# Applying the Conjoint Technique in Identifying Preschool Preference of an Ideal Game for Nutrition Literacy

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## Abstract

The advancements and innovations in the industries of healthcare and education are at the threshold of a breakthrough. The main players have increasing efforts to address the pending issues on health and health literacy. Congruent to the increasing cases of malnutrition among children due to health illiteracy is the increasing advancements in the gaming industry. Hence, many educators and game designers are looking at the potentials of computer games in addressing the piercing issues on nutrition. However, little in understood in terms of the gaming preferences of preschool children. Using card-based conjoint analysis (n=30), this paper was meritorious in uncovering the gaming preferences of these population group. Findings showed that children prefer the red color (0.97) as a dominating theme in the game. They are also in favor of the action (0.27) type of game as the genre and they prefer to play with their family members (0.26). Lastly, in designing an ideal game for preschoolers, the most important factor to consider among these attributes is the color (48.40). This paper is directed towards a future not only where children have a better experience in gaming but also where children are provided fair access to health literacy and services.

**Keywords:** Nutrition, Literacy, Game Preference, Preschool, Conjoint, Orthogonal, Card-based

## 1.0 Introduction

The penetrating issues concerning wellbeing and literacy has pushed the key players on health and education to create extensive efforts in improving their means of providing knowledge in order to achieve its goals. The latest survey by the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST, 2008) presented a significant increase in the prevalence of underweight children from 24.6% in 2005 to 26.2% in 2008, and under height children from 26.3% in 2005 to 27.9% in 2008. This provides a strong evidence that in every 100 children the Philippines, there are about 27 children who lacked the necessary nutrition. Despite the initiatives created by government and private bodies, such as Philippine Plan of Action for Nutrition (PPAN) which aspired to decrease the prevalence of malnutrition among children ages 0-5 years (National Nutrition Council, 2012), the problem is still persistent in its existence.

Experts were suggesting that malnutrition is hypothetically linked with the decline in health literacy among children. For an instance, Azim, Shafi, Qureshi, Sheikh, Azim, & Hayat (2005) and Gopalan (2000) were confident that ignorance serves as an important factor in causing the problem in nutrition. Therefore, a change in attitude in health dissemination is proposed as a catalyst to produce reform (Gopalan, 2000). The focus now turns towards fighting health illiteracy.

Analogous to the piercing concerns on literacy are the advancements in the gaming industry. First world countries have been enjoying the benefits of this progress as manifested by the extensive users of computer games as well as the exceedance of the annual growth rate attained by the industry (Entertainment Software Association, 2011). However, such improvements has shed little light in the hands of third world countries. Still, many educators and game designers alike are positive about the potentials of this industry in bridging the gap on literacy.

Considering all factors conferred, it becomes important to tackle the issues on gaming preferences (Brandtzæg & Heim, 2009) among preschool children. Researchers have presented broad perspectives on the gaming preferences of school age children. However, literature gaps are still in need to be filled, specifically to the preferences of

preschool children. Using conjoint analysis, this research therefore aspired to determine the gaming preferences of preschool children. This task would be beneficial in creating a concrete pathway for the utilization of health games to directly influence pedagogical knowledge. This study would also contribute knowledge and theoretical bases for related researches and innovations in the future.

## 2.0 Background

### 2.1 Theoretical Framework

In order for this research to envision a tentative answer to its research goals, the researcher was guided by the Experiential Learning Theory by Kolb (1984). John Dewey (1938) and David Kolb (1984) both claimed that learning is an outcome of a person's experience, while both the quality of experience and reflection is significant to overall learning. Initially, the person grasps the experience, called prehension, then organizes the experience in order to make sense of it, and then followed by active experimentation, wherein the experience is modified as fitted from the person's preference.

There are several factors that would determine the quality learning, stemming from both experience and reflection. While experience would depend on the level of involvement of the person, reflection would rely on the tool that aids the process. This is essential in using computer games to promote learning. It is necessary to understand the characteristics of a computer game – the tool that would encourage deep involvement from players and later on would initiate a quality reflection from them.

### 2.2 Preschool as a Developmental Stage

Preschool age varies from one theorist to another but generally, this stage is ranged at 3-7 year (Erikson, 1980). This stage presents challenges to the child, the parent and the educators. At this stage, self-expression starts to focus more towards the language of the child (Videbeck, 2008). Through play and social interactions with friends or family members, these children also develop assertion and control (Cherry, 2012).

Another development that is predominant over preschoolers is their graphical observations, wherein meanings and object classifications becomes more understandable to them through symbols, gestures and even mental images (Videbeck, 2008), specifically through the organization of these symbols in a logical fashion (Boyd, 2008). Children at this age can also get understand and follow simple directions and can learn how to manage conflicts and anxiety (Videbeck, 2008).

Such changes would be potential keys in terms of learning method and gaming. In fact, this may be a good time to present these children with educational games. Games with simple interface and mechanics would be enjoyable to children. These simple games may also offer challenges or conflicts that children may solve on their own. Winning these challenges would also be very beneficial because it would give them the feeling of management and competence (Cherry, 2012).

*2.3 The State of Nutrition among Preschoolers in the Philippines*

By definition, nutrition is the overall process of taking in and assimilating substance that drive sustenance of life (Brookover, 2012). But simply stating it, nutrition is basically a human right (United Nations International Children Emergency Fund, 2003) and is essential for human survival and development of children (DevPulse, 2008). Nutrition has always been a point of concern among developed and developing countries because nutrition has always been associated with malnutrition, a problem more worthy of the focus.

Malnutrition is defined as the absence of the essential nutrients that a health body possesses (World Health Organization, 2011). Accompanied by its definition is an vast problem that penetrates among third world countries like the Philippines, leading UNICEF (2012) to brand it as a "invisible emergency".

A number of data were published by local and international bodies to support the magnitude of the situation. 2.9 million families were estimated to express unintentional hunger, while 760,000 families to express severe hunger (Social Weather Station, 2008 cited in DevPulse, 2008). As to the children specifically, 26.2% were noted as underweight as of 2008 (FNRI-DOST, 2008), while 20.7% were

noted as of 2009 (WHO, 2011). Also according to the seventh National Nutrition Survey (2008), 6.1% of children 0-5 years old were wasted while 27.9% were stunted. Purely looking at the numerical data, one might not see the complications of such problems especially to the preschool population.

Various disorders or disabilities were – surprisingly – associated to malnutrition. In fact, it is the leading reason for the most imaginable diseases the world faces (Caulfield, de Ontis, Blossner & Black, 2004). Vitamin A deficiency, a representation of malnutrition (DOH, 2012) generates roughly 350,000 occurrence of blindness and partial blindness to children annually, while iodine deficiency continues to cause mental retardation (Jukes, 2007). A significant number of deaths due to diarrhea, malaria, pneumonia and measles were associated to malnutrition (Caulfield, de Ontis, Blossner & Black, 2004). Children may also become deprived from schooling or more like to become absent from school (Jukes, 2007). The lack of knowledge from schooling can even lead to more serious, cyclical, deprivation of health knowledge and nutrition.

*2.4 Gaming Definition and Demographics*

Games defined by Schell (2008) as a "problem-solving activity approached with a playful attitude". Education supported with technological innovations has been seen as a new method of learning, but among these advancements, computer games are central in educating both children and teenagers (Kostkova, Farell, de Quincey, Weinburg, Lecky & McNulty, 2010). And it is the entertainment factor that often draws people towards playing computer and video games. But despite the centrality of games as a method of education, it has been given little attention by the people (Kostokova et al, 2010), which is indirectly proportional to the number of gamers around the world.

In the US alone, 72 out of 100 American households play computer games and 18% of them are below 18 (ESA, 2011). Therefore, it is thought that an immense community of players exists within the US. Though an immense community also exists in other areas of the world, specifically the Philippines, such cannot be backed up by written validations.

*2.5 Gaming Preference*

*2.5.1 Genre*

With the abundant number of average people playing computer games, it becomes important to take a glimpse on the issue of gaming preferences among players (Brandtzæg & Heim, 2009). Preferences on gaming genres have been linked positively to several factors such as peer acceptance, scholastic and athletic competence, as well as levels of parental monitoring (Brandtzæg & Heim, 2009). But on a general view of the picture, it was reported in 1998 that the choice of gamers fall within the action and adventure genre of games (Media Analysis Laboratory, 1998). According to AlienwareArena on its 2011 website report, however, it is strategy genre that topped the list. On a more recent report in 2011 by Entertainment Software Association, the best-selling video and computer games by genre turned out to be action and strategy for consoles and PCs respectively. Given these reports and its timeliness, it seems that the strategy genre is currently more preferred by consumers.

In order to provide clarification, Grace (2005) has discussed the different genres in her report. Action games are unique because of the intensity of its gameplay. The main key to playing these games very well lies in the fast reflexes and skills of the players. This mainly involves the coordination of the player's sight, body and hand reflexes and their ability to remember the correct controls when needed immediately. Action games are mostly shooting, stealth and sports games.

To continue, the former mentioned that adventure games differ a lot from action because it mainly focuses on world exploration and puzzle solving. In adventure games, fast reflexes and coordination are not needed. Instead, adventure games concentrates more on the engrossing storyline and achievements.

Lastly, strategy games offer entertainment mainly through reasoning and problem solving of the players, according to Grace (2005). Strategy games differ from action and adventure alike because strategy games do not rely main on fast paced reflexes as well as an engrossing story, but on careful analysis of the situation to win.

Despite the data on gaming preference by genre, little is known specifically on the genre preference of preschoolers. The discussion lead the research to the following:

**Research Question 1:** *Is strategy the most preferred game genre over action and adventure?*

**H₁:** *Preschoolers prefer strategy the most over action and adventure genres.*

*2.5.2 Companion*

Games can usually be played either alone or with company. Generally, teenagers prefer playing with their friends but younger teens may prefer playing with siblings or parents (Media Analysis Laboratory, 1998), which can be explained through the Psychosocial Development by Erikson (1980). Erikson has delineated several significant persons according to age group, and according to this source, children at their younger years are more accustomed with family members than peers, and the centrality goes outward from the family to the community as the person ages. However, Media Analysis Laboratory (1998) also mentioned that heavy gamers are split between the group who plays with peers and who plays alone depending on the type of game. Yet again, sources that specifically report preschooler's preference as to playing alone or with companion/s are limited. Hence, the following argument was devised:

**Research Question 2:** *Do preschoolers opt to play with family member rather than playing alone or with friends?*

**H₂:** *Preschoolers opt to play with a family member instead of playing alone or with friends.*

*2.5.3 Color*

One of the top reasons concerning why players play or purchase computer games is the quality of graphics (ESA, 2011). Color preference, in particular, is very important

in directing many sides of human behavior, since it determines how people pay attention to visual environment (Adams, 1987). Colors can either be chromatic, which represent colors with hue such as red or blue, or achromatic, which represents the greys. Chroma, or hue, may have longer wavelengths of light giving a redder color, or shorter wavelengths emitting a bluer color. In terms of general color preference, boys preferred blue and green while girls prefer purple, pink and white (He, Zhang, Zhu, Xu, Yu, Chen, Liu & Wang, 2011). Putting gender aside, however, children prefer colors with long wavelengths such as red and yellow colors on top of colors with short wavelengths such as purple, blue and green (Adams, 1987; Jong, Lee, Hong, Hwang & Hao, 2009). Nonetheless, little is known about color preference as predictor directly to games and behavior intention of gamers, making the researcher to ask the following:

***Research Question 3:*** *Is red the most preferred color theme instead of yellow, green, blue and violet?*

***H₃:*** *Red is the most preferred color theme by the preschoolers instead of other colors.*

Furthering the argument based on the foregoing discussions and in light of the personal judgement of the researcher, the study would like to advance a summative question:

***Research Question 4:*** *Is genre the most preferred attribute when designing for an ideal game for preschoolers?*

***H₄:*** *Genre is primarily considered over color and companion when deciding for an ideal game for preschoolers.*

Upon assessing the relationships of the variables discussed, the following figure is created:
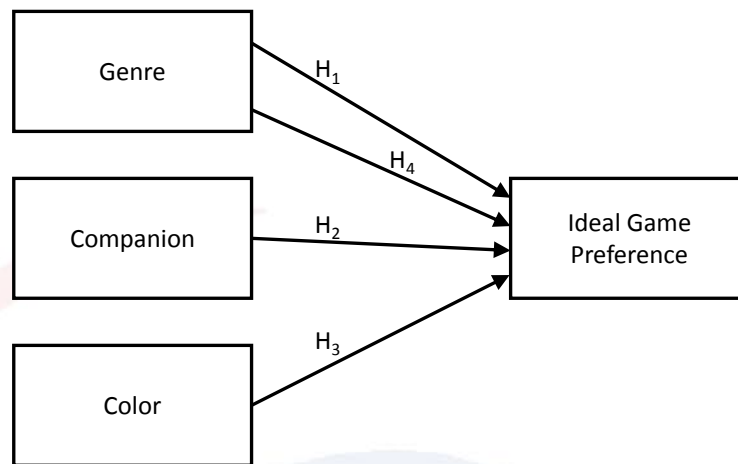
*Figure 1: Hypothesized relationship between the gaming attributes to the ideal game preference of preschoolers*

## 3.0 Methods

### 3.1 Research Design

This paper is quantitatively approached through collection of data in numerical figures (Harrison III, 2012). Likewise, to determine the gaming preferences of preschoolers, the researcher employed conjoint analysis as method for acquiring data. Conjoint analysis has been widely used to elicit preferences through presentation of an array of attributes or profiles among specific market groups (Noguchi & Ishii, 2000; Park, 2004; Bridges, Hauber, Marshall, Lloyd, Prosser, Regier, Johnson & Mauskopf, 2011). The usage of conjoint analysis in health care has increased rapidly and so far, has been successful in determining preferences for a vast range of health applications (Bridges et al, 2011).

Specifically in this study, the researcher will utilize the orthogonal, card-based type of conjoint analysis.

Orthogonal Conjoint Analysis permits statistical testing of various factors, or attributes, without testing every combination possible (IBM, 2012). Through the exclusion of implausible combinations (ISPOR, 2012), Orthogonal Conjoint Analysis answers the core goal of conjoint analysis which is to minimalize the options

presented for each respondent, while still getting good estimates of results (Dobney.com, 2010)

### 3.2 Tools and Measures

The researcher prepared a deck of cards with each card representing 3 basic attributes that gamers find substantial namely: typological dimension, graphic dimension and social dimension. Typological dimension are specific genres of games and includes 3 types: [1] action, [2] adventure and [3] strategy. Graphic dimension involves colors and includes 5 types: [1] red, [2] yellow, [3] purple, [4] blue, and [5] green. Lastly, social dimension involves the person/s that gamers prefer to be with while playing games and this includes 3: [1] with peers, [2] with family, and [3] with self. Each card will represent a combination of the 3 attributes for a total of 45 cards. Using the conjoint analysis feature of the SPSS v21 software for Windows to elicit the orthogonal combinations, the total number of cards were reduced to 25 combinations. These cards were numbered permanently at the back. With the assistance of the researcher, respondents picked their preferred combination through sorting the cards based on their most and least preferred. The cards' corresponding numbers were recorded and were analyzed for results.

### 3.3 Study Subjects

In this study, the researcher intended to determine the gaming preferences of preschoolers, and purposively gathered a total of 30 preschoolers from a selected preschool facility in Quezon City to undergo card sorting.

Purposive sampling was utilized to select the respondents who met a set of criteria: (1) must be a preschool student of the selected facility regardless of age, (2) must be willing to participate in the study, and (3) has consent of a parent or a guardian to participate in the study.

Likewise, the researcher was guided by the following criteria for the selection of preschool facility: (1) must be conducting normal preschool education in case the

facility is also providing special education, and (2) must have given the researcher permission to conduct the study in its premise.

*3.4 Data Analysis*

After the order of sorted card has been recorded for each respondents, the researcher utilized a spreadsheet software to create the basic tally sheet. The file underwent statistical analysis using the conjoint analysis feature of the SPSS v21 software. Statistical Package for Social Sciences (SPSS), is a Microsoft Windows package program (Arbuckle, 2006 cited in Schreiber, 2008) that transcribes quantitative data and present results with more accuracy through a vast multivariate statistical techniques (IBM, 2012), which makes it capable of solving an extensive array of statistical problems.

**4.0 Results**

Table 1 provides scores for the conjoint analysis as indicated by the characteristics utility estimates, standard errors, important values and p-values of each attribute. These results indicate that the action genre together with color red and family as companion scored the highest in their respective attributes.

Specifically, when exploring the different scores in terms of genre, action counted the highest (0.23) followed by strategy (0.14). Not surprisingly, adventure scored the lowest (-0.41).

With regards to color characteristics, red and green attained the highest marks (0.97 and 0.65 respectively). It is followed by yellow color (0.28). Blue color had a negative score (-0.50) while purple got the lowest rank among the characteristics (-1.4).

Lastly in terms of the social dimension, playing computer games with family members got the highest rank (0.26) followed by just playing without a companion (0.15). Interestingly, playing computer games with friends ranked the lowest between the three with a negative score (-0.42).

Color has the highest important value of 48.40, which exceeded 'social dimension' and 'genre' which have relative scores of 27. 04 and 24.55 respectively. The correlation between the observed and estimated preferences has a Pearson r value of 0.67 (p= 0.00).

Plotting the research data against the research arguments, the following figure is presented:
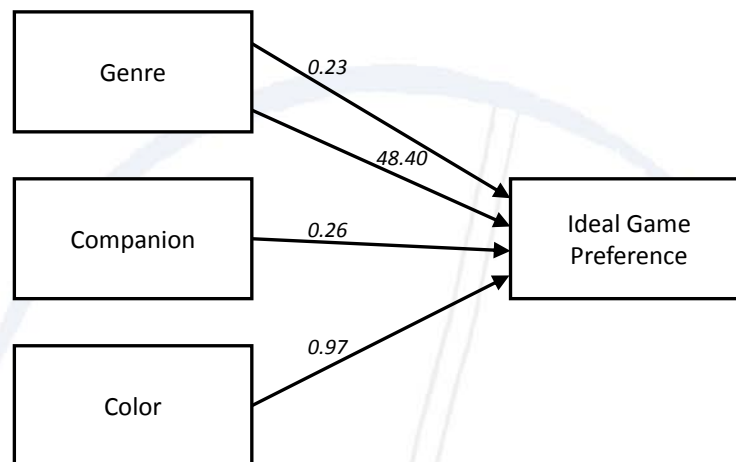


*Figure 2: Resulted relationship between the gaming attributes to the ideal game preference of preschoolers*

**5.0 Discussion**

The research findings suggest that the most important factor in designing an ideal game is the color theme that would radiate on the game interface, while the number of players and the type of game play secondary but are still important. This might be due to the fact that children at this age bracket are mostly visual (Videbeck, 2008; Boyd, 2008) in terms of acquiring information rather than instructional. Therefore, it is what they see that is more important, rather than what they play or how they play the games. This would become a very important factor when designing a computer game since children are mostly more associated with color combinations.

Interestingly, the findings in terms of specific color almost matches the literature formerly discussed in this paper. Similar to previous studies, preschoolers prefer colors with longer wavelengths such as red, than with shorter wavelengths such as blue and purple. This might be because younger people are more visually stimulated

with chromatic colors, or colors with hue, rather achromatic colors, or colors without hue such as grey or black (Adams, 1987). Children prefer hues over greys, and the more hue or wavelength the color possess, the more they are stimulated. Colors are a very prominent environmental cue, which allows people to recognize, classify and categorize objects in a highly fashioned manner (Hurvich, 1982 cited in Adams, 1987). Color discernment is a dominant characteristic of preschoolers, significant when learning how to discriminate objects.

The results shown for social dimension is very congruent with several literature. Children prefer to play with their family members such as with siblings or parents, rather than with their friends. Although preschool is a time where children go to school to learn and meet new people, it is still the family members who are central to the preschooler's development and learning of what's right and wrong, similar to the proposition of Erik Erikson (1980) in his Psychosocial Theory. Also, it would not be so surprising that preschoolers prefer to play with family members because of the social nature of Filipino families.

Finally in terms of the type of games, preschoolers prefer to play action type of games, quite dissimilar to what was previously discussed from other literature. This is significant in designing an ideal game for children because the game genre can also attract or not attract attention of children in playing games and would determine how long the children will stay interested in playing the game. However, adventure type of games unsurprisingly got the lowest score, similar to the previous discussions. This may be explained by the fact that adventure type of games suffered a significant drop in popularity during the late 1990s (Nixon, 2007). By 2010, only 7-8% of game sold were adventures games, dominated by both action and strategy games (Entertainment Software Association, 2011).

The Pearson r value shows that the presented model together with the gathered data values has significant positive relationship indicating its fitness.

**Conclusion**

The findings of this study are very relevant not only game producers but also to the educators and healthcare team as well. The results poses as a guide for their collaborative action in order to design an ideal game for health, particularly on what aspect to focus on, and to what type of game to create.

There are limitations imposed in this study, one being the limited number of respondents. This paper recommends further studies with more respondents. Another limitation is the lack of differentiation according to demographics, however a more generalized preference is more interesting for game designers. Also, since there are limited number of studies that deal with gaming preferences for children, it would be interesting to perform similar studies in different nations or cultures. Descriptive-comparative researches in the context of culture is also a significant area of further inquiry.

Despite the limitations, the findings presented provide a new dimension for understanding the effects of games among preschoolers. It is envisioned to be the starting point in extending related researches in the future, and for the gaming developer sector to contribute to building a healthier nation.

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