini-game. Observation forms also included quantitative rating scale observations made by the interviewer. All data from handwritten observation forms was first entered into an excel spreadsheet for storage and manipulation. Quantitative observation tables were created to compare data such as time on task, knowledge scores (based on correct/incorrect choices made during game play), attention child paid to instructions, interviewer rating of child difficulty level, and emotional measures (frustrated, bored, engaged, fidgety, and calm) by participant ID, and mini-game.

To evaluate individual mini-game usability, the "positive response" criterion is a rating of greater than "a little fun" on the fun scale, and between either "a little too short" or "a little too long" on the length scale. Ratings of the helpfulness of the instructions would need to be greater than "a little helpful" to qualify as a positive response. For individual mini-game likeability, a criterion of 80% (B-) or greater was chosen. Thus, if the children rated the game greater than 80% on average, we consider this positive response for likeability. This standard of 80% has been used before as a threshold to test whether a computer game for child asthma education was intrinsically motivating (Shegog et al., 2001).

To examine game usability (or a component of usability) across all mini-games, means of child ratings and interviewer observations across all mini-games were compared to neutral response through a series of one-sample two-tailed t-tests (Shegog et al., 2006). Neutral response was dependent on the mid-point on the likert scale for each question. For 5-point likert scales, such as Length (1=Way too short, 2=A little too short, 3=Just right, 4=A

little too long, 5=Way too long) neutral response was 3, whereas for 3-point likert scales such as Fun (1=Not fun, 2=A little fun, 3=A lot of fun), neutral response was 2. For the "letter grade as in school" interview question determining likeability, the neutral response value chosen was 80%, or a B- on the scale presented to participants.

Qualitative analysis involved coding of the interview transcripts for helpful comments from children that could aid in making the game more understandable, usable, or fun. Transcripts were reviewed and compared against interview tapes for errors prior to coding. Coding was completed by entering informative child comments into a document by interview question and then grouping the comments by theme. From this, a table was generated that displays, for each mini-game and interview question asked, the general child responses (e.g.: "X children felt the game was too difficult because they could not hit the target.") as well as important helpful ideas from the children in detail (e.g. "Child liked that he could select his own goal but wanted to be able to see all choices at once"). This method of organizing and coding qualitative data is similar to the method Miles and Huberman (Miles & Huberman, 1994) describe as Conceptually Ordered Displays.

Qualitative observation data, including interviewer comments about game interface or technical problems as well as notes on child game interactions, were also coded for common themes, problems, and suggestions.

In order to facilitate examination qualitative interview and observation data regarding each game, game summary tables were created that summarize game play components, children's suggested changes from interview coding, and technical and game-play problems from observation notes coding. These summary tables do not incorporate all child comments

or observations related to the games, but only those comments related to game-play problems or possible improvements, as this was the target of alpha-testing.

Lastly, because knowledge scores were calculated and recorded differently for each game, they are difficult to compare across mini-game and are instead summarized and displayed in a separate table.

Specific Aim 2

The association between demographic variables (age, gender) and usability of the games was assessed using two-tailed unpaired t-tests. Means of rating scale responses for each game were calculated separately for males and females and for two age groups of younger (9 to 10 year olds) and older (11 to 12 year olds) children. Significant differences were assessed at alpha = 0.05.

Specific Aim 3

Follow-up meetings with the video game software development team were conducted to review alpha-test results and to determine what child suggestions and interviewer observations could feasibly be incorporated into the revised game. The proposed changes that were delivered to the software team based on alpha-testing were tabulated with the rationale for inclusion and exclusion and modifications made to meet logistic constraints.

RESULTS

Demographic Variables

The study sample included 10 ethnically diverse children (4 male, 6 female). The group consisted of five 12-year-olds, one 11-year-old, three 10-year-olds, and one 9-year old. The majority of the children were fairly experienced with computer video games. Fifty percent of the children were frequent video game players (played 4 days per week or more), 30 percent were moderate game players (played one or two days per week), and only 20 percent of the children were not game players (played never).

Table 5. Demographics of participants by gender

	Male	Female	Overall
	n=4	n=6	
Age			
9 Years old	0	1	10%
10 Years old	1	2	30%
11 Years old	1	0	10%
12 Years old	2	3	50%
Race/Ethnicity			
Caucasian	1	3	40%
African American	1	2	30%
Hispanic	2	0	20%
Asian	0	1	10%
Video Game Usage			
Frequent (>=4 days/week)	2	3	50%
Moderate (1-2 days/week)	1	2	30%
Never	1	1	20%

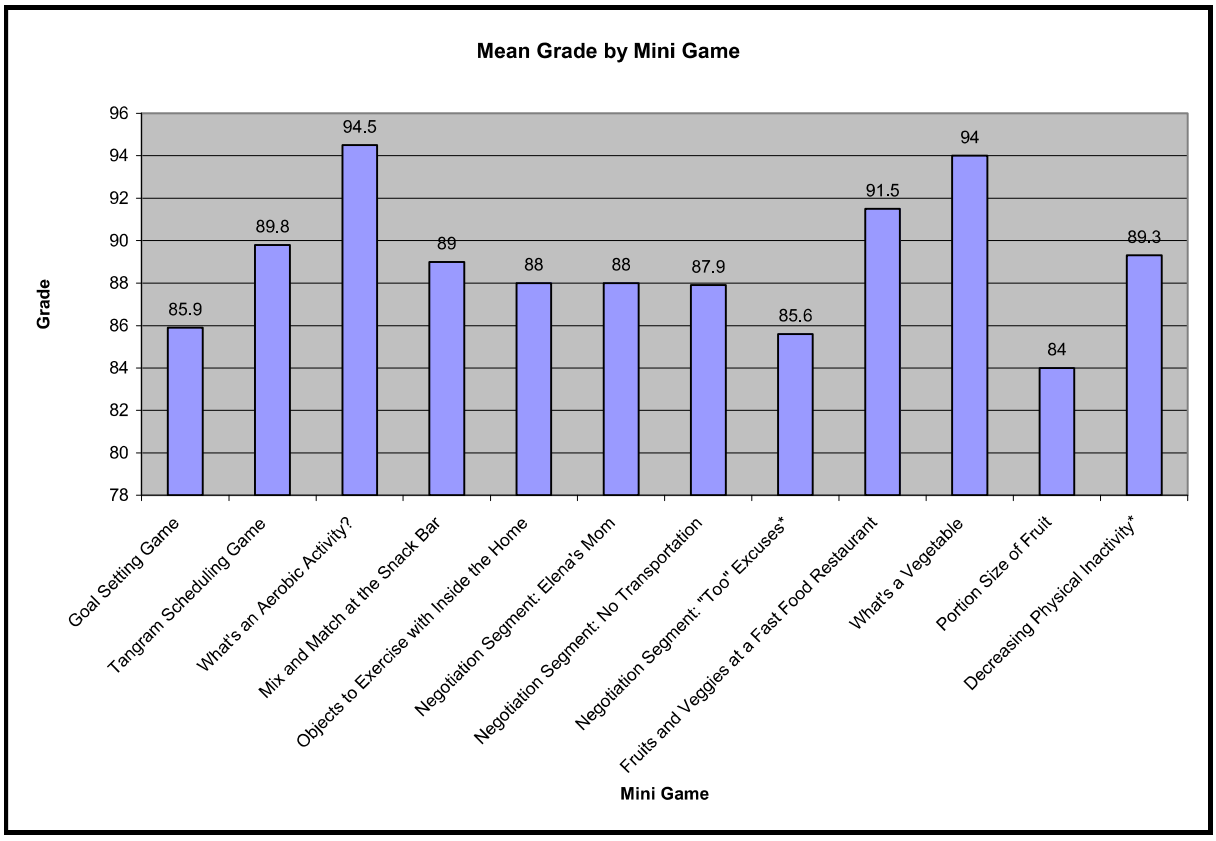
Specific Aim 1

Usability Based on Child Self-report Ratings

All child ratings are measures of usability. Specifically, grade given by children to each mini-game is a measure of likeability. Ratings on difficulty, fun, length, and

helpfulness of instructions are all unique measures of general usability. Mean child ratings and t-test results can be viewed in Appendix A. On average children gave each individual mini-game a score of higher than the likeability criterion of 80%. While the "What's A Vegetable" game received the highest grade at 94, the "Portion Size of Fruit" game, "Goal Setting" game and "Negotiation" segments received the lowest likeability grades from children. "Portion Size of Fruit" received the lowest grade at 84. Participants mostly noted that they rated this game as they did because it was difficult (n=3) and lacks fun (n=3). The grade of 85.9 given to Goal Setting, however, includes all A to B range grades with the exception of one D. The participant who graded Goal Setting a D, gave as a reason for doing so that "it's not a game, you are just setting goals. There is not much you can change to make it better." Removing this D from the group would bring the mean up to 88.2. Other participants mostly noted that the reasoning behind their A or B-level grade was that the game and instructions were somewhat confusing or complicated (n=6), but that the game was fun (n=6) or helpful in real life (n=2). The Negotiation Segment: "'Too' Excuses" was given the second lowest grade at 85.6. One participant gave this game an F, without which the average would be 89.4. This one participant also scored the other two negotiation segments similarly, and noted that this was because they felt it was not really a game, just making selections, however "there is nothing you can change to make it better without changing the point of it." The remaining participants rated this game a B or higher and mostly mentioned that it was good, cool, or fun (n=4).

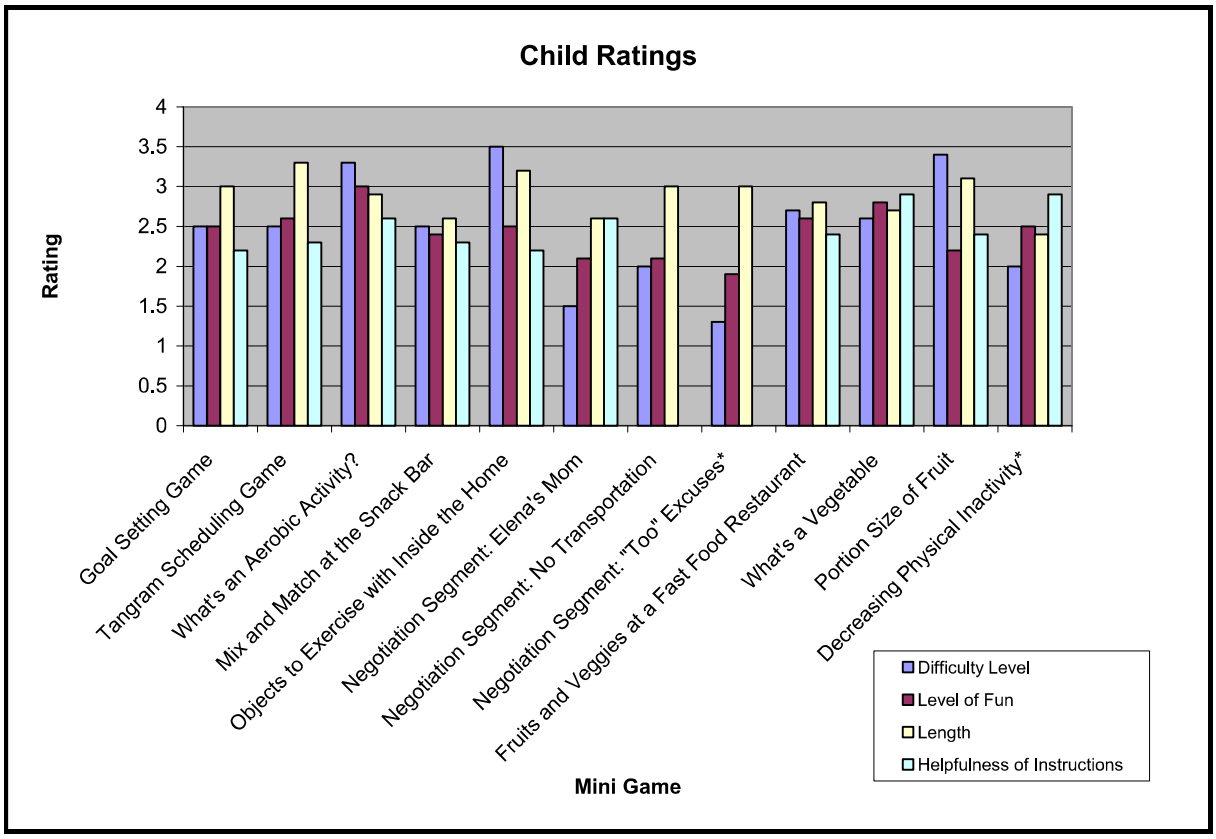
Figure 4. Child likeability ratings by mini-game



All scores for difficulty level are in the "positive" criterion range (between 2 and 4), with the exception of two of the negotiation segments, which were ranked closer to Very Easy (1). However, most kids stated that it was a good thing that the "Negotiation Segment: Elena's Mom" was easy (n=5), some mentioning that this is because it not as much a game as simply selections and thus should not be difficult. Remaining scores placed the games each closest to "a little fun" or "a lot of fun" for level of fun, "just right" for length, with the exception of "Decreasing Physical Inactivity", which was rated as 2.4, or closest to "a little too short". This game only took children an average of one minute, and children mostly commented that it should take longer to complete (n=4). Helpfulness of the instructions was ranked primarily as "a little helpful" or "very helpful" (Figure 5). "Goal Setting" and

"Objects to Exercise with Inside the Home" both ranked lowest at 2.2 (closest to a little helpful).

Figure 5. Child usability ratings by mini-game



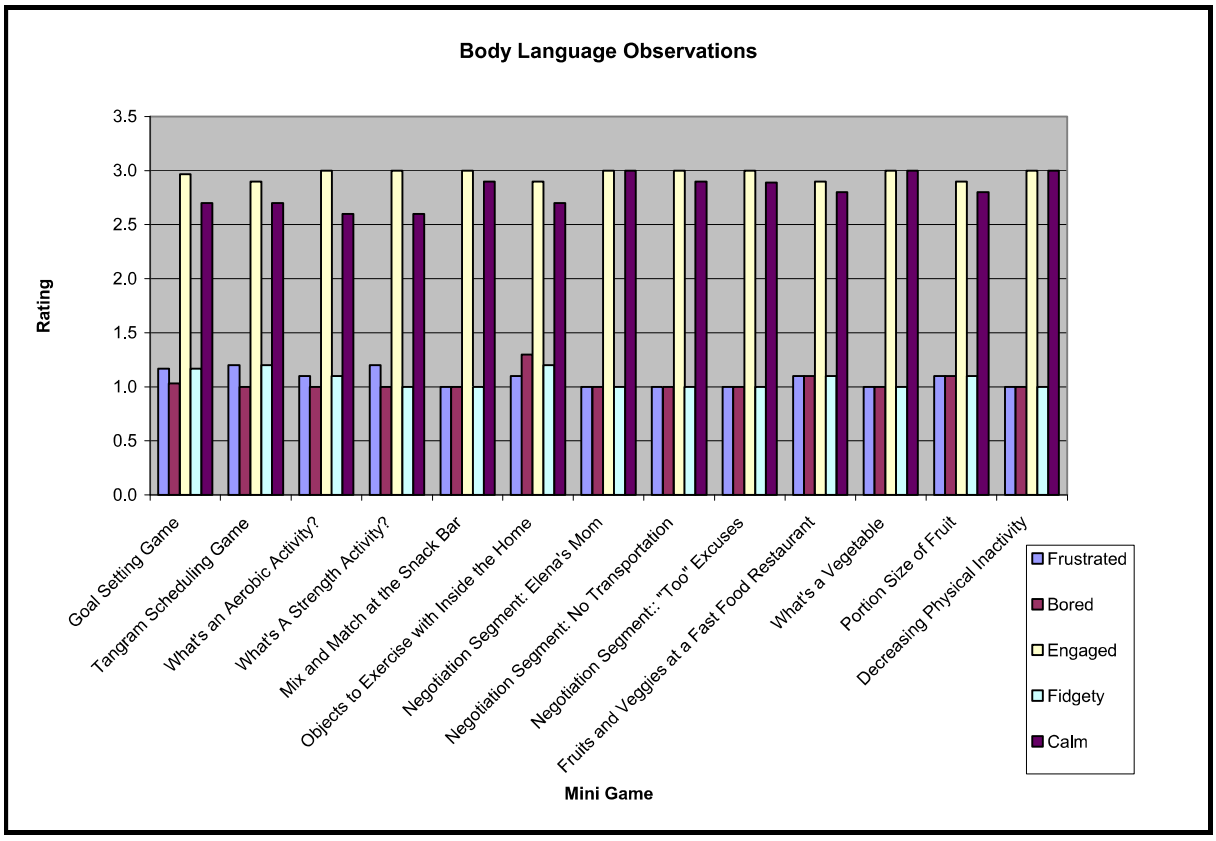
The mean likeability grade given by children across all mini-games of 89% was shown by two-tailed t-test to be significantly higher than the neutral grade of 80% ($p < 0.01$) (See Appendix A). Across all mini-games, children also rated the game better than neutral for "fun" and "helpfulness of instructions" (both $p < 0.01$). Additionally, across all mini-games, children rated the game a 2.5 on average for difficulty (between a little easy and not sure), but when compared to a neutral value of "not sure", results were significantly different ($p < 0.05$), indicating that the games are on average on the "easier" side of "not sure". Child

ratings of length across all mini-games, when compared to the neutral value of "just right", were not significantly different and thus the length of the games could indeed be closest to "just right".

Usability Based on Observer Ratings of Child Game-play

All observation ratings are measures usability. Specifically, "time on task" is a measure of efficiency, body language measurements reflect satisfaction, and "difficulty the player had with the game" and "attention paid to instructions" measure effectiveness. Mean observer ratings and t-test results can be viewed in Appendix B. Time on task seemed appropriate for most games. However, more than an ideal amount of time was spent on both "Goal Setting" (13 minutes), "Tangram Scheduling Game"(15 minutes), and "Objects to Exercise with Inside the Home"(15 minutes). The difficulty with "Objects to Exercise with Inside the Home" is also reflected by the high observer rating of difficulty children had with this game at 2.5 (in between a little and a lot of difficulty). No other mini-games were rated as giving children more than "a little difficulty" on average. Regardless of any lengthy duration or confusion, participant body language was rated on average as indicating that during all games participants were "not frustrated", "not bored", "very engaged", "not fidgety" and "very calm". Some body language measures do not necessarily imply a negative or positive tendency as far as satisfaction. For example, "not calm" could describe a child who is visibly angry with the game or visibly excited about the game, among other emotional states.

Figure 6. Satisfaction: Body Language Observations by Mini Game (n=10)



For satisfaction across all mini-games, all body language measures were significantly different than the neutral values when compared by two-tailed t-tests (all $p < 0.01$). This indicates that participants were not observed to be frustrated, bored or fidgety, and were observed to be engaged and calm. As a measure of effectiveness across all mini-games, participants were also observed to have paid significantly more than "a little attention" to instructions ($p < 0.01$) and to have had significantly less than "a little difficulty" with the games ($p < 0.01$)) on average.

Because knowledge scores are tabulated very differently for each game, they cannot be compared across games. Instead, knowledge game score descriptions, ranges and means are displayed in Table 6 below. For games in which players must play repeatedly until they

win, players generally got more answers correct and fewer answers incorrect with each attempt until they were able to pass the game. Thus correct scores generally increase with each round and incorrect scores generally decrease with each round. It should be noted that some players completed the game in fewer rounds and thus were not factored in to later round means as they had no score for these later rounds. This helps to explain why, for example, the scores for Round 4 and 5 of the "What's a Strength?" game seem poor relative to earlier round scores, as these scores represent the only player who needed a 4th and 5th attempt to win these games.

Table 6. Knowledge Score Summary

Game Name	Score Description	Score: Range	Mean
What's an Aerobic Activity?	Players must get 20 aerobic activities to win. If they hit 10 non-aerobic activities first, they must start over. Scores include how many aerobic and non-aerobic activities the player selected each time. Additionally, the mean number of times each player had to play the game to win is reported.	Aerobic: 0-20	**Round 1: 14.6** **Round 2: 15.7** **Round 3: 15.0** **Round 4: 20.0**
		Non-Aerobic: 0-10	**Round 1: 9.0** **Round 2: 8.4** **Round 3: 8.4** **Round 4: 7.0**
		Number of Attempts to Win	**2.4**
What's an Strength Activity?	Players must get 20 strength activities to win. If they hit 10 non-strength activities first, they must start over. Scores include how many strength and non-strength activities the player selected each time. Additionally, the mean number of times each player had to play the game to win is reported.	Strength: 0-20	**Round 1: 16.2** **Round 2: 16.0** **Round 3: 19.3** **Round 4: 19.0** **Round 5: 20.0**
		Non-Strength: 0-10	**Round 1: 7.4** **Round 2: 9.4** **Round 3: 7.5** **Round 4: 10.0** **Round 5: 8.0**
		Number of Attempts to Win	**2.1**
Mix and Match at the Snack Bar	Players must select 3 healthy foods to win. If they first select 5 unhealthy choices, they must start over. Scores include number of correct and incorrect choices the player made each time the played the game. Additionally, the mean number of times each player had to play the game to win is reported.	Correct Choices: 0-3	**Round 1: 2.9** **Round 2: 3.0**
		Incorrect choices: 0-5	**Round 1: 2.2** **Round 2: 2.0**
		Number of Attempts to Win	**1.1**

Game Name	Score Description	Score: Range		Mean
Objects to Exercise with Inside the Home	Players must drag and deliver 10 objects with which to exercise to the character Dagan within a time limit. When time runs out, the player must start over. Scores include how many items the players were able to deliver to Dagan during each game attempt. *Note: Some players were unable to complete this game and therefore were never able to deliver all 10 objects. Also, the observer did not record # of objects delivered for rounds after 7 tries. This explains why final round averages are not equal to 10.*	Number of objects delivered to Dagan: 0-10		**Round 1: 0.0** **Round 2: 0.3** **Round 3: 3.6** **Round 4: 2.4** **Round 5: 1.2** **Round 6: 5.0** **Round 7: 5.0**
		Number of Attempts to Win		**6.2**
Negotiation Segment: Elena's Mom	Players answer questions to solve a fruit/vegetable goal problem. Score is the number of incorrect answer choices made.	Number of Incorrect Answer Choices		**1.7**
Negotiation Segment: No Transportation	Players answer questions to solve an exercise problem. Score is the number of incorrect answer choices made.	Number of Incorrect Answer Choices		**1.4**
Negotiation Segment:: "Too" Excuses	Players answer questions to solve an exercise problem. Score is the number of incorrect answer choices made.	Number of Incorrect Answer Choices		**0.9**
Fruits and Veggies at a Fast Food Restaurant	Players remove unhealthy choices from three groups (sides, drinks, desserts) leaving healthy choices remaining. Players must restart if they make 5 incorrect choices.	Sides	Correct Choices: 0-11	**Round 1: 9.0** **Round 2: 10.6** **Round 3: 11.0**
			Incorrect Choices:0-5	**Round 1: 4.3** **Round 2: 2.1** **Round 3: 2.0**
		Drinks	Correct Choices: 0-11	**Round 1: 9.3** **Round 2: 6.7** **Round 3: 10.0**
			Incorrect Choices:0-5	**Round 1: 1.9** **Round 2: 1.7** **Round 3: 3.0**
		Desserts	Correct Choices: 0-11	**Round 1: 11.6** **Round 2: 10.3** **Round 3: 12.0**
			Incorrect Choices:0-5	**Round 1: 2.2** **Round 2: 2.3** **Round 3: 2.0**
		Number of Attempts to Win		**1.4**

Game Name	Score Description	Score: Range	Mean
What's a Vegetable	The child must collect 20 vegetable items from vegetable/non-vegetable pairs. If time runs out or they are caught by a guard they must start over.	Vegetables 0-20	**Round 1: 15.2** **Round 2: 11.6** **Round 3: 14.5** **Round 4: 12.5** **Round 5: 20.0**
		Non-Vegetables: 0-20	**Round 1: 2.1** **Round 2: 1.1** **Round 3: 1.3** **Round 4: 2.0** **Round 5: 0.0**
		Number of Attempts to Win	**2.4**
Portion Size of Fruit	Players must select 5 correct fruit portions to pass the game.	Number of incorrect choices (unlimited)	**13.6**

Usability Based on Structured Interviews with Children

Structured interviews with children yielded information about the problems they experienced with individual games and suggestions on how to mitigate these while making the game less difficult and more interesting. Summaries for each are provided. Full coding of structured interview data is provided in Appendix D.

Goal Setting Game

While children generally found this game "good", "fun", or "cool" (7), they also found it "hard" or "complicated" (4). Many mentioned that they did not know what to do at first (6), and so were shooting randomly at the value/reason/goal asteroids for some amount of time (6), but eventually figured it out. Therefore, most kids mentioned an instruction screen should be added (5), that this screen should show an example of what to do (2) and the word "probe" should be changed to be more clear (2). Some children did not know that they

were answering questions related to goals, and thought that audio narration of the questions (4) or questions blinking or popping up center-screen (3) would make this more clear.

Tangram Scheduling Game

Most children liked this game or found it "fun" or "interesting" (8), mostly because they liked the puzzle aspect (4). Some children also mentioned that it could be helpful in real life (4). However, many children did not know that the goal of the game was to add 60 minutes of activity to their schedule (5), and so most children felt the minute counter should blink, pop, or sound upon adding minutes to make this more evident (8). A few children found it confusing (3) or difficult (2) and some thought the instructions should be made more clear (5), especially the wording of "cannot cover activities" needed to be changed (4). Also, some children mentioned that they did not want to read the same long dialogue in between each level of the game and this dialogue should be shortened or changed each time (4).

"What's an Aerobic Activity?" And "What's a Strength Activity?"

All 10 children said this game was "fun", "cool" or they "liked it", even though some found it challenging (5), mostly because they enjoyed rolling the ball around (6). There were very few problems mentioned with this game, and so most children said they just would want it to be longer (5) or more difficult by having the ball get bigger and slower as the player answers incorrectly (5). Players also requested changing the way "aerobic" and "strength" are defined (5), mostly requesting adding audio to the definition screen (2) or a "help" button that would repeat the definition (2).

Mix and Match at the Lifepad Snack Bar

Most children mentioned that the game was "good", "cool", or "fun", with most saying this was because they liked the puzzle aspect (6). There were very few problems mentioned with this game, and almost all the children (9) mentioned ways to make the game harder, for example by requiring more correct answers (6), or enlarging the puzzle grid (5). To clarify the instructions children mentioned that they should say to pick the "healthiest" food, not to pick a "healthy" food (4).

Objects to Exercise with Inside the Home

Some children said this game was hard (5) or confusing (4) because it was hard to move the boxes (3) or because the instructions were misleading (2), although some also said it was "fun", "nice", or they "liked it" (5). The children mostly liked having a time limit for this game (8), however they thought they should have more time (3) or the timer should not run down while the exercises are being demonstrated (4). Almost all the children agreed that the instructions needed to be made more clear and had suggestions to this regard (8), and felt that when they lost on level 2, 3, or 4 they should not have to restart at Level 1 (8). They also thought that there should be fewer boxes to move in early levels and progressively more in later levels (8). They often did not realize at first that they were supposed to push the boxes to Dagan and so felt that he should somehow be highlighted or made more obvious (8).

Negotiation Segments: "Elena's Mom", "No Transportation", "'Too' Excuses"

These three negotiation segments received mixed opinions with most children making positive comments (4, 7, 4 respectively), but some kids saying they were just "okay" (3,0,2 respectively) or even boring (1, "Elena's Mom") or not fun (1, "'Too' excuses"). Most

children who did not enjoy the games said that this was because they were just making choices and that they did not really consider it a game. Of the three negotiation segments, "No Transportation" received the most positive response, with one child indicating that this was because it could help in real life. This seems in line with fact that this game also received the highest rating on average of how likely the children would be to have this problem (2.1 versus 1.5 and 1.7). For the "Elena's Mom" segment, children thought there should be more questions/conversation (2), audio of the questions (2), and a correct answer choice option for the first question (3). For the "No Transportation" game, most children wanted to change the number of correct answer to win (6), although they were divided on whether this number should increase (2) or decrease (4). Regarding the "Too Excuses" segment, children mostly offered that the "too clumsy" excuse should either be removed (3) or reworded (3).

Fruits and Veggies at a Fast Food Restaurant

Almost all children remarked that the game was "fun", "good", or they "liked it" (9) with some also saying that they liked that it was challenging (3). Many children also note that the game was "difficult" "hard" or "tricky" (5), or that they were confused at first because they thought they had to shoot the healthy foods not the unhealthy foods (4). Children mostly mentioned changing the summary screen at the end of the game (9), with many mentioning that it should also list the unhealthy foods(5) and say why they are not healthy (3). Children also often noted that they would want additional levels such as "snacks" or "main course"(5) and that if you lose on a level you should not have to restart the whole game (3).

What's a Vegetable?

Children generally had positive things to say about this game noting mostly that it was fun/good/cool/liked it (8), with many saying that they liked being chased by the guards (6). They had few suggestions for changes, mostly saying that it was easy (4), and offering ways to make it more difficult such as having the energy decrease faster (6) or more correct answers required to win (4).

Portion Size of Fruit

Most children said that this game was good/fun (6), although they also mentioned it was hard (6), because it was difficult to stop the wheel at the right time (3), to discover the pattern in the wheel (2), or to know the correct portion sizes (2). Many children thought therefore that the wheel should spin more slowly (6), or that the instructions should be changed (5) to clarify that there is a pattern to the portion wheel lights (3). Children also offered other changes to the mechanism of the portion wheel (2) and the fruit wheel (3), or mentioned a change in the number of correct portions they had to guess (3).

Decreasing Physical Inactivity

Most children said that the game was good/fun/they liked it (6), mostly because they liked running around (3). Children also mentioned that it was short (3), and offered changes to make the game longer including more levels in different settings (5), and mostly supporting the idea proposed by the interviewer of adding an additional inactive state to the character (7). The children also suggested to make the game more longer or more challenging by having the energy meter decrease faster or increase slower (2) or the active groups switch back to inactive more quickly (2).

Usability Based on Observation of Child Game-Play

Observational notes yielded information about technical problems encountered in game play and how the children interacted with the games. Summaries for each game are provided. Full coding of observation notes is presented in Appendix C.

Goal Setting Game

Possibly due to a lack of game instructions prior to goal setting, the players were observed to not know what to do when beginning this game (5), and often the interviewer had to explain all or part of the game to the player (4). Much of the trouble seemed to stem from children not knowing how to properly probe and shoot the asteroids or move the flyer (5). However, often the children seemed to just be guessing and randomly shooting at the asteroids, instead of reading the value, reason and goal setting choices and thinking about them (3). Interviews uncovered that this was because they sometimes did not know they were supposed to be answering a question. Lastly, a few of the children were observed to struggle with reading some of the text (2).

Tangram Scheduling Game

Again, some children did not seem to know what to do at first in the game (4), and the interviewer had to explain all or part of the game to the players (3). Players seemed confused with how to turn a puzzle piece (2) and putting multiple small pieces over a larger shape (2). They also seemed to be thrown off when seeing the "cannot cover activities" message (1), or correctly placing a piece that did not snap to the puzzle because it was not exactly within the lines (1).

Players experienced a few technical problems in this game including that one player was able to place a larger piece over a smaller piece, and a second player had placed enough puzzle pieces/minutes of activities to win the game, but then one was taken away from this player unexpectedly, so they were forced to continue playing.

"What's an Aerobic Activity?" And "What's a Strength Activity?"

There were no technical problems experienced and very few usability problems. Only one player did not seem to understand why aerobic activities were not registering as "correct" answers during the "strength" game because they player had skipped through the instructions.

Mix and Match at the Lifepad Snack Bar

This game had no technical problems and very few usability issues, with only one player not seeming to understand what to do at first.

Objects to Exercise with Inside the Home

This game seemed to be very confusing for players at first with most not seeming to not know what to do (9). Most children required help from the interviewer with understanding all or part of the game (8). It was evident during observation that many players did not know what to do when the tried to push empty boxes to the character Dagan (6) instead of the PA objects. Players were also observed to have trouble moving the boxes in general (3), or they never figured out that they could pull the boxes, not only push them (2). Technical problems experienced included players being able to skip delivering one of the items but still pass the game (3), and after losing the game screen reappearing but with no characters to move (2).

Negotiation Segments: "Elena's Mom", "No Transportation", "'Too' Excuses"

There were very few usability problems observed for this game, however due to the game containing a lot of text 1 player did have trouble reading at reasonable pace and seemed to get frustrated with all of the reading.

A few technical problems were experienced including that answers that had been previously selected were reappearing on answer choice lists later in the game (2), and one player was not allowed to pass the game after selecting a correct answer on the fifth try.

Fruits and Veggies at a Fast Food Restaurant

Observers only noted one actual usability problem for this game which was that a few players did not understand that they were supposed to shoot the "unhealthy" foods at first, and seemed to think the goal was to shoot the "healthy" foods (2), and therefore the interviewer had to explain all or part of the game to one child. There were several small technical problems including that the food baked potato showed up twice, and the food baked potato with salsa was incorrectly listed as baked potato with butter.

What's a Vegetable?

There were no real usability problems with this game. The observer noted that several of the children were repeatedly caught by the guards (5), however children mentioned in interviews though that they enjoyed being chased by the guards (6) so this does not necessarily qualify as a problem.

Portion Size of Fruit

Children seemed to have a lot of difficulty with timing their selection on the portion size wheel (7), and some children even seemed to repeatedly just select at random throughout

the game because they never noticed a pattern in the way the portion wheel lights up (2). Adding to the difficulty children had with this game, was the technical issue that the messages mean to help children with their selections "Whoa that's a lot!" and "Are you sure that's enough?" were reversed so that they were playing at the wrong times, which was noticeable confusing for the players (3). The results screen also displayed a gray number off to the right of the score if the player did not get any answers correct on the first try.

Decreasing Physical Inactivity

There were no real technical or usability problems with this game, but one child did have trouble keeping all the characters active at once to win the game. Most other players passed the game very quickly though, and commented that it was too short, so this is likely not a problem.

Specific Aim 2

Gender Differences in Observer and Child Ratings

There were no significant between gender differences for most self-reported and observational usability ratings. Compared to the males, the females rated the game as more fun ($p < 0.05$) and as closer to being the right length ($p<0.01$) (Table 7). In contrast, boys rated the game as "too short" and demonstrated significantly less frustration ($p < 0.05$) and more engagement ($p < 0.01$) than females (Table 8).

Table 7. Gender differences in child usability ratings of 12 mini-games

	Mean of mini-game rating means *X (± SD)*		
Gender	Male	Female	P-value
Number of Children in Gender Group	4	6	
If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?	90.1 (3.56)	88.2 (4.11)	0.235
On a scale of 1 to 5, how easy or hard was this segment?	2.3 (0.78)	2.6 (0.68)	0.300
On a scale of 1 to 3, rate this segment (Level of fun).	2.2 (0.46)	2.5 (0.27)	0.048
On a scale of 1 to 5, what did you think about the length of this segment?	2.5 (0.40)	3.1 (0.31)	0.001
On a scale of 1 to 3, how helpful was the explanation at the beginning of this part of the game?	2.4 (0.44)	2.5 (0.32)	0.498

Table 8. Gender differences in observer usability ratings of 13 mini-games

	Mean of mini-game rating means *X (± SD)*		
Gender	Male	Female	P-Value
Number of Children in Gender Group	4	6	
Time on Task	0:05	0:07	
Attention to Instructions (1 = paid no attention, 2 = paid a little attention, 3 = paid close attention)	2.75 (0.33)	2.66 (0.17)	0.383
Difficulty Player had with Game (1 = no difficulty, 2 = a little difficulty, 3 = a lot of difficulty)	1.35 (0.33)	1.62 (0.52)	0.171
Frustrated (1 = not frustrated, 2 = a little frustrated, 3 = very frustrated)	1.02 (0.07)	1.11 (0.12)	0.023
Bored (1 = not bored, 2 = a little bored, 3 = very bored)	1.00 (0.00)	1.07 (0.14)	0.073
Engaged (1 = not engaged, 2 = a little engaged, 3 = very engaged)	3.00 (0.00)	2.94 (0.08)	0.015
Fidgety (1 = not fidgety, 2 = a little fidgety, 3 = very fidgety)	1.03 (0.07)	1.09 (0.11)	0.095
Calm (1 = not calm, 2 = a little calm, 3 = very calm)	2.85 (0.16)	2.79 (0.15)	0.194

Age Differences in Observer and Child Ratings

No significant differences in self-reported ratings of the games were found between younger children (9-10 years of age) and older children (11-12 years of age) (Table 9). Observational results indicated that younger children paid significantly less attention to instructions, and were significantly more fidgety and less calm than older children (all $p < 0.05$) (Table 10). Though younger children were observed to have more difficulty with the games and to show more frustration, these results were not significant for this sample.

Table 9. Age group differences in child usability ratings of 12 mini-games

	Mean of mini-game rating means *X (± SD)*		
Age	**9 to 10 yr olds**	**11 to 12 yr olds**	**P-value**
Number of Children in Age Group	**4**	**6**	
If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?	**90.3 (4.17)**	**88.1 (3.66)**	**0.182**
On a scale of 1 to 5, how easy or hard was this segment?	**2.5 (0.54)**	**2.4 (0.94)**	**0.814**
On a scale of 1 to 3, rate this segment (Level of fun).	**2.5 (0.34)**	**2.3 (0.36)**	**0.252**
On a scale of 1 to 5, what did you think about the length of this segment?	**2.8 (0.27)**	**2.9 (0.35)**	**0.192**
On a scale of 1 to 3, how helpful was the explanation at the beginning of this part of the game?	**2.4 (0.36)**	**2.6 (0.28)**	**0.250**

Table 10. Age group differences in observer usability ratings of 13 mini-games

	Mean of mini-game rating means *X (± SD)*		
Age	**9 to 10 yr olds**	**11 to 12 yr olds**	**P-Value**
Number of Children in Age Group	**4**	**6**	
Time on Task	**0:06**	**0:06**	
Attention to Instructions (1 = paid no attention, 2 = paid a little attention, 3 = paid close attention)	**2.48 (0.26)**	**2.83 (0.26)**	**0.015**

	Mean of mini-game rating means *X (± SD)*		
Age	**9 to 10 yr olds**	**11 to 12 yr olds**	**P-Value**
Difficulty Player had with Game (1 = no difficulty, 2 = a little difficulty, 3 = a lot of difficulty)	**1.62 (0.49)**	**1.44 (0.40)**	**0.247**
Frustrated (1 = not frustrated, 2 = a little frustrated, 3 = very frustrated)	**1.12 (0.14)**	**1.04 (0.07)**	**0.101**
Bored (1 = not bored, 2 = a little bored, 3 = very bored)	**1.04 (0.09)**	**1.04 (0.10)**	**0.711**
Engaged (1 = not engaged, 2 = a little engaged, 3 = very engaged)	**2.96 (0.09)**	**2.97 (0.06)**	**0.799**
Fidgety (1 = not fidgety, 2 = a little fidgety, 3 = very fidgety)	**1.12 (0.13)**	**1.03 (0.07)**	**0.049**
Calm (1 = not calm, 2 = a little calm, 3 = very calm)	**2.71 (0.20)**	**2.88 (0.13)**	**0.029**

Specific Aim 3

Proposed Changes and Outcomes

The interview and observation notes summary tables presented in Appendices C and D show that children and observers had many suggestions for changes to the Nanoswarm and Diab video games. However, due to time and financial constraints (and some child suggestions being somewhat unrealistic or unnecessary for the goal of the game; e.g. adding 10 levels of a particular mini-game) not all suggested changes were actually proposed to the software company. The list of suggestions from children an interviewers was reviewed for those most beneficial and necessary, and then submitted to the software company. Table 16. shows the changes proposed and the end result in the game.

Table 11. Proposed game changes and outcomes

Alpha Testing Mini-Games: Proposed Changes and Outcomes

Game Session/Segment

Nanoswarm: Goal Setting Game

Issue	Child/Researcher Suggestions	Proposed Change	Outcome
Instruction Screen missing. Children did not understand to probe targets and then shoot them.	Instructions should mention that they have to probe first to read the asteroid and then shoot the item 3 times to select it.	Screen was supposedly built but not included in testing. Since we have not yet seen this screen, we will need to review it for clarity.	Instruction screen now included.
Children often skip instructions and then look for them after beginning the game.	Include a button to re-display instructions once in the game. This would be helpful with many other games as well.	Include a button to re-display instructions once in the game. This would be helpful with many other games as well.	Button 10 now takes the child back to instruction screen.
Children sometimes did not notice the question being asked at the top of the screen or had trouble reading the question. When this happened they often thought that they were supposed to just shoot the asteroids and did not recognize that they were in fact answering a question.	Have a voice reading the question aloud to help the children notice it and understand that they were supposed to be answering a question by shooting the asteroids.	Use the Vitalink voice to read aloud the questions as they appear on the screen.	Vitalink voice reads directions and introduction, but not all questions.
When there are a lot of answer asteroids on the screen, the children sometimes lose track of which is which and cannot find the one they want, so they just pick an answer at random.	Create a running list somewhere on the screen that lists the number and value of all asteroids that have been probed up to that point.	Create a running list somewhere on the screen that lists the number and value of all asteroids that have been probed up to that point.	The 4 button allows users to see a list of values of asteroids they have selected.

Nanoswarm Episode 7: Tangram Scheduling Game

Issue	Child Suggestions	Proposed Change	Outcome
Children were sometimes confused by the instructional statement "Cannot Cover Activities" as they thought this meant that they could not place a piece on top of any other activity piece.	Change this statement to "Cannot replace this activity"	Change this statement to "Cannot Replace Activity"	Change has been implemented as described.
Typo "You wouldn't have ot give up all 60 minutes of your computer ***your computer*** game."		Fix typo	Typo fixed.
Dialogue in between games does not always apply to the schedule the child has chosen for the Tangram game.	Adjust the dialogue so that it applies to the schedule selected.	Have a specific dialogue for each schedule. Dialogues to be used are listed in this file: Nanoswarm S#7 - Dialogues for Schedules.xls	Change has been implemented as described.
Dialogue in between games is bulky and repetitive. Children become bored with reading the same dialogue repeatedly.	Only play the long dialogue for the first tangram game. In between tangram games, play a shorter dialogue.	Play the long dialogue for the first tangram game. In between tangram games, play the following shorter dialogue: "Great job wings! Thanks for helping me put my schedule back together. Now can you help me fit 60 minutes of physical activity into my busy day?"	Change has been implemented as described.
Children did not see the 60 minute meter in the upper right corner of the screen.	When new minutes are added to the PA meter, have the number of minutes appear in the center of the screen and then shrink back up to the meter; Have the meter blink/flash when new minutes are added to it.	Have the meter blink/flash when new minutes are added to it.	Change has been implemented as described.
Pieces did not snap into place on the tangram shape. This caused children to be confused when they put a piece near the correct spot but it did not register as added to the schedule. Chidlren were frustrated when they could not get the piece to fit right.	Have pieces move in increments and snap into places when they are in the correct place so that there is less confusion on when/where they fit.	Have pieces move in increments as if on a grid and snap into places when they are in the correct place so that there is less confusion on when/where they fit.	Once the child now presses the button to place a piece, the peice snaps into place on the puzzle, provided the child placed it in close enough proximity to a correct placement.
Some children did not know to put pieces inside the shape outline to complete the initial tangram puzzle.	Slightly darken the color of the tangram shape or put an outline around it to make it more noticeable and obvious that this is where the pieces are to be placed.	Slightly darken the color of the tangram shape or put an outline around it to make it more noticeable and obvious that this is where the pieces are to be placed.	An outline was created around the Tangram puzzle shape.

Diab Episode 6: What's an Aerobic Activity? & Diab Episode 7: What's a Strength Activity?

Issue	Child Suggestions	Proposed Change	Outcome
Game is a little easy for older children. Many passed it quickly and would have preferred it to be a little more difficult.	Add obstacles; ball gets bigger and slower as they select wrong answers (make it slightly more exaggerated than it currently is).	Ball gets bigger and slower as they select wrong answers (make it slightly more exaggerated than it currently is).	The size and speed change of the ball based on game performance is now more exaggerated.

Nanoswarm Episode 2: Mix and Match at the Lifepad Snack Bar

Issue	Child Suggestions	Proposed Change	Outcome
Game is too short/easy for most children.	* Change to 5 correct to win, 3 wrong to lose. * Require the player to win the game multiple times, instead of just once. * Make the tiles slide gride larger (eg. 6X6 Grid) * Make the grid into a maze so that you can only slide the tiles in certain directions.	Change the game from 3 correct to win, 5 wrong to lose to **5 correct to win, 3 wrong to lose**.	Change was implemented as described.
Instruction wording confused a child.	Change the instructions from "Slide the pictures around until ***a healthy*** selection is in the ? space." to ""Slide the pictures around until ***the healthiest*** selection is in the ? Space."	Change the instructions from "Slide the pictures around until ***a healthy*** selection is in the ? space." to ""Slide the pictures around until ***the healthiest*** selection is in the ? Space."	Change was implemented as described.
Children did not always know why the food they selected was bad.	Briefly explain why their "Bad" selections were Bad.	On Score screen: As bad foods appear, display a brief message about why the food is bad. Eg: Too much fat! Too much sugar!	Messages about why bad foods are bad are displayed on summary screen.

Diab Episode 5: Objects to Exercise with in the Home

Issue	Child Suggestions	Proposed Change	Outcome
Many children were not able to figure the game out without help from the researcher.	* Improve the instructions	*Instructions currently say "Use 2 to push the boxes to Dagan". Reword this to "Use 2 to push the household objects to Dagan".	Instruction wording has been changed to say "Press and hold the 2 button to make bearspaw push or pull things to dagan before time runs out."
Many children were not able to figure the game out without help from the researcher.	* Have Dagan where brighter clothing so that he is more visible.	* Have Dagan where brighter clothing so that he is more visible.	Adjusted the lighting of the game setting to make Dagan more visible.
Many children were not able to figure the game out without help from the researcher.	* Have a word bubble coming from Dagan's mouth that indicates to push the objects to him. If empty boxes are instead pushed to Dagan, indicate not to push these, but instead the objects. Have Dagan standing on a brightly colored circle or area with arrows pointing towards him.	* Have a word bubble coming from Dagan's mouth that indicates to push the objects to him("Hey! Push me the objects so that I can get some exercise!"). If empty boxes are instead pushed to Dagan, indicate not to push these, but instead the objects ("No, not the empty boxes! Push me the household objects.")	This change was not implemented.
Once children understood the game, it was still too difficult for many of the younger children to pass.	* Have fewer empty boxes to push in the beginning levels, and gradually more as the levels increase, eg, 2 boxes at level one, 3 boxes on level 2, 5 boxes on level 3, etc.	* Have fewer empty boxes to push in the beginning levels, and gradually more as the levels increase, eg, 2 boxes at level one, 3 boxes on level 2, 5 boxes on level 3, etc.	Change was implemented as described.
Once children understood the game, it was still too difficult for many of the younger children to pass.	* When the player loses, have them restart on the same room they were on, as opposed ot restarting at Room 1. * Remove the time limit.	* When the player loses, have them restart on the same room they were on, as opposed to restarting at Room 1.	Change was implemented as described.
Children did not always understand the purpose/concept of the game: that these were exercises that can be done with objects found in the home.	After the game has been completed display all the household objects used on the screen with a simple statement such as "Here are all the objects you found to exercise with inside your home."	After the game has been completed display all the household objects used on the screen with a simple statement such as "Here are all the objects you found to exercise with in your home."	A summary screen now shows all the objects with the message: "Great job finding all the objects, try to remember these the next time you need to exercise at home."
Game time runs down while player is watching Dagan perform his activity.	Stop the timer while watching Dagan perform activity, because they cannot move past this.	Stop the timer while watching Dagan perform activity, because they cannot move past this.	This change will not be implemented because the time that is lost is actually given back to the player before starting the next level, and the time depletion will help give the child a sense of urgency in the game.
Bugs: * Sometimes when the player loses on Room 1 and then replays this Room level, the game does not require them to push both objects to Dagan but only one before moving on to level 2. *Sometimes when the player loses, the game restarts but with no characters to move around.	Bug Fixes	Bug Fixes	All bugs have been addressed.

Nanoswarm Episode 3: Negotiation Segment

Issue	Child Suggestions	Proposed Change	Outcome
On the first question in this game, the child receives no "good" response options to choose from and is forced to answer with a "bad"answer.	Give the child one "good" answer and 4 "bad" answers to choose from.	Give the child one "good" answer and 4 "bad" answers to choose from.	Good answer options are now included for first question.

Nanoswarm Episode 6: Negotiation Segment

Issue	Child Suggestions	Proposed Change	Outcome
Most children would prefer to answer the question fewer than 5 times	Change to 4 times.	Change to 4 times.	Change was implemented as described.
When a child selects an answer, it does not get removed from the answer pool and comes up a again. This is confusing to them, because they already know that it is an incorrect answer.	Remove an answer from the pool of possible answers when it has been selected.	Remove an answer from the pool of possible answers when it has been selected.	Change was implemented as described.

Nanoswarm Episode 8: Negotiation Segment

Issue	Child Suggestions	Proposed Change	Outcome
Most children did not identify with the "Too Clumsy" problem.	Change the wording of the excuse response from "That's a good idea Wings, but I'm afraid I would be too clumsy to do that exercise. How can I still meet my goal?" to "That's a good idea Wings, but I'm afraid I was never able to do that exercise. How can I still meet my goal?	Change the wording of the excuse response from "That's a good idea Wings, but I'm afraid I would be too clumsy to do that exercise. How can I still meet my goal?" to "That's a good idea Wings, but I'm afraid I was never able to do that exercise. How can I still meet my goal?	Change was implemented as described.

Nanoswarm Episode 1: Fruits and Veggies at a Fast Food Restaurant

Issue	Child Suggestions	Proposed Change	Outcome
Some children missed the instruction to "Remove all unhealthy choices form the 3 fast food restaurants." and thus did not know whether to shoot the healthy or unhealthy foods once playing the game.	Make the instructions, especially the portion that says to remove the *unhealthy choices*, larger and bolder, so that the player is more likely to notice this.	Change the game so that children select the HEALTHY items instead, and make this clear in the instructions.	Change was implemented as described.
Potato Salad shows up twice as a food.		Bug fix.	Change was implemented as described.
Baked Potato with Butter shows up as a healthy food.		Correction: Should be Baked Potato with Salsa.	Changed "Baked Potato with Butter" to unhealthy.
2% Milk is considered good in this game.	A child noted that they felt this fact was not consistent with other games.	Go back through past games for consistency. Where possible change 2% milk to 1% and mark as "good". Where this is not possible, make sure that 2% milk is consistently marked as "bad". For this game change the 2% milk to 1%.	2% Milk was changed to a bad food, but 1% milk was not added.

Diab Episode 1: What's a Vegetable?

Issue	Child Suggestions	Proposed Change	Outcome
Game was fairly easy for most children to pass. Could be made slightly more difficult.	Increase speed of green energy bar, to create a sense of urgency and make slightly more difficult to complete.	Increase speed of green energy bar, to create a sense of urgency and make slightly more difficult to complete.	Change was made.

Diab Episode 4: Portion Size of Fruit

Issue	Child Suggestions	Proposed Change	Outcome
Some children did not notice the pattern in the portion size light wheel. Because they did not see a pattern, they simply hit the button randomly to guess, and because frustrated when they could not pass the game.	*Have the light pattern start out even more slowly than current speed to allow child more time to notice the pattern. *Have the light pattern start out the same speed, but stay slow for a longer amount of time before speeding up. *Tell the child in the instructions that there is a pattern to look out for.	Have the light pattern start out the same speed, but stay slow for a longer amount of time before speeding up.	Change was implemented as described.
Verbal warnings "Woah That's A lot!" and "Are you sure that's enough!" are not occuring at accurate times.		Bug fix.	This issue was fixed.
Score screen items not occuring in correct places.		Bug fix.	This issue was fixed.

Diab Episode 8: Decreasing PI

Issue	Child Suggestions	Proposed Change	Outcome
Game takes many children less than one minute to complete.	*Remove the X's from below the characters so that the player is forced to notice the activity that the character is performing instead of just viewing the X to determine whether to "tag" this character. *Have the energy bar raise more slowly when 6 character groups are active. *Have more levels of the game.	*Remove the X's from below the characters so that the player is forced to notice the activity that the character is performing instead of just viewing the X to determine whether to "tag" this character.	Change was implemented as described.
The behavior change component of the game is too subtle.		Instead of each character having 2 states(active,inactive), each character could have 3 states(inactive, inactive, active) and when the player "tags" a character the next activity they perform would be random. This way, when the player "tags" a character, they would need to watch the character to see if they have changed from an inactivity to an activity, or from an inactivity to another inactivity.	Not implemented.

DISCUSSION

Benefits of Usability Testing

The usability of an intervention, including acceptability, credibility, comprehensibility, attractiveness and relevance of the educational media with the target group, has been shown to be necessary for attitude and behavior change (Vandelanotte et al., 2004). Elaboration Likelihood Model says that for a behavior change program to be most effective, children must be motivated by material that is relevant to them and have the ability to comprehend such material (Petty & Cacioppo, 1986a). Testing the usability of a software program can help to identify both cognitive and psychomotor problems associated with its use, providing insight into modifications that need to be made to maximize benefit (Zimmerman et al., 2003). By observing children interacting with the behavior change video games we can uncover issues with unintuitive screen design or instructions, as well as uncover bugs that may not have turned up in initial bug testing due to adult users interacting with the game differently that child users. By then interviewing children about their game experience, we can gain insight into whether the children understand the purpose of the material or how to navigate properly through the game, and whether the game is at an appropriate ability level. If the user interface is too complex or unintuitive, the child's compliance with the intervention may be reduced due to unrealistic cognitive demands (Stinson et al., 2006). Ensuring that this is done early enough in product development is important because errors in software programming or design that are found late in the product lifecycle can be very expensive to fix (Balentine, 2001). For these reasons, early and thorough testing of the *usability* of the intervention is of the utmost importance.

Game Length Issues

Some of the games tested took less than a desirable amount of time when considering the end goal for playing an entire Episode of the "Escape from Diab" or Nanoswarm full game would be less than an hour. With respect to "Goal Setting", it should be noted that the developed instruction screen was accidentally not included with the game module prior to testing. This was not mentioned to participants, and their rating was actually on the "on-screen" instruction bar, as opposed to the "pre-game" instruction screen. The originally developed screen was added in after testing and taking into account participant suggestion from this alpha-testing. Most children said the reason for their lower rating of the Goal Setting instructions was due to not noticing the instruction bar (n=3) and 5 participants agreed that there should be a pre-game instruction screen added. Eight children made suggestions for changing the instructions to the "Objects to Exercise with Inside the Home" game, indicating that these likely need to be modified. The long duration of "Goal Setting" was in part due to participants not knowing what to do at first (n=5), according to the observer. The interviewer had to explain all or part of this game to the participant in 4 cases. This could be due to the lack of instruction screen as previously noted, and might be resolved by simply adding one. The length of the "Tangram Scheduling Game" was also partly due to participants not knowing what to do at first (4). The interviewer also had to explain all or part of this game to several children (n=3), however this particular game would require extra time regardless of the speed at which the participant plays due to several long textual dialogues the participant must view as well as lengthy game play procedures. Thus while changes to this game should help shorten the duration somewhat, it may continue to be one of the

lengthier games. Regarding the duration of the game "Objects to Exercise with Inside the Home", it should be noted that, some children were unable to finish this game due to time constraints. Therefore, had the children been able to continue game play until they finished, the average time on task for this game would have been higher. Almost all of the children did not know what to do at first while playing this game (n=9), and so spent some time trying fruitlessly trying to push empty boxes to the character Dagan (n=6). The interviewer eventually needed to explain all or part of this game to most participants (n=8). The confusion with this game is also reflected by the high observer rating of difficulty children had with this game at 2.5 (in between a little and a lot of difficulty).

Time on task is a performance metric of "efficiency" (U.S. Department of Health and Human Services). Therefore, if a game duration is longer than it should be for the presented task, this indicates a weakness in game. Efficiency is a key aspect of usability (U.S. Department of Health and Human Services) which is highly important for behavior change (Vandelanotte et al., 2004). Therefore, by following child and observer suggestions to improve instructions and screen mechanism and design for these games, we might enhance behavior change. Researchers testing the usability of a game called QuiQui's Giant Bounce, made modifications to their game mechanism after children were observed trying to steer the game character in a different way than game design allowed (Hoysniemi et al., 2003). After modifying the steering mechanism to operate the way the children had attempted, the researchers then compared time spent on task with the original version to time spent on task with the modified game version. Results showed children spent 34% less time with the modified version, indicating an improvement in game controls and efficiency. Similar

testing, comparing time on task for the original mini-games and mini-games modified with child and observer suggestions, would be recommended to test for efficiency enhancement.

Overall Problems Identified and Changes Proposed

During the alpha-testing of the present intervention, while the difficulty level seemed appropriate for most mini-games, and games received positive ratings on "fun" and high grades (See Table 7 above), the instructions were sometimes not very clear and the screens not intuitive. This caused children to waste game play time trying to figure out what to do. In some cases, the interviewer had to intervene to explain to the child how to play (16 instances, with most (8) instances occurring in the game "Objects to Exercise with Inside the Home"). If the child was at home playing the game, there would be no interviewer to help and the child would then be forced to stop playing or spend additional time investigating what to do. This could lead to frustration which could then lead the child refusing continued compliance with the intervention. To solve these problems, many instructional changes were proposed and completed. Children often suggested audio reading of instructional material, because they tended to skip reading the instruction screens, arriving at the game screen unable to play. The issue of skipping instructions was also resolved by allowing children to return to instruction screens by pressing a button, as a "help" button was suggested repeatedly. Supporting these suggested modifications, changes to instructions are a major area of focus in literature on child usability guidelines. Though the literature is not conclusive on whether children like to read textual instructions, it is emphasized that instructions should be age-appropriate, easy to comprehend and remember, and that audio reading of instructions by a character is very beneficial (Hanna et al., 1999) (Nielsen, 2002).

This is because children pay more attention to characters than to audio alone and animation and sound effects are considered very positive design elements by children (Hanna et al., 1999) (Nielsen, 2002). Additionally, Hanna et al. support our findings that children should be allowed to control access to instructions through clicking a "help" button, among other options (Hanna et al., 1999).

Interviews revealed that children sometimes did not understand the actual purpose of the game. This can have a major impact on learning, as the child then comes to their own conclusion regarding the message of the game. For example, when asked about the purpose of "Objects to Exercise with Inside the Home" only 3 children were able to state that they were learning about objects they could exercise with in the home. The remaining children mostly mentioned that they were learning about everyday objects or unusual objects with which to exercise. Without understanding the true purpose of the game, they may be less likely to be able to apply their learning in real life. For example, if they do not realize that they are learning exercises to do in the home, they may not recall these exercise options when presented with a situation in which they need to exercise indoors. To clarify the purpose, changes were proposed to the wording of the instructions or to a summary screen that more clearly and blatantly state the purpose of the games. For example, a summary screen was added to the "Objects to Exercise with Inside the Home" game that reviews each of the objects in the home to exercise with and states to "Try to remember these the next time you need to exercise at home." Thus, as the child leaves the game this is the final message they will see, reinforcing this knowledge.

Children often mentioned that they did not see certain meters, counters, timers, questions, or other items located in the periphery of the screen. This affected their ability to grasp the game play mechanics, thus taking more time to play the games, and possibly affecting their level of learning. For example, in the "Tangram Scheduling Game", half of the children did not understand that they were supposed to be adding 60 minutes of activity to their day because they did not notice the counter that adds up the 60 minutes. Eight children therefore suggested that the counter should be made more noticeable. Similarly, in the "Goal Setting Game" some children did not notice the questions being asked at the top of the screen and so did not understand that they were answering questions and therefore shot randomly at the choices. Many changes were proposed to make questions, counters, and meters on the screen more noticeable, by having them blink or flash in some way to draw the eye. These proposed changes are supported in the literature, as issues with icon noticeability are a prominent problem with screen design noted in child usability guidelines. Nielsen noted a similar problem that overly flat graphics can cause child users to miss information by overlooking the graphics (Nielsen, 2002). Hanna et al. suggest similar solutions to ours, that icons use animation, audio, or highlighting to indicate where to find functionality, adding that a 0.1 to 0.5 second delay should be present for audio clues so that children can use the clue deliberately (Hanna et al., 1999).

Lastly, for games with which children had few problems, they often suggested ways to make the games more difficult or elaborate. For example, for mini-games consisting of one or more levels children often suggested multiple levels that increase in difficulty. The literature supports this expanding complexity, noting that levels should only increase in

complexity as children gain mastery and that mastering the activity should be supported by feedback that provides new information (Hanna et al., 1999). Although many of the changes to make games more elaborate were not implemented due to time constraints, they do provide insight for future game development into what children find interesting and exciting.

Without the crucial information gathered during alpha-testing, the aforementioned issues may not have been discovered and would have remained unchanged. Because of alpha-testing, however, we can be bettered assured that the intervention will be understandable and appropriate for our target population.

Limitations/Strengths of Research

The sample size of 10 is likely too small to be very reliable for quantitative analyses of the rating scale data collected. Thus, though we did perform a brief quantitative analysis of this data to suggest the children's thoughts about game difficulty, fun, length and clarity, we cannot be sure that the values calculated would truly represent the population. For the analysis of the qualitative data however, the sample size issue may not be a limitation as with usability testing, statistical significance is not required to determine problems in usability and the best cost-benefit ratio can attained with 3-5 users from each representative group (Nielsen, 1993). Our sample of 10 users representing early adolescent population should cover this requirement.

Other limitations include the use of secondary data. Because this data set was previously collected, the researcher does not have control over the types of data collected or the questions asked of the children. Though we are attempting to determine the usability of the two computer-based interventions, we do not necessarily have all the data necessary to

fully make judgment on this usability and will not be generating or receiving further data from the sample population.

Implications for Future Research

Though this study did provide insight into improvements needed for this particular set of video games, alpha-testing should be performed on all newly developed computer-based interventions. The present study highlights the importance of creating clear instructions, making peripheral screen cues more eye-catching or noticeable, and vigorously stating the purpose of the game to improve understandability. However, future interventions will each present unique materials and user-interfaces and should therefore also be thoroughly alpha-tested. Although application of the results of the present study could prove beneficial in building future interventions, by enhancing instructions, screen designs, and learning through statement of purpose, it would not be enough to ensure a usable end product. All games will likely present different problems, and usability issues may even vary by gender, age, or other classification across the target population. Future research should therefore include usability testing with any intervention target population prior to final development of such software and software should be adjusted accordingly.

CONCLUSIONS

Three major issues were uncovered and corrected as a result of usability testing of the Nanoswarm and Diab video games. First, children were often unsure how to begin playing a game due to lack of adequate instructions or skipping instruction screens. Thus, instructions were modified and a button added to repeat instructions, among other changes. Second, because children did not always understand the purpose of certain games, the purpose was

made more obvious through instructional changes or summary screen modifications. Third, children did not always notice screen cues such as meters, counters, and questions, affecting their understanding of the game. These cues were therefore made more visually obvious by flashing or drawing the eye in some way. Many other changes were made as a result of child and observer suggestions, and these usability enhancements can be drawn upon for future interventions with similar populations. However, usability testing with all software learning tools should be paramount and will uncover unique usability concerns and improvements.

APPENDICES

Appendix A. Child usability ratings by mini-game

Mini Game Name	Likeability (Grade)[a] *X (± SD)*	Difficulty Level[b] *X (± SD)*	Level of Fun[c] *X (± SD)*	Length[d] *X (± SD)*	Helpfulness of Instructions[e] *X (± SD)*
Goal Setting Game	85.9 (8.39)	2.5 (1.18)	2.5(0.60)	3.0 (0.82)	2.2 (0.63)
Tangram Scheduling Game	89.8 (6.68)	2.5 (0.76)	2.5 (0.50)	3.3 (0.48)	2.3 (0.79)
What's an Aerobic Activity?	94.5 (3.69)	3.3 (1.23)	3.0 (0.16)	2.9 (0.75)	2.6 (0.52)
Mix and Match at the Snack Bar	88.9 (4.59)	2.5 (0.97)	2.4 (0.58)	2.6 (0.52)	2.3 (0.82)
Objects to Exercise with Inside the Home	88.0 (6.75)	3.5 (0.71)	2.5 (0.60)	3.2 (0.79)	2.2 (0.79)
Negotiation Segment: Elena's Mom	88.0 (12.52)	1.5 (0.85)	2.1 (0.76)	2.6 (0.76)	2.6 (0.70)
Negotiation Segment: No Transportation	87.9 (10.58)	2.0 (1.06)	2.1 (0.57)	3.0 (1.22)	NA
Negotiation Segment: "Too" Excuses	85.6 (12.36)	1.3 (0.71)	1.9 (0.73)	3.0 (1.00)	NA
Fruits and Veggies at a Fast Food Restaurant	91.5 (4.12)	2.7 (1.06)	2.6 (0.50)	2.8 (0.54)	2.4 (0.68)
What's a Vegetable	94.0 (5.16)	2.6 (1.26)	2.8 (0.42)	2.7 (0.82)	2.9 (0.32)
Portion Size of Fruit	84.0 (8.76)	3.4 (1.17)	2.2 (0.82)	3.1 (0.91)	2.4 (0.73)
Decreasing Physical Inactivity	89.3 (6.82)	2.0 (1.00)	2.5 (0.71)	2.4 (1.24)	2.9 (0.35)
Mean	**89.0**	**2.5**	**2.4**	**2.9**	**2.5**
SD	**3.18**	**0.70**	**0.31**	**0.27**	**0.26**
p	**0.0000**	**0.027**	**0.0006**	**0.161**	**0.0003**

[a]Scale: A+=100, A=95, A-=90, B+=89, B=85,B-=80, C+=79, C=75,C-=70, D+=69, D=65,D-=60

[b]Scale: 1 = very easy, 2 = a little easy, 3 = not sure, 4 = a little hard, 5 = very hard

[c]Scale: 1 = no fun, 2 = a little fun, 3 = a lot of fun

[d]Scale: 1 = way too short, 2 = a little too short, 3 = just right, 4 = a little too long, 5 = way too long

[e]Scale: 1 = not helpful, 2 = a little helpful, 3 = very helpful

Appendix B. Mean observation ratings (n=10) across mini-games (n=13)

Observation Question / Mini Game	Time on Task *X (± SD)*	Attention to Instructions[a] *X (± SD)*	Average Attention to Goal Setting Selection[b] *X (± SD)*	Difficulty Player had with Game[c] *X (± SD)*	Frustrated[d] *X (± SD)*	Bored[e] *X (± SD)*	Engaged[f] *X (± SD)*	Fidgety[g] *X (± SD)*	Calm[h] *X (± SD)*	Understanding of What to Do (% of player who understood) *X (± SD)*	How many tries to win the game? *X (± SD)*
Goal Setting Game	0:13 (0:07)	NA	2.3 (0.63)	1.8 (0.79)	1.2 (0.32)	1.0 (0.11)	3.0 (0.11)	1.2 (0.32)	2.7 (0.67)	NA	NA
Tangram Scheduling Game	0:15 (0:03)	2.7 (0.67)	NA	1.8 (0.92)	1.2 (0.42)	1.0 (0.00)	2.9 (0.32)	1.2 (0.42)	2.7 (0.67)	0.7 (0.48)	NA
What's an Aerobic Activity?	0:05 (0:01)	2.7 (0.48)	NA	1.5 (0.53)	1.1 (0.32)	1.0 (0.00)	3.0 (0.00)	1.1 (0.32)	2.6 (0.84)	NA	2.4 (1.17)
What's A Strength Activity?	0:05 (0:04)	2.7 (0.67)	NA	1.4 (0.52)	1.2 (0.42)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	2.6 (0.70)	NA	2.1 (1.37)
Mix and Match at the Snack Bar	0:03 (0:01)	2.2 (0.79)	NA	1.3 (0.48)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	2.9 (0.32)	0.8 (0.42)	NA
Objects to Exercise with Inside the Home	0:15 (0:07)*	2.9 (0.32)	NA	2.5 (0.53)	1.1 (0.32)	1.3 (0.48)	2.9 (0.32)	1.2 (0.42)	2.7 (0.67)	NA	6.2 (4.24)*
Negotiation Segment: Elena's Mom	0:04 (0:01)	NA	NA	1.2 (0.42)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	3.0 (0.00)	NA	NA
Negotiation Segment: No Transportation	0:01 (0:00)	NA	NA	1.0 (0.00)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	2.9 (0.32)	NA	NA
Negotiation Segment:: "Too" Excuses	0:02 (0:01)	NA	NA	1.1 (0.33)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	2.9 (0.33)	NA	NA
Fruits and Veggies at a Fast Food Restaurant	0:06 (0:02)	2.7 (0.48)	NA	1.7 (0.67)	1.1 (0.32)	1.1 (0.32)	2.9 (0.32)	1.1 (0.32)	2.8 (0.42)	0.8 (0.42)	NA
What's a Vegetable	0:03 (0:01)	2.7 (0.48)	NA	1.3 (0.48)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	3.0 (0.00)	NA	2.4 (1.35)
Portion Size of Fruit	0:04 (0:01)	2.9 (0.32)	NA	1.9 (0.74)	1.1 (0.32)	1.1 (0.32)	2.9 (0.32)	1.1 (0.32)	2.8 (0.42)	NA	NA
Decreasing Physical Inactivity	0:01 (0:01)	2.8 (0.67)	NA	1.1 (0.33)	1.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	3.0 (0.00)	1.0 (0.00)	NA
Mean	**0:05**	**2.7**	**2.3**	**1.5**	**1.1**	**1.0**	**3.0**	**1.1**	**2.8**	**0.8**	**2.3**
SD	**NA**	**0.21**	**NA**	**0.42**	**0.08**	**0.09**	**0.05**	**0.09**	**0.15**	**NA**	**NA**
p	**NA**	**0.000**	**NA**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**NA**	**NA**

*Some players quit after a number of tries
[a]Scale: 1 = paid no attention, 2 = paid a little attention, 3 = paid close attention
[b]Selection of Values, Reasons, Goals, Problems, Solutions, Good Guy/Bad Guy
[c]Scale: 1 = no difficulty, 2 = a little difficulty, 3 = a lot of difficulty
[d]Scale: 1 = not frustrated, 2 = a little frustrated, 3 = very frustrated
[e]Scale: 1 = not bored, 2 = a little bored, 3 = very bored
[f]Scale: 1 = not engaged, 2 = a little engaged, 3 = very engaged
[g]Scale: 1 = not fidgety, 2 = a little fidgety, 3 = very fidgety
[h]Scale: 1 = not calm, 2 = a little calm, 3 = very calm

Appendix C. Observation Notes Coding

GAME SET A				
	Nanoswarm	Nanoswarm	Diab	Diab
Description of Segment	"Goal Setting Game"	"Tangram Scheduling Game"	"What's an Aerobic Activity?"	"What's a Strength Activity?"
General Description	The player uses a ship to shoot floating asteroids to select from sets of values, reasons for these values, goals, barriers, and solutions. This data then generates their goal statement, after which the player recommits to attempting this goal.	The player must first arrange tangram puzzle pieces into a shape to decode their schedule. Then the player must fit 60 minutes of PA into their schedule by replacing PI pieces with PA pieces.	The player rolls a ball around the screen attempting to collect 20 aerobic activities while avoiding non-aerobic activities.	The player rolls a ball around the screen attempting to collect 20 strength activities while avoiding non-strength activities.
Other Characteristics	Player must shoot a probe to read each of the asteroids before shooting the one they want 3 times to select it. The order of the goal setting sequence is as follows: 1) Value and Reason selection 2) Selection of Goal, Dates to perform goal, Implementation intentions 3) Problem-solving with Problem and Solution selection 4) Good Guy/Bad Guy segment (refuation preemption) and Recommitment to goal	Players see an introduction explaining that they can fit exercise in their day by replacing part of their PI time wih some PA; for example, replacing 1 hour of TV time with 30 minutes of TV and 30 minutes of walking. They then help the character Elena by inserting 60 minutes of activity into her schedule. When the player places a PA piece over a PI piece, Elena's schedule changes accordingly.	Activities are represented by circular disks floating around the screen. If the players ball tags a non-aerobic activity the disk freezes on the screen creating a obstacle and making the screen more crowded and difficult to navigate. The ball gets faster and smaller as the player correctly tags aerobic activities. A score screen summarizes the disks correctly and incorrectly tagged.	Activities are represented by circular disks floating around the screen. If the players ball tags a non-strength activity the disk freezes on the screen creating a obstacle and making the screen more crowded and difficult to navigate. The ball gets faster and smaller as the player correctly tags strength activities. A score screen summarizes the disks correctly and incorrectly tagged.
Results of Observation of Players				
Technical Problems Encountered	None	Game allowed player to cover a small piece with a large piece(15 min over 30 min) (1) Player had enough place pieces to win, but then one disappeared (orange part of schedule went away) (1)	None	None
Other Problems Encountered	Player did not know what to do at first (5) Player could not figure out how to properly probe/shoot or move (5) Interviewer had to explain all/part of the game (4) Player was just guessing/rapid-fire shooting at any target (3) Player had trouble with reading all the text (2) Player could not find the option he wanted at first (1)	Player did not know what to do at first (4) Interviewer had to explain all/part of the game (3) Player did not know how to turn a piece at first (2) Player did not think they could put multiple small pieces on one large piece (2) Playerwas confused by "cannot cover" message, thought they couldn't cover any activities (1) Player tried to place a correct piece, but lined it up slightly off, and was confused when it would not fit (1)	None	Player did not read the instructions and did not understand why aerobic activities were not registering as correct (1)
Results of Interviews with Players				
Players' Understanding of Purpose of Segment	Understood (7) Somewhat understood (3)	Understood (8) Somewhat understood (2)	Understood (8) Somewhat understood (1) Did not answer question (1)	Understood (7) Did not answer question (3)
Comments	Add an instruction screen at the beginning (5) (this screen should show an example of what to do(2)); Add audio narration of questions/selections (4); The instruction bar should be made more obvious by blinking or relocation (3); Questions or statements needs to be more obvious by blinking or popping up mid-screen at first (3); The ship needs easier braking (2); Have fewer asteroids on one screen (2); A list on the screen defining the asteroids would be good (2); Change the word "probe" to "pick" or "read" (2); Make the game harder (2) (by having asteroids move faster(1), by adding things in the way on the screen(1)); Add a help button that would repeat the instructions(1); Ask for confirmation of selection(1).	Make the counter more noticeable (blink, pop-up, larger, noise upon added minutes) (8); Change the instructions to make them clearer (5); Change the dialogue between each game so it is different or shorter (4); Reword "Cannot Cover Activities" to make the phrase more clear (4); The tiles should include more sports activities (4); The shape outline should be darkened to make it clear to put pieces there (2); Make the game more difficult or interesting (time limit, more pieces you can't cover, build your own activity pieces) (3); You should be able to choose the number of puzzles to do (1).	The ball should get bigger and slower as you get answers wrong (5); Change the length (5) (add levels (2), require 15 correct aerobics (2), require 60 correct aerobics (1)); Change method of defining "aerobic" (5) (add audio of definition (2), add help button that repeats the definition (2), add pictures to help during definition (1)); Add more non-aerobic tokens to make it harder (2); Tell why the non-aerobics were not aerobic on a score screen (1); The tokens should move more slowly so they are readable (1).	The ball should blink when it grows or shrinks (1); The game should be shorter (1); Make strength and aerobic into levels of the same game (1); Add pictures during the description of "strength" (1); You should be able to bump off the non-strength tokens when they come near you (1).

GAME SET B					
	Nanoswarm	**Diab**	**Nanoswarm**	**Nanoswarm**	**Nanoswarm**
Description of Segment	"Mix and Match at the Lifepad Snack Bar"	"Objects to Exercise with Inside the Home"	"Negotiation Segment: Elena's Mom"	"Negotiation Segment: No Transportati	"Negotiation Segment: "Too" Excuses"
General Description	Tile-slide puzzle game in which players must select 3 healthy snack foods from a group of healthy and unhealthy choices.	In a warehouse filled with boxes and objects found in a home (a bed, TV, etc.), the player must pick up and drag the objects to the character Dagan who is standing at the front of the room. Dagan then demonstrates a physical activity that can be done with the home object.	Players first view a video showing that Elena's mom serves a high-calorie meal with no vegetables. The player must then help Elena ask her mom for vegetables in her meal by giving her suggestions via a "text messaging" conversation on the screen. The player then views a video of Elena asking for a vegetable that corresponds with the vegetable they suggested to her.	Demetrius must get to the community center for exercise, but his mom cannot bring him. Players must help him get to the community center by suggesting alternate methods of transportation via "text messaging" conversation on the screen.	Elena needs to get exercise but is giving many excuses for why she cannot: it's too hot, it's too rainy, she's too clumsy, it's too late (out of time). The player must give her suggestions via "text messaging" conversation on the screen to overcome these problems and get exercise.
Other Characteristics	Each tiles has a picture of a food. Players make a selection by sliding tiles around a puzzle until the food they want is in the bottom right corner. The player then presses the 2 button to see if their answer is correct. If the player gets 5 answers wrong, they lose and must start over.	There are 4 levels and several objects to drag to Dagan level. There is a time limit for each level. If the player is not able to drag all objects to Dagan within the time limit, they must start over at the beginning of the game. There are empty boxes that block the way to Dagan and the player must move these boxes out of the way.	The player selects answers to Elena's questions from a multiple choice list. If the player gives a correct answer they move onto the next question. If they give an incorrect answer, Elena explains why she cannot take that advice and the player tries again. The player tells Elena how to ask, when to ask, what to ask for, and also suggests a fruit dessert.	Players are given a multiple choice list of options to choose from. The player must answer the question 5 times and, on the 5th try, give a correct answer to pass the game. If the player gives an incorrect answer on the 5th try, they will answer again until they give a correct answer. Until the player's final answer, they are given a reason or excuse for why Demetrius cannot take each piece of advice.	The player is given a multiple choice list of solutions to select from. Elena presents the player with the first "too" excuse and if they answer correctly, then presents the next "too" problem. If they answer incorrectly, the player must answer again until the select correctly and move onto the next problem.
Results of Observation of Players					
Technical Problems Encountered	None	After losing, game allowed player to skip delivering sofa and moved on (3) After losing, game reappeared but with no characters (2) Warehouse is very dark, hard to see in bright lit room (1)	None	Players received answer options that they had already previously selected (2) Player answered correctly on 5th try but game still required more answers(1)	None
Other Problems Encountered	Player did not know what to do at first (1)	Player did not know what to do at first (9) Interviewer had to explain all/part of the game (8) Player tried to push empty boxes to Dagan (6) Player had trouble moving boxes (3) Player did not figure out how to pull (2)	Player had trouble with reading dialogue (1)	None	Player had trouble with reading dialogue (1)
Results of Interviews with Players*					
Players' Understanding of Purpose of Segment	Understood (10)	Understood (3) Somewhat understood (4) Did not understand (2) Did not state a purpose (1)	Understood (6) Somewhat understood (4)	Understood (9) Somewhat understood (1)	Knew 3 or 4 of the "too" problems (2) Knew 1 or 2 of the "too" problems (6) Did not understand (1) Did not play game (1)
Comments	Make the game harder (9) (require more correct answers to win(6), bigger puzzle grid(5), time limit(2), vary the number of healthy foods in the machine(2), block pieces from moving in certain directions(1), add tricky foods(1)); The instructions should say to pick the "healthiest" food, instead of the "healthy" food (4); Add information on why the incorrect choices were unhealthy (3); Add a back button in case players missed the instructions (1); Should be able to play the game 3 times (1).	Suggestions for changes to the instructions (8); If you lose, you should be able to start over on the same level or one back (8); Have fewer extra boxes in the beginning and progressively more on harder levels (8); Make Dagan more obvious (8) (highlight Dagan with color or arrows (4), Dagan speaks audio saying to bring the boxes to him (3), Dagan has a word bubble saying bring the boxes to him (3)); The timer should stop running while Dagan demonstrates his activities (4); The player should have more time on the timer (3); The rooms should be like a maze (2); Change the number of levels (3) (more (2), fewer (1)); Make it more clear what object is on a box (3) (zoom in on box (1), flashlight (1), print object name when near (1)); Add progressively more objects as the levels increase (2); The game should mention/assign doing these activities at home (2); The warehouse should be brighter (1); Boxes tagged "just a box" should be a slightly different color (1).	Add a "correct" answer option for the first question (3); Add audio reading of the conversation/questions (2); Add more questions/answers/conversation (2); Fewer correct answers and more incorrect answer options for each question (1); List the whole conversation at once and answer one question (1); State the purpose at the beginning of the game (1); Elena should make excuses for not using ideas to make it longer (1); Elena should say "Just joking Wings" after giving all bad answer options to first question (1); Add text captions to video (1); Conversation should begin with "Shhh Wings" to indicate why text messaging (1); Fruit selection should be done using a ball-rolling game (1).	Change the number of correct answers to win (6) (would rather give 3 or 4 answers (4), would rather give 7 or 8 answers (2)); Increase the ratio of incorrect answer choices to correct answer choices to make the game harder (2); Textual changes to the responses (2); All the good answers should be listed after the game so the player knows these are good regardless of the excuses (1).	The problem "too clumsy" should be removed from the game and there should only be 3 problems (3); Change the wording of the "too clumsy" problem (3); Have fewer correct answers each time to make the game harder (1); A character other than Wings should propose solutions and the player should pick 'yes' or 'no' (1); Add pictures of the activities so players know what they are (1); Suggestion to change to the text of a solution (1).

*Some children were not able to answer certain interview questions due to lack of time

GAME SET C				
	Nanoswarm	**Diab**	**Diab**	**Diab**
Description of Segment	"Fruits and Veggies at a Fast Food Re	"What's a Vegetable?"	"Portion Size of Fruit"	"Decreasing Physical Inactivity"
General Description	From a "target-shooting gallery" type screen, players must shoot all the unhealthy foods while leaving all the healthy foods remaining on the line. Players remove the unhealthy foods from 3 categories: sides, drinks, and desserts.	The player must run through the streets of Diab to find his friends. When they get to an intersection, the player must choose which of two foods is a true vegetable. If they run down the path choosing all 20 healthy vegetables, they will find his friends at the end.	Spinning wheel of fortune type game in which players select different vegetables and then identify the correct portion size for each vegetable.	The player runs their character around a courtyard filled with inactive people. When the player tags the inactive people, they begin a physical activity (walking, biking, playing catch). To win, they must keep enough characters active to fill their energy meter.
Other Characteristics	Food tiles move sideways across the screen, rotating in and out of the players view. If the player accidentally shoots 5 healthy foods, they lose the game and must start over with all 3 categories. A summary screen following the game lists all of the healthy fast food choices.	If the player picks an incorrect path they will soon be confronted by a guard. They must run quickly away towards the healthy vegetable or the guard will catch them. If the guard catches them or if their energy bar runs down, they lose the game and must start again. Players see a summary screen listing all their healthy and unhealthy choices following the game.	Players press 2 to stop the wheel on a random fruit, and the have to notice a pattern in the lights on the portion wheel in order to time their selection af a portion. Players must guess 5 correct portion sizes to win. When they select an incorrect portion, the chosen portion is removed from the 5 options. If they make 3 incorrect selections on one fruit, they must select a new fruit to try.	When tagged, the people remain active for several seconds before going back to their inactive state. The player must then tag them again to keep them active. The energy meter will fill while 6 kids are active and deplete whehn 6 kids are not active.
Results of Observation of Players				
Technical Problems Encountered	Potato Salad showed up twice (1) Typo: "Reatart" should be Restart (2) Baked Potato with Butter should be Baked Potato with Salsa (1)	None	Woah That's A Lot and " Are you sure that's enough?" messages are reversed (3) Results screen puts a grey 2 off to the right if the player didn't get any perfect answers (1) Screen says how many cups, but all portions are not in cups(1)	None
Other Problems Encountered	Player did not seem to understand that they were supposed to shoot the “unhealthy” foods at first (2) Interviewer had to explain all/part of the game (1)	Caught by guard several times (5) Player ran near, but not through, the bad choice and it registered as if they had run through it (1)	Player seemed to have trouble timing the portion size selection (7) Player seemed to be randomly guessing without thought because they did not see the pattern (2)	Player could not keep enough charactes active at once (1)
Results of Interviews with Players*				
Players' Understanding of Purpose of Segment	Understood (10)	Understood (7) Somewhat understood (2) Did not mention purpose (1)	Understood (9) Somewhat understood (1)	Understood (8) Did not understand (1) Did not answer question(1)
Comments	Change the summary screen (9) (add unhealthy foods(5), say why unhealthy foods are bad(3), display number wrong/right(1)); Suggestions to clarify or elaborate on the instructions (6); Add additional categories (5) (“main course” (5), “snacks” (1)); If you lose on one level you should not have to restart the whole game (3); Change the tiles (4) (faster(3), slower(1), smaller(1)); Make the counters more obvious (3) (blink(2), move to top of screen(1)); Add more foods in each game (2); Change the shooting device (2) (faster(1), more force towards center(1)); Add a help button (1); Change “Sides” to “Side dishes” (1); Make the food pictures more clear and display nutritional info for the foods (1).	The energy bar should drain more quickly (6); Add more than 20 vegetable choices to win (4) (2 said "30",1 said "40",1 said "60"); Change the score screen (2) (all foods appear at once(1), explain why bad foods are bad(1)); Add more levels of different types of foods (2); Each intersection should be a 3-way fork (2); The “bad” choice halls should be longer so you get lost (1); The green salad should look more green (1).	The portion wheel should go slower (6); Change the instructions (5) (should mention the portion wheel pattern(3), add a portion size explanation/hint(2), state that you are picking the “healthiest” portion (1)); Change the number of correct portions to win (3) (10 correct (2), 3 correct but player starts over if 1 wrong answer (1)); Change the fruit wheel (3) (should stop at random(1), should stop immediately on button press(1), more fruits(1), remove unknown fruits(1)); Change the portion wheel (2) (upon wrong answer wheel should scramble portions and remain full(1), add more portions(1), upon selection ask for confirmation of choice(1)); Fruit portion pictures should appear on plate or bowl to give idea of size (1); Add a time limit to selecting portions (1).	Change to the proposed idea of two inactive states and one active state (7); Add multiple levels of this game in different settings (i.e. park, school, etc.) (5); Change meter speed (3) (meter should go down faster or up slower(2), meter should not go down at all (1)); The people should stop their activity more quickly (2); The game should be longer (2); Tthe red Xs should be removed (2) (add instead be a subtle green circle (1)); The energy bar should blink to be noticeable (1); Add more people on the screen (1); Add a counter of how many people are active (1); A summary screen should list all the activities (1); If your energy hits the bottom you should lose (1); The instructions should say to keep 6 “people” active (1); The whole park should not be in view at once (1); People should quit exercising at different time intervals (1); Upon tagging a person the game should pause to show their activity (1).

*Some children were not able to answer certain interview questions due to lack of time

Appendix D. Interview Coding

Nanoswarm: Tangram Scheduling Game

Tell me about the game you just played.

GENERAL PURPOSE: 8 kids understood that the purpose was to add physical activity to their schedule; 2 kids mentioned adding to their schedule, but did not seem to understand that they were adding physical activity.

GENERAL OPINION: 8 kids said it was "fun", "interesting", or they "liked it" (4 mentioned the puzzle aspect was fun, 1 thought the scheduling was fun); 4 kids thought the game was helpful in real life; 3 kids were confused at first on how to play; 2 kids said it was difficult; 1 kid said it was easy.

A01-2: It was about a schedule being lost and you had to find it again and find things that didn't matter as much as physical activity and either combine or replace them. It was interesting, but some things should be changed. For example, the girl in the dialogue says she only needs 30 minutes more of PA, but really in the game you need to get 60.

A02-3: The purpose was to bring 60 more minutes of exercise time into someone's schedule. She liked it. It was more interesting because it was like a puzzle.

A02-5: She really liked it, because she had to reorganize things in Elena's schedule so she would have time to do other things like play basketball. The purpose related to real life to organize your daily schedule. She had to get exercise instead of doing something like playing a video game.

A01-6: It was fun to match the pieces on the shadow. He was taking out electronic time and putting in better things like take a nap, walk the dog, talk on the phone. The purpose was to not have much electronic time. (He did not mention or seem to understand that he was putting in physical activities.) It was kind of easy, but he wasn't sure what to do at first because he couldn't see the shadow.

A01-11: The game was about helping someone with their schedule, putting pieces in a puzzle, and then taking off time of things that are not very important, and putting in athletic things. At first he didn't know what to do because he got the message "cannot cover activities", so then he tried to put pieces around the outside of the puzzle.

A02-12: It was challenging, but fun and helpful, because you learned to make a schedule and only watch 30 minutes of TV. The purpose was to teach you about getting active, like going for a walk, walking the dog, instead of sitting in your room talking to a friend.

A02-13: She liked it because she liked putting the puzzles together. It was helpful in figuring out how to manage your day. Like still have fun but exercise. The purpose was to figure out how to get enough exercise. She didn't know what to do in the game at first, but thinks that you should just let people figure it out.

A01-14: This game is about learning to balance you schedule between activities, doing homework, and leaving enough time for physical activities. It is helpful for people who can't balance their schedule right. Like instead of watching TV for an hour you can watch for 30 minutes and walk the dog for 30 minutes.

A02-15: It was a little hard but she liked it. You had to put the pieces back together on the schedule, and then you had to get pieces to make up 60 minutes of doing stuff on her schedule, like mow the lawn, jump rope, and walk the dog. She did not see a difference between the activities she was putting on the schedule and the ones already there (she did not mention that they were physical activities).

A02-16: You had to help fit schedules, and then replace a few things with physical activity. It was really fun putting the pieces together, and can help you get more organized with your schedule.

What did you need to do to win this game?

GENERAL: 5 kids understood that they needed to add 60 minutes of activity; 4 kids understood they were adding activity, but did not know it was 60 minutes; 1 kid did not understand that they were adding in a certain number of minutes of activity.

A01-2: Get 60 minutes of physical activity. He realized this when he did not win the game with 30 minutes.

A02-3: To bring 60 more minutes of exercise time into someone's schedule.

A02-5: She thought that she needed 30 minutes of activity and did not really understand the meter. She thought that the meter should more slowly alert kids of how many minutes they still need to get. At first she thought she had to put all the pieces back on the puzzle a second time, but when it told her "cannot cover activity" she realized this was not the case.

A01-6: Take off some pieces and put on other ones. He knew he could fill in 60 minute pieces with 30 minute pieces, but did not seem to realize that he was supposed to get 60 total minutes or that he could do this in other ways. He did not notice the meter except when it said 60 of 60 minutes.

A01-11: Put in 15 or 30 minute activities, for a total of 60 minutes.

A02-12: First, you put a puzzle together with what they wanted to do and then you had to put more active things. She thought you had to get 10 minutes. She did not notice the meter. She did not know at first that she was supposed to put the smaller shapes to fit into the bigger one and thinks it needs better directions read aloud.

A02-13: Put the puzzle together and then put an hour in for exercise.

A01-14: First, you needed to put the blocks together to fill out a schedule. Then, you replace a portion of all the things that are not physical activity, with a little bit of physical activity. He did not know that you had to put 60 minutes in.

A02-15: Finish the puzzle and then make 60 minutes of activity.

A02-16: Replace a few things with physical activity, like 15 minutes or 30 minutes (she did not notice that it was 60 total minutes).

What if anything did you learn from playing this game?

GENERAL: 5 kids learned that they can replace or combine their other daily activities with physical activities in small or larger amounts; 2 kids mentioned adding physical activity to their day; 1 kid said nothing; 2 kids were not asked this question.

A01-2: That in one hour, you don't have to do one thing, you can break it up and do different things at different times.

A02-3: You don't have to play video games for a certain amount of time, you can cut in and play less or sleep less amount of time and add something else active.

A01-6: Nothing really, because he does not play with electronics much.

A01-11: You can do some exercise and have fun at it at the same time and get more things to do in a day.

A02-12: She learned that like instead of watching TV you can read a book, or dance to music or go swimming.

A02-13: How to still do the things you like but exercise at the same time.

A02-15: That you should have physical activity in your day, instead of just like sitting around watching TV and playing with your computer

A02-16: How to get more organized and how you can really put physical activity and still do a lot of things in your day, just maybe for a shorter time.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 89.8.

A01-2: A B, because it was kind of confusing and information on the screen was harder to notice.

A02-3: A B, because it was sort of in the middle, it was fun but not that fun. It is not like a game you would see in the game store.

A02-5: An A, because it explains what to do and tells what buttons to push.

A01-6: A B+, because it was in between complicated and easy to understand.

A01-11: A C, because the instructions weren't very good. There needs to be more visible aids.

A02-12: An A, because it is fun. It helps you read and get active. She likes puzzles and she like changing out the minutes of activity.

A02-13: An A, because it was easy to understand.

A01-14: A B+, because the "Cannot cover activities" part was confusing.

A02-15: An A, because it was fun and it wasn't really easy, because in the beginning she didn't get 60 minutes, but then she read and understood it.

A02-16: An A, because it was fun.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.5.

A01-2: The difficulty level is not bad, but it should be made less confusing.

A02-3: It is a good thing that it is easy.

A02-5: Not sure because it was easy but it was hard in a way. It was easy building the puzzle, but hard going back and reorganizing it to fit it all in her schedule. It should not be made harder because kids might not understand it.

A01-6: A little easy. It was good because you don't want it too easy.

A01-11: A little hard because it was confusing. Once he understood it, it was a little bit easy.

A02-12: Not sure because it's a little easy but a little hard. People don't understand at first, but then it's easy when they understand.

A02-13: A little easy, which is a good thing. You could make it a little more difficult by having more activities that you cannot cover.

A01-14: It could be made a little harder.

A02-15: A little easy because it wasn't really easy but it wasn't really hard. The hard part was replacing the pieces because it wasn't obvious.

A02-16: A little easy because at first she didn't understand where to put the pieces, but when you get the hang of it, it is really easy.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.6.

A01-2: It would be more fun with the changes he mentioned.

A02-5: A lot of fun because you can relate it to real life, like some kids have a lot of fun exercising even when they don't know they're exercising.

A01-6: A little fun, but I'd was not so complicated it would be more fun.

A01-11: A little fun, because he liked putting the puzzle together and having to think what things aren't important to replace.

A02-13: A lot of fun because it is fun figuring things out.

A01-14: A little fun because you don't know what you're supposed to put the physical activities over. For example, there is a 30 minute "walk the dog" piece that he couldn't put over a 15 minute "talk on the phone" piece, like he wanted to.

A02-15: A lot of fun, because she likes putting puzzles together.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 3.3.

A01-2: He would rather play 2 than 3.

A02-3: A little too long with all the schedules you had to do. She would rather only have to do 2: one from "school day" and one from "non-school day".

A02-5: A little too long, because it kept playing that same message over and over again. She doesn't want to game to be shorter though, but just change up the message to make it more interesting.

A01-11: Three puzzles was a good number.

A02-12: She'd rather do more puzzles. She would want to do 10 puzzles.

A02-13: Three puzzles was a good number.

A01-14: You should have to play 3, but play one from school day and one from non-school day.

A02-15: She liked doing 3 puzzles.

A02-16: Three was a good number of puzzles.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.3.

A01-2: A 2.5, because he didn't completely understand what to do.

A02-3: Instructions were very clear, but the narrative between Wings and Elena does not need to be repeated every time.

A02-5: A little helpful because she didn't understand what she was doing in the beginning. Instructions should be kid-friendly with no big words.

A01-11: There should be an example of what to do.

A02-12: Not helpful, there needs to be better instructions.

A01-14: A little helpful because the instructions could be clearer. They should indicate that you are trying to replace the unnecessary activities. The narrative with Wings and Elena was not very helpful in understanding the game.

A02-15: Very helpful because instead of just being at the bottom of the screen, they were up on the whole screen so you had to read them.

A02-16: Very helpful because it helped you really understand if you actually read them

On a scale of 1 to 3, how likely would you be to <insert PAs they selected> instead of <insert PIs they replaced> in your real life?

1 = not likely 2 = a little likely 3 = very likely

GENERAL: The average rating was 2.5.

A01-2: A little likely because he doesn't really do some of those activities, but he thinks it would be possible to do them together if you wanted to.

A02-3: A little likely because some activities apply to her, like basketball and some don't, like jumping rope.

A02-5: Very likely because exercising is important to her.

A01-6: A little likely because he can usually do both, like ride his bike for 30 minutes and play on the computer for 15 minutes.

A01-11: Very likely because you would get exercise.

A02-12: Very likely because she loves shooting hoops.

A02-13: A little likely because she doesn't do a lot of those inactivities, like watching TV so she doesn't need to replace them.

A02-15: A little likely because sometimes she likes to play on the computer, but sometimes she likes to play outside with her dog.

A02-16: Very likely because she's never been that into talking on the phone or watching TV.

On a scale of 1 to 3, how helpful was it to you to have the schedule with activities shown on the left hand side of the screen in understanding how to play this game?

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.7.

A01-2: A little bit helpful because you could see what you've changed.

A02-3: It would have been confusing without the schedule there.

A02-5: Very helpful because when she placed something on the schedule, it showed her that she didn't need to do anything else to that part of the schedule.

A01-6: Very helpful and it was big enough.

A01-11: A little helpful because you can see if you got it right, and you can see where it placed it. It would have taken more time without it.

A02-12: Very helpful because without it you would have no idea what you were changing.

A02-13: A little helpful, but she would not have understood the game without it there.

A01-14: Yes, that was helpful. It would have not been as understandable without it.

A02-15: Very helpful because it showed you what you were doing.

A02-16: Very helpful because then you know what you put into the schedule or not.

Suggestions for changes:

GENERAL: 8 kids mentioned ways to make the counter more noticeable(blink, pop-up, larger, noise upon added minutes); 5 kids offered ways to change the instructions to make them clearer; 4 kids mentioned changing the dialogue between each game so it is different or shorter; 4 kids offered ways to reword "Cannot Cover Activities" to make the phrase more clear; 4 kids thought the tiles should include more sports activities; 2 kids thought the shape outline should be darkened to make it clear to put pieces there; 3 kids had ideas to make the game more difficult or interesting(time limit, more pieces you can't cover, build your own activity pieces); 1 kid thought you should be able to choose the number of puzzles to do.

A02-2: To better notice the minutes counter: when you add minutes have the number added pop up in the middle of the screen (with a noise) and then recede to the corner in the counter. Also, have the activity you have added pop up in the middle of the screen and then slide into the schedule. He would prefer to help Elena with a schedule for a specific day of the week (i.e. Monday), rather than a school day/non-school day, and at the end she could say "I can do the rest". You should be able to build the pieces, by select an activity you want from 100 choices and then selecting the minutes/size of the shape. When you cover an activity that can be covered, it should beep and the activity you are trying to cover should flash red. The dialogue explanation in between each game should be different from the last, and should say something like "You're getting really good at this stuff, But, you know, I still don't have my exercise for this day, Can you help me with that?"

A02-3: Maybe make the minute gauge bigger if people can't see it. She noticed a typo in Elena's narrative: "your computer, your computer game".

A02-5: The meter should say "blank" of 60 minutes and more slowly alert kids of how many minutes they need. The message (dialogue) should be different each puzzle to make it more interesting.

A01-6: The shadow of the shape should be darker to indicate that you put the pieces there. Make the meter bigger. It should be read to you through the headphones that you need to get 60 minutes of activity. Include more sports, like go to football or soccer practice in the activities.

A01-11: "Cannot cover activities" should be changed to "This is an important subject, You can't replace it." The instructions should show an example of putting a smaller, e.g. 30 minute piece, on a larger, e.g. 1 hour piece, Make the meter into a bar type meter with a rising line, instead of just "0 of 60 minutes", etc. Activities should include more of the main sports.

A02-12: A little man should point to the meter and tell you what to do. You should have the option of doing 1 to 10 puzzles.

A02-13: It should say in the dialogue that you need to put the pieces inside the shape outline. You could make it more difficult by having more activities that you cannot cover. Volleyball could be added as an activity.

A01-14: The meter should blink once at the beginning, after you first put the puzzle together, and then should blink each time you add a minutes to the puzzle. Change "Cannot cover activity" to "Required Activity-Cannot Replace". Have the game be related to the foods you eat, so that based on what foods you eat in the beginning you can only choose from certain activities. The instructions should say try to replace the activities that are not needed as much.

A02-15: "Cannot cover activities" was confusing. It should say "You have to do this activity-you cannot replace it)". Add jumping on the trampoline as an activity. Shorten the dialogue, but keep it before every game in case the player still does not understand.

A02-16: The minutes meter should be a brighter color to stand out more, and there should be a definition above it of what it means. When minutes are added they should pop up in the middle and then shrink back to the meter in the corner. The dialogue should be different each time. The instruction screen should explain where to put the pieces, and the shadow outline should be more defined to make it more obvious that this is where they go (not on the schedule). You could add a time limit to make it more exciting.

Diab: What's an Aerobic Activity

Tell me about the game you just played.
GENERAL PURPOSE: 4 kids said it was to find "aerobic" activities; 4 kids said to find ones that are good for your "heart" or "lungs"; 1 kid said to find "outside and running activities".
GENERAL OPINION: 10 kids said it was fun, cool, or they liked it (6 thought rolling the ball was fun, 2 mentioned figuring out which were aerobic was fun); 5 kids said it was hard or challenging (2 said rolling the ball was hard, 1 said figuring out which were aerobic was hard); 1 kid said it was easy and short.
A01-2: He liked it a lot. He likes games where there is just a ball instead of a character because they are simple and they look better. He liked how the ball would bounce off of the bad choices.
A02-3: You had to pick physical activities that make your heart rate increase. It was fun having to move the ball or around and run it over stuff. It's hard to control the ball.
A02-5: It was hard mes ing the ball to get the aerobics and not get the non-aerobics, and she had to try 3 times to get it. She liked it though, because she liked trying to figure out which were aerobics and which were not.
A01-6: It was the easiest one and it was fun. It was short and not complicated, he knew what to do. It was fun to hit the tokens. The purpose was to help your lungs grow or something, and find good ones like martial arts, or skating.
A01-11: It was about finding things that get your heart pumping and make you breathe harder. It has sports and walking. You had to pick with the ball. It was fun because everything was moving fast which made it more challenging.
A02-12: It was really fun and challenging but it wasn't hard. It was challenging because you didn't know which ones were right or not right. You had to get 20 outside and running activities.
A02-13: Very fun. She likes picking the different things and rolling the ball. The purpose was to find out what's healthy and what's not for exercise. To win, you had to roll over everything that makes your heart beat faster. Aerobic.
A01-14: He had to find all these activities that were aerobic, that increase the heart rate and everything. It was okay, it was cool that the activities bounce off of each other. You had to locate 20 aerobic activities.
A02-15: You had a ball and you had to move around to hit the aerobic activity. It was fun, because you had to be careful to not hit the ones like playing on a computer, watching TV.
A02-16: It was a little challenging, but fun. The challenge makes it fun. The purpose was to show you what things are good physical activity for your heart and which are not.

What if anything did you learn from playing this game?
GENERAL: 5 kids mentioned a specific activity that they learned was or was not aerobic or healthy; 4 kids learned what was and was not aerobic; 1 kid learned that you should get out and play; 1 kid said they learned nothing.
A01-2: That sit-ups, weights, pull-ups, lunges aren't considered aerobic. You need stuff that actually gets you running, moving.
A02-3: What things are aerobics and what aren't. Basketball is aerobic, but chest pressing isn't.
A02-5: With sports you should play instead of hanging at the mall and talking on the phone, like get out and go play.
A01-6: Nothing really.
A01-11: More, different things about what gets your heart pumping and exercise.
A02-12: Yoga is not running.
A02-13: That doing pushups is not aerobic.
A01-14: There are a lot of aerobic activities to choose from.
A02-15: What was and what was not an aerobic activity.
A02-16: More things than you think are good for you, like washing the car.

Why do you think you had to replay the game?
GENERAL: 6 kids knew that it was because they hit too many non-aerobic activities; 3 kids were not asked this question because they completed the game on the first try; 1 kid said because it was hard.
A02-3: Because it's hard to control the ball and make it hit things.
A02-5: She knew that it was because she got 10 non-aerobics. And she knew she needed to get twenty to win.
A01-6: Because he didn't get enough of the tokens. He knew he needed to get 20 right before 10 wrong.
A02-12: Because she got 10 wrong.
A02-13: Because she kept hitting the wrong ones.
A02-15: Because she got more things that weren't aerobic activities then were. You had to get 20 aerobic to win.
A02-16: Because she got more than 10 non-aerobic selected. She knew she had to get 20 aerobic.

Did you notice anything about the ball?
GENERAL: 7 kids did not notice that the ball changed size or speed; 3 kids did notice that the ball changed size or speed.
A01-2: That it was green. He didn't notice that it was changing size and speed, but thinks that to win the game you should have to make the ball get so small that it disappears.
A02-3: No. She did not notice that it changed size and speed, and does not think this is important. But if it got bigger and slower as you made incorrect choices, she thinks this would make the game harder and it would be good.
A02-5: She noticed that it changed speed and that it got smaller. She thinks it would be good to make it harder by making it get bigger and slower as you made incorrect choices.
A01-6: It got smaller. It was good, not too challenging. It would be cool if they made it get bigger when you get answers wrong, but don't make it more dramatic of a change.
A01-11: It was fast, he did not notice the size change. If he had seen it that, it would have made sense to him. It should stay the way it is, but tell people about it in the instructions.
A02-12: It was a tennis ball. It got really fast but would stop at a dime. She did not notice that it changed size and speed.
A02-13: It doesn't stop very quick. She didn't notice anything about the size or speed. It would be good if it got bigger and slower as you got answers wrong.
A01-14: It was green. He didn't notice the change, but he thinks it would be good if it got bigger and slower when you got answers wrong.
A02-15: It got smaller as you got more. It was a good thing because it made it easier to hit the ones you want.
A02-16: She did not notice anything about the size or speed. She thinks it is pretty cool that it changes though, it makes sense. It's already tough though so to make it slower and bigger would be too hard.

The purpose of this game was to decide which activities were aerobic activities. What does "aerobic" mean?
GENERAL: 7 kids could correctly define "aerobic activity"; 2 kids could not define "aerobic"; 1 kid sort of knew what "aerobic" meant.
A01-2: Aerobic is something that makes your heart pump and your lungs breathe more.
A02-3: Activities that make your heart rate increase.
A02-5: Go outside and play sports, like do something active. She did not understand why "washing the car" is aerobic or why "chest press" is not aerobic.
A01-6: It made your lungs better.
A01-11: Things that get your heart pumping and make you breathe harder.
A02-12: She did not read the instructions and so did not remember a definition of aerobic. She felt the definition the interviewer read was understandable though.
A02-13: Makes your heart beat faster.
A01-14: Something to do with cardiovascular. Makes your heart beat faster.
A02-15: An activity that makes you breathe harder and raises your heart rate.
A02-16: Things that make your heart beat faster and pump harder. She thought the description was good.

Please give me examples of an aerobic activity.
GENERAL: 8 kids were able to give an example of an aerobic activity; 2 kids were not asked this question.
A02-3: Basketball.
A02-5: Sports and washing the car.
A01-6: Martial arts and soccer.
A01-11: Running, sports like soccer and basketball.
A02-13: Volleyball, dancing.
A01-14: Running, rugby.
A02-15: Gymnastics.
A02-16: Soccer.

How did you decide which activities were "aerobic"?
GENERAL: 4 kids picked ones that made them "breathe hard" or their "heart pump"; 2 kids picked ones that involved moving around; 2 kids picked sports; 1 kid picked exercise or activities that were "rough"; 2 kids mentioned being surprised by activities that were not aerobic.
A01-2: Stuff where you are moving around more and doing an actual activity.
A02-3: Whichever one made me breathe harder.
A02-5: Since she read the description of "aerobics" it made a little sense, and she just kept on thinking what those sentences were and tried to stay away from the non-aerobics, but the ball kept moving on it.
A01-6: He was thinking of the exercise ones like yoga. Ones that were rough but not too rough or hard. He didn't seem to understand that he was picking ones that make you breather harder and could not clarify this when asked.
A01-11: The ones that really make your heart pumping like snowboarding, skiing, hiking, and walking. Pushups not being aerobic was surprising.
A02-12: First she tried yoga, but that didn't work so then she tried action, but that didn't work either. Then she tried sports and stretching. Stretching didn't work, but with just sports she got it right.
A02-13: She picked ones that she had done before that made her heart beat faster.
A01-14: He was picking physical activities, but then some like yoga don't make you breathe harder. So he was picking ones that he does.
A02-15: She thought of the ones that you moved from place to place.
A02-16: She thought of what sports that people always mention that are good for you.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?
A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60
GENERAL: The average score was 94.5.
A01-2: An A, because he thought it was nice and liked it a lot.
A02-3: An A, it was the most fun one of the 3 games so far. Because it was more challenging and she liked rolling the ball.
A02-5: An A, because it shows you what are good sports to do.
A01-11: An A, because everything was moving fast which made it a little challenging and fun.
A02-12: A+, because it was fun challenging and helpful. She liked the big bouncing ball.
A02-13: An A, because she understood it really well.
A01-14: An A, because it was really fun. It was fun because the ones you got wrong stayed in the same place and the others bounced off, which made it more challenging.
A02-15: An A, because she thought it was fun and understood the instructions and what to do.
A02-16: A B, because it was pretty tough if you didn't understand in the beginning what you were supposed to roll over.

On a scale of 1 to 5, how easy or hard was this segment?
1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard
GENERAL: The average rating was 3.3.
A01-2: It was a little bit hard, but he still liked it a lot.
A02-3: A 3.5 because at first it was hard to control the ball but then she got used to it. It was a good thing that it was hard.
A02-5: A little hard because when she got to about 17 aerobics and only needed 3 more, there were so many non-aerobics on the screen it was hard to avoid them. It was good though because at the beginning all the aerobics are there to catch.
A01-6: A little easy, which is good because you don't want it to easy.
A01-11: A little easy, which is a good thing because you don't want things to be extremely hard.
A02-12: Not sure, which is a good thing. It's already hard enough.
A02-13: A little hard because the ball got faster as she got them right and it was hard to maneuver. It could be a little harder by making the ball get bigger.
A01-14: It was a good thing that it was a little hard.
A02-15: Very easy which was a good thing but you could make it more difficult.
A02-16: It was pretty challenging compared to the other games. This is partly a good thing, and partly a bad thing. She thought a challenge was pretty cool but some people might not.

On a scale of 1 to 3, rate this segment.
1 = no fun 2 = a little fun 3 = a lot of fun
GENERAL: The average rating was 3.0.
A02-5: A 3, a lot of fun because it shows people to get out and go play a sport or go bike riding or horseback riding.
A02-13: A 3, because she knew all the choices and it was easy to pick.

On a scale of 1 to 5, what did you think about the length of this game.
1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long
GENERAL: The average rating was 2.9.
A02-3: It was just right to have to get 20 because it's a challenge.
A01-6: Once you get 20, on the next level you should have to get 30.
A01-11: A little too short because it was so fun. He would want to have to get 60 right to win the game.
A02-12: Just right because it wasn't too short. Twenty is a good number to get right to win, but ten would be good too.
A01-14: Twenty is too many, you should do fifteen. And then you could only get 5 wrong.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.
1 = not helpful 2 = a little helpful 3 = very helpful
GENERAL: The average rating was 2.6.
A01-2: Those were pretty good. You figured out what roll means once a ball appears on the screen. He doesn't think that he could come up with a better definition and wouldn't change it.
A02-3: They were good except they didn't really explain what to do.
A01-6: The speaker should read the instructions, and if you need help you could click help to repeat the instructions.
A01-11: Very helpful because it explained what the definition of aerobic was.
A02-12: A little helpful because she didn't read the directions and likes to figure games out on her own instead.
A01-14: For him it was helpful enough, but might be harder for people who don't know what aerobic is already.
A02-16: The description of aerobic made you really understand.

Suggestions for changes:
GENERAL: 5 kids said the ball should get bigger and slower as you get answers wrong; 5 kids mentioned changing the length (add levels (2), require 15 correct aerobics (2), require 60 correct aerobics (1)); 5 kids mentioned changes to method of defining "aerobic" (add audio of definition (2), add help button that repeats the definition (2), add pictures to help during definition (1)), 2 kids mentioned adding more non-aerobic tokens to make it harder; 1 kid mentioned telling why the non-aerobics were not aerobic on a score screen; 1 kid said the tokens should move more slowly so they are readable.
A01-2: Add stationary obstacles. Have more bad choices accumulate towards the end so that it is harder at the end. Have 5 levels where you have to get 10 activities each. It should tell you why the "bad" choices were bad. For example, if you selected "pull-ups" it should say that "These are anaerobic activities, which are good for you, but don't make your heartbeat go up so much and breathe hard."
A02-3: The ball could get slower and bigger as you make incorrect choices.
A02-5: There should be pictures in the description of aerobic activity to help people understand. It would be good to make it harder by making it get bigger and slower as you made incorrect choices.
A01-6: The definition of aerobic needs to be more involved and read over the headphones. There could be more, harder levels of it with different sports. If you need help, you should be able to click a help button to repeat the instructions.
A01-11: The instructions should mention that the ball changes size and speed when you select right or wrong choices. You should have to get 60 right to win.
A02-12: The ball should always get faster when you get answers right or wrong. A narrator should read the description of "aerobic activities" over the headphones.
A02-13: When you get answers wrong the ball should get bigger and slower.
A01-14: When you get answers wrong the ball should get bigger and slower. You should have to get 15 right before getting 5 wrong.
A02-15: The ball should get bigger and slower when you get answers wrong. Make it more difficult by having more incorrect answers on the screen to bump into.
A02-16: There could be a "more" button on the instruction screen, that describes further the difference between an aerobic and other activity. You should only have to get 15 right answers to win. Maybe the tokens should move more slowly so you could really read them.

Nanoswarm: What's a Strength Activity?

Tell me about the game you just played.

GENERAL PURPOSE: 7 kids understood the purpose and mentioned "strength" or "muscles"; 3 kids were not asked this question due to lack of time.

A01-2: It was to teach you about strength or anaerobics, to help your muscles get stronger. And some things were the same (both aerobic and strength), like rowing.

A02-3: Same as the other one, except you had to find ones that used your muscles a lot.

A01-6: The purpose was to see what makes you stronger.

A01-11: It was about things to help you get strengthened, like weight-lifting and rowing because it works out your arms.

A02-13: The purpose was to find all the activities that make you stronger.

A01-14: Like the last one but instead of finding aerobic activities, you were trying to find activities that build your muscles, make your muscles bigger.

A02-15: The purpose was to show you what are strength activities.

The purpose of this game was to decide which activities were strength-building activities. What does "strength" mean?

GENERAL: 9 kids could properly define "strength activity"; 1 kid did not seem to understand the concept of "strength activities".

A01-2: It makes a specific muscle work. Focusing on muscles and making them stronger.

A02-3: Activities that used your muscles a lot.

A02-5: Building your bones, making them stronger. Building up your strength.

A01-6: Make your muscles bigger.

A01-11: Things that work out your body to make it stronger.

A02-12: It means working up your muscles.

A02-13: She didn't read the description of "strength building activities" but just knew that she was trying to find ones that make you stronger. She gave the example that "running builds your muscles" though, so she didn't really seem to understand the difference between strength and aerobic.

A01-14: Build your muscles, make your muscles bigger.

A02-15: Activities that make your muscles work harder and make them stronger

A02-16: Make your muscles stronger

Please give me examples of a strength activity.

GENERAL: 9 kids were able to give an example of a strength activity; 1 kid was not asked this question.

A01-2: Resistance training.

A02-3: Doing curls and canoeing.

A02-5: Like weight-lifting and pushups and things.

A01-11: Weight-lifting and rowing.

A02-12: Yoga and stretch your muscles. Basketball because you wrestle the ball away.

A02-13: Lifting weights.

A01-14: Lifting weights.

A02-15: Rowing.

A02-16: Lifting weights.

How did you decide which activities were "strength-building"?

GENERAL: 4 kids mentioned activities that used "muscles"; 2 kids said that they guessed or used trial and error; 2 kids said they pictured the activities; 1 kid said activities that were the opposite of aerobic; 1 kid said because they know all sports; 1 kid was not asked this question due to lack of time.

A01-2: Interviewer did not ask this question.

A02-3: Just by guessing which ones were more muscle-related and which ones weren't. It was easy to tell.

A02-5: By picturing different ideas of strength-building, like sit ups, pull-ups.

A01-6: Looking for ones that were the opposite of the aerobic ones, ones that make you strong.

A01-11: Usually ones about weight lifting and rowing, because he could see a picture in his mind about doing it.

A02-12: Because she knows every sport ever made and is really good at activities like sporting and running.

A02-13: She didn't know what all the activities were so she learned by trial and error which were strength.

A01-14: Not the ones that tire you out, but the ones that make your muscles hurt.

A02-15: She thought about which ones would like make you really tired and might have to do with your muscles.

A02-16: She thought of what would really make your muscles better and things.

On a scale of 1 to 3, how helpful was the score screen at the end of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.3.

A01-2: It was good, he liked it. It tells you how many you got wrong and how many you got right.

A02-3: Not helpful because it didn't tell you anything new. It just showed which ones you chose and which you didn't.

A02-5: It was a little helpful because it shows all the ones that are strength-building and the non-strength ones, so she can know in later life what to do for strength.

A01-6: A little helpful because he already knew that.

A01-11: Very helpful because you saw the things you got wrong and the ones you got right and you learned more.

A02-12: Very helpful because you could see them after and say "Oh, I got that wrong."

A02-13: A little helpful because you could see how you did until you got 20.

A02-15: It was very good because it showed you what you got right and what you got wrong.

A02-16: A little helpful because your already aware of what you did and it just reviews it with you.

Suggestions for changes:

GENERAL: 1 kid thought the ball should blink when it grows or shrinks; 1 kid thought the game should be shorter; 1 mentioned making strength and aerobic into levels of the same game; 1 kid would add pictures during the description of "strength"; 1 kid thought you should be able to bump off the non-strength tokens when they come near you.

A01-2: The bad ones should come towards you magnetically and you have to bump them off. He liked that the strength and aerobic games came right after each other, but maybe they could be separated in the game by other fun stuff.

A02-5: There should be pictures during the description of "strength activity" to help people understand.

A01-6: Combine aerobic and strength into one game where each is a level.

A02-13: It could be a little shorter.

A01-14: The ball should blink when it shrinks or grows bigger.

Nanoswarm Episode 2: "Mix and Match at the Lifepad Snack Bar"

Tell me about the game you just played.

GENERAL PURPOSE: 10 kids understood that the purpose was to choose healthy foods/choices (3 of these kids actually mentioned that they were picking healthy "snacks").

GENERAL OPINION: 8 kids said the game was good/cool/fun (6 said the puzzle was fun; 1 said figuring out which were healthy foods was fun; 1 said the difficulty was fun); 3 kids said the game was hard/difficult (2 said the moving the puzzle pieces was hard; 1 said figuring out which were healthy was hard); 3 kids said they did not know they were supposed to find the healthy foods at first; 1 kid said the game was alright; 1 kid said the game was too short.

B01-2: You had to choose healthy selections by moving a picture around like a jigsaw puzzle. It was a good game, because he likes those kinds of puzzles.

B02-3: It was alright, because she does not like computer games that much. The purpose was to see if you knew what healthy things were and what not healthy things were.

B02-5: It was trying to get me to separate healthy choices from very bad choices, like separate sports drinks from vegetables. It was hard to move the pieces around to where you push 2, but it was good that it was a little challenging.

B01-6: It was fun, it was a little too short. He didn't click anything and it skipped the instruction screen. So at first he didn't know whether he was supposed to pick the healthy or unhealthy foods, so he tried to pick an unhealthy food, but then learned that he was supposed to pick the healthy ones. The purpose was to help you choose healthy foods for snacks, so that maybe if you don't know what a healthy food is you could pick it as a snack.

B01-11: The game was about seeing what healthy choices were and moving the things around to get 3 healthy choices in the space. It was actually pretty fun because you had to move stuff around and you had to think where to put things like a puzzle.

B02-12: At first she didn't get it, because she thought she was supposed to pick healthy foods, but then picked milk and pickle and they were not wrong, so she didn't understand why. But she just kept picking things she thought were healthy until she got it. She did read the directions and understood how to select and move the pieces. It was fun moving the pieces and because it helped figure out which stuff is healthy for you. The purpose was to choose how healthy snacks are.

B02-13: It was cool, she liked using the controllers to slide the tiles around and figuring out how to move the piece to the bottom. The purpose was to choose healthy foods.

B01-14: You pick out the healthy choices. The difficult part was that you had to move around like it was a puzzle. The instructions weren't very clear because he didn't know that he was supposed to get the healthy food into the box until he got some wrong.

B02-15: You were trying to slide healthy foods to question mark and then press 2 to see if it was healthy or unhealthy. It was fun because it was like a puzzle.

B02-16: It was choosing which foods were healthy and you had to move them around to choose the healthy ones. She thought it was pretty cool. It was fun, because it wasn't just choosing the food, you had to get to them, and it was hard to pick which foods were healthy and which weren't.

What did you need to do to win this game?

GENERAL: 8 kids knew you had to get 3 healthy choices; 1 kid said that you had to pick a drink and two other things; 1 kid was not asked this question.

B01-2: You have to get 3 good answers.

B02-3: To get three healthy selections

B02-5: You had to get 3 healthy choices.

B01-6: To get 3 healthy foods. You would lose if you got 5 wrong.

B01-11: Pick 3 healthy choices.

B02-13: Pick a drink and two other things.

B01-14: To get three healthy choices into the box before getting 5 wrong.

B02-15: Get three healthy foods. She didn't know how many you had to get wrong to lose.

B02-16: You have to get three healthy foods and try not to get three unhealthy foods.

What, if anything, did you learn from playing the game?

GENERAL: 4 kids mentioned learning that whole milk was not healthy/healthiest; 3 kids said they learned some other food was not healthy; 2 kids said they learned nothing; 2 kids learned about making healthy choices; 1 kid was not asked this question.

B01-2: That whole milk is not healthy for you, or not the healthiest.

B02-3: Nothing, because she already knew which were healthy selections.

B02-5: That you're supposed to mostly make healthy choices, but very seldom you can have like a soda or something.

B01-6: Nothing really. I wasn't sure if whole milk was healthy because it has a lot of fat in it, but I clicked on it and saw it was unhealthy.

B01-11: There were some that he didn't know like fruit gelatin, but he picked the ones that he knew were healthy.

B02-12: That there are some foods that aren't good for you that you shouldn't eat, like whole milk.

B02-13: Try to see what's healthy from what's unhealthy. Whole milk was surprising.

B01-14: Interviewer did not ask this question.

B02-15: She learned some unhealthy foods that people normally eat, like she learned that dill pickle was not a healthy food.

B02-16: That sports drink was unhealthy.

What did you think about the choices of foods in this game segment?

GENERAL: 10 kids suggested foods to add; 3 kids mentioned that the foods were easy/obvious; 3 kids said the food were good because they were tricky; 3 kids said there was a good number/selection of foods; 1 kid said they were "foods from today", meaning modern times.

B01-2: There was usually an obvious good choice or good snack, like fruit and stuff. To make it harder, you could put some more in there that people wouldn't think are healthy but it actually are. He would add granola bar.

B02-3: It was easy. There was like one healthy thing out of it all, so it was easy to choose the healthy one. She might add pizza as a snack.

B02-5: There were a good number of healthy choices and fun foods. Baby carrots were here favorite snack that was there. Chips are a snack she eats a lot that was not there.

B01-6: It was good, it wasn't hard, but there were more unhealthy foods than easy foods. It's okay to only have two healthy foods, but maybe have different levels and change the number of healthy foods based on the level. Milk, carrots, sports drink, crackers were his favorite snacks there. Suggestions to add: baked potato, fruit salad, and salads that might be tricky, like fried chicken salad.

B01-11: They were good and tricky because they had ones that you know would be fruit , but they had some close ones that had fruit in the word. Grapes were his favorite snack that was there, goldfish and candy were his favorites that weren't included.

B02-12: There were some that she didn't like, like potato chips. She likes grapes, broccoli, peaches and cheese snacks. She thinks fruit salad, salad, plums, and apples should be added.

B02-13: They were foods from today. Apples and milk were her favorites that were there. Peaches were missing. Two healthy choices per puzzle is a good number.

B01-14: It was a good difficulty level because there were some hard ones like whole milk, that he didn't get at first. He thinks we should add hot dog and salad.

B02-15: She thought the choices were good. Her favorite snacks were popsicles and popcorns. She likes apples, but didn't see it in the game. She also thinks we should add granola bars. She thinks two good answers on the screen is a good number.

B02-16: They were kind of challenging because it was hard to tell on some of them, like she thought sports drink would be healthy. Bananas and the fruit juice bar were her favorite snacks that were in the game. For a tricky one, she thinks you could add fried lettuce.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 89.0.

B01-2: An A-, because you might be able to make it more fun. It was interesting and a little challenging, but it could be made more fun by making it more difficult, or adding a time limit.

B02-3: A B, because it's just something to do and she doesn't like games on computers.

B02-5: A B, because it was a little bit challenging but also fun. It was challenging to find the healthy foods, but it was hard to move them onto the plate.

B01-6: An A, because it was fun, but it would be more fun if it was longer.

B01-11: A B, because you had to move everything around, like a puzzle. It would be better if it were bigger with more choices.

B02-12: In between an A and a B, because she didn't understand what to do at first, but she liked figuring out what to do. It doesn't need to be changed.

B02-13: An A, because everything was clear. She figured out to push 2 from the instructions at the bottom.

B01-14: A B, because of the unclear instructions.

B02-15: An A, because it was fun and the instructions were clear.

B02-16: A B, because it is fun but it could be more specific about the foods, by maybe listing them before the game. But it was pretty clear, the moving the tiles was the confusing part at first, but then she saw the tiles and figured it out.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.5.

B01-2: A little easy because the moving pieces was easy, but thinking about the foods was harder. It should be made more difficult though.

B02-3: To make it harder there should be some hard ones where you get stuck deciding if it is healthy or not healthy, like fruit cup.

B02-5: Not sure because it was on the easy side and on the hard side. The easy part was finding the vegetables and fruits, but the hard part was getting them to the plate.

B01-6: A little easy because some of the foods were a little tricky and sometimes it's hard to move them around a little bet too.

B01-11: A little easy because he had played it before (in other testing). It all made sense.

B02-12: Not sure because the controls are easy to control in this game but you actually have to think about which are healthy and which aren't, so that makes it hard.

B02-13: A little hard, which is a good thing.

B01-14: It's a good thing that it's a little easy because you don't spend too much time on a game that's just picking healthy food. People might get frustrated if it's too hard because of the puzzle.

B02-15: A little hard, which is a good level of difficulty.

B02-16: A little easy because sliding the tiles was kind of hard, and telling the foods was kind of hard too. It's a good thing that it is a 2, because if it was too easy it would be boring.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.4.

B01-2: A little fun because of the jigsaw puzzle, and it was fun going through it really fast.

B02-3: A 1.5. If it were harder it would be a little bit more fun.

B02-5: It was a lot of fun because it tells me what foods I should and shouldn't eat while at the same time putting the tiles in place.

B01-6: A little fun because it wasn't long enough.

B02-12: A little fun, but it would be more fun if there were more pieces to make it harder.

B01-14: A little fun because he likes moving the puzzle.

B02-16: A lot of fun because the sliding the tiles was challenging. It's not just selecting the food, it's interacting with it.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 2.6.

B01-2: A little too short, but making it harder would make it longer.

B02-3: Just right because she wouldn't want to spend a long time on it, or she would get bored.

B02-5: Just right because it doesn't take long, and then you move on to the next part of the game.

B01-6: It wasn't way too short. It would be okay if you didn't add anything to it, but he thinks you should add something to it.

B01-11: He would want more to pick from. He would also want to have to get 10 answers right to win.

B02-12: Just right, but it could be a little bit longer.

B02-13: Three correct answers to win is a good number.

B02-15: A little too short. She would want to get 5 right to win.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.3.

B01-2: Very helpful because this game doesn't need much instructions.

B02-3: Not helpful because you didn't really need instructions for this game because the arrows show you which way you can push the tiles and you can just guess that the 2 button is the one to press. But for younger kids the instructions might have been more helpful.

B02-5: They're a little helpful because at first she didn't know what to do. She did read the instructions and so she knew what to do, but where to move the pieces was hard for her.

B01-6: A little helpful, but he didn't really get to read them. He did get to read how to move and that 2 was to pick, and something about snacks.

B01-11: Very helpful because it explained what to do and where to find it and what the buttons did.

B02-13: Very helpful though she skipped through them so didn't read them or need them.

B01-14: Not helpful because he didn't understand to pick the healthiest food.

B02-16: Very helpful because it's pretty simple. It tells you what to do right on the screen so you can notice it.

Suggestions for changes:

GENERAL: 9 kids gave suggestions to make the game harder (require more correct answers to win(6), bigger puzzle grid(5), time limit(2), vary the number of healthy foods in the machine(2), block pieces from moving in certain directions(1), add tricky foods(1)); 4 kids said the instructions should be changed to say to pick the "healthiest" food, instead of the "healthy" food; 3 kids said the game should inform players why the incorrect choices were unhealthy; 1 kid said the screen should have a back button in case players missed the instructions; 1 kid said they would want to play the game 3 times.

B01-2: The directions should say to select "the one you think is the healthiest". When you push two and the item is "not healthy" underneath those words it should say why it is not healthy. To make it more difficult: add a time limit, get more correct answers to win the game, have pieces be blocked from moving in certain directions sometimes, make it a bigger grid of more foods. You should have to get 5 right before you get 3 wrong to win.

B02-3: Make it harder by adding some tricky foods, like fruit cup.

B02-5: You should have to get 5 correct answers right to win to make it more hard.

B01-6: On the score screen at the end, it should tell you why the bad answers were wrong (high in fat, etc.). You could set an easy or hard level and the hard level would have fewer healthy choices in the machine, easy level would have more. On the hard level you should have to get 5 right before 3 wrong to win, medium level 3 right before 5 wrong, and easy level 2 right before 7 wrong. To make it longer you should have to play the whole game 3 times. Another level could be with exercises and non-exercises. Add a back button in case the player misses the instructions.

B01-11: Make it harder with a bigger grid with more foods. You should have to get 10 right to win, and 5 wrong to lose. Instructions should say to find the "healthiest" food.

B02-12: There should be more pieces (a bigger grid). There should sometimes be just one healthy food and sometime more than one so that you aren't sure how many there are. You should have to get 5 right to win, and 5 wrong to lose.

B02-13: There should be a bigger screen with more tiles to make it harder.

B01-14: The instructions should say to get the "healthiest" food into the box. He thinks the puzzle grid should be bigger.

B02-15: You should have to get 5 right to win. Add a time limit.

B02-16: There should be a screen at the end with a sentence about why each of the bad foods selected was bad. In the instructions, "pick the healthy food" should be changed to "pick the healthiest food".

Diab Episode 5: "Objects to Exercise with Inside the Home"

Tell me about the game you just played.

GENERAL PURPOSE: 3 kids knew the purpose was to show exercises you could do at home; 2 kids said it was to show exercises with regular or everyday stuff; 2 kids thought the purpose was to show exercises with things you would not normally use for exercise; 1 kid thought it was just to show exercises; 1 kid thought the purpose was fun.

GENERAL OPINION: 5 kids thought it was hard (3 said that it was hard to grab or move the boxes); 4 kids thought it was confusing at first (2 mentioned that the directions were misleading); 5 kids said that it was fun/nice/liked it (3 said they liked moving/moving boxes around, 1 said they liked the time limit).

B01-2: It was a harder game. You had to get this guy things in the room that he could use for exercise. It was to teach you what you can actually use for exercise with regular stuff not equipment. He liked the way you had to push and pull things out of the way.

B02-1: You had to grab stuff to exercise with and give it to someone. When questioned, she said it was stuff lying around. She thought Dagan was hard to move because sometimes he wouldn't grab and sometimes he would grab the wrong thing behind you.

B02-5: You had to push and pull the boxes to get the exercises that were in or on top of the box. The exercises had to do with not every day things that you would use (she did not seem to understand that they were objects in the home). She thought it was a nice game, except pushing and pulling the boxes was the hard part. Sometime it was hard to push or it would go the opposite way.

B01-6: It was a little complicated, it was fun. It was confusing that the instructions said "move the boxes to Dagan" but, you were supposed to move the chair and it's not a box, he didn't know what to push. He saw Dagan there but didn't know what to do with him. It was fun to move around but a little too short. The purpose was to teach that you could get exercise out of a lot of stuff that you normally wouldn't use for exercise.

B01-11: It was about bringing the objects that would help him exercise to him. They were all just exercises (he didn't mention that they were exercises to do at home).

B02-12: It was a lot of fun moving the boxes, and the directions were very good, but she didn't know which ones were just boxes and which weren't. The hardest part was the extra boxes, easiest was pushing and pulling but it was hard to grab the boxes. The purpose was having fun. She did not notice that they were activities to do at home; and does not think others will notice this.

B02-13: She liked it because it was fun watching him move all over the place and do the exercises. (She did not mention that they were exercises to do at home).

B01-14: He was supposed to get the objects that are found around house and give it to him and he will show you how to do exercise. The purpose was to teach what things you could do around your house to exercise. It was kind of confusing at first because he saw that some of them said "just a box" and didn't know what to do with them, but then he saw that the game said "home exercise" so he realized he was supposed to get the things that are found around the house. It needs better instructions.

B02-15: You were moving everyday objects in your house to the guy so he could do exercise with them. She thought it was a little hard. She did not understand what to do at first but figured it out by trying dragging different things to Dagan.

B02-16: You had to get the things that could help exercise to the man, and you had to move boxes out of your way. They were things you find at home like a bed or TV. It was pretty fun. It was exciting because of the time limit. She was confused in the beginning, because it took so long to move some things that then she didn't think she could move them at all, but she did understand the instructions and what to do.

What did you need to do to win this game?

GENERAL: 7 kids said to push all the objects to Dagan; 2 kids said to get through all the rooms; 1 kid was not asked this question.

B01-2: Interviewer did not ask this question.

B02-1: Go through all the rooms.

B02-5: To get all the everyday exercise things to Dagan.

B01-6: To push all the objects to the kid.

B01-11: To bring all the objects to the guy in the triangle.

B02-12: Drag the boxes to his friend

B02-13: Get all the boxes in the rooms to Dagan.

B01-14: Push all the objects to Dagan in 5 different rooms.

B02-15: Complete all the levels that were in the rooms in a certain amount of time.

B02-16: You had to get all the things in the room that you could exercise with to the guy.

What, if anything, did you learn from playing the game?

GENERAL: 9 kids mentioned a specific exercise that they learned they could do; 5 kids mentioned learning different exercises or exercises with everyday things; 3 kids said they learned exercises they could do "at home"; 1 kid learned nothing.

B01-2: That you can do exercises with cans. Pushups on the dresser.

B02-3: Nothing, because she already knew those exercises because her Dad does them.

B02-5: You can use everyday things at home to exercise, you don't have to go to a gym. You could do TV aerobics, jumping jacks, you could do dancing.

B01-6: That you could do exercise with a lot of things. The chair, that video game for dance, curls, pushups, situps.

B01-11: That you can find anything at home that would help you exercise. Like dips with the chair, the dance mat.

B02-12: Stuff that you can do at home, like pushups and dancing. You can watch TV and do the treadmill at the same time.

B02-13: Different exercises that you could do. There were pushups and a dancing one. She didn't know how to help people understand that their supposed to learn exercises for home.

B01-14: That there are a lot of things that you can do exercises on, like bed pushups and dips on a chair.

B02-15: That you can exercise with everyday objects, like the TV. Pushups on the dresser.

B02-16: That there are a lot of things at home that you can actually exercise with, like doing pushups on the bed or TV exercise program.

What did you think about the activities or exercises that Dagan was doing?

GENERAL: 6 kids said the exercises were cool/fun/nice/good; 3 kids commented that the exercises were creative/new to them/good to learn; 10 kids thought they or their friends could do those exercises at home; 7 said they thought they would try them; 2 kids mentioned that they already do exercises like this at home; 6 kids said all the exercise animations were clear; 2 kids mentioned an exercise animation that was not clear/dips, TV aerobics); 2 kids mentioned an idea for a new home exercise to add.

B01-2: They were good, they were exercises that you could do whenever. Dips were the only one where he couldn't tell what Dagan was doing. He thinks he and his friends could and would do those exercises at home.

B02-3: It was clear what Dagan was doing in the animations. Danced to music and curls with cans were two that she remembers. She and her friends could do those exercises but she doesn't know if they would want to.

B02-5: There were good, except that the time was running down while he was doing them. TV aerobics was a little confusing but she could see the text label of what it was. She thinks she and her friends could and would do those activities at home, because you don't have to have many materials to do them.

B01-6: They were cool, fun. You could add different kinds, like maybe shoot baskets with something inside. He does some of them at home like pushups and situps. It was clear what Dagan was doing. He and his friends could and would do these exercises at home.

B01-11: Very creative, and you can take anything from home and exercise on it. He thinks that he and friends could do exercises at home, but he does some different ones. He does situps with the bed.

B02-12: They were pretty fun, like jogging in place. It was clear what he was doing. She could do those activities, because her mom makes them do pushups for softball. She and her friend might do them sometimes, maybe a little bit.

B02-13: They were funny because you would never think you could do those exercises with those things. It was clear what Dagan was doing, and she and her friends could and would try those activities at home.

B01-14: It was nice to show what you should do. They were clear. He and his friends could do them but might not, because he gets his exercise at school.

B02-15: It was clear what Dagan was doing. She thinks she and her friends could and would try those exercises, like dad does chair dips. One you could add is step up, step down or jump up on a step stool.

B02-16: She didn't know that you could exercise with all of those things. She thinks she and her friends could and would try those exercises because everyone has those objects at home, so you don't have the excuse of not having them.

What did you think about having a time limit to finish this game?

GENERAL: 8 kids indicated that the time limit was positive; 2 kids indicated that they did not like the time limit; 3 kids mentioned that the time should stop while Dagan demonstrates the exercises.

B02-1: He didn't feel like he was going to run out of time, but the time should stop while Dagan is doing the exercises.

B02-3: It was good because it was kind of challenging.

B02-5: The time limit was okay, but it didn't give much time to get the objects to Dagan.

B01-6: It was cool. It was better than not having one, because with a time limit if you lost you could reread the directions. The time should stop though while Dagan is doing his activity.

B01-11: It was good because you had to get certain amounts of them to the guy in that much time. So it made it a little difficult and made it fun.

B02-12: She didn't like the time limit and would want to have it untimed.

B02-13: She likes the time limit because it makes you hurry up and get it.

B01-14: It's good to have a time limit but the time at the beginning is kind of short. The timer should stop while Dagan does his exercises.

B02-15: She liked having a time limit. It was a good amount of time, but you have to understand what to do in order to finish the game in the amount of time given. The time limit could be longer.

B02-16: It was exciting.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 88.0

B01-2: An A, due to the challenge of moving the things and getting them where you want them to go.

B02-3: A B, because it's just something to do and she doesn't like games on computers.

B02-5: A C, because she didn't like that it kept starting her over when she was almost done and her time kept running out.

B01-6: A B, because it was a little complicated and a little too short.

B01-11: A B, because it shows you creative exercises that you can use at home. Changing the directions would make it better.

B02-12: An A, because it's fun, it's challenging and not hard. The most fun part was moving the boxes.

B02-13: A B, because she didn't like that when you ran out of time you had to start over at the first level.

B01-14: An A, because it's giving good information of what you can do around the house with exercising.

B02-15: A B, because the instructions were a little confusing.

B02-16: An A, because there wasn't anything bad about it, it was fun, and it was things you could do at home.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 3.5.

B01-2: A little hard, which is good. But you could still even make it harder.

B02-3: Not sure, which is a good thing.

B02-5: A little hard because she kept starting over.

B01-6: It should be made a little bit harder.

B01-11: A little hard because he didn't know what to do at first.

B02-12: Not sure because it's not easy and not hard.

B02-13: A little hard because it was hard to move the boxes around, but getting it to him was easy.

B01-14: A little hard, which is both a good thing and a bad thing. It is a good thing because the boxes make you think about what you have to do first and how to do it, like moving the boxes out of the way. But it's bad because if someone doesn't get it they'd get frustrated and turn it off.

B02-15: A little hard, which was kind of good and kind of bad. It was bad because she didn't know what to do in the beginning, but good because it took a little bit of time.

B02-16: It should stay the same difficulty level.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.5.

B01-2: A lot of fun because you had to brainstorm how to move things around and you were on a time limit.

B02-3: A little fun because it kept starting over. She kept running out of time.

B01-6: A little fun because it was a little complicated and short.

B01-11: A little fun because of showing different exercises that you could do at home.

B01-14: A little fun because moving around the boxes is fun, but it is hard to move them.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 3.2.

B01-2: He would want about 5 levels instead of just 4, but with levels progressing in difficulty.

B02-3: She would want to stop at 3 levels.

B02-5: A little too long because you didn't have enough time. But 4 levels is a good number.

B01-6: It should be 5 levels.

B01-11: Four rooms is a good number.

B02-12: You should be able to pick between having levels within the rooms or no levels.

B02-13: Four was a good number of rooms.

B02-16: A little too long because maybe there should only be 3 rooms.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.2.

B02-3: A little helpful because it didn't describe everything, it only told you how to move him with the controller.

B02-5: Very helpful because as soon as she started playing the game she understood it.

B02-12: She didn't get the first time she read it, but she had to read it over and over (after losing) and then she got it.

B02-13: At first she thought she was trying to push the boxes through a door or to push all the boxes to Dagan, and she had trouble pushing them until she figured out to hold down the two button, but she didn't have suggestions for the instructions and thinks they should stay the same.

B02-15: They told you briefly what to do but not enough to help you complete the game.

Suggestions for changes:

GENERAL: 8 kids suggested changes to the instructions; 8 kids said if you lose you should be able to start over on the same level or one back; 8 kids said there should be fewer extra boxes in the beginning and progressively more on harder levels; 8 kids had suggestions to make Dagan more obvious (highlight Dagan with color or arrows (4)). Dagan speaks aside saying to bring the boxes to him (3); Dagan has a word bubble saying bring the boxes to him (3)); 4 kids said the timer should stop running while Dagan demonstrates his activities; 3 kids thought the player should have more time on the timer; 2 kids thought the rooms should be like a maze; 3 kids suggested changing the number of levels (more (2), fewer (1)); 3 kids mentioned ways to see more clearly what object is on a box (zoom in on box (1), flashlight (1), print object name when near (1)); 2 kids said there should be progressively more objects as the levels increase; 2 kids said the game should mention/assign doing these activities at home; 1 kid said the warehouse should be brighter, 1 kid said boxes tagged "just a box" should be a slightly different color.

levels should start simpler with 3 boxes in the way. You should be able to start over at the level you lose on, but then you can add more levels on the end. To make it harder: make the objects less obvious among the boxes, and have a simple maze in the room to push the objects around. You could add stepups, situps, and a pullup bar.

B02-3: Instructions should say that you can pull boxes, not just push. The warehouse should be brighter. To indicate, that you have to push an object to Dagan, it should say the name of the object when you get near it, not just when you press 2 to grab it. The instructions should say that you need to bring all objects that aren't boxes to Dagan.

B02-5: Eliminate some of the extra boxes so the time limit does not run out. On the first level you should push 1 object to Dagan, 2 objects on the second level, etc. At the end of the directions, have a stop sign that says "Stop, please remember to push these buttons: __". A word box out of Dagan's mouth should say "Bring me the TV and we'll do this exercise." When you lose you should only go back one level from where you were. Give bonus seconds: for picking up coins, or delivering objects to Dagan. Make a maze to push the boxes through instead of pushing boxes out of the way.

B01-6: Before the game begins, the screen should zoom in on Dagan talking, saying "Push the boxes to me that have the objects on them." Directions should say "Get the objects to Dagan and push the other boxes away." There should be 1 object on the first level, 2 on the second, 3 on the third, 4 on the fourth. After the game you should be able to select an exercise to do at home. "Which one do you want to do today?", and it could assign 15 or 30 situps, for example, depending on the level. The timer should stop while Dagan does his activity.

B01-11: For instructions, there should be an example or video showing what to do. It should show your character pushing a couch or something to Dagan. It should show pushing, and pulling the box. There should be an arrow pointing to Dagan and when you pick up the right thing there should be a checkmark at the bottom of the screen. Start with only 2 or 3 extra boxes on level one and have more as the levels increase. Make it so you start over at the same level you lost on. To make it more fun, you could put random things like a t-shirt in some of the boxes to be tricky.

B02-12: When you pick up a box, it should zoom in so you can see what it is. There should be 4 levels, but each level should have 4 rooms. There should only be one extra box on the first level, and more as you go up. You should have more time and the time should not tick down while Dagan is doing his exercise. After the game it should say "Hey gang, you can do these exercises at home, maybe you should come and try it." You should start over at the same level you lost on. There should be a flashlight to light the boxes. Instructions need to tell you to push the objects to Dagan and how to push AND pull.

B02-13: You should be able to start over at the same level when you lose. In the beginning there should only be a few boxes to push out of the way, with more on harder levels. Dagan should glow so you know to push the boxes to him.

B01-14: There should be a dialogue box coming from Dagan saying to push all the everyday objects to him. The "just a box" boxes should be a slightly different color than the object boxes. The timer should stop while Dagan does his exercises. If you lose, should should start over one level back. There should be fewer extra boxes in the beginning and gradually more in later levels. To help with moving the boxes, there should be arrows around a box when you've grabbed it.

B02-15: Instructions should say "Move the objects you see in your home to Dagan." Or "Drag the objects to Dagan, not the empty boxes." There should be audio instructions with Dagan's voice saying "Drag me the objects". Dagan should blink red in the beginning. If you lose, you should start over on the same level you were on. There should be fewer extra boxes in the beginning, and progressively more. The time limit should be longer.

B02-16: To help people realize that these are exercises you can do at home, the game should be set in a living room. The instructions should also say that these are objects from home. There should be fewer boxes in the beginning level and gradually more. There should be more time in the beginning level and gradually less time in subsequent levels. The time should pause when Dagan is doing his exercise. You should be able to start over from the same level you lose on. There should be 3 rooms. A word bubble from Dagan's mouth should tell him the first object to push, to help people understand in the beginning.

Nanoswarm Episode 3: "Negotiation Segment – Elena's Mom"

Tell me about the game you just played.

GENERAL PURPOSE: 6 kids knew the problem involved getting more vegetables; 3 kids did not mention vegetables, but mentioned helping to get "healthy foods" for the girl; 1 kid mentioned not being disrespectful. 6 kids mentioned that they had to help tell "mom"; 4 kids did not mention telling "mom".
GENERAL OPINION: 4 kids said it was good/fun/liked it (because it could help in real life (2), because of making choices(2)); 3 said it was okay (because it was too short (1), because it was not that fun(1)); 2 kids said it was not a game, just choices; 1 kid said it was boring; 1 kids said it was easy; 1 kid said it was too much reading; 1 kid said it was unclear that the mom served unhealthy foods.
B01-2: You had to help her with telling her mom that they need more vegetables and less calories for their food.
B02-3: She didn't think it was a game, just choices and selections. It was kind of boring. The purpose was to see if you could choose the right things to say and choose some fruits and vegetables because the girl wanted to eat more fruits and vegetables.
B02-5: It gave me choices to tell mom what to do. Her mom cooked a big meal, but she didn't have vegetables and there were a lot of calories in the meal. It was a good game, because this could happen to you in real life.
B01-6: it was okay, because it was too short. There should be more questions and answers. The purpose was to eat more fruits and vegetables, eat more healthy foods. He didn't think it was clear that Elena's mom had given her unhealthy foods and thinks that is should be made more clear in the intro.
B01-11: It was about a girl that had a lot of unhealthy foods, and she wanted healthy foods so I was giving her ideas of what to pick, like telling her if she didn't have corn for dinner, she could make it. It was good because at my house sometimes we have healthy dinner and some are non-healthy, so it might happen to me.
B02-12: It was fun, but way too much reading. She liked watching the videos and giving advice best. The purpose was to reach a goal and the problem was that her mom was cooking not so many healthy foods.
B02-13: She liked it because it was looking in on someone's life and she liked the choices, they were funny. The purpose was to help solve dilemmas because her mom cooked brownies and there were no veggies.
B01-14: It was okay. It wasn't all that fun. You're just trying to tell your mom in a way that's not being disrespectful.
B02-15: You watch a video and then you help a girl decide what to tell her mom about having vegetables in their dinner. It was just okay, because you were just choosing things, not really playing a game.
B02-16: You have to help this girl find the best way to explain to her mom that she wants healthier food for dinner. It was to tell her mom politely when she is writing up the grocery list. It was pretty easy.

What, if anything, did you learn from playing the game?

GENERAL: 4 kids said nothing; 2 kids learned about asking their parents for healthy foods or FV; 2 kids learned that they should eat healthy and exercise; 1 kid learned that fruit smoothie is healthy; 1 kid learned that sometimes parents are the cause of unhealthy eating.
B01-2: Nothing really, but that fruit smoothie is healthy.
B02-3: Nothing.
B02-5: You should always eat healthy, but you can seldom have a bag of chips. You should go on walks and get exercise, and you should have a fruit or vegetable each day.
B01-6: Nothing really.
B01-11: Ideas, like if you didn't have any vegetables or fruits, you could tell your parents to get vegetables, or you can go down by the store.
B02-12: About take an hour walk, eating vegetables, grapes, fresh fruit.
B02-13: She didn't know.
B01-14: Nothing.
B02-15: That there is a way to ask your parents for like a healthier dinner or meal.
B02-16: Maybe sometimes it's because your parents don't make healthy food that you don't eat healthy.

How likely would you be to have this problem if you tried to eat vegetables?
1 = not likely 2 = a little likely 3 = very likely
GENERAL: The average rating was 1.5.
B01-2: Not likely because his mom is a nutritionist, so she provides vegetables.
B02-3: Not likely because her parents are always telling her to eat more fruits and vegetables.
B02-5: A little likely because we don't usually run low on canned vegetables and fresh carrots.
B01-6: Not likely because his mom doesn't serve bad food.
B02-12: Not likely because her mom always prepares vegetables.
B02-13: Not likely because her mom always has a vegetable available.
B01-14: Not likely because his mom is always forcing him to eat vegetables.
B02-16: Not likely because her dad is a doctor so there is always a vegetable.

Tell me what you thought about the text messaging (TM) conversation on the screen.
GENERAL: 7 kids commented on likeability (nice/good/cool/liked it (6), okay (1)); 6 kids commented on clarity (clear/simple/easy to understand (5), confusing (1)); 5 kids commented on the realism of the problem (not realistic (4), realistic (1)); 8 kids commented on whether they would try the solutions (would try (5), might try (2), wouldn't try (1)); 4 kids said the solutions were good; 6 kids commented on having no "correct" answers to the first question (not okay this way, need to add a correct answer (3), okay this way (3)).
B01-2: He liked it. It's good that she's asking about what foods she should have. He doesn't think that 12 year olds sit at dinner and think about asking for more vegetables with their meal though.
B02-3: It was just a conversation. The problem was weird, because even if someone's mom wasn't offering fruits and vegetables, she doesn't think they would set goals to eat more fruits and vegetables. She didn't like that there were no good solutions at first, and thinks there should be a good answer to the first question. Once there were good solutions, they were good and she would try them.
B02-5: It was nice, but it would be a little better if instead of asking lots of questions, just give the whole thing. Elena has to say and then give all the solutions.
B01-6: Some of it was confusing because he didn't know that her mom was serving bad foods. The solutions were all good, except there should be one good choice for the first question. He didn't think he or his friends would really try these solutions because they don't have this problem.
B01-11: It was good because when he picked something it responded to his choice instead of saying the same thing over and over. He would try these solutions.
B02-12: It was cool, it made sense. She knew her first answer wasn't right but once she got farther she got them right. Some of them would be rude. She would try the solutions.
B02-13: I liked it there. It made sense, it was a normal problem. The solutions sounded right. It was okay that all the first answers were bad. She and friends would try the solutions.
B01-14: It was okay. It was easy to understand what you needed to do. With Elena's problem, he thinks that is usually the other way around for most people, where most kids don't want to eat vegetables and their parents make them. He and friends might try the solutions if they had that problem. It was weird that all the answers to the first question were bad, but it is okay and should stay that way because otherwise you wouldn't get to see all the options.
B02-15: She thought it was good, it made sense. She thought it as funny that all the first answer choices were bad and thinks it should stay this way because you learn what not to do. She thought the solutions were good and she would try them.
B02-16: It was simple. Elena turned down a lot of things, but in the end you help her with the best one. She did think it was confusing that there were no good answers for the first question, although she thought it was good because it made her talk longer, but she would put one good answer in there so it would still be tricky. She and her friends might try those solutions.

How did you decide which TM answer to select?
GENERAL: All 10 kids thought about or used reasoning for their choice and did not just guess at random; 6 kids said they read all of the choices before choosing; 2 kids said they read most but sometimes chose before finishing.
B01-2: He was deciding what he would do. For most of them he read through them all, except the grocery list one, because he saw it first and thought it was good.
B02-3: Common sense.
B02-5: Some of the choices you'd have to do stuff on your own to get it, so I tried to choose the one that seemed most reasonable to me. It was easy to pick because most of the choices were really rude, so it was easy to find the polite one.
B01-6: The one that sounded like the best. He read most of them first before picking.
B01-11: He read all of them and chose which one was the best one.
B02-12: She went down the row, sometimes she knew which was the right one and didn't have to read them all.
B02-13: She read them all.
B01-14: He read them all and picked the one that wouldn't make his mom mad.
B02-15: She read all of them and pick the one that most applied to her.
B02-16: She read them all and thought about them for a little bit.

What did you think about the speed of the TM words as they appeared on the screen?
GENERAL: 9 said it was a good/fine speed; 1 said it was too fast.
B01-2: It was good. It should scroll like it does, not just pop up.
B02-3: She could read it so it was fine.
B02-5: It was okay. She couldn't read it while it was typing, but she could when her whole text was there.
B01-6: It was fine how it was.
B01-11: It was good.
B02-12: It was fast, it should go slower.
B02-13: It was just right.
B01-14: It was a good speed, you could keep up with it.
B02-15: She thought it was a good speed and then it just left it there so you could see.
B02-16: They weren't too fast or to slow, so it seems like she's actually typing it to you.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?
A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60
GENERAL: The average score was 88.0.
B01-2: A B, because there were some confusing parts, like why was she text messaging, and the all negative answers, and how she asks her during the meal instead of while making the grocery list.
B02-3: An F, but there is nothing you can change to make it better without changing the point of it.
B02-5: An A, because kids should learn from the game that they should always eat fruits and vegetables, and they should never be rude to their parents.
B01-6: A B, because it wasn't so fun and it was kind of short. It was just picking answers, not a real game.
B01-11: An A, because it compares well to real life experience and solutions he would pick.
B02-12: An A, because it helps you reach your goals.
B02-13: An A, because it was easy and it was fun.
B01-14: An A, because of all the choices of what to tell her mom.
B02-15: An A, because it taught you something.
B02-16: A B, because it was kind of short.

On a scale of 1 to 5, how easy or hard was this segment?
1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard
GENERAL: The average rating was 1.5.
B01-2: Kids wouldn't really consider it a major game, just something in between so it doesn't really need to be much of a challenge.
B02-3: Very easy because you didn't have to really do anything. It's good that it's easy because you don't want to spend a lot of time on that kind of thing.
B02-5: A little easy because it was easy, but it wasn't hard.
B01-11: Very easy, but it's a good thing.
B02-12: The hard part is the reading, but the easy part is the choosing.
B02-13: Very easy because it was simple but to the point. The answers were obvious. It was good that it was easy.
B01-14: Since it is a game with just words and no pictures, it needs to be easy, because if it's hard nobody will want to play.
B02-15: Not sure because it's not really a game, it's more like just goals.
B02-16: It could be a little harder with more choices, but the answers were kind of tricky.

On a scale of 1 to 3, rate this segment.
1 = no fun 2 = a little fun 3 = a lot of fun
GENERAL: The average rating was 2.1.
B02-5: A lot of fun because you can learn from this game.
B01-11: A little fun but there is nothing to change to make it more fun.
B02-16: A little fun because it was short.

On a scale of 1 to 5, what did you think about the length of this game.
1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long
GENERAL: The average rating was 2.6.
B01-2: In between a 1 and a 2. The conversation could be longer, by having her make excuses as to why those answers don't work for her.
B02-5: Just right, because it didn't give a time limit to answer questions. It only took a little while because she was reading all the answers before picking.
B01-6: Way too short. There should be about 7 or 8 questions instead of five.

On a scale of 1 to 3, how helpful was the video at the beginning of this game in helping you to understand the game?
1 = not helpful 2 = a little helpful 3 = very helpful
GENERAL: The average rating was 2.6.
B02-5: The video was very helpful because it gave the idea that she was supposed to answer a question.
B01-6: Not helpful because he was confused, and didn't understand what foods she was being served to know that they were bad.
B01-14: Very helpful because he knew what he had to do.

Suggestions for changes:
GENERAL: 3 kids said there should be a "correct" answer option for the first question; 2 kids said there should be audio reading of the conversation/questions; 2 kids said there should be more questions/answers/conversation; 1 kid suggested each of the following: fewer correct answers and more incorrect answer options for each question, list the whole conversation at once and answer one question; state the purpose at the beginning of the game, Elena should make excuses for not using ideas to make it longer, Elena should say "Just joking Wings" after giving all bad answer options to first question, add text captions to video, conversation should begin with "Shhh Wings" to indicate why text messaging, fruit selection should be done using a ball-rolling game.
B01-2: If we keep the all negative choices for the first question, Wings should say "Just joking.." before displaying his second choice. You tell Elena to ask mom while she's making her grocery list, but then she does it during meal time in the video instead, so the video or statement should be changed. The TM conversation should say "shhh" to indicate why you are text messaging from across the table. To make the conversation longer, Elena could make excuses about why your answers don't work for her.
B02-3: There should be a good answer for the first question.
B02-5: Instead of lot of questions, it should just list everything Elena has to say, and then all the solutions.
B01-6: There should be a few more questions and answers. In the beginning it needs to say something like "Help her mom make better food choices for dinner". They should say the text messaging conversation in the headphones.
B01-11: For the first question, there should be one good answer.
B02-12: The conversation should be read aloud. There should be a good answer option to the first question.
B01-14: During the part where you have to pick the fruit, have it change to a game where you have to roll around the ball to pick the fruit.
B02-16: Add more text messaging after the conversation to make it longer. Have fewer good answers and more bad answers each time. When the video is playing it should type out what she's saying like a caption at the bottom of the screen.

Nanoswarm Episode 6:"Negotiation Segment – No Transportation"

Tell me about the game you just played.

GENERAL PURPOSE: 9 kids knew that they were solving the problem of getting to the community center or no transportation; 1 kid said they were finding solutions for exercise problems.

GENERAL OPINION: 7 kids said it was good/fun (because of the choices (1), because it helped in real life (1), because they like solving problems (1), because there was less reading (1)); 3 kids said it was clear; 3 kids mentioned that there were a lot of excuses for not using the solution; 3 kids said it was short; 1 kid said it was challenging.

B01-2: It was a good thing for being just a short part in between games. You're trying to figure out how you can get yourself to the community center, and it's trying to teach you all your options. He was okay with having to make 5 choices to get past the game. He

B02-3: You had to figure out a way for somebody to get to the community center. It seemed like Demetrius didn't want to go, because his bike happened to be broken and stuff like that. When it as explained that this was so the player could come up with multiple solutions, she said that this was good though and not confusing.

B02-5: Demetrius was challenged to go play basketball at the community center and didn't have a way to get there, so I gave him some explanations of how to do it, and it showed me some answers that I could use. It was challenging because he kept making excuses for why he couldn't use your solution, so you had to find better and better answers.

B01-6: It was a little short, but better than the first negotiation segment. He understood what was going on. They were trying to make up their fight but they couldn't find a ride so they were going to take the bus.

B01-11: It was about two kids who got in a fight and to settle it they need to go a basketball place but they didn't have a ride, so they tried to figure out some transportation. It was good because sometime in your life, you may have a problem where you don't have

B02-12: It was good, because there was not a lot of reading. It was two boys who have to settle by playing basketball. The purpose was to get your exercise. The problem was the boys are fighting and their mom couldn't drive them so you had to pick a way for

B02-13: The doctor sent them to exercise to work out their problem, but they had all these excuses. It was fun to have all the different choices, and none of them worked. The purpose was to help find solutions for exercising problems. Having to give 5 solutions is

B01-14: He was supposed to find a way for Demetrius to get to the community center, because his mom couldn't take him. It gives good enough information on what you should do. The purpose is to get him to play basketball.

B02-15: You were text messaging Roberto. You helped him solve the problem of getting to the community center with Demetrius because his mom couldn't drive and his brother couldn't either. She thought it was a good game, because she likes trying to help solve

B02-16: You thought of possibilities to get a ride. It was kind of short, but it definitely made you think about what you could take to get there.

What, if anything, did you learn from playing the game?

GENERAL: 3 kids learned about persevering to solve a problem; 2 kids learned new transportation methods; 2 kids learned about ways/places to get activity; 1 kid learned not to argue; 1 kids learned to fix their bike; 1 kid learned nothing.

B01-2: That a lot of people can be really limited to getting to places, and it's actually pretty hard, and you just have to brainstorm and think about what you're going to do.

B02-3: To fix your bike if it's broken.

B02-5: That you should never really get into an argument, and try to find the most polite ways to settle things.

B01-6: Nothing really.

B01-11: How to get places and ideas of what to do. Like ask someone else's mom or walk.

B02-12: You can do a lot of exercise things on the way to your exercise.

B02-13: Reminded me that I could go to school and play there.

B01-14: That if you commit to something you should find a way instead of just giving up.

B02-15: You should be resourceful when you have a problem.

B02-16: There are usually a lot more things than just driving there, like riding a bike, taking the bus, and getting an older sibling to drive you.

How likely would you be to have this problem if you tried to exercise?

1 = not likely 2 = a little likely 3 = very likely

GENERAL: The average rating was 2.1.

B02-5: Not likely because I have different sources of transportation, my mom would be able to drive me, my dad would be able to drive me, and I have a bike.

B01-6: Not likely because he usually has a ride where he is going.

B02-12: Very likely because she can barely make it to practice sometimes.

B02-13: Not likely because she could get a ride.

Tell me what you thought about the text messaging (TM) conversation on the screen.

GENERAL: 4 kids commented on likeability (good/liked it (3), okay (1)); 9 kids commented on clarity (all clear/simple/easy to understand (7), some part was confusing (2)); 3 kids commented on the realism of the problem (not realistic (2), realistic (1)); 8 kids commented on whether they would try the solutions (would try (6), might try (2)); 5 kids said the solutions were good; 4 kids commented on the excuses to their solutions (they were okay/good(3), bothered by them(1)); 2 kids mentioned they could not try some of

B01-2: The conversation made sense. He and his friends don't go out to parks and places.

B02-3: It was just a conversation. If she wanted to go, she would probably try the solutions but her mom won't let her ride her bike in the road. The solutions were good, there was a good selection of them.

B02-5: It made sense, but the excuses bothered me.

B01-6: It was okay, but it should be slowed down a little bit. Five is a good number and the excuses are not confusing. He and his friends might try those solutions but they wouldn't usually have that problem.

B01-11: It was good. The solutions were good, and he and friends would try them because sometimes his friends ask him for a ride and sometimes he says he can and sometimes he can't.

B02-12: She would try the solutions, she's too little to walk or ride if it's far, but the friend's mom could take her. The conversation made sense. The problem is cool, it happens all the time.

B02-13: She liked it. The one confusing part was that it said that you could not skateboard because it was 8 miles away but then she picked running and it said okay. The solutions were pretty good and she or her friends would probably try them

B01-14: It was all clear to what you have to do. It is okay that he gives excuses because they're all good reasons for not being able to use that option. He doesn't think that is confusing at all, but would only want to get 3 or 4 answers. He would try some of those

B02-15: It was good. It was clear, the solutions were good and she and her friends would try the solutions. It was a little confusing at first that she was getting excuses for all her answers, but it was okay and should stay that way. She thinks 5 is good number of

B02-16: It was similar to the other one, it was simple. It made sense, she was kind of scared he would turn down every option. But she thinks the excuses are okay and would still want to answer it 5 times. The solutions were good but it might be kind of far in real

How did you decide which TM answer to select?

GENERAL: All 10 kids thought about or used reasoning for their choice and did not just guess at random.

B01-2: He was only picking answers that would get Demetrius to the community center.

B02-3: Common sense.

B02-5: She went through all the answers and picked one that was a nice answer, and then it was gone from the list the next time.

B01-6: The one that sounded the best, and that made the most sense.

B01-11: Pick the best one.

B02-12: She read all of them.

B02-13: She was reading them all and thinking about it.

B01-14: He was thinking about what would get him to the community center.

B02-15: She was selecting which one she would try.

B02-16: Reading all of them and thinking them over.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69

A = 95 B = 85 C = 75 D = 65

A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 87.9.

B02-3: A D-, it was better than the last one because of the topic.

B02-5: A B, because it explains what to do, the only problem is all the excuses.

B01-6: An A-, because it was a little hard. It was more fun than the other one though.

B01-11: An A, because it compares to real life.

B02-12: An A-, because it was fun but short.

B02-13: An A, because you can understand it well and it could happen in real life.

B01-14: An A, because he has a really good problem that some kids face.

B02-16: A B, because it was really short. It needs video clips.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.0.

B01-2: A little easy because you had to keep on doing it.

B02-3: A 1.75 because it was a little harder than the last one because you had to keep selecting choices.

B02-5: Not sure because it has the same idea as the other game but a little different.

B01-6: It should be made harder by making it longer or adding more bad choices for answers

B02-13: A little hard, but that's a good thing. It was hard because there were all these choices but he had excuses for them.

B01-14: A little easy because it was just picking out different ways of transportation to the community center.

B02-15: To make it harder have more bad answers.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.1.

B02-5: A little fun because the only problem was the excuses.

B01-6: A little fun because it was too short.

B01-14: A little fun because it is fun picking until he doesn't have an excuse.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 3.0

B01-2: Five is just right.

B02-3: A 4.5. Maybe you should have to get 3 or 4 solutions.

B02-5: A little long because it didn't give her a time limit.

B02-15: A little too long. She would want to do 3 or 4.

Suggestions for changes:

GENERAL: 6 kids mentioned changing the number of correct answers they have to give to win (would rather give 3 or 4 answers (4), would rather give 7 or 8 answers (2)); 2 kids would increase the ratio of incorrect answer choices to correct answer choices to make the game harder; 2 kids mentioned textual changes to the responses; 1 kid said that all the good answers should be listed after the game so the player knows these are good regardless of the excuses.

B01-2: The responses to the bad answers should say "Wings, I need my exercise for the day." or "It would probably be better if I got to the community center".

B02-3: The excuse for not skateboarding should say "I don't have a skateboard" instead of "I don't know how to skateboard." She would want to give 3 or 4 solutions.

B02-5: She would want to give seven solutions.

B01-6: Make it harder/longer by adding more bad choices for answers, like 2 good answers and 3 bad answers for every question. He would want to pick 8 answers instead of 5.

B01-11: He would want to answer 3 times.

B02-12: After the game, list all the good answers that were selected so that they know they were good options even though they weren't used.

B01-14: He would only want to give 3 or 4 solutions.

B02-15: Have only 1 good answer and the rest bad each time. She would want to give 3 or 4 solutions.

Nanoswarm Episode 8 "Negotiation Segment – "Too" Excuses"

***1 child did not play game due to lack of time.**

Tell me about the game you just played.

GENERAL PURPOSE: 4 of the kids mentioned 2 of the "too excuses" they were trying to overcome; 2 of the kids mentioned 1 of the "too excuses"; 1 of the kids mentioned 3 of the "too excuses"; 1 of the kids recalled all 4 of the "too excuses"; 1 of the kids said the purpose was meeting goals.

GENERAL OPINION: 4 of the kids said the game was good/fun/cool (because they liked picking the solutions(2), because it showed things you could do(1)); 2 kids said it was okay because it was just picking/problem solving, not really a game; 1 kid said it was not fun because it was too long and there were too many excuses; 2 kids mentioned it was short.

B01-2: His friend didn't want to exercise with him because it was too hot, it was going to rain. And you had to make him exercise with you. It was a good thing because it shows you what you could do instead.

B02-3: She couldn't run because it was too hot. You had to press 2 for every selection that you thought was right. Everyone but Wings looks stupid because they can't come up with ideas so they always need to ask him. She thought the concept of "too excuses" was clear.

B01-6: It was a little bit fun, it was a little too short. The basketball one was more fun, this one didn't explain anything. It should have a movie. It was about meeting your goals.

B01-11: It was too hot so his friend and him couldn't go running so I had to find solutions of what to do. It was also going to rain that day. It was good because of picking the solutions.

B02-12: It was no fun, because there was no video, it was too long, and there were too many excuses. The purpose was to fit exercise into a rainy day (she didn't seem to notice the other "too" problems).

B02-13: It was cool, because it was a lot of fun, and she likes answering the questions. The purpose was to figure out the problems, like it was too hot, it was going to rain.

B01-14: Elena couldn't exercise with her friend because it was too hot, and so he had to make suggestions on what other things she should do for exercise. When prompted, he was also able to recall the "too clumsy" and "too rainy" problems. The game was okay, but it was just picking out words or whatever.

B02-15: You were helping Elena find a way to exercise because her friends thought it was too hot to run. It was raining, then she didn't have enough time and she was too clumsy. She thought it was okay, it wasn't like a game where you had to accomplish getting somewhere, you were just trying to solve a problem.

B02-16: You have to help him to find a way to get his exercise. He couldn't really go outside cause it might rain and he didn't have time to do some of them. It was short but to the point.

What, if anything, did you learn from playing the game?

GENERAL: 6 kids learned to find another way to exercise or to do indoor things for exercise instead; 2 kids said nothing; 1 kid learned to try to get exercise on a rainy day.

B01-2: It was a good thing because it shows you what you could do instead.

B02-3: Nothing.

B01-6: Nothing really.

B01-11: When you need your exercise you can do other things instead of doing something else.

B02-12: Try to get exercise on a rainy day. She already knows how to overcome these problems so she doesn't need to learn it.

B02-13: How to find like indoors things to do. Like things in the garage.

B01-14: You should always meet your goal if you say you're going to exercise. Don't let the weather or what your friend says get in the way, just find another way to do it.

B02-15: You can do exercise inside when there is something going on outside.

B02-16: There's a lot of ways that you can get your exercise, but sometimes it just doesn't work out so you need to find another way.

How likely would you be to have this problem if you tried to exercise?

1 = not likely 2 = a little likely 3 = very likely

GENERAL: The average rating was 1.7.

B02-3: Not likely because she exercises inside at the YMCA.

B01-6: Maybe a little likely. He would be most likely to have the "too rainy" problem.

B01-11: He'd be most likely to have the too hot and too rainy problem. He and his friends would try the solutions.

B02-12: Not likely because she swims in the rain or walks in the rain or on the treadmill.

B02-13: Not likely because she has an indoor pool at school.

B01-14: Not likely because most of the sports he does, you don't stop for bad weather.

Tell me what you thought about the text messaging (TM) conversation on the screen.

GENERAL: 6 kids commented on likeability (good/liked it (5), okay (1)); 6 kids commented on clarity (all clear/made sense (4), some part was confusing (2)); 4 kids commented on the realism of the problem (not realistic (2), realistic (4)); 8 kids commented on whether they would try the solutions (would try (3), might try (4), would not try (1)); 7 kids said the solutions were good; 3 kids mentioned there were a lot of excuses.

B01-2: It made sense, it was all excuses. His friends might or might not try those solutions.

B02-3: For the option about looking at a magazine for exercise ideas, she was confused because she thought it meant to look for ideas and then do those ideas. This should be rephrased to be more clear. The solutions were good, but she and her friends wouldn't try them. I'm too clumsy should be removed because she doesn't think this one sounds like a real problem.

B01-6: It was good. He and his friends would maybe, but probably not, try those solutions.

B01-11: It was good. The solutions were good because some were tricky and some were right.

B02-12: It was good and clear. It was a normal problem. The solutions were good. She would not exercise in the garage but might try other solutions.

B02-13: She liked the text messaging, it looks like a cell phone. There were no parts that were confusing. The problem was like an average kid, and the solutions were good. She would try them.

B01-14: It was okay, but there should be pictures of the activities (like Tae Bo, Aerobics) so people don't get confused about what they are. The problem doesn't apply to him, but might apply to other people. The solutions were good, but she always had an excuse. He and his friends might try some of them, like going to the pool or Tae Bo.

B02-15: It was a good conversation and it was pretty clear. She remembered Taebo, active chores, pushups, crunches, situps. She thought they were good solutions and would try them.

B02-16: They are excuses a lot of people would give. She could relate to the solutions because they are what she would say to a friend. She would try the ones at home.

How did you decide which TM answer to select?

GENERAL: All 9 kids thought about or used reasoning for their choice and did not just guess at random.

B01-2: He was trying to pick which ones were good ideas.

B02-3: Common sense.

B01-6: The ones that made most sense and sounded the best. He read through most of them but would pick if he saw a good answer.

B01-11: By comparing the solution to the problem and how it's going to come out.

B02-12: Read and pick the best one.

B02-13: She read them all.

B01-14: At first Elena was trying to run, so he was trying to get her something close to running, something aerobic.

B02-15: She was reading them all and selecting which one she thought she would do.

B02-16: She was just thinking about them and what would be reasonable.

If you had to give this game a grade (A, B, C, or D– like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69

A = 95 B = 85 C = 75 D = 65

A– = 90 B– = 80 C– = 70 D– = 60

GENERAL: The average score was 85.6.

B01-2: A B, because he kept on having these problems. He seemed like a complainer.

B01-6: A B, because it was a little too short.

B01-11: A B, because it's a little too long. He would take out "too clumsy", it's really just that they're too lazy.

B02-12: An A-, because it's boring but fun. It's boring because too many words.

B01-14: A B, because some of the excuses are not very legitimate.

B02-15: An A, because it wasn't boring because you had to pay attention to try to solve the problem.

B02-16: An A, because it helps you think of a lot of ways you can exercise.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 1.3.

No comments.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 1.9.

B01-6: A little fun because it was short and just picking things.

B01-14: It would be more fun with pictures.

B02-16: It was more fun than the other negotiation segments because she can relate better to the problem.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 3.0.

B01-2: He would only want to solve 3 problems, and would take out "too clumsy".

B01-11: A little too long, he would want 3 "too" problems instead of 4.

B02-13: Just right, four problems is a good number to solve.

B02-15: Just right, four problems is good.

B02-16: A little too short, four problems is a good number.

Suggestions for changes:

GENERAL: 3 kids said that the problem "too clumsy" should be removed from the game and there should only be 3 problems; 3 kids suggested a change to the wording of the "too clumsy" problem; 1 kid said there should be fewer correct answers each time to make the game harder; 1 kid said that a character other than Wings should propose solutions and the player should pick 'yes' or 'no'; 1 kid said that there should be pictures of the activities so players know what they are; 1 players suggested a change to the text of a solution.

B01-2: Take out "too clumsy" to make it shorter.

B02-3: The other characters should propose some solutions and Wings should say yes or no. For the option about looking in a magazine, rephrase to "Look in an exercise magazine to get new ideas for another day". Take out "too clumsy".

B01-6: Change "I'm too clumsy" to "I don't know how to"

B01-11: Take out "too clumsy" and have only 3 problems.

B01-14: Add pictures of the activities that are mentioned (like Tae Bo, Aerobics) so that it is clear what they are.

B02-15: There should only be two right answers and the rest wrong on each choice. "Too clumsy" should be stated as "I'm not that good at that activity."

B02-16: "Too clumsy" should be stated as "I was never really able to do those kind of exercises".

Nanoswarm Episode 1: "Fruits and Veggies at a Fast Food Restaurant"

Tell me about the game you just played.

GENERAL PURPOSE: All 10 kids knew that the purpose was to eliminate/get/pick out the unhealthy foods.

GENERAL OPINION: 9 kids said it was good/fun/liked it(liked that it was challenging(3), liked looking at/selecting foods(2), liked shooting(2), liked multiple levels(1)); 5 kids said it was difficult/hard/tricky (choosing the right foods(4), because the tiles moved fast(1)); 4 kids said they were confused at first and thought they were supposed to shoot the healthy foods; 5 kids commented on the correct/incorrect answer counters (noticed both counters(3), noticed 1 counter(1), noticed neither counter(1)); 1 kid thought it was easy.

C01-2: It had menus of different things like sides, desserts and drinks, and you had to take out all the unhealthy things from the menu by pressing them and they fall down. It was good how as they moved off the screen your shooter slowed toward the edge of the screen and couldn't quite get there in time, because it makes it difficult. It kind of frustrates you but it's cool. He did not see either of the counters on the screen.

C02-3: You had to eliminate the unhealthy choices from sides, desserts and drinks. The sides was a little hard because some of the sides people think are healthy but they really are not. It's good that they're tricky though. She saw the counters and they were clear to her.

C03-5: She liked it because what she had to do was get all the bad foods to eat. She thought at first that you were supposed to get the healthy foods, but when she lost she realized you were supposed to get the unhealthy foods. She didn't see the counter of wrong answers, but did see the number remaining.

C01-6: You had to get all the unhealthy food out. It was kind of complicated, because it is hard to tell what some of the foods are from the pictures. It was fun, and he liked that he played three of the levels instead of just one. The counters were clear to him on the screen.

C01-11: The game was about picking healthy choices and eliminating unhealthy choices, of sides, drinks and desserts. It was pretty tricky because they put things that were close to healthy and close to not healthy, which was a good thing. The potato and whole milk were tricky. He saw both the counters.

C02-12: You had to pick out all the bad ones. It was hard, because she didn't read the directions so at first she thought she was supposed to pick the healthy foods. Shooting the tiles was easy, but picking between the unhealthy and healthy foods was hard. She didn't know Jello would be a bad one.

C03-13: She liked it, because she liked moving the shooter around and shooting. The purpose was to pick healthy choices and unhealthy. She knew she was picking out the unhealthy choices.

C01-14: He was supposed to pick out all of the unhealthy choices coming from either drinks, sides or desserts. He figured it out because he shot a healthy one and it said it was incorrect, so then he knew to shoot the unhealthy ones. It was pretty cool, but you should be able to move the cursor faster.

C02-15: There were healthy and unhealthy choices running across the screen and you had to shoot the unhealthy ones. She thought it was good and fun, because it was a little bit challenging but not impossible. It was challenging because the tiles were going fast. She would want them to go a little slower.

C03-16: There are different foods from sides, drinks, and desserts menus moving around and you have to pick the unhealthy foods out from the menu. It was really fun and it was interesting to roll around and see what kinds of foods were on the menu. She misread the instructions at first and so was shooting the healthy foods but when she lost she reread the instructions and figured it out.

What did you need to do to win this game?

GENERAL: 8 kids knew you had to eliminate all the unhealthy foods without picking 5 healthy foods; 1 kid thought they had to get 5 correct unhealthy foods; 1 kid thought they had to shoot them all without picking wrong.

C01-2: You have to like eliminate all the unhealthy choices from the list. You could get 5 wrong to lose.

C02-3: Eliminate all of the unhealthy choices without picking five of them that were wrong.

C03-5: To win the game she had to get 5 correct unhealthy foods. She said she realized that if you got 5 wrong you would lose, but didn't seem to fully understand. The first time she played she thought she had a 5 minute time limit. She did see the number remaining counter though and understood this.

C01-6: You had to get all the unhealthy food out of the fast foods. You could get 5 wrong.

C01-11: Eliminate all the unhealthy choices, without picking the healthy ones 5 times.

C02-12: You had to pick out all the bad ones. She knew that you could only get 5 wrong.

C03-13: Shoot them all without picking the wrong thing. She did not know that you would lose if you got 5 wrong.

C01-14: There was a number at the bottom of how many unhealthy choices you had left, and at the top there were five spots for incorrect choices.

C02-15: Click on all of the unhealthy ones and not choose 5 of the wrong ones.

C02-16: You had to get all the unhealthy foods out of the menu without getting five wrong.

What, if anything, did you learn from playing the game?

GENERAL: 7 kids said they learned that specific foods they thought were healthy are unhealthy or vice versa; 1 kid learned to not eat bad foods; 1 kid learned nothing; 1 child was not asked this question.

C01-2: That baked potato with butter isn't bad (which was an error in our game). That potato salad is bad.

C02-3: That some of the foods that she usually eats she should cut down on, like going from whole milk to 1%. The baked potato and garlic bread were also tricky ones that she learned.

C01-6: Nothing really, because he knew most of them already. The ones he was unsure about were because some brands of certain foods are unhealthy and some aren't, and he didn't know which kind the food was supposed to be. For example, he wasn't sure on macaroni and cheese.

C01-11: He didn't know whole milk was unhealthy.

C02-12: Don't eat the bad foods, like potato chips and soda.

C02-13: That Jello is not healthy. That pinto beans are healthy.

C01-14: That sometimes the things we think are unhealthy are actually healthy to a certain extent, like baked potato with butter. I then explained to him that this was a mistake in the game. Then he said he was unsure about peach cobbler too, and learned it was unhealthy.

C02-15: There are some things that you think are good for you but they're actually not. Buttered potato was a tricky one (Interviewer explained that this was an error.)

C02-16: There are a lot of different kinds of milk, just because something says milk doesn't mean it's healthy. The fruit pies were also tricky because you think it's fruit.

What did you think about the foods shown in this game?

GENERAL: 7 kids mentioned foods that were tricky in the game; 5 kids suggested other new or tricky foods to add; 3 kids said the foods were good; 2 said the foods were normal; 1 kids said picking out the healthy foods was obvious; 1 kid said there were the right amount of foods.

C01-2: To be tricky, you could add fruit punch, some other bad salads. Macaroni and cheese was a tricky one. The side of lettuce should be a lettuce salad. There should be an additionally category for snacks and main dishes.

C03-3: There was a good selection.

C02-5: There was the right amount of foods in the game, because 10 of them were unhealthy and she picked those and then there were 10 or so remaining. The drinks were tricky, but she knew soda was bad and juice was good, then she just remembered what her mom told her about 1% milk. Carrot cake was tricky.

C01-6: They were good. It is hard to tell what some of the foods are, like the carrot cake. Macaroni and cheese looks like corn. The tile speed was good, but the words were too small. He didn't know what "baked potato with works" meant, so it should be "supreme baked potato". Whole milk was a tricky one. We could add more healthy foods, like fruit to make it more mixed up.

C01-11: Some of them are obvious that they are healthy choices. You could add some tricky desserts, like frozen yogurt. The side dishes were already pretty tricky.

C02-12: They're good, the one tricky one was carrot cake. Tricky is good. Fruit pie would be another tricky one to add.

C02-13: They were normal.

C01-14: Peach cobbler and baked potato were tricky. The rest were not tricky if he read them, but if he was just looking at the pictures he could mistake them for other things, like he thought form the picture that the pineapple juice was soda. The tile speed was good enough to read the words.

C03-15: The potato ones were tricky, but all the other ones were clear. We should add healthy and unhealthy rice dishes, like rice with butter on it.

C02-16: They're foods you come across.

Did you see a summary or score screen for this game?

GENERAL: 9 kids saw the screen; 1 kid did not see the screen. 5 kids said it was a good screen; 4 kids said it should instead show both the healthy and unhealthy foods; 1 kid said there should not be a summary screen.

C01-2: Yes, he saw it but he thinks it should list both the unhealthy and healthy foods separately, instead of just the healthy foods.

C02-3: Yes. She doesn't think there should be one because it doesn't matter. If you do have one though, it should have how many you got wrong and how many right.

C02-5: She thinks that screen is good because when a kid tries the game and they don't win, it shows all the incorrect food so they know not to pick it again.

C01-6: Yes, it was good. It showed how many you got right and how many you got wrong.

C01-11: It was good because you can see all the healthy ones.

C02-12: She didn't see it, but it's good to have one.

C02-13: She saw the screen. She would add the unhealthy foods to the summary screen too.

C01-14: He saw it, but he didn't understand why it was showing the healthy choices when he had selected the unhealthy choices. The screen should show both.

C02-15: Yes, it was good because if you got 5 wrong it shows you what you missed. It should also explain why you missed they were wrong answers.

C02-16: She saw it but did not understand it how it was, because it was showing a different number every time. It should instead show the unhealthy foods, and then the healthy foods.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 91.5.

C01-2: An A-, because it should have some differences to get harder.

C02-3: A B. It is sort of interesting because it's a little more challenging than the other testing games, but it's not a real video game like the ones she plays.

C02-5: A B, because it was kind of hard but at the same time easy. It was easy because she read the directions that says to push Z to shoot, but the hard part was trying to figure out if the foods are healthy or unhealthy.

C01-6: An A-, because it was hard to tell what some of the pictures were and you weren't sure if they were a healthy brand or not.

C01-11: An A, because it had tricky food groups where you didn't know if they were healthy or unhealthy.

C02-12: An A-, because the foods are tricky which is a good thing.

C03-13: An A, because it was fun and it was easy to play.

C01-14: An A, because with the panels moving around you have to read really fast.

C02-15: An A, because she liked it and the instructions were helpful. She liked it because it was challenging to shoot the tiles.

C02-16: An A, because it was fun and it was challenging, which made it more fun.

On a scale of 1 to 5, how easy or hard was this segment?
1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.7.

C01-2: A little easy, which is a good thing. But it should be made broader by adding more categories.

C02-3: A 2.5, which is good.

C03-5: Not sure, which is a good thing.

C01-6: A little easy, which is a good thing.

C01-11: A little hard, which is a good thing.

C02-12: A little easy, which is a good thing.

C03-13: A little hard, which was a very good thing.

C01-14: Very easy, which is a good thing. Don't make it harder.

C02-15: A little hard, which was a good thing. Picking which foods were unhealthy was the hardest part.

C02-16: A little easy because the foods were not very obvious, they were all mixed up like fruit pie. She thinks it should be harder.

On a scale of 1 to 3, rate this segment.
1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.6.

C01-2: A 2.5, but it would be more fun if the tiles were circles bouncing (like the strength/aerobic games) around instead of going in straight lines.

C02-5: A lot of fun because it's good to try to find unhealthy foods because when you go to the store you'll know what not to get.

C01-6: A little fun because the pictures look the same and you didn't know what brand it was.

C01-11: Have the disks move faster to make it more fun.

On a scale of 1 to 5, what did you think about the length of this game.
1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 2.8.

C01-2: A 1.5, but to make it longer you could add more foods or have to shoot each one twice to weaken it.

C02-5: Just right because kids shouldn't spend an hour on a game like this. She would add an entrée category.

C01-6: He liked playing 3 categories.

C02-12: Just right, but she would want one more category, "dinner" or main course.

C03-13: Just right, but she would want one more category, like main course.

C01-14: A little too short. He would want one more category with "main course".

C02-15: Just right, but you should not have to do them all over again if you lose.

C03-16: Three categories is fine.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.
1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.4.

C01-2: Very helpful because they were good and it was basic.

C02-3: You could figure it out just by pressing the buttons.

C02-5: A little helpful because at first she read the instructions but didn't know what to do.

C01-11: A little helpful because he didn't know what "Sides" meant on the instruction screen and would change this term.

C02-12: Not helpful because the type is too small.

C01-14: He didn't really see it because he skipped through the first screen. There should be a help button

C02-16: She misread them, so maybe make them a different color, or where it tells you that you are shooting the unhealthy foods, bold or underline the word "unhealthy".

Suggestions for changes:

GENERAL: 9 kids suggested changes to the summary screen (add unhealthy foods(5), say why unhealthy foods are bad(3), display number wrong/right(1)); 6 kids made suggestions to clarify or elaborate on the instructions; 5 kids suggested additional categories ("main course" (5), "snacks" (1)); 3 kids said that if you lose on one level you should not have to restart the whole game; 4 kids suggested changes to the tiles (faster(3), slower(1), smaller(1)); 3 kids suggested ways to make the counters more obvious (blink(2), move to top of screen(1)); 2 kids said there should be more foods in each game; 2 kids suggested changes to the shooting device(faster(1), more force towards center(1)) 1 kid said add a help button; 1 kid said change "Sides" to "Side dishes"; 1 kid said to make the food pictures more clear and display nutritional info for the foods.

C01-2: To help people see the counters, have it blink bolded and then fade back. There should be additionally category for snacks and main courses. The summary screen should list healthy and unhealthy choices. To make it harder, have the force towards the middle be stronger. As you pick wrong ones, have it get faster, or as time goes on it gets gradually faster. Need to check on 2 percent milk because he thinks in this one it was good but in past games it was bad. To make it longer you could add more foods or have to shoot each one twice to weaken it. If you lose on a level you should not have to do them all again. Instead, it should list them all and there should be a check through each one you have beaten.

C02-3: The score screen should show how many you got wrong and how many right.

C02-5: The instructions should tell you that you can get 5 wrong and there's no time limit. Add more healthy foods like fruits. The score screen should also show the unhealthy choices. She would add an entrée category. At the bottom of the instructions in big letters it should tell you " Make sure you get the unhealthy foods."

C01-6: Make the pictures on the tiles more clear, and when you scroll over a picture the label should be at the bottom on big letters so you can read what it is, because the word on the tiles are too small. The nutritional information or ingredients should be listed for each food so you can see whether it is a healthy version or not. At the end of the game you should say why the bad foods are bad, e.g. "This has too many calories".

C01-11: To make it more fun, have the disks move faster. Also change the category "Sides" to "Side dishes". Show an example of what to do in the instructions.

C02-12: The game should tell people why the unhealthy foods are bad. There should be a "dinner" or main course category also. The type should be bigger on the instructions.

C02-13: You should not have to do all the categories over again if you lose. The summary screen should display both unhealthy and healthy foods. The tiles should move faster to make it harder. There should be an additional category, main course.

C01-14: The cursor should move faster. The score screen should show both unhealthy and healthy choices. There should be another category for 'main course'. There should be a help button with which you could see the instructions on the side, desserts, drinks choice screen. Or when you pause the game you should see the instructions.

C02-15: The tiles should move more slowly. The instructions should tell you that there is a counter at the bottom of the screen or the counter should blink to be more noticeable. The summary screen should explain why the ones you missed were wrong. If you lose on a level, you should not have to do all the levels over again.

C02-16: The summary screen should show the unhealthy foods, and then the healthy foods. The counter should be at the top not the bottom. To make it harder, make the tiles smaller, but you don't have to shoot them, just tag them. Make the instructions a different color, or where it tells you that you are shooting the unhealthy foods, bold or underline the word 'unhealthy'.

Diab Episode 1: "What's a Vegetable?"

Tell me about the game you just played.

GENERAL PURPOSE: 7 kids knew they were choosing the healthy vegetables; 2 kids did not mention "vegetables", but said they were picking healthy "foods".

GENERAL OPINION: 8 kids said it was good/fun/cool/liked it (liked being chased by the guards(6), liked the tricky food choices(3); helps in real life(1)); 4 kids said it was easy; 2 kids indicated that it was too short; 1 kid said it was hard; 1 kid said it was okay.

C01-2: It was a really, really good game because he could tell the foods were meant to be confusing because the bad choices were not obviously bad and the good choices were not obviously good. Like cornbread has corn but that's not the only thing in it, so he went for the things that were pure vegetable.

C02-3: You had to follow the path that had healthy vegetables on it. It was easy.

C02-5: She liked it because it gave her two different choices to pick and she had to think about which one would be more healthy and she kept running down each road. The game was very interesting to her because it was helpful in her real life. The purpose was to get all the healthy vegetables until you get to your friends.

C01-6: It was fun because if you chose a wrong food they would chase you and if they ran into a box they would trip. It was kind of easy and a little short, but it was good how it was. The purpose was for people to figure out what vegetables are and what vegetables aren't.

C01-11: The game was about choosing healthy vegetables to get to your friends and not getting the unhealthy ones. It was really fun because we had some tricky choices and it was fun doing it over and over again. It was fun that if you made the wrong choice, you could either run away or get caught. It was a little hard.

C02-12: It was easy, there should be more levels. It was fun and she would want to play 10 levels. It should be harder. It was fun to run away from the guards. The purpose was to tell you don't make bad choices about unhealthy foods.

C03-13: She really liked it, because when you pick the wrong way, the guy chases you and it keeps you on your toes. The purpose was to follow the healthy road. When prompted she could not indicate that she knew she was picking vegetables, but just said healthy food or food.

C01-14: It helped us choose out all the vegetables and go that path, and the person would run after you if you picked the bad one. It was a pretty cool game because the guard trips over the boxes which is pretty funny. The purpose was to choose out all the vegetables or better food to eat when you were faced with two choices.

C02-15: You ran down the street and came to a point where there were two choices and one was healthy and one was unhealthy, and you had to choose the healthy vegetable. She thought it was fun running and getting away from the bad guy.

C02-16: In order to catch up with the friends, you have to follow the path with the healthy vegetables. It was okay, it wasn't too hard though.

What did you need to do to win this game?

GENERAL: 3 kids knew they had to get 20 vegetables.

C01-2: You had to get through this maze and the way you knew how to go was by picking all the good foods. There were 20 vegetables.

C02-3: You had to follow the path that had healthy vegetables on it. She did not know there were 20.

C02-5: She guessed that she had to get at least 10 healthy vegetables.

C01-6: Get 20.

C01-11: You had to pick healthy vegetables to catch up with your friends.

C02-12: Get away from the guards, stay away from bad food, and don't lose all your energy.

C03-13: Don't let them catch you. She did not know how many vegetables she needed to get to win.

C01-14: You had to get 20 to go save you friends.

C02-15: Go through all the healthy choices to get to your friends.

C02-16: You had to move through the path with the healthy vegetables. She did not know there were 20.

What, if anything, did you learn from playing the game?

GENERAL: 5 kids learned specific foods that were healthy or not healthy; 3 kids learned nothing; 2 kids learned it is better to eat healthy/bad to eat unhealthy.

C01-2: Olives aren't good.

C02-3: Nothing.

C02-5: She learned that there are other varieties of vegetables that are healthy, like beans, that she can try now. It's not just cabbage and spinach.

C01-6: Nothing.

C01-11: What healthy vegetables are and what unhealthy ones are, like baked potato is healthy. Guacamole was a tricky one.

C02-12: Nothing.

C02-13: That zucchini is not a vegetable. (She missed that it said "fried zucchini" which she incorrectly selected as a vegetable, and so this misled her).

C01-14: When you get bad foods to eat you will run out of energy. Jalapeno and salsa was tricky and olives and onions.

C02-15: That it's better to eat healthy foods. Olives were the tricky one.

C02-16: Not all foods that you think can be healthy, like she thought guacamole was healthy.

Did you see a score screen for this game?

GENERAL: All 10 kids saw the score screen. 7 kids thought it was good; 2 kids thought it doesn't matter/is not helpful; 1 kid thought it should be changed so all the foods appear at once.

C01-2: Yes, where it said "good" for each one. He noted though that when you pick the bad route you usually lose so that when you finally win it is almost all good choices and the score screen only has your good choices. The format is good how they come in the center of the screen and then move up, that is a good way to catch attention with anything.

C02-3: Yes, but it didn't really matter, as long as you know that you got them all right.

C02-5: She thought it was the right thing for someone who lost, because then they would know what to pick the next time. However, she thought the vegetables should just all appear at once, not one at a time, because it takes too long.

C01-6: Yes, it was good. He wouldn't change anything.

C01-11: It was good because you could see all the healthy choices you picked and which ones you got wrong.

C02-12: She saw it but didn't know what it was for. It wasn't really helpful.

C02-13: Yes, she liked how it made a sound and then checked it.

C01-14: Yes, it showed you how many correct you got and how many incorrect. It was good with the X and the check, but it should tell you why the bad foods are bad.

C02-15: Yes, she thought it was helpful because it showed you the ones that were healthy.

C02-16: It was pretty cool. It showed you what was right and what was wrong.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69

A = 95 B = 85 C = 75 D = 65

A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 94.0.

C01-2: An A+, because it has a time limit and it can be funny with making the guards fall down.

C02-3: A B, because it wasn't a real video game like the ones she plays, but it was more interesting than some of these testing games.

C02-5: An A, because the game helps you and it gives you enough time and energy, and the guard running after you is a good hard part.

C01-6: An A, because it was fun. It was not too hard, and the end was just right

C01-11: An, A, because there were things that he didn't know were vegetable or non-vegetables, and the fact that you get to move a person around the screen. The fact that it was a maze also made it fun.

C02-13: An A, because it was good and clear.

C01-14: An A, because the dude chases after you if you get a wrong one, so you have get a right one to make him trip over the boxes.

C02-15: An A, because it was fun and the instructions were clear

C02-16: A B, because it was a good game, but if you're right at the end and you have to start over it will get boring.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.6.

C01-2: A little easy because he messed up once and even though he got it mostly right, there were ones that he wasn't sure about until he went the good way.

C02-5: A little easy because all you had to do was get the healthy foods and try not to run in to the bad food. It is a good thing and does not need to be harder.

C01-6: A little easy, but it's good that way.

C01-11: A little hard, which is a good thing because it's tricky.

C02-12: A little hard because you had to run away from guards. It is a good thing.

C03-13: A little hard, which is a good thing.

C01-14: A little easy, which is a good thing and it's pretty fun having the dude chase after you. It doesn't need to be harder because it is pretty challenging at the same time with the tricky foods.

C02-15: A little hard because you had to be careful where you moved with the controller or you might go into the bad route. This was good because you had to pay attention and be careful.

C02-16: Very easy, but you could add things that you have to go around or dodge to make it harder.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.8.

C01-2: A lot of fun, but it still needs some changes.

C02-5: A lot of fun because it will help you in real life.

C01-6: A lot of fun, but it was a little short, but it's okay that way.

C01-11: A lot of fun because you move around the character and have a maze to go through.

C02-16: A little fun because it's not challenging enough.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 2.7.

C01-2: Just right, but it could be maybe a little bit longer.

C02-3: She would want to do 60 vegetables instead of 20.

C02-5: A little too long because you had to get 20 and she made it just in time. But 20 is the right number to get.

C01-6: It's a mini-game so it's a good length.

C01-11: A little too short, because he would have wanted to go further. He would want to pick 40 vegetables.

C02-12: She would want 10 levels.

C02-13: Just right, but it would be more fun to do 30 vegetables instead of 20.

C01-14: Twenty was a good number of vegetables.

C02-15: Twenty was a good number of vegetables.

C02-16: Twenty was a good number of vegetables.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.9.

C01-2: They might not explain exactly what it going to happen but they're good because you figure it out in the game.

C02-3: A 2.75 because you could have figured it out without them but you might have run out of time.

C02-5: Very helpful because she read the directions and it told her what to do.

C02-12: She didn't read them.

C02-13: Very helpful because they were very clear.

C01-14: He knew what he was supposed to do.

Suggestions for changes:

GENERAL: 6 kids said the energy bar should drain more quickly; 4 kids said there should be more than 20 vegetables to pick in this game (2 said 30,1 said 40,1 said 60); 2 kids suggested new tricky vegetables to add; 2 kids made suggestions for the score screen (all foods appear at once(1), explain why bad foods are bad(1)); 2 kids thought there should be more levels of different types of foods; 2 kids thought each intersection should be a 3-way fork; 1 kid said the "bad" choice halls should be longer so you get lost; 1 kid said the green salad should look more green.

C01-2: The green salad should look more green, because he couldn't tell if there were other things in it. Instead of having the green bar go down faster, the bad choice halls of the maze should be longer so that if you make a bad choice you might go down that hall a ways and run your energy down or get lost. There should be 3-ways with two good foods and one bad, but only one real way to finish so that some of the good paths dead end to make it more of a maze. Do the game with other kinds of foods, aside from vegetables.

C02-3: The energy bar should run down more quickly. Make the choices harder, by adding bad foods that are not fried, like fattening salads. She would want to pick 60 vegetables instead of 20 vegetables.

C02-5: On the score screen, the vegetables should just all appear at once, not one at a time.

C01-6: The energy meter should go down a little faster. He might want to get 30 vegetables instead of 20. Tomato could be a tricky one to add, because it is a fruit.

C01-11: The energy bar should go down faster to make it more tricky. You should have to pick 40 vegetables. You could add pickles to the game.

C02-12: There should be 10 levels of this game. The player should be able to pick how many levels. On some levels you should pick healthy foods, not just vegetables. There should be three paths at each intersection/choice instead of 2.

C02-13: You should get to do 30 vegetables instead of 20 to win. She would like it if the energy bar went down faster to make it harder.

C01-14: The score screen should tell you why the bad foods are bad. The energy meter should go down faster.

C02-16: To make it harder add things that you have to go around *or* dodge. The energy bar should go down faster.

Diab Episode 4: "Portion Size of Fruit"

Tell me about the game you just played.
GENERAL PURPOSE: 9 kids seemed to understand they were picking the correct portion or amount of fruit; 1 kid thought they were picking a good size amount of fruit for one day.
GENERAL OPINION: 6 kids said it was good/fun; 6 kids said it was hard (hard to stop the wheel at the right time(2), hard to discover pattern in wheel(2), hard to know the right portions(2), because of the fractions(1)); 1 kid said it was easy; 1 kid said it was okay; 1 kid said it was boring; 1 kid said it should be longer.
C01-2: It was good. It's something you would do as a refresher. You spin a fortune wheel and you don't know what you're going to pick. The purpose was to figure out the serving size of the fruit, because fruits are good, but if you eat a ton of fruit it's not good, so you need a good amount of serving size.
C02-3: You had to get the correct portion of fruit. It was kind of boring because you were just selecting portion sizes of fruit.
C02-5: She had to get the correct proportion for each fruit. She thought it was a good game, because usually people eat a whole or nothing, and now she knows that she should get different proportions of fruits and vegetables.
C01-6: It was fun. It was easy. It was okay in how long it was, but he would make it twice as long. The purpose was to make you see how much fruits you could eat and what a good size amount of fruit would be in one day.
C01-11: It was about choosing what proportion fruits or healthy choices that you think would be right. It was fun and it's a little bit hard because you had to follow the pattern with your eyes, and that was pretty hard.
C02-12: It was a little fun. It was hard to stop the portion wheel on the portion you wanted. The wheel lights should go slower. The purpose was to learn how much fruit you should eat. She did not know what figs are.
C02-13: It was okay because she didn't know what the right portions were and it was hard to time pushing the button to select one. The purpose was to pick the right amount of fruit.
C01-14: There was a spinning wheel, and you were supposed to spin it so it randomly lands on a fruit and then pick the correct portion of the fruit. It was pretty hard because the lights went in a crazy pattern and you had to look at it first and try to anticipate where it was going. So sometimes he picked by accident because when he hit the button it had already gone to the next one. It was also difficult because he didn't know what the portions were. He didn't know what some of them were, like pomegranate. C02-15: There's a wheel that spins and you have to stop it on a certain fruit and then there's another wheel and you have to stop it on the correct portion size. It was fun but it was a little hard because it was hard to pick the portion you wanted because you didn't know when it was coming up on the wheel.
C02-16: You selected fruit on a spinner and then you chose the portion or how much. It was hard, because math isn't her best subject and nobody really likes to think that much.

What did you need to do to win this game?
GENERAL: 6 kids knew you had to get 5 correct portions.
C01-2: To finish the game you had to get five fruits of the right serving size.
C02-3: She thinks you had to get five or six.
C02-5: She thought you had to get 4 portions.
C01-6: You had to pick 5 right portions of fruits.
C01-11: You had to pick what proportion would be the best out of all of them.
C02-12: Pick 5.
C02-13: She guessed that she had to get 8 right.
C01-14: Pick the right portion for 5 fruits.
C02-15: She thought it was 5 correct portions.
C02-16: You had to get the right portion size of fruit, but she didn't remember how many.

What, if anything, did you learn from playing the game?
GENERAL: 5 kids learned about portion sizes in general (learned to eat less(2), learned to eat more(1)); 3 kids learned nothing; 1 kid learned that a portion is a half cup; 1 kid learned a new fruit.
C01-2: I learned that basically with the small fruits if you can measure about half a cup, that's nearly a serving.
C02-3: That there was a fruit that's called star fruit.
C02-5: She learned that she should cut down on her portions, because now she knows that she can eat a half or two small things of fruit.
C01-6: Nothing.
C01-11: What proportion is like the best and some kinds of fruit like the one that started with a Q (Quince).
C02-12: She didn't learn anything because her mom is pretty particular about fruit portions.
C02-13: She doesn't know because she usually just picked how much she eats of the fruits.
C01-14: That you should pretty much eat a pretty small portion.
C02-15: That portion sizes are important. They may not always be what you think they're going to be.
C02-16: Just because you eat a fruit doesn't mean that you necessarily eat enough.

How did you decide which fruit portion sizes to choose in this game?
GENERAL: 7 kids were trying to pick a portion that was reasonable/medium/normal; 2 kids were picking the portion they would eat; 1 kid tried to pick one-half of a full piece of fruit.
C01-2: He would eliminate the smallest one and biggest on that were unreasonable and then guess from the ones in the middle.
C02-3: She was guessing by thinking about how much she would want to eat of it.
C02-5: She tried to get a medium-sized amount for everything, and was guessing this based on how much she thought one person could eat.
C01-6: Whichever seemed the best. Not too much, like medium. I think it's like the size of about your fist.
C01-11: What looked best, like not too small, not too much, but in between.
C02-12: She was guessing sometimes, but sometimes she hit the button to try to pick one and it would go the next one so she missed it. She looked at the numbers and tried to pick one half of a full fruit.
C02-13: She usually just picked how much she'd usually eat of a fruit. But sometimes she picked it by accident. The dates she thought were as small as raisins from the picture.
C01-14: He was thinking which one is the most reasonable, and using process of elimination, deleting the ones that aren't possible.
C02-15: She looked at the picture on the fruit wheel and used that and then thought of a normal portion, not a whole bowl and not just a little.
C02-16: She guessed on all of them by thinking about what was reasonable. She had one in mind and tried to hit it, but she was only able to hit the one she wanted about half the time.

Describe any patterns you saw, if any, for the correct portion sizes.
GENERAL: 6 kids did not see the pattern; 3 kids noticed that 1 medium piece fruit was a portion; 1 kid noticed that ½ cup or 1 medium piece was a portion.
C01-2: He noticed that half a cup is basically pretty good. The smaller ones like the berries and cherries, it was half a cup, and then on the peach and bigger fruit, one is good. And on small ones like plum and fig, he thinks two would be reasonable.
C02-3: There was usually one medium fruit. In terms of cups, she thought it was different for a few of them.
C02-5: She didn't see a pattern.
C01-6: He didn't see one. But he did notice a piece of fruit was one medium.
C01-11: He didn't remember in terms of cups. But he did notice a piece of fruit, like an apple, was one portion.
C02-12: She didn't see a pattern.
C02-13: She didn't see a pattern. After I explained it to her, she thought it was hard to tell from the game, that there was that pattern because she didn't know what a lot of the fruits were and because the game would tell her "Woah that's a lot!" or "are you sure that's enough?" but it was wrong.
C01-14: He didn't see a pattern.
C02-15: She didn't see a pattern.
C02-16: She did not see a pattern.

Describe any patterns you saw, if any, in the way the portion sizes lighted up on the portion wheel.
GENERAL: 6 kids did not see the pattern; 3 kids did see the pattern; 1 kid sort of saw the pattern.
C01-2: He didn't notice the pattern, but he doesn't think it is important for people to know that there is one.
C02-3: She recognized the pattern and so knew which one it would land on next. It was helpful to have it light up in a pattern.
C02-5: She didn't recognize the pattern, but she did notice that after she had eliminated two choices it seemed to then go in order.
C01-6: He noticed that if he wanted ½ cup, it would go to ¼ cup first, so he would wait to hit the button when it was on ¼ to get ½. He sort of noticed a pattern in that he could find which portion lighted up before the one he wanted.
C01-11: It's a pattern that went faster and faster as you went, which was good because you had to follow it and then choose.
C02-12: She didn't see a pattern.
C02-13: She did not see the pattern.
C01-14: He saw the pattern. It was zigzag or crazy and it was hard to anticipate where it was going.
C02-15: She didn't see a pattern. She thinks the instructions should tell you to look out for a pattern.
C02-16: She did not see the pattern. She thinks the narrator should give a hint that there is a pattern in the beginning.

What did you think about the speed of the lights on the portion size wheel?
GENERAL: 6 kids thought the wheel should go slower; 4 kids thought the speed was okay.
C01-2: It starts slow and goes faster. He thought it as fine that way. It was not too fast.
C02-3: It was good. She liked that it started slow and got faster.
C02-5: First she said it was just right, but then she decided it should go slower in the beginning. Then she mentioned that the kids should be able to choose if they want it in fast or slow mode.
C01-6: The speed is okay, he didn't really see the pattern and hit some by accident but that is okay.
C01-11: It was good that it got faster, because if it went the same speed it wouldn't be that fun. It took him a little while to see the pattern, but he doesn't think it goes too fast and he thinks other kids would be able to see it.
C02-12: It should go slower. She likes that is starts slow and speeds up.
C02-13: It should go slower so you can see the pattern, because she was still looking at the portion amounts when it sped up too fast.
C01-14: It was pretty fast. It should stay slow longer, not get so fast at the end.
C02-15: It was a little too fast. It should go slower.
C02-16: It was going kind of fast. It should go slower, and not speed up as much.

If you had to give this game a grade (A, B, C, or D-like in school), what would you give it?
A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60
GENERAL: The average score was 84.6.
C01-2: A B, because he didn't quite like it as much as the other two.
C02-3: A D, because it was boring.
C02-5: A C, because when the wheel got faster it was hard to tell which one she wanted. And because there are some fruits that she hasn't heard of, so she doesn't know how big they are at all. She couldn't tell how big they are from the picture.
C01-6: A B, because it was okay. It was a little short. It was just more of a clicking game.
C01-11: An A, because the directions were helpful, some of the fruit portions are what he would have so it was obvious, and it was fun.
C02-12: A B, because it's not fun.
C02-13: A B, because she didn't really know the portions.
C01-14: An A, because of the difficulty.
C02-15: A B, because it was a little too hard and a little confusing, because she didn't know about the pattern on the wheel.
C02-16: A B, because it was very hard.

On a scale of 1 to 5, how easy or hard was this segment?
1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard
GENERAL: The average rating was 3.4.
C02-5: A little hard because she only had 3 tries.
C01-11: A little hard because it went fast and there were some fruits he had never heard of before. It was good that it was hard.
C02-12: Very easy, which is a good thing.
C02-13: A little hard, which is a good thing.
C01-14: A little hard, which is a good thing and a bad thing. Bad because it was really hard to figure out which was the right portion and anticipate where the wheel was going next to pick you answer, but good because you're figuring out what portions of fruit to actually eat to not overdo it over under do it.
C02-15: A little hard, which was kind of a bad thing.
C02-16: Very hard, so it should be made easier by making the portion wheel slower, and adding hints about the portion size and wheel pattern.

On a scale of 1 to 3, rate this segment.
1 = no fun 2 = a little fun 3 = a lot of fun
GENERAL: The average rating was 2.2.
C01-2: A 1.5 because it was fun trying to hit it right. It would be better with a bigger wheel that spins more.
C02-5: A lot of fun because you can always relate it to real life.
C01-6: A little fun because it should be a little longer.
C01-11: A lot of fun because of the choices and the pattern.
C02-13: It was a lot of fun, even though it as kind of hard.
C01-14: A little fun because in the instructions it said the wheel would stop but it didn't stop on the one you wanted, it just stopped slowly.
C02-16: A lot of fun because it wasn't something you could do quickly or easily.

On a scale of 1 to 5, what did you think about the length of this game.
1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long
GENERAL: The average rating was 3.1.
C01-2: A 1.5, because he would want to get ten fruit portions right to win.
C02-3: She would only want to do 3 fruit portions.
C02-13: A little too long, but she would still want to pick 5 vegetables.
C01-14: Five is a good number.
C02-15: Five is a good number.
C02-16: Five is a good number.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.
1 = not helpful 2 = a little helpful 3 = very helpful
GENERAL: The average rating was 2.4. *1 child did not answer this question due to lack of time.*
C01-2: Very helpful because there's not much to explain really.
C01-6: Very helpful, but he would have figured it out even without the instructions. It was good that it was narrated.
C01-11: Very helpful because it said to pick the best proportion and told you what to do with the controller.
C01-14: A little helpful, they should explain to people that you are trying to get the healthiest size portion.
C02-16: A little helpful because there were no hints about the portion sizes or light wheel pattern.

Suggestions for changes:
GENERAL: 6 kids said the portion wheel should go slower; 5 kids mentioned changes to the instructions (they should mention the portion wheel pattern(3), add a portion size explanation/hint(2), state that you are picking the "healthiest" portion (1)); 3 kids suggested a change to the number of correct portions to win (10 correct(2); 3 correct but player starts over if 1 wrong answer(1)); 3 kids mentioned changes to the fruit wheel(should stop at random(1), should stop immediately on button press(1) more fruits(1), remove unknown fruits(1)); 2 kids suggested other changes to the portion wheel (upon wrong answer wheel should scramble portions and remain full(1), add more portions(1), upon selection ask for confirmation of choice(1)); fruit portion pictures should appear on plate or bowl to gie idea of size(1); add a time limit to selecting portions(1).
C01-2: He noticed that the first click on the fruit wheel makes it land 3 after, it should spin more randomly. When you pick a wrong answer, they should scramble the portions and put another wrong portion in so that the wheel stays full. Make the wheel bigger with more fruits, and have it spin faster. Have the portion wheel be bigger also with more portion and spin like the fruit wheel, but so that you could time it. You should have to get 10 fruit. portions right to win.
C02-3: If you get an answer wrong you should lose or have to start over. She would want to pick 3 fruit portions.
C02-5: It should tell you on the screen that there is a pattern in the light wheel, but then there should be a time limit. The portion wheel should go slower in the beginning, or the kids should be able to choose fast or slow mode. The fruit pictures should all be in bowls or plates, so you can tell how big they are. When you pick a portion, it should show it up close and then ask "is that your final answer?".
C01-6: He would want to pick 10 portions instead of 5.
C01-11: Add orange to the fruit wheel.
C02-12: The portion wheel lights should go slower.
C02-13: The portion wheel lights should go slower. There should be an explanation before the game about what is a portion of fruit. Take out the fruits that people haven't heard of.
C01-14: The portion wheel lights should stay slow longer, not get too fast at the end. The fruit wheel should stop right when you hit the button so you can pick the fruit you want. Explain in the instructions that you are trying to get the healthiest size portion.
C02-15: The instructions should tell you to look out for a pattern on the portion wheel. The lights on the portion wheel should go slower.
C02-16: The narrator should give a hint that there is a pattern to the portion wheel in the beginning. The portion wheel lights should not speed up as much. The instructions should give a hint about the correct portion size of fruits.

Diab Episode 8: "Decreasing Physical Inactivity"

***1 child did not play this game due to lack of time**

Tell me about the game you just played.

GENERAL PURPOSE: 7 kids said that the purpose was to get/keep the people active; 1 kid said the purpose was to show people activities they can do; 1 kid wasn't sure if it was a "just for fun" game or if it was to tell you that people don't exercise as much as they need.

GENERAL OPINION: 6 kids said it was fun/good/cool/liked it(3 said this was because the liked running around); 3 kids said it was short; 1 kid said it was easy; 1 kid said it was hard; 1 kid said it was alright; 1 kid said it was funny.

C01-2: The game was where the people were not concentrated on doing what they needed to do and you had to walk over and get them going again. It was a pretty good game. The purpose was maybe to tell you that people don't really exercise as much as they need, or to give them motivation maybe. He was unsure of the purpose and thought it was supposed to be a just for fun game.

C02-3: You have to make all those people active. It was really short.

C01-6: It was fun because you could run around and pick them to make them be active. It was kind of easy. The purpose was to show people if they don't know what to do to be active then they can do these activities.

C01-11: You had to help have groups of people stay active by running around and tagging the Xs until the active meter was full. It was fast, but it was pretty fun because after you tag them they go back to being boring, so you have to keep running around.

C02-12: It was fun. The purpose was to get everyone to exercise.

C02-13: It was funny that she runs over and smacks them because they're lazy. The purpose was to keep them active. It was cool, because you had control of it, it was fun. She liked moving the guy around.

C01-14: You had to make everybody in the park active. When they stopped playing you were supposed to go make them play again. It was alright, but it was kind of short. He thinks there should maybe be a way to lose, or just have the meter go down faster when they aren't active.

C02-15: There were people just lying and sitting around and you had to run around and pass them and get them active. The purpose was to get active.

C02-16: You're on a playground and there are 6 groups of people that you have to get moving. It was kind of hard, but in a good way, because just when you get them all moving some of them stop.

What did you need to do to win this game?

GENERAL: 4 kids said they needed to fill up the energy meter; 4 kids said they needed to have 6 people active at once; 2 kids thought they needed to have all of the people active at once to fill the meter; 1 kid did was not asked this question.

C01-2: He thought he had to have them all active at once, and didn't know that it was just 6 of them for a period of time. After I told him, he did understand.

C02-3: You had to have six groups in order to win.

C01-6: To get all your green active full of energy.

C01-11: Run around and tag the Xs until the active meter was full.

C02-12: The purpose was to get everyone to exercise and get the green thing to fill up. She thought everybody had to be exercising at once for it to fill.

C02-13: Keep 6 people active and fill up the energy bar.

C02-15: She knew from the instructions that you have at least 6 people to be active at a time for the active meter to go up.

C02-16: You have to get six groups of people moving at the same time.

What, if anything, did you learn from playing the game?

GENERAL: 3 kids learned that they need to stay active; 2 kids learned different activities they can do; 2 kids learned nothing; 2 kids learned about motivating other people to be active; 1 kid didn't really respond to the question and instead mentioned that the game was easy.

C01-2: People can sometimes not want to be physical and they need motivation.

C02-3: Nothing.

C01-6: It was easy, it should be longer.

C01-11: Different things to keep you active instead of just running around like they did.

C02-12: Nothing.

C02-13: To keep active and all the different stuff you can do.

C01-14: You need to stay active.

C02-15: That you need to get active sometimes. You can't always sit and watch TV.

C02-16: Sometimes when you try to help someone out, they stop a lot sooner than you think.

Tell me what activities you saw the characters doing in this game?

GENERAL: All 9 kids were able to name activities from the game.

C01-2: Dancing, playing basketball, bicycling, jump roping, walking. He couldn't tell what the skateboarder was doing.

C02-3: Some people were playing soccer, another one was jump-roping, and then the other was riding a bike.

C01-6: They were throwing a ball, riding a bicycle, walking. It was clear what they were doing.

C01-11: Skating, soccer, passing a ball, and biking.

C02-12: Tag, dancing, biking, skateboarding, jump roping, walking, rollerblading.

C02-13: Dancing, walking.

C01-14: Riding a bike, walking, kicking a ball, jumping rope. He wasn't focused on the activities, he was just kind of running around. It was clear what they were doing.

C02-15: Running, riding a bike, jump-roping, skateboarding. They were good but she wasn't really paying attention to them, she was paying attention to running around hitting the Xs.

C02-16: Rollerblading, bike riding.

Did you see the bar in the bottom left corner of the screen?

GENERAL: 8 kids saw the energy bar; 1 kid did not see it.

C01-2: He did see the energy meter, but he though it filled at intervals, like if you had 1 person going it filled a little, two going filled more, all the way up to 6 and you were done.

C02-3: No, she didn't see it.

C01-6: He saw it. It filled at a good speed.

C01-11: He saw it. It filled a little too fast.

C02-12: She saw the energy bar. She thinks it should not decrease when less tan 6 people are active, but just stop filling.

C02-13: Yes, she saw the energy bar.

C01-14: The energy bar was clear, it was big and green.

C02-15: Yes, she saw the energy bar.

C02-16: Yes, she saw the energy bar.

If you had to give this game a grade (A, B, C, or D- like in school), what would you give it?

A+ = 100 B+ = 89 C+ = 79 D+ = 69
A = 95 B = 85 C = 75 D = 65
A- = 90 B- = 80 C- = 70 D- = 60

GENERAL: The average score was 89.3.

C01-2: An A-, because it was a good fun game, but it has a lot of improvements. He likes games where you can run around and control yourself.

C02-3: A B, because it was somewhat interesting and it was short.

C01-6: A B+, because it's a little short.

C01-11: A B, because the activity meter filled too fast, and it would be better if it was harder with multiple rooms.

C02-12: A C, because it's boring.

C02-13: An A, because it was easy to understand.

C01-14: An A, because of the running around and because it tells you to be more active.

C02-15: An A, because it was fun but it was a little too easy.

C02-16: An A, because it was fun, not too hard, not too easy either.

On a scale of 1 to 5, how easy or hard was this segment?

1 = very easy 2 = a little easy 3 = not sure 4 = a little hard 5 = very hard

GENERAL: The average rating was 2.6.

C01-2: Not sure, because even though it was short, it didn't seem very easy.

C02-3: A 1. Make it longer by making the people quit their activities faster.

C01-6: Very easy. He would want more rooms.

C01-11: A little easy, he would want to play 3 to 5 levels of the game.

C02-12: Very easy.

C02-13: A little hard.

C01-14: A little easy.

C02-15: A little easy. To make it more difficult she just likes the idea of the three activity states instead of 2.

C02-16: A little easy, which is a good thing.

On a scale of 1 to 3, rate this segment.

1 = no fun 2 = a little fun 3 = a lot of fun

GENERAL: The average rating was 2.5.

C01-2: A 2.5.

C02-3: A 2.

C01-6: A 2, because it was so short.

C01-11: A lot of fun, because he liked running around and looking at the different active things to do.

C02-12: No fun.

C02-13: A lot of fun.

C01-14: A lot of fun.

C02-15: A lot of fun, because you had to keep 6 groups active to get the active meter up.

C02-16: A lot of fun.

On a scale of 1 to 5, what did you think about the length of this game.

1 = way too short 2 = a little too short 3 = just right 4 = a little too long 5 = way too long

GENERAL: The average rating was 2.4.

C01-2: A 1.

C02-3: A 2, she would want to play it twice as long.

C01-6: A 1.

C01-11: A little too short.

C02-12: Way too long. But it took her 3 minutes to play it and she said that was a good length.

C02-13: Just right.

C01-14: Just right. If we change it to make it more difficult though, it will be a better length.

C02-15: A little too short. She would want to play for 5 minutes instead of 1 minute.

C02-16: Just right. But she would want to see more levels of it.

On a scale of 1 to 3, how helpful was the explanation at the beginning of this game.

1 = not helpful 2 = a little helpful 3 = very helpful

GENERAL: The average rating was 2.9.

C01-2: A 3. They should just say "Keep everybody moving". I knew what to do but it was self-explanatory.

C02-3: A 3, you could have figured it out, but you wouldn't have known that you have to keep 6 of them active.

C01-6: Very helpful.

C01-11: Very helpful.

C02-12: She did not read the instructions. Child was asked this question but never gave a rating.

C02-13: Very helpful.

C01-14: A little helpful. He didn't know what the meant by "groups" in the instructions until he started playing.

C02-15: Very helpful.

C02-16: Very helpful. because it showed you what to do.

Suggestions for changes:

GENERAL: 7 kids thought we should change to the proposed idea of two inactive states one active state; 5 kids said there should be multiple levels of this game in different settings (i.e. park, school, etc.); 2 kids thought the meter should go down faster or up slower, while 1 kid thought it should not go down at all; 2 kids thought the people should stop their activity more quickly; 2 kids thought the game should be longer; 2 kids thought the red Xs should be removed (1 thought there should instead be a subtle green circle); 1 kid thought each of the following: the energy bar should blink to be noticeable, there should be more people on the screen, there should be a counter of how many people are active, a summary screen should list all the activities, if your energy hits the bottom you should lose, the instructions should say to keep 6 "people" active, the whole park should not be in view at once, people should quit exercising at different time intervals, upon tagging a person the game should pause to show their activity.

C01-2: A summary screen should list all the activities that the people did. Make it more complicated and longer by having the people on different levels or in a maze and you have to run up stairs and in different rooms to tag them, but then you should only have to get 4 people active. To make it more challenging, you could either shorten the length of time the people exercise, or have the whole area not even in view so you can't see the people without moving closer to them. The people should stop exercising at different intervals, lengths of time. Having more than two activity states is good but hard to do. Instead, you should take away the Xs to make it harder to see who to touch, then you would have to focus on the activity.

C02-3: To make it longer, after you tag a person they should be active for 3 seconds only and then stop. There should be blockages in between the groups of people so that you have to press a button to work through them to get to the next group. There should be 2 inactive states, and one active state. The energy bar should flash to make it more noticeable. It should take 2 minutes instead of 1 minute. There should be more levels of the game.

C01-6: To make it longer: you should have 3 different levels/rooms, and you have to get 6 kids active in each room. It should take 5 minutes instead of 1 minute. There should be 3 states of activity/inactivity. If your energy goes all the way down, you should lose the game.

C01-11: There should be more people on the first level, and when you finish that level, there should be arrows to another level and so on. The speed of the activity meter should get more difficult each level. There should be 3 to 5 levels. Add running as an activity. He liked the idea of having 2 inactive states.

C02-12: She likes the idea of having 2 inactive states. The meter should not go down when less than 6 people are active, it should just stop filling.

C02-13: She liked the idea of having two inactive states.

C01-14: The meter should go down faster when the people aren't active. He liked the idea of having two inactive states per character, but if this is done there should be fewer character groups. The instructions should say to keep 6 "people" active even though they are groups.

C02-15: She liked the idea of having 2 inactive states.

C02-16: There should be a counter of how many people you have moving at once. She thinks that when you tag someone, it should pause and show what activity they're doing at the top of the screen. Instead of just taking the Xs away, you could put a green circle around them to be more subtle. There should be more levels, where one is at the park, one is at school, etc.

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