Munchy Monster: Using video gaming to objectively evaluate front-of-pack labelling strategies for school-aged children

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Marketers have long targeted children in an attempt to influence food purchases. This is not the case for regulators; nutrition information is complex, using decimal places, percentages, and units of measure. It has been suggested that the approach to nutrition labelling in the United States is difficult for some adults to interpret, let alone children. This is unfortunate as children influence purchase decisions and childhood is a critical time for developing long-lasting eating habits. An alternative approach to traditional nutrition labelling employs the use of front-of-pack (FOP) nutrition labels. FOPs provide simplified, truncated nutrition information on the front of packages.

The objective of this work was to evaluate how four different FOP label designs impact the ability of children to assess product healthfulness and time to assessment. Children aged 6 to 10 played a video game where they fed “Munchy Monster” the healthier of two options. Across trials, the FOP format varied in a 2 (colour/no colour) × 2 (facial icon/no facial icon) factorial design. Within a trial, both cereals presented the same FOP format, with one healthier than the other. Two groups of children participated in trials; those in the uninstructed group were simply asked to feed the monster the healthier cereal (n = 38); the “minimally instructed group” (n = 41) was told that “this part of the package” (the FOP) might help you decide which is healthier.

Accuracy of selection and time to selection were dependent variables. With regard to accuracy, both groups showed evidence of a significant face by colour interaction (P < .001), with the colour or facial icon presence improving accuracy. For uninstructed participants, accuracy of selection significantly improved with any combination of colour or facial icon, and all other labels were improved when accuracy was compared with the treatments with no face/no colour, but none containing colour and/or facial icons differed from one another. Minimally instructed participants were also more accurate in identifying the healthier product for all FOP label designs compared with the no face/no colour condition (P < .001). However, the trials with FOPs including both face with colour also performed better than the face with no colour label, P = .001. A main
effect of colour was evident for both groups when time to correct selection was the dependent variable ($\alpha = .01$). Results demonstrated that colour coding and/or facial icons significantly benefit selection accuracy and speed, particularly for the youngest children. Minimal training further improved accuracy and speed of responses. FOPs that leverage visual indicators assist even young children in assessing the nutritional value of a product. This should be considered as FOPs are debated and standard practices regarding these labels emerge.

**KEYWORDS**
childhood obesity, front-of-pack labels, gaming, information processing, nutrition labels, serious games, traffic light labels

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**1 | INTRODUCTION**

**1.1 | Background**

"Obesity has more than doubled in children and quadrupled in adolescents in the past 30 years," and 60% of overweight children suffer from high blood pressure, high blood cholesterol levels, and/or high levels of insulin in the blood (a precursor to diabetes). Although multiple factors (eg, insufficient exercise, increases in sedentary forms of entertainment, emphatic promotion of foods high in fat and sugar, etc) play a role, one clear factor is poor diet.

Current research suggests that only 2% of children eat a diet that is consistent with the Food Guide pyramid, consuming diets too high in fat, saturated fat, and sodium and too low in fibre. Furthering concern is the fact that childhood is a determinate phase in the establishment of eating habits and that developing healthy eating practices as a child has long-term health benefits. With this knowledge, it is crucial that we consider the ways in which children develop good health behaviours and ideate and trial strategies that empower children to do so.

Children have traditionally been an appealing segment for food marketers. They not only represent a primary market with growing access to discretionary income but also have significant power to influence decisions and are a promising future market as well. As such, children represent an attractive target for marketers, and research suggests that they are vulnerable to the messages that target them.

Directing messages to children "increases children’s preferences for the foods advertised and increases their requests to parents for those foods." Recognizing this, packaging plays an important role in the marketing mix. The US Federal Trade Commission (FTC) has estimated that 12% of all youth marketing expenditures are spent on packaging and in-store displays. This is because of packaging’s ability to influence at the point where purchasing decisions are made, something that researchers have referred to as the "nag factor." Robinson et al gave children (less than 5.5 y old) identical foods (one in packaging from McDonald’s and the second in a matched but unbranded package) and asked the children to indicate if they tasted the same or if one tasted better. Children indicated a significant taste preference for the McDonald’s branded foods, and children with more

televisions in their home demonstrated a stronger pro-McDonald’s taste bias. Unfortunately, it has also been suggested that foods marketed to children are "composed almost entirely of messages for nutrient-poor, calorie-dense foods." The use of product packaging to present information to children with the goal of motivating sales is often utilized; however, the idea of presenting regulated information (eg, nutritional information) in a format that might be readily understood by this vulnerable audience has not been widely explored. A major goal of nutritional labelling on food packages is to help consumers make appropriate choices; however, the current approach to nutrition labelling is targeted at adults, rather than children.

Even with recent modifications, the “Nutrition Facts panel” (NFP), required on the vast majority of packaged food products sold in the United States, uses complex words that are unfamiliar to children (eg, carbohydrates and cholesterol) and numerical data that include decimals, percentages, and units of measure (eg, g and mg). This approach is not suited to the cognitive abilities of young children, who are likely to have difficulty reading the words and interpreting the numerical values. Indeed, research suggests that even older children (9–12 y of age) who are aware that nutritional information is meaningful have difficulty comprehending this information and applying it to food choices.

In fact, research using adults indicates that even they have difficulty with NFPs. Traditional labelling practices have been criticized because they do not attract attention, and do not promote easy cross-product nutritive comparisons. If one were to consider the effectiveness of traditional nutrition labels for children who have less sophisticated cognitive systems, it is likely that these deficits would be even more profound.

While little attempt has been made to design nutrition labels that are effective for children, there has been a global push to adopt labels that would be more impactful for adults. A large part of this push has been the introduction of front-of-pack (FOP) nutrition labels. FOP labels present nutrition information on the front of the package, often called the Principal Display panel (PDP). The primary reasoning for this strategy is that these labels are more likely to capture attention and facilitate quick and accurate cross-product comparisons.
The approach to FOP labels varies from summative marks where the overall health of a product is assessed against specific standards (see Figure 1—Summative [directive]24) to those which provide explicit, numeric values of nutrients tending to be associated with disease states (eg, fat, saturated fat, sodium, and sugar), leaving the interpretation of “healthfulness” to the consumer (see Figure 1—Explicit information [non-directive]25). Traffic lighting systems combine the “healthfulness” assessment with detailed information regarding nutrients by using a categorical summation that colour codes each nutrient on the FOP. Traffic light colour coding is analogous to a traffic light, with red indicative of high levels of nutrients that tend to be associated with disease states (eg, sodium and hypertension [stop]; yellow with moderate [relates to slow down] and green with low [relates to eat up]; see Figure 1—semidirective]26).

The evidence that marketing information on packages can influence children’s choices leads us to believe that research investigating the impact of new labelling techniques for nutrition information should also target children. To the best of our knowledge, there is, as of yet, no empirical research that examines whether nutrition information on packages could be designed to influence children.

Most studies researching FOPs have been done in other countries with adults. Studies in France27 and Mexico28 have found that FOPs are generally understood and accepted by adults, while others in Europe have focussed on adults’ use of FOPs.22,28 Findings in Australia,29 New Zealand,30 and France31 show that adult consumers are able to make healthier food choices with the help of FOP labelling formats and adolescents in Spain were able to do the same.32

Although children as young as age 4 are capable of classifying familiar foods (eg, ice cream vs broccoli) as healthy or unhealthy,23,34 we are the first to examine whether children can use visual cues from FOP labels to compare and evaluate food products from the same category (cereal) and the first to employ a serious gaming strategy to do so.

Two semidirective overlays (see Figure 1), namely, colour (two levels present/absent) and facial icon (present and absent), were crossed, for a total of four FOP treatments (see Figure 2A). We investigated colour because it mimics the traffic light system FOP design used in the United Kingdom and the use of colour is a topic of significant debate globally.

Additionally, we tested the efficacy of schematic facial expressions representing high, medium, and low values for nutrients (ie, frowning for high, straight face for moderate, and a smile for those low), Overwhelming evidence indicates that face stimuli are given extremely high attentional priority35-38 and that the processing of facial expressions of emotion requires very few cognitive resources.39,40 These findings, coupled with research suggesting that faces capture attention, even when they are irrelevant to a person’s goals,35,41,42 suggest that a face stimulus might be particularly effective at drawing attention to the FOP and conveying relative qualitative information about nutritional value. As such, we postulated that they would be particularly well suited for use with children. Faces are known for garnering increased attention in infants,43 and children as young as 4 can reliably identify facial expressions of emotion.44 In fact, developmental research often exploits children’s ease of comprehending iconic faces to measure children’s judgements of stimuli or situations.45

We leveraged these fundamental insights to hypothesize that facial icons and colour in FOP labels would enhance attention to and comprehension of nutrition information and that this would be particularly useful for vulnerable audiences (in our case, children aged 6-10).

To objectively test the efficacy of this labelling strategy, we utilized a “serious gaming” strategy. Serious games have been defined as “a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.”46 Given that games are fun and engaging47 and the dry nature of the topic (objective evaluation of varied nutrition labelling strategies) and the age of our target participants (6-10 y olds), we conjectured that this would be an effective approach.

2 | OBJECTIVE

The objective of this study is to objectively measure the efficacy of colour coding and facial icons as FOP design strategies on the ability of elementary-aged children to assess product “healthfulness.”

3 | MATERIAL AND METHODS

3.1 | Participants

Methods were approved under Social Science Behavioral/Education Institutional Review Board (SIRB) number 13-678 and filed with

(A) Summative (Directive) (B) Explicit Information (Non-directive) (C) Semi-directive

FIGURE 1 Front-of-pack label examples summative image source;24 explicit/non-directive image source;25 and semidirective image source26
Children aged 6 to 10 were recruited via a flyer sent out using University’s Family Resource Center List Serve. Inclusion criteria indicated participants needed to be 6 to 10, legally sighted, have a parent or legal guardian present, have transportation to the test site, provide contact information for appointment reminders, and be willing to have deidentified data stored. No other inclusion/exclusion criterion was considered for this experiment. Written consent was obtained from parents, signed assent was available from the child.
obtained for children aged 8 to 10, and a verbal assent script was read to children less than 8.

3.2 Stimulus design

The FOP designs were created using a 2 × 2 design treatment matrix where colour coding and facial icon were crossed, resulting in the following FOP label treatments (see Figure 2A):

a. text plus colour (kindred to the traffic light system used in the United Kingdom);
b. text without colour;
c. facial icons plus colour (our proposed design); and
d. facial icons without colour.

In an attempt to minimize potential confounding effects due to previous experiences with or exposure to advertising and branding, we designed 42 mock cereal brands, a subset of which is presented in Figure 2B; a complete set is available in the supplemental materials that are provided online. On screen, the principal display panel measured 160-mm tall by 130-mm wide, the FOP label measured 12-mm tall by 32-mm wide, and the NFP measured 125-mm tall and 25-mm wide. The RGB values of the colour-coded FOPs, as measured with the colour selector tool in Adobe Illustrator, were 248, 30, and 64 for high amounts of nutrients (red); 243, 158, and 42 for medium amounts (yellow); and 142, 252, and 76 for low levels (green).

3.3 “Munchy” video game task

Children were seated at a desktop computer with an Intel Xeon CPU E3-1275 v3 at 3.5-GHz processor and a 64-bit Windows operating system with 16 GB of RAM and an ASUS VE247 23.6” monitor with a resolution of 1,920 × 1,080 set to a refresh rate of 60 Hz. After being introduced to the idea that they were going to play a video game of which goal was to feed a monster named Munchy healthy foods as quick as they could, the programme was started. Researchers demonstrated the key stroke that needed to be pushed to feed Munchy the product on the right and the key stroke to use to feed Munchy the product on the left. The programme, created using E Prime 2.0 (Psychology Software Tools, Inc, Sharpsburg, PA), began with an instruction scene in which a monster character (Munchy) said,

“Hi my name is Munchy. I like to eat, but only healthy foods. Will you please feed me? In the game, you will see two cereal boxes. One is healthier than the other. To feed me, please press the button on the side with the healthy cereal. If you select the healthy one I will eat it and you will get points. If you select the unhealthy one I will refuse to eat and you will not get any points. I am really hungry so please choose the healthy one as fast as you can. Do you have any questions?”

Children began with two practice trials intended to familiarize them with the game and which keys to press to make selections. This was followed by 80 trials where two packages appeared side by side below “Munchy” (see Figure 2C). Upon selection (as indicated by button depression), the cereal would fly towards Munchy. If the selected cereal was the healthy option, Munchy would eat it, and points would accrue as sound played. If the selected cereal was unhealthy, Munchy would shut his mouth, and the cereal box would bounce off with a “bonk” sound with no points accruing.

For each trial, both cereals had the same FOP treatment. However, one package contained “healthy levels” of key nutrients (eg, for coloured FOP treatments, three or more nutrients at “green levels”) while the other contained “unhealthy levels” (three or more nutrients at “red levels”). An example trial composed of colour and facial icon treatments can be seen in Figure 2C. Nutrients were categorized into high, moderate, and low levels based on Traffic Light Label Guidelines released by the Food Standards Agency. The appearance of the brand and the position of the package (right or left side of screen) was randomized; additionally, a second randomization was done with the healthfulness level of the nutrition information such that the positioning (right side of screen or left) was randomized. As a result, for one subject, brand X might appear as healthy, while for another, it might be presented with unhealthy information. Each participant completed 80 trials, with each of the four FOP designs (see Figure 2A) appearing in 20 trials per participant by the conclusion of the game. The time it took for the participant to make a correct choice was recorded along with a binary response of correct choice (yes or no).

4 RESULTS AND DISCUSSION

4.1 Participants

A total of 80 participants 6 to 10 years of age were recruited for the study, split into two experiments. Thirty-nine participants were recruited in support of the first experiment; one of whom, a 7-year-old boy, did not engage because of boredom; as such, data collected from a total of 38 uninstructed participants were included for the purpose of analysis. These participants received no introduction to FOP labelling prior to beginning the game (the uninstructed group).

Realizing that subjects might not use the FOP during decision making when not informed that it contained nutrition information, we conducted a second experiment (N = 41), which provided minimal information about the FOP. These subjects (the "minimally instructed" group) were provided with further instruction. Specifically, at the beginning of the experiment, in addition to being shown the basic premise of the game and told that Munchy preferred to eat healthy options, the researcher pointed to one of the FOPs and told children “this information might be helpful when you decide what’s healthy.” This instruction was uniformly provided to each of the last 41 participants recruited.

Results obtained from children who were 9 or 10 years of age were grouped for the purpose of data analysis due to a limited number of 10 year olds recruited and tested.
4.2 Accuracy

A 2 (colour/no colour) × 2 (facial icon/no facial icon) repeated measures ANOVA with accuracy (proportion of correct identifications) as the dependent variable was performed for each test group (uninstructed and minimally instructed). Both groups showed evidence of a significant facial icon by colour interaction, uninstructed $F_{1,37} = 4.94, P = .032$, minimally instructed $F_{1,40} = 19.36, P < .001$. The source of the interactions is clear from Figure 3: the addition of colour or a facial icon to the label improved accuracy, and performance with any combination of colour and facial icon was roughly equivalent. Planned paired t-test comparisons validate this interpretation. For uninstructed participants (Figure 3A), all conditions differed significantly from the no facial icon/no colour condition, all $t(37) > 2.10$, all $P < .043$, but none of the conditions that had colour and/or facial icons differed from one another, all $t(37) < 0.7$, all $P > .49$.

Minimally instructed participants (Figure 3B) produced a similar pattern. Children were more accurate in identifying the healthier product for all conditions of FOP label compared with the no face/no colour condition, all $t(40) > 5.32$, all $P < .001$. However, the trials with FOPs including both facial icon with colour also performed better than the face icon with no colour label, $t(40) = 3.47, P = .001$.

Finally, looking across experiments (composed of the different training levels; a comparison of the left and right sides of Figure 3), it appears that the magnitude of the effects is significantly larger for those who received minimal training than the group that received no instruction regarding the labelling.

To investigate this further, Figure 4 plots accuracy as a function of age. For uninstructed participants (left side of Figure 4), performance tends to increase with age across all label formats. Readers are encouraged to interpret these results with caution, given the very limited number of observations per cell (see Table 1). A multivariate between-subjects ANOVA with accuracy for each label type as the dependent variable and age as a covariate suggests that age is a significant covariate for the no facial icon/no colour labels, $F_{1,36} = 4.24, P = .047$. However, there is no evidence that age was a significant covariate for any of the remaining label treatments with this group. That is, when not provided any information on the FOP, children improve their performance when working with plain labels as they age, but age does not significantly enhance their ability to determine the healthier option with the other labels, namely, face/colour labels, $F_{1,36} = 3.18, P = .083$, the no facial icon/colour labels, $F_{1,36} = 1.03, P = .316$, and the facial icon/no colour labels, $F_{1,36} = 2.28, P = .140$.

For the treatment that yielded significant results, the no facial icon/no colour condition, post hoc, independent t tests found that 6 year olds performed significantly worse than all other age groups (all $t > 2.20$, all $P < .048$). Performance did not differ significantly between any combination of the 7- to 9- and 10-year-old group (all $t < 0.82$, all $P > .42$).

A similar pattern emerges for the group that was minimally instructed (right side of Figure 4), and the larger effect size and smaller variability that resulted when the area of the FOP was pointed out to participants prior to testing make the pattern clearer. Age was a significant covariate for the no facial icon/no colour labels, $F_{1,38} = 9.00, P = .005$. It was also significant for the facial icon/no colour condition, $F_{1,38} = 4.65, P = .038$, but there was no evidence that age was a significant covariate for the two remaining label conditions, which contained colour, namely, facial icon/colour and no facial icon/colour, both $F_{1,38} < 2.73$, both $P > .100$.

**FIGURE 3** Accuracy level and front-of-pack (FOP) label condition. The left panel presents data from the uninstructed group and the right data collected with the minimally instructed group. Error bars represent standard error of the mean.

**FIGURE 4** Accuracy levels for front-of-pack (FOP) label conditions and age. The left panel presents data for the uninstructed group and the right those who received minimal instruction. Error bars represent standard error of the mean.
To isolate the age effects in the no facial icon/no colour condition, post hoc, independent samples t tests found that 6 year olds performed significantly worse than the oldest group (9 and 10 y olds), \( t(18) = 3.82, P = .001 \), and the 7 year olds performed marginally worse than oldest group (9 and 10 y olds) \( t(19) = 1.91, P = .07 \). None of the other pairwise comparisons reached significance, all \( P > .22 \). For the facial icon/no colour condition, the 6 year olds performed worse than the oldest group (9 and 10 y olds), \( t(16) = 2.18, P = .04 \); all other pairwise comparisons did not reach significance, all \( P > .11 \).

These patterns suggest that comprehension of the difficult no facial icon/no colour label improves with age. However, when a facial icon is added to the label, comprehension becomes easier, and even the young children perform well, so there is little opportunity to improve, leading to a compression of range. Adding colour to the label further enhances accuracy, thereby leading to even more compression of range, limiting the ability to improve.

4.3 Reaction time

While accuracy was our main dependent variable of interest, we also investigated whether different label formats influenced reaction time. This was done both to ensure that any accuracy effect we observed was not due to a speed accuracy trade-off and to determine whether particular label formats allowed for a fast, accurate decision, suggesting a labelling strategy that is easy to understand. As with accuracy data, a \( 2 \) (colour/no colour) \( \times 2 \) (facial icon/no facial icon) repeated measures ANOVA with median reaction time as the dependent variable was performed for each of the two test groups (see Figure 5).

For the uninstructed group (Figure 5A), there was a main effect of colour, \( F_{1.37} = 20.63, P < .001 \), but no main effect of face icon, \( F_{1.37} = 0.81, P = .375 \), and no interaction evident, \( F_{1.37} = 1.18, P = .284 \). For the minimally instructed group (Figure 5B), there was a main effect of colour, \( F_{1.40} = 80.684, P < .001 \), no evidence for a main effect of face icon, \( F_{1.40} = 0.33, P = .57 \), and the colour by facial icon interaction did not reach significance, \( F_{1.40} = 3.66, P = .063 \). Across experiments (uninstructed vs minimally instructed), it is clear that reaction times are much faster when the label includes colour. Given that colour coding was also associated with high accuracy, we can eliminate any speed accuracy trade-off concerns and conclude that colour-coding nutrition information produced fast and accurate decisions of the healthier product among our test participants.

Although the interaction did not quite reach significance at the .05 level, it was marginally significant. To investigate this marginal effect in more depth, we performed paired t tests. All comparisons that compared a condition with colour to a condition without colour were significant, all \( t(40) > 7.2 \), all \( P < .001 \), demonstrating the powerful effect of colour. When holding colour constant and looking at the effect of adding a face, the addition of a face did not speed responses for the no colour FOPs, \( t(40) = 1.34, P = .19 \). However, adding a facial icon to a coloured FOP showed some evidence of speeding responses, \( t(40) = 1.99, P = .054 \). While we do not wish to make too much of this marginal effect, it suggests that having faces may be beneficial but only when colour is also present.

Figure 6 plots reaction time for correct responses as a function of age. Given the low sample size per age condition and the variability of reaction time data, we consider these data exploratory. For uninstructed participants (see left side of Figure 6), a multivariate

![Figure 5](image-url) Reaction time for front-of-pack (FOP) label conditions. The left panel presents data for the uninstructed group and the right those who received minimal instruction. Error bars represent standard error of the mean.
between-subjects ANOVA with reaction time for each label type as the dependent variable and age as a covariate indicates that age is a marginally significant covariate for the facial icon/colour condition, $F_{1,36} = 3.78, P = .06$. There was no evidence that age was a significant covariate for any of the remaining label treatments with this group, all $F_{1,36} < 2.34$, all $P > .134$. For the minimally instructed group (right side of Figure 6), age was a marginally significant covariate for the no face/colour condition, $F_{1,39} = 4.02, P = .052$, the facial icon/no colour condition, $F_{1,39} = 3.85, P = .057$, and no evidence of difference for facial icon/colour condition, $F_{1,39} = 2.98, P = .092$. Only the no facial icon/no colour condition did not provide evidence of significance, $F_{1,39} = 1.15, P = .29$. In short, there is some marginal evidence for faster reaction times as a function of age, particularly in the minimally instructed condition.

4.4 Cross-experiment comparisons

Figure 3 suggests that the accuracy benefit due to colour and facial icons is greater for participants who received minimal training regarding the FOPs existence. To objectively investigate this possibility, we ran a mixed model ANOVA with the $2 \times 2$ within factors of colour and facial icons and the between factor of instruction level (uninstructed and minimally instructed). There was a significant effect of colour, $F_{1,77} = 33.16, P < .001$, and a significant colour by instruction interaction, $F_{1,77} = 11.30, P = .001$, with colour yielding a greater improvement with age for the minimally instructed group than the uninstructed group. In this more powerful analysis (that collapsed across conditions), there was also a significant main effect of facial icon, $F_{1,77} = 29.71, P < .001$, and facial icon by instruction interaction, $F_{1,77} = 4.79, P = .032$, with a greater effect of the facial icon in the minimally instructed condition. The facial-icon-by-colour interaction was also significant, $F_{1,77} = 21.10, P < .001$, with a greater influence of the facial icon when colour was absent. The three-way interaction between facial icon, colour, and instruction level yielded no evidence of significance, $F_{1,77} = 1.56, P = .22$.

5 CONCLUSIONS

To our knowledge, no other research team has utilized a serious gaming strategy to investigate the efficacy of label designs targeted for use with children. Our results suggest this to be a promising strategy for working with children, as we had only one out of 80 children fail to complete the task, which was composed of 80 trials. Given the age of the children (6-10 y olds), we believe this to be an outstanding retention rate and would encourage researchers and professionals in packaging and labelling to further explore gaming as a means of collecting meaningful data.

As obesity rates have climbed globally, there has been an emerging interest in using FOP labelling strategies to quickly and effectively communicate information to adults regarding nutrients that tend to be associated with disease states. Many designs of FOP have been trialed, with no global standard emerging. Among the FOP designs, most vehemently contested are those that overlay a qualitative assessment of colour (ie, the traffic light system).

Results demonstrated that colour coding and/or facial icons significantly benefit selection accuracy and speed, particularly for the youngest children. Minimal training further improved accuracy and speed of responses. FOPs that leverage visual indicators assist even young children in assessing the nutritional value of a product. This should be considered as FOPs are debated and standard practices regarding these labels emerge.

6 LIMITATIONS

The primary limitations of this study lie within subject pool characteristics and conditions of the experiment. Aside from the previously described qualifications for inclusion, more specific criteria such as reading level, prior academic exposure to nutrition information, colour blindness, socioeconomic status, parental education level, parent’s opinions in relation to children’s nutritional literacy, and availability of healthy foods were not considered. Since the primary objective of this study was to demonstrate the generalized effects FOP labels can have on healthy selection among children, these topics were not considered but could serve as a platform to continue further research on FOP labels and how healthy decisions are affected by variances among these characteristics.

In addition, the conditions of the experiment are different from what a child experiences. For example, three-dimensional packages on a store shelf may be seen much differently than the two-dimensional representations used in the Munchy video game. Colour characteristics, such as brightness, saturation, and contrast, as well as graphic designs can be very different in these settings.

Overall, our data suggest that taking a labelling approach that qualitatively overlays nutritional assessment (ie, a semidirective element) benefits the selection accuracy of children of all ages but is particularly helpful for the youngest age groups of children. The use of both
colours and facial icons led to higher levels of accuracy and response times. Additionally, minimal training (awareness of the FOPs existence and that it might contain nutrition information) further improved accuracy and rapidity of responses. This is an important finding as childhood has been shown to be a determinant phase in establishing long-lasting eating habits and rates of obesity in children and adolescents are on the rise.

HUMAN PARTICIPANTS APPROVALS

It was registered with MSU’s Social Science Behavioral/Education Institutional Review Board) number 13-678 as an expedited 2-7 category and using the same number, with clinicaltrials.gov.

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CONFLICT OF INTEREST

Laura Bix has had previous research work funded by Gerber, Kraft Foods, and Kellogg. None of these entities had any role or influence in any aspect of the work presented herein. Further, they did not review any aspect of the study, analysis, or manuscript.

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