United States
Consumer Product Safety Commission

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CPSC Staff Statement[1] on Kalsher & Associates, LLC's, "CPSC Warning Label Safety Symbol Research: Final Report"

The attached report, titled, "CPSC Warning Label Safety Symbol Research: Final Report," presents the findings of research conducted by Kalsher & Associates, LLC, under Contract 61320620P0038.

The objective of the research was to evaluate the comprehensibility of a set of 10 graphical safety symbols developed by the contractor. The symbols consisted of two symbol variants for each of five topics: (1) stay within arm's reach; (2) never add soft bedding (to a baby's sleep environment); (3) place baby on back to sleep; (4) magnet ingestion hazard; and (5) furniture tip-over hazard. The contractor developed the symbols based on the results of research performed on similar symbols in a previous contract for the U.S. Consumer Product Safety Commission (CPSC) and on feedback from CPSC staff.

Comprehension was evaluated with a sample of 80 participants over 18 years old, using the open comprehension test procedures described in ANSI Z535.3, *American National Standard Criteria for Safety Symbols* (2011; R2017). ANSI Z535.3 is the primary U.S. voluntary standard for guiding the design, evaluation, and use of safety symbols to identify and warn against specific hazards, and to provide information to avoid personal injury. In addition, a sub-group of 40 participants took part in focus group sessions to gain a better understanding of how participants understood the symbol, the symbol's strengths and weaknesses, and specific recommendations for improvement.

The test results showed that three of the 10 symbols related to the topics of never adding soft bedding, placing a baby on their back to sleep, and furniture tip-over, passed the ANSI Z535.3 comprehension criteria of at least 85 percent correct comprehension, as measured against the contractor's strict (fully correct) criterion, and less than 5 percent critical confusions. Critical confusions are responses that indicated the participant understood the symbol in a manner that was opposite its intended meaning, or the participant's interpretation could otherwise actively lead to potentially hazardous behavior. The contractor also recommended changes to each symbol that might improve comprehension, and participant feedback indicated that some of the seven symbols that failed to meet the ANSI Z535.3 comprehension criteria might pass with relatively minor changes. The three passing multipanel symbols are shown and summarized below.

[1] This statement was prepared by the CPSC staff, and the attached report was prepared by Kalsher & Associates, LLC, for CPSC staff. The statement and report have not been reviewed or approved by, and do not necessarily represent the views of, the Commission.

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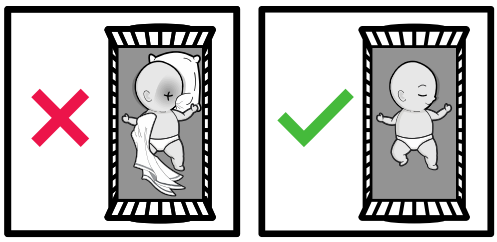
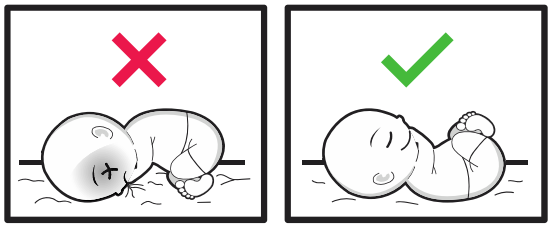
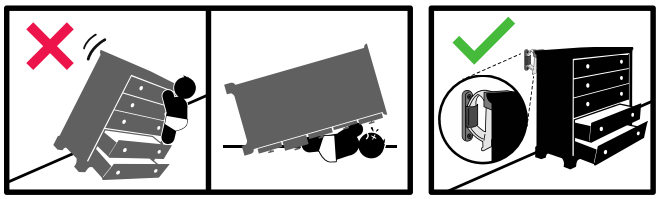
- *Never add soft bedding (to a baby's sleep environment), variant 2.* This symbol passed overall comprehension testing criteria when scored strictly (87.5%), with no critical confusions. This symbol incorporated features to communicate the consequence of having loose items in a crib with a baby, including a baby with "*X*'s" for eyes and shading on the baby's face that reinforced the intended suffocation hazard message. Suggestions for improvements include adding more toys and items that are unsafe for a baby's sleep environment, and showing the baby in the right-hand panel wearing more clothing, thereby obviating the need for a blanket.



- *Place baby on back to sleep, variant 1.* This symbol passed overall comprehension criteria when scored strictly (85.0%), with two critical confusions (2.5%). The use of the green check mark and red X, connoting what-to-do and what-*not*-to-do, respectively, were particularly helpful to participants. Suggestions for improvement include editing the lines on the fabric to communicate the suffocation hazard more clearly, depicting an adult placing the baby into the sleeping environment, and making sure the baby does not appear to be swaddled. An earlier variant of this symbol, tested in a prior contract, also passed overall comprehension criteria, and might be a better option because the baby is more realistic in appearance and does not appear to be swaddled.



- *Furniture tip-over hazard, variant 1*. This three-panel symbol passed comprehension testing when scored strictly (87.5%), with no critical confusions. The use of the green check mark and red X features were helpful, as were the lines depicting motion, indicating that the furniture was tipping over. Suggestions for improvement centered around being clearer about not permitting children to climb on the furniture, but also included a recommendation for the coloring of the dressers to be consistent. CPSC staff notes that this symbol shows a particular method of anchoring the dresser, so the effectiveness of the symbol might depend on the specific anchoring method chosen for a dresser, and how that is depicted in the symbol.



CPSC Warning Label Safety Symbol Research: Final Report

Order Number: 61320620P0038

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Executive Summary

This research formally evaluated the comprehensibility of a set of ten graphical safety symbols intended to communicate information pertaining to hazards that primarily affect young children. The five topics, or safety messages, were the following: (1) *Stay within arm's reach*; (2) *Never add soft bedding* (to a baby's sleep environment); (3) *Place baby on back to sleep*; (4) *Magnet ingestion hazard*; and (5) *Furniture tip-over hazard*. There were two symbol variants for each of the five hazard concepts. The symbols selected for this project were developed based on the results of research performed on symbols in a previous project supported by the CPSC. Revisions to the symbols were informed by the results of prior comprehension testing and focus group findings, and feedback from CPSC staff.

Participants were recruited via a snowball method, posters displayed at public venues, word of mouth, and through postings on social media. The final study sample of 80 participants consisted of 49 females and 30 males, and one participant who preferred not to answer. The mean age of participants was 42 years, ranging in age from 21 to 79 years. The racial profile of the sample was as follows: 62.5% Caucasian (*n* = 50), 15% Asian (*n* = 12), 7.5% African American (*n* = 6), 7.5% Hispanic/Latino (*n* = 6), 2.5% mixed race (*n* = 2), and 5% gave no response. The 2010 U.S. Census ethnicity breakdown reported the population as 72.4% Caucasian, 16.3% Hispanic/Latino, 12.6% African American, and 4.8% Asian. Participant occupations varied widely, falling into eighteen of the Bureau of Labor Statistics' occupation categories. The most common reported occupation categories were as follows: 17.5% worked in computer and mathematical occupations, 15% were educational instructors or held library occupations, 13.75% were retired, and 10.0% were unemployed. Education also varied widely among participants, ranging from completing some high school to completion of doctoral or other professional degrees. Nearly half of participants (47.5%) reported having children.

To evaluate symbol comprehension, all 80 participants completed a *Cognitive Interview* (an online survey). Four different symbol orderings were used to reduce the potential for carryover effects. Each symbol was accompanied by contextual information (a brief statement and a photograph) intended to communicate the types of products and the context in which the symbol might appear. For each symbol, participants were asked the following three open-ended questions: (1) "What do you think this symbol means?"; (2) "What should you do or not do in response to this symbol?"; and (3) "What could happen if you do not follow the symbol's message?". Additionally, 40 of these individuals took part in a focus group session following their completion of the online survey. The aim of these sessions was to facilitate discussion of each symbol in greater detail to gain a better understanding of how people understood the symbol, its positive and negative attributes, and specific recommendations for its improvement in terms of better communicating the symbol's intended message.

The online survey responses were scored independently by two trained raters using a grading rubric developed by the contractor in cooperation with the CPSC Contracting Officer's Representative. Raters used a binary scoring system (0 = incorrect; 1 = correct) to mark the three open-ended questions. Critical confusions were scored as a "1" if the responses indicated the participant understood the symbol in a manner that was opposite its intended meaning or if their interpretation could otherwise lead to potentially hazardous behavior. Otherwise, critical confusion was marked as a "0." After the

initial scoring, the raters met virtually to review instances of disagreement. The raters reviewed and discussed every scoring discrepancy until 100% consensus was reached.

The project team also developed a rubric for assigning an overall comprehension score for each participant for each symbol. The score was intended to reflect whether, overall, a participant understood a symbol's intended meaning, or not. The scores were assigned using both a lenient (i.e., partially correct) and a strict (i.e., fully correct) criterion. We then used this scoring to determine the number (and percentage) of participants who correctly understood each symbol according to both the strict and liberal criteria.

Overall, results of the testing showed that seven of the ten symbols failed to pass the ANSI Z535.3 comprehension criteria of at least 85% correct comprehension, as measured against the strict criterion, with fewer than 5% critical confusions. A summary of the comprehension testing results for each of the symbols, in terms of the overall comprehension scores and percentage of critical confusions, is presented in Table 4. Participant feedback indicated that some of the symbols that failed to meet the ANSI criteria might do so with some modifications. Three symbols passed the ANSI Z535.3 comprehension criteria, as follows:

- *Symbol 4. Never add soft bedding (to a baby's sleep environment), variant 2.* This symbol passed overall comprehension testing criteria when scored both leniently (98.3%) and strictly (87.5%), with no critical confusions. As compared to the other symbol intended to communicate the same concept (i.e., Symbol 3), this symbol incorporated features to communicate the consequence of having loose items in a crib with a baby. In particular, it depicted a baby with "*X*'s" for eyes and shading on the baby's face that reinforced the potential suffocation hazard message. Facial shading was mentioned by participants in ten of the sixteen focus group sessions.
- *Symbol 5. Place baby on back to sleep, variant 1. This* symbol passed overall comprehension criteria when scored both leniently (100.0%) and strictly (85.0%), with two critical confusions (2.5%). Focus groups participants noted that the use of the green check mark and red X (connoting *what-to-do* and *what-<u>not</u>-to-do*, respectively*)* were particularly helpful.
- *Symbol 9. Furniture tip-over hazard, variant 1*. This three-panel symbol passed comprehension testing when scored both leniently (95.0%) and strictly (87.5%), with no critical confusions. Focus group participants noted that the use of the green check mark and red X (connoting *what-to-do* and *what-<u>not</u>-to-do*, respectively*)* were helpful, as were the lines depicting motion, indicating that the furniture was tipping over.

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Background

Well-designed symbols (also termed "pictorials" or "pictograms") can help to communicate safety-related information. The ultimate purpose of graphical safety symbols in warnings is to promote safety-appropriate behavior (Wogalter et al., 2006). Safety symbols contribute to warning effectiveness by alerting people to hazards, conveying the consequences of contact with the hazards, and/or communicating hazard-avoidance information. Safety symbols have been shown to increase noticeability of warnings, by capturing and maintaining user's attention, and to facilitate comprehension of safety messages (e.g., Young & Wogalter, 1990; Laughery et al., 1993; Hammond et al., 2007). Safety symbols can promote greater and more rapid communication of safety messages over text-only warnings. They can also help to communicate safety-related information to persons with limited or no English literacy. This is critical given the diversity of the U.S. population and its workforce.

The primary aim of this research was to evaluate the comprehensibility of a set of ten safety symbols intended to communicate five different hazards that primarily affect young children (see Table 1). Since research indicates that different people often interpret symbols differently, the goal was to determine the extent to which each of the ten symbols communicates its intended message to a diverse group of people. The five topics, or safety messages, were the following: (1) *Stay within arm's reach*; (2) *Never add soft bedding* (to a baby's sleep environment); (3) *Place baby on back to sleep*; (4) *Magnet ingestion hazard*; and (5) *Furniture tip-over hazard*. There were two symbol variants for each of the five hazard concepts. The symbols selected for this project were developed based on the results of research performed on symbols in a previous project supported by the CPSC.[1] Revisions to the symbols were informed by prior comprehension testing, focus group findings and feedback from CPSC staff.

Table 1. Final set of graphical symbols.
1. Stay within arm's reach (of baby) – Variant 1
2. Stay within arm's reach (of baby) – Variant 2
3. Never add soft bedding or padding to (baby's) sleep environment (e.g., a crib) (a suffocation hazard) – Variant 1
4. Never add soft bedding or padding to (baby's) sleep environment (e.g., a crib) (a suffocation hazard) – Variant 2
5. Place baby on back to sleep (a suffocation hazard) – Variant 1
6. Place baby on back to sleep (a suffocation hazard) – Variant 2
7. Magnet ingestion hazard (swallowed small magnets, typically, but not exclusively ball-shaped, can attract to one another in the intestines, causing internal injuries, as opposed to a choking hazard) – Variant 1
8. Magnet ingestion hazard (swallowed small magnets, typically, but not exclusively ball-shaped, can attract to one another in the intestines, causing internal injuries, as opposed to a choking hazard) – Variant 2
9. Furniture tip-over (can crush or kill, especially young children) – Variant 1
10. Furniture tip-over (can crush or kill, especially young children) – Variant 2

[1] Contractor report "CPSC Gather Consumer Feedback: Final Report," conducted by Kalsher & Associates, LLC, under Contract HHSP233201860070A can be found at: https://www.cpsc.gov/s3fs-public/CPSC%20Gather%20Consumer%20Feedback%20-%20Final%20Report%20with%20CPSC%20Staff%20Statement%20-%20REDACTED%20and%20CLEARED.pdf?GTPK5CxkCRmftdywdDGXJyVIVq.GU2Tx

Method

Participants

Prospective participants were recruited for this research using a snowball method, posters displayed at public venues (e.g., public libraries, a fitness club, a public golf course), word of mouth, and through posting on social media. A screener survey with demographic information was used to aid in inviting as diverse a participation pool as possible. As an incentive, participants were offered $45 for completing a *Cognitive Interview* (a survey) and $45 for participating in a focus group, for a possible total of $90. The method for each of these research components is described below. All of the study's procedures and materials were reviewed and approved by a university institutional review board (IRB). Due to IRB restrictions brought about by the COVID pandemic, all data collection was carried out online.

A total of 80 non-student participants completed an online survey (described in greater detail below). There were 30 males, 49 females, and one participant who responded that they preferred not to say. The mean age of participants was 42 years, ranging in age from 21 to 79 years.

A sub-group of 40 participants who had completed an online survey took part in one of 16 online focus group sessions that occurred immediately following survey sessions, between May and August 2021. Focus groups took place over Zoom or WebEx and contained between one (in the event of no-shows) and five participants. The size of the focus groups was intentionally more limited than would typically be done for in-person testing to ensure the conversation was able to flow smoothly in a virtual setting.

Participant race was 62.5% Caucasian (*n* = 50), 15.0% Asian (*n* = 12), 7.5% African American (*n* = 6), 7.5% Hispanic/Latino (*n* = 6), 2.5% mixed race (*n* = 2), and 5.0% gave no response. Given its relatively modest size, the ethnic composition of the study sample is relatively consistent with the 2010 U.S. Census ethnicity breakdown, which reported the population as 72.4% white, 16.3% Hispanic/Latino, 12.6% African American, and 4.8% Asian.

The open-ended responses for participant occupations were categorized according to the 2018 Standard Occupational Classification (SOC) system, a federal standard used to classify workers into 23 occupational groups for collecting and analyzing data. Additional categories were used in the present analyses for individuals who reported being retired, a homemaker, or unemployed. Participant occupations varied widely, falling into 18 of the Bureau of Labor Statistics' occupation categories (refer to Table 2). The most common reported occupation categories were as follows: 17.5% worked in computer and mathematical occupations, 15.0% were educational instructors or held library occupations, 13.8% were retired, 10.0% were unemployed, 8.8% were in management occupations, and 6.3% were employed in the Architecture and Engineering and Business and Financial Operations categories, respectively.

Education also varied widely among participants, ranging from completing some high school to completion of doctoral or other professional degrees. Reported education is displayed in Table 3.

Nearly half of participants (47.5%) reported having children; the remaining participants (52.5%) reported not having children. Overall, the demographic breakdowns reveal that the participant sample

for the present research included a range of life experiences. The testing for effects of demographics on symbol comprehension is presented in the Results section.

Table 2. Reported participant occupations as Standard Occupational Classification (SOC) Categories.

Occupation	Percent	Frequency
Computer and Mathematical Occupations	17.5%	n=14
Educational Instruction and Library Occupations	15.0%	n=12
Retired	13.8%	n=11
Unemployed	10.0%	n=8
Management Occupations	8.8%	n=7
Architecture and Engineering Occupations	6.3%	n=6
Business and Financial Operations Occupations	6.3%	n=5
Healthcare Practitioners and Technical Occupations	5.0%	n=4
Legal Occupations	2.5%	n=2
Sales and Related Occupations	2.5%	n=2
Homemaker	2.5%	n=2
Community and Social Service Occupations	1.3%	n=1
Arts, Design, Entertainment, Sports, and Media Occupations	1.3%	n=1
Personal Care and Service Occupations	1.3%	n=1
Office and Administrative Support Occupations	1.3%	n=1
Construction and Extraction Occupations	1.3%	n=1
Installation, Maintenance, and Repair Occupations	1.3%	n=1
Transportation and Material Moving Occupations	1.3%	n=1

Table 3. Reported participant education level.

Education Level	Percent	Frequency
Some high school	1.3%	n=1
High school	10.0%	n=8
Some college	8.8%	n=7
2-year college degree	2.5%	n=2
4-year college degree	50.0%	n=40
Master's degree	21.3%	n=17
Doctoral degree or professional degree	5.0%	n=4

Comprehension Testing

Symbol comprehension was assessed using an online survey format (see Appendix A). The survey was modeled after the open comprehension procedures described in ANSI Z535.3 (2011; R2017).

The first page of the survey (the title page) provided space for participants to type their name and date of the session. Four different survey versions, varying in symbol orderings, were created in SurveyMonkey to reduce the likelihood of carryover effects (see Appendix B). The version link sent to

each participant was carefully tracked in a spreadsheet to ensure even distribution. As with testing with a paper survey, participants had the ability to go back to prior pages in the online survey if they wished, though no participants mentioned doing so.

The second page contained a sample (non-tested) symbol that served as a vehicle for instructing participants as to what constituted "good" versus "inadequate" answers (described more fully below). Subsequent pages of the survey contained the ten to-be-tested graphical symbols, each accompanied by contextual information consisting of a brief statement and a photograph, intended to communicate the types of products on which the symbol might appear. Finally, the last page of the survey requested the following demographic information: age, biological sex, highest level of education attained, marital status, whether they had children, race, and current occupation.

After receiving oral instructions from a member of the research team and reading and signing an informed consent form (see Appendix C), participants began the survey questions. The instructions included a review of a sample graphical safety symbol not being tested (i.e., a hand being crushed by gears) presented on page two of the survey. The sample symbol was accompanied by examples of both "good" and "inadequate" answers to the three open-ended questions below, as specified in ANSI Z535.3 (2011; R2017). The purpose of this part of the instruction was to establish a shared mental model among the respondents regarding what constituted a complete answer.

The remaining pages of the survey presented the ten test symbols, their respective supporting contextual information, and space to answer the following three questions:

(1) "What do you think this symbol means?"

(2) "What should you do or not do in response to this symbol?"

(3) "What could happen if you do not follow the symbol's message?"

After completing the survey, participants who did not also participate in a subsequent focus group (see below) were sent the $45 gift card incentive via email and thanked for their participation. Participants typically completed the survey in about 30 minutes.

Focus Groups

Forty of the 80 participants who completed a survey also participated in one of the 16 focus group sessions. As noted previously, the focus groups were held in the period between May and August 2021 (see Appendix D for more detail). After participants had completed the online survey and read and signed an informed consent form for the focus group (see Appendix E), a member of the research team guided and moderated group discussion while screen sharing images of the symbols on Zoom or WebEx to gain a better understanding of how the participants understood each symbol, the positive and negative attributes of each one, and specific recommendations for improving each symbol's ability to correctly communicate its intended message. On average, the focus group discussions lasted about 30-45 minutes in duration. Audio was recorded and transcribed for each of the focus group sessions.

Participants' suggestions from the focus group discussions for improving each of the ten symbols are summarized in the Results section. Although none of the participants had specific expertise

in the areas of warnings and risk communication, their suggestions provided valuable insight into how they understood the symbols.

Cognitive Interview Scoring Procedure

Open ended responses and critical confusions. Two raters independently scored the survey responses for each of the three open-ended comprehension questions and identified critical confusions based on these responses. For the three open-ended questions, raters used a binary scoring system in which correct responses were marked as "1" and incorrect responses as "0" according to a scoring rubric developed by the contractor in cooperation with CPSC staff (refer to Appendix F). Critical confusions were scored as a "1" if the open-ended responses to the three questions overall indicated the participant understood the symbol in a manner that was opposite its intended meaning or if their interpretation could otherwise lead to potentially hazardous behavior. Otherwise, critical confusion was marked as a "0."

After the initial scoring, the two raters met virtually to review any discrepancies. For each question, the raters reviewed and discussed every scoring discrepancy until 100% consensus was reached.

Overall correct interpretations (pass score). The project team developed a rubric for assigning an overall correct interpretation score (passing score) for each participant's responses to each symbol. This overall comprehension score was derived using both a lenient (i.e., partially correct) and a strict (i.e., fully correct) criterion. Thus, for each symbol, participants' answers were scored as either fully correct, partially correct, or incorrect. This distinction enabled us to tabulate the frequency (and percentage) of participants who correctly understood each symbol according to both the strict and lenient criteria, as well as the frequency (and percentage) of participants who did not.

The criteria for a partially correct or fully correct response were developed individually for each symbol. An overall correct score did not necessarily correspond to the correctness of the individual open-ended questions, which were scored strictly based on the rubric, but critical confusions were automatically scored as overall incorrect. The specific criteria used to ascribe an incorrect, partially correct, or fully correct score are presented in the Results section for each symbol, respectively.

Results

Responses from the comprehension testing surveys were scored for three items: (1) correctness for each of the three open-ended response elements described previously, based on a scoring rubric; (2) a determination of critical confusions based on those responses; and (3) overall correct interpretation (hereafter *pass score*), where responses were scored as "2" (correct according to a "strict" or fully correct criterion), "1" (correct according to a "lenient" or partially correct criterion, or "0" (incorrect). Content analysis of the focus group transcripts provided additional detailed information regarding participants' reasoning for their responses in the comprehension testing survey.

Testing for Carryover Effects

As noted previously, four different symbol orderings were employed (i.e., Survey versions 1, 2, 3, 4) to counteract the potential for carryover effects. The orderings were arranged such that pairs of symbols intended to communicate the same message were separated from each other by at least two different-message symbols, and the order in which participants saw each pair was counterbalanced across the survey versions. Analyses were performed to determine whether there were significant differences in overall comprehension of the symbols as a function of ordering. Due to violations of parametric statistical assumptions, non-parametric statistical tests were utilized as appropriate.

The Kruskal-Wallis test was used to test for order effects. Symbol ordering, which was tracked using the four different booklet numbers, was the between-subjects grouping variable and the pass score was the dependent variable. There was a significant effect of symbol ordering only for Symbol 10 (intended to communicate furniture tip-over, Variant 2), $H(3) = 10.9$, $p < 0.05$. Follow-up tests revealed significant differences between test booklet 2 ($M = 1.3$, *S.D.* = 0.6) and the other three test booklets, all with p's < .05. The means and standard deviations for the other three test booklets were as follows: test booklet 1 ($M = 1.8$, *S.D.* = 0.4); test booklet 2 ($M = 1.7$, *S.D.* = 0.5); and test booklet 3 ($M = 1.7$, *S.D.* = 0.5). All other pairwise comparisons were non-significant (p's > 0.05). The Kruskal-Wallis tests performed for each of the other nine symbols were all non-significant (p's > 0.05).

Overall, the disproportionately large number of non-significant results indicates that carryover effects did not differentially impact overall comprehension scores.

Testing for Demographic Effects

Additional analyses were performed to examine whether overall comprehension for each of the ten symbols differed as a function of demographic characteristics (i.e., age, sex, education, race, marital status, and whether participants had children). Non-parametric statistical tests were utilized as appropriate in these analyses.

Age. Participants' age was significantly correlated to pass score for only three of the ten symbols: Symbol 4 (never add soft bedding to sleeping environment, Variant 2), $r = -0.3$, $p < 0.05$, Symbol 6 (place baby on back, Variant 2), $r = -0.2$, $p < 0.05$, and Symbol 9 (furniture tip-over, Variant 1), $r = -0.3$, $p < 0.05$. These results indicate that pass score, at least for these three symbols, was inversely related to age. The correlations between age and pass score for the other seven symbols were non-significant (p's > 0.05).

Sex. A series of Mann Whitney U tests, in which biological sex was the grouping variable and pass score was the dependent variable, were all non-significant (p's > 0.05), indicating that men and women did not differ significantly in terms of their overall comprehension of the ten graphical symbols.

Parenthood. A series of Mann Whitney U tests, in which whether participants had children (yes or no) was the grouping variable and pass score was the dependent variable, revealed significant relationships for two symbols. However, no significant relationships were found for the other eight symbols (p's > 0.05).

The Mann Whitney U test for Symbol 7 (magnetic ingestion hazard, Variant 1) was significant, U =577.5, $p < 0.05$, r = - 0.2. Participants who reported having no children (M = 1.5, *S.D.* = 0.5) had significantly higher pass scores than participants who reported having children (M = 1.3, *S.D.* = 0.5).

The Mann Whitney U test for Symbol 9 (furniture tip-over, Variant 1) was significant, U = 627.0, $p < 0.05$, r = - 0.2. Participants who reported having no children (M = 1.9, *S.D.* = 0.3) had significantly higher pass scores than participants who reported having children (M = 1.7, *S.D.* = 0.6).

Education. The relationship of level of education to overall comprehension score was assessed. Due to the small sample sizes in some of the original education categories (i.e., some high school, high school degree, some college, 2-year college degree, 4-year college degree, master's degree, doctoral or professional degree, other degree), for the purposes of this analysis we collapsed these into the following three categories: (1) some high school/high school/some college; (2) 2-year/4-year college degree; and (3) advanced degree. Kruskal-Wallis tests were then performed to determine whether level of education was significantly related to overall comprehension for each of the ten symbols. Level of education was the between-subjects grouping variable and pass score was the dependent variable. There was a significant relationship for four of the ten symbols.

The Kruskal-Wallis test for Symbol 7 (magnetic ingestion hazard, Variant 1) was significant, $H(2)$ = 10.7, $p < 0.05$. Follow-up pairwise comparisons showed significant differences between the lowest (M = 1.1, *S.D.* = 0.2) and intermediate levels of education (M = 1.5, *S.D.* = 0.6), and between the lowest and highest education levels (M = 1.5, *S.D.* = 0.5), p's < 0.05. The difference between the intermediate and highest education levels was not significant ($p > 0.05$).

The Kruskal-Wallis test for Symbol 8 (magnetic ingestion hazard, Variant 2) was significant, $H(2)$ = 11.5, $p < 0.05$. Follow-up pairwise comparisons showed a significant difference between the lowest (M = 1.0, *S.D.* = 0.4) and intermediate levels of education (M = 1.5, *S.D.* = 0.5). No other comparisons were significant (p's > 0.05).

The Kruskal-Wallis test for Symbol 9 (furniture tip-over, Variant 1) was significant, $H(2)$ = 18.6, p < 0.05. Follow-up pairwise comparisons showed significant differences between the lowest (M = 1.4, *S.D.* = 0.9) and intermediate levels of education (M = 2.0, *S.D.* = 0.2), and between the lowest and highest (M = 1.9, *S.D.* = 0.2) education levels (p's < 0.05). No other pairwise comparisons were significant (p's > 0.05).

The Kruskal-Wallis test for Symbol 10 (furniture tip-over, Variant 2) was significant, $H(2)$ = 7.6, p < 0.05. Follow-up pairwise comparisons showed significant differences between the lowest (M = 1.3, *S.D.* = 0.6) and intermediate levels of education (M = 1.7, *S.D.* = 0.5), and between the lowest and

highest levels of education (M = 1.8, *S.D.* = 0.4), p's < 0.05. No other pairwise comparisons were significant (p's > 0.05).

Marital status. A series of Kruskal-Wallis tests were carried out to determine whether marital status was significantly related to overall comprehension. Participants' marital status (i.e., single, divorced, married) was the between-subjects grouping variable and pass score was the dependent variable. The results revealed a significant relationship for only one of the ten symbols.

The Kruskal-Wallis test for Symbol 6 (place baby on back, Variant 2) was significant, $H(2) = 15.8$, $p < 0.05$. Follow-up pairwise comparisons showed a significant difference between married (M = 1.5, *S.D.* = 0.7) and divorced (M = 2.0, *S.D*. = 0.0) participants, and between married and single (M = 1.9, *S.D.* = 0.3) participants. The difference between the divorced and single participants was not significant (p > 0.05).

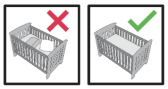
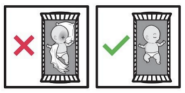
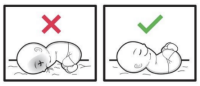
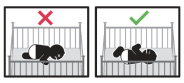
Race. Race was also evaluated for significant relation to overall comprehension score. Although the demographic section of the test booklets offered eight racial options (i.e., American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, Hispanic or Latino, White, Mixed Race, prefer not to answer), all of the 80 study participants fit into four categories: Asian, White, Underrepresented Minority (Black or African American/Hispanic or Latino), or Ambiguous (Mixed Race/prefer not to answer). Kruskal-Wallis tests were then performed on each of the ten symbols, where racial category was the between-subjects grouping variable and pass score was the dependent variable. No statistically significant relationships were found (all p's > 0.05), indicating that all races demonstrated similar levels of overall comprehension of the ten graphical symbols.

Comprehension Testing Overview

As noted previously, the project team developed a rubric for assigning an overall correct interpretation score for each participant's responses to each symbol. This score was derived using both a lenient (i.e., partially correct) and a strict (i.e., fully correct) criterion. This distinction enabled us to tabulate the frequency, and percentage, of participants who correctly understood each symbol according to both the strict and lenient criteria, as well as the frequency (and percentage) of participants who did not. We also determined the percentage of responses that constituted critical confusions. These percentages are displayed in Table 4.

For grading the individual questions, the scorers took a lenient approach to correctness (e.g., a correct answer to what action should be taken for a "stay within an arm's length from the baby" symbol could say "stay close to the baby"), and overall correct interpretation considered all three responses and whether strict or lenient criteria were met overall. The criteria for "passing," as defined by ANSI Z535.3 (2016) is at least 85% correct interpretations, with fewer than 5% critical confusions. We used the strict criteria to determine whether each symbol achieved a passing score. More detailed information concerning analyses of the comprehension testing surveys and focus groups is provided separately for each symbol in the sections that follow.

Table 4. Overall comprehension testing results organized by correct responses according to both the strict (fully correct) and lenient (at least partially correct) criteria *(% Correct*) and critical confusions *(% Critical Cs*) as a percentage of total responses for each of the ten graphical symbols.

Symbol	1 	2 	3 	4 	5 
% Correct					
Strict	62.5	68.8	62.5	87.5	85.0
Lenient	96.3	97.5	98.8	98.8	100
% Critical Cs	3.8	2.5	0.0	0.0	2.5
Symbol	6 	7 	8 	9 	10 
% Correct					
Strict	76.3	40.0	38.8	87.5	62.5
Lenient	96.3	98.8	97.5	95.0	98.8
% Critical Cs	7.5	2.5	0.0	0.0	0.0

Symbol 1: Stay Within Arm's Reach (Variant 1)

Cognitive Interview Survey Elements

Table 5a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	96.3% (77)	Stay within arm's reach
What should you do or not do in response to this symbol?	96.3% (77)	Stay within arm's reach (Implied but not essential: do not walk away from changing table).
What could happen if you do not follow the symbol's message?	93.8% (75)	Baby may fall and user would be too far to safely catch the baby.

Overall Comprehension

Table 5b. Count and percent of correct and incorrect responses for Symbol 1.		
	Count (n)	**Percent**
Overall Correct	77	96.3%
Strict Criteria	50	62.3%
Lenient Criteria	77	96.3%
Overall Incorrect	3	3.8%
Critical Confusions	3	
As a % of total responses		3.8%
Total	80	100%
Fully correct response: - Must mention staying within arm's reach of the baby, or something specifically related like keeping contact or touching the baby. *Partially correct response (only mentions one or more of the following):* - Referring to "staying close" to the infant or similarly vague wording.		

Table 5c. Critical Confusion Statements and frequency of occurrence for Symbol 1.	
Critical Confusion Statement	**Frequency**
"Tipping" issue	*n* = 1
Thought the danger was the child would walk away	*n* = 1
Thought the item was a swing	*n* = 1

For Symbol 1, responses were marked as correct if they specifically demonstrated an understanding of staying within arm's reach, or similarly, staying in contact or touching the baby at all times. With lenient scoring criteria, 96.3% of participants correctly understood the meaning of the symbol, whereas the strict scoring criteria showed 62.3% correct comprehension. This discrepancy between strict and lenient scoring is because the strict criteria required participants to be specific about the safe distance from the infant, such as "arm's length" as intended or something similar. There were also three critical confusions (3.8%) for Symbol 1, which all indicated that those participants did not understand the nature or severity of the hazard (see Table 5c for specific responses).

Focus Groups. Overall, participants tended to express a good understanding of the meaning of this symbol regarding staying close to an infant while using the changing table. In particular, participants responded that the red X and green check were helpful, as were the contrasting red dotted line and green circle. However, there was some criticism that the consequence was not shown, such as by depicting a baby falling off the table when the adult is too far away.

Table 5d. Focus group suggestions for Symbol 1.	
Suggestion	**Example Quotes**
Show a consequence (e.g., child falling off)	"I don't see any consequences indicated. I know from personal experience and life experience what the consequences are but I don't see anything in these that show consequence." —*Participant in Focus Group 6* "On the right side, if the adult hand was touching the child hand, and then on the left, if the child was shown falling or getting hurt, I think that would clarify here what they're trying to communicate." —*Participant in Focus Group 11* "So it was difficult to know if they were recommending you should just be close or be able to touch your infant at all times. And that it's bad to be far. But they don't show the baby falling or getting hurt. And I thought this one in particular was interesting, this and the other one with the changing table, because compared to the symbols that showed the baby, like, suffocating or getting crushed or something like that, there was no change in the infant's posture here. So I thought that the result of it was not clear. But they were just saying that you shouldn't be far but not necessarily why." —*Participant in Focus Group 11*
Show the adult touching the child	"The adult character is not touching the baby which kind of bothered me. I looked at that, I noticed it. But it's close enough. I mean, you know, it sends its message that this is better than being far away." —*Participant in Focus Group 16*

Symbol 1 Summary

Overall, this symbol passed comprehension criteria only when scored leniently (96.3%) but not with the strict criteria requiring specificity of distance (62.3%). There were only three critical confusions (3.8%) which is within the ANSI Z535.3 acceptable limit. Comprehension of this symbol would likely improve if it displayed the consequence of a child falling off the product when the adult is too far away (i.e., farther than arm's distance).

Symbol 2: Stay Within Arm's Reach (Variant 2)

Cognitive Interview Survey Elements

Table 6a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	97.5% (78)	Stay within arm's reach
What should you do or not do in response to this symbol?	97.5% (78)	Stay within arm's reach (Implied but not essential: do not walk away from changing table).
What could happen if you do not follow the symbol's message?	93.8% (75)	Baby may fall and user would be too far to safely catch the baby.

Overall Comprehension

Table 6b. Count and percent of correct and incorrect responses for Symbol 2.		
	Count (n)	**Percent**
Overall Correct	78	97.5%
Strict Criteria	55	68.8%
Lenient Criteria	78	97.5%
Overall Incorrect	2	2.5%
Critical Confusions	2	
As a % of total responses		2.5%
Total	80	100%

Fully correct response:

- Must mention staying within arm's reach of the baby, or something specifically related like keeping contact or touching the baby.

Partially correct response (only mentions one or more of the following):

- Referring to "staying close" to the infant or similarly vague wording.

Table 6c. Critical Confusion Statements and frequency of occurrence for Symbol 2.	
Critical Confusion Statement	**Frequency**
Stay two arms' lengths away	*n* = 1
Thought the danger was that the child would leave the room	*n* = 1

For Symbol 2, there was a similar discrepancy to Symbol 1 between lenient (97.5%) and strict (68.8%) scoring. As with Symbol 1, Symbol 2 showed passing comprehension only when scored leniently, though there were only two critical confusions compared to the three critical confusions for Symbol 1. One critical confusion was related to a participant indicating the correct distance was two arm's lengths rather than one, and the other represented a misunderstanding of the severity of the hazard (see table 6c).

Focus Groups. Participants tended to find that Symbol 2 clearly communicated information about the length of the adult's arm being the measure of a safe distance from the baby. In particular, the dotted lines next to the adult figure's arms for the positive and negative examples were helpful.

However, the differing angles between the positive and negative images were potentially confusing. Focus Groups 1 and 16 talked about misunderstanding that the symbol was communicating safe angles rather than distance. Focus Group 11 also discussed how it seemed like the different placements of the adult figures' hands might mean that the symbol was communicating that the safe place to hold a baby is by the back or neck. Overall, these groups all agreed on the correct interpretation but expressed that at first, they had been confused.

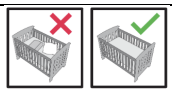
Table 6d. Focus group suggestions for Symbol 2.	
Suggestion	**Example Quotes**
Show a consequence (e.g., child falling off)	"And then as (participant name) mentioned, [I would like to see] a picture of the baby falling and showing the consequences of that person, of the adult, being farther or closer. That would be the main improvement. Although I know that would require an extra sort of set of graphics." *—Participant in Focus Group 11*
Reduce safe distance communicated to less than an arm's length	"The arm is not even touching the baby on the right hand side. But it does look safer, it's just [...] an adult's arm is how long? As long as the baby? That's enough time for a baby to wiggle and fall off. So for safety's sake, I would say keep your arm on the baby. Not arm's length." *—Participant in Focus Group 16*
Show the child lying down rather than sitting	"If I'm changing my child, the child has no business relaxing, or playing, or sitting on the changing table. If the purpose of the changing table is for changing the child, then the child should have— It's not a picture of a child laying, meaning, this is the only reason why I brought this child here just to change." *–Participant in Focus Group 12*
Use consistent angles with the adult's arm	"I thought there was maybe an angle you're supposed to help the child on the changing table at first, but then I realized, no, no angle, it's just a distance thing again." *—Participant in Focus Group 1*

Symbol 2 Summary

As with Symbol 1, Symbol 2 passed comprehension testing criteria only when scored leniently (97.5%) but not strictly (68.8%), though these percentages and the number of just two critical confusions were an improvement over Symbol 1. Opportunities for improving this symbol again include showing the consequence of a child falling off when the adult is too far away.

Symbol 3: Never Add Soft Bedding (Variant 1)

Cognitive Interview Survey Elements

Table 7a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	97.5% (78)	Do not put soft materials, such as blankets or pillows, in a baby's sleep environment. They may suffocate the baby.
What should you do or not do in response to this symbol?	97.5% (78)	Do not put blankets, pillow or other soft materials into a baby's sleep environment.
What could happen if you do not follow the symbol's message?	60.0% (48)	Child may suffocate and die.

Overall Comprehension

Table 7b. Count and percent of correct and incorrect responses for Symbol 3.		
	Count (n)	**Percent**
Overall Correct	79	98.8%
Strict Criteria	50	62.5%
Lenient Criteria	79	98.8%
Overall Incorrect	1	1.3%
Critical Confusions	0	
As a % of total responses		0.0%
Total	80	100%
Fully correct response: - Refers to removing blankets and pillows, loose objects, and/or soft objects from the crib to prevent a baby from suffocating and/or dying. *Partially correct response (only mentions one or more of the following):* - Vague consequence.		

Symbol 3 passed comprehension testing when scored with the lenient criteria (98.8%) that allowed for responses with vague consequences. The strict scoring criteria resulted in a non-passing comprehension score (62.5%), requiring participants to express the potential consequence of baby

suffocation or death and thus demonstrate an understanding of the specific hazard and consequence. There were no critical confusions for this symbol.

Focus Groups. Many participants thought that the consequence was unclear in this symbol, consistent with the findings from the strict scoring criteria. Most focus groups discussed how this symbol does not show a child or directly communicate the consequence of not following the symbol's instruction. At least three focus groups (1, 9, and 10) talked directly about how they drew conclusions about this symbol's intended message based on seeing Symbol 4 first in the survey. One participant in Focus Group 3 also talked about the meaning of this symbol being "don't use a crib for storage," an interpretation which might not lead to a person taking appropriate safety measures to avoid a child's potential suffocation.

Table 7c. Focus group suggestions for Symbol 3.

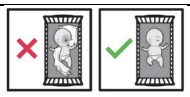
Suggestion	Example Quotes
Depict a child in the symbol	"I think in the survey, there was one with a child and without the child. So that probably helps me to understand that you do not do it with the child in the bed. Otherwise, what difference does it make, an empty bed, a bed with a pillow and a blanket?" *—Participant in Focus Group 1* "I know from context and from being around children before that that's why you're not supposed to have them at the crib. But from this image alone, it's just kind of vague as to why I shouldn't have it, like, there's no clear consequences as to why I shouldn't have pillows and blankets, because, culturally speaking, it's normal to put those things in beds or cribs. So, this image doesn't tell me why I shouldn't use them." *—Participant in Focus Group 8* "To kind of tie the whole thing together. It's kind of like the baby's the most important part, yet we don't see a happy baby on the right side image." *—Participant in Focus Group 15*
Be clearer about whether toys or other items are allowed	- "The only thing I could think about is like, they just put a pillow and a blanket. [I want it to] be very direct and read it and be like, don't put a pillow or a blanket, but everything else, toys, whatever, like I'm not 100% sure those are fair game." - "Yeah, I wondered the same thing about toys." *—Discussion in Focus Group 9*
Use a positive and negative example format (e.g., with a green check mark and red X)	- "I think having just the objects on its own, I think having a visual representation of what will happen to the child if you put in like a blanket and a pillow with it would be helpful." - "True. Yeah. I think showing just even an 'X' through it, showing 'don't have the baby in there with it.'" *—Discussion in Focus Group 4*

Symbol 3 Summary

Overall, Symbol 3 had no critical confusions and passed comprehension testing with the lenient criteria only (98.8%) but not the strict criteria (62.5%) which required that participants reference the possible consequences of suffocation or death. Focus group discussions confirmed that this image did not communicate much information about the hazard itself or what could happen if the message is not followed.

Symbol 4: Never Add Soft Bedding (Variant 2)

Cognitive Interview Survey Elements

Table 8a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	96.3% (77)	Do not put soft materials, such as blankets or pillows, in a baby's sleep environment. They may suffocate the baby.
What should you do or not do in response to this symbol?	97.5% (78)	Do not put blankets, pillow or other soft materials into a baby's sleep environment.
What could happen if you do not follow the symbol's message?	91.3% (73)	Child may suffocate and die.

Overall Comprehension

Table 8b. Count and percent of correct and incorrect responses for Symbol 4.		
	Count (n)	**Percent**
Overall Correct	79	98.3%
Strict Criteria	70	87.5%
Lenient Criteria	79	98.3%
Overall Incorrect	1	1.3%
Critical Confusions	0	
As a % of total responses		0.0%
Total	80	100%
Fully correct response: - Refers to removing blankets and pillows, loose objects, and/or soft objects from the crib to prevent a baby from suffocating and/or dying. *Partially correct response (only mentions one or more of the following):* - Vague consequence.		

Symbol 4 passed comprehension testing criteria when scored both leniently (98.3%) and strictly (87.5%), with no critical confusions. Compared to Symbol 3, this symbol more clearly demonstrated the consequence of having loose items in a crib with a baby, resulting in higher comprehension scores.

Focus Groups. Participants tended to think this symbol's intended message about the hazard and consequence were clear, particularly because the image of the baby explained the danger of suffocation. Specifically, the symbol showed a baby with "*X*'s" for eyes in the negative image compared with a happily sleeping baby in the image with pillows and blankets removed from the crib, which participants said was clear. Some participants also noticed the shading on the baby's face that reinforced the suffocation message. However, even with the baby depicted in the symbol, some participants still deduced a vague consequence from the symbol. Focus Group 5 also discussed how the image of the baby seemed to depict it sleeping, not necessarily in danger.

All of the focus groups correctly understood the instruction in Symbol 4 to remove pillows and blankets from the crib, but there is some ambiguity about other items like toys. Focus Group 12 also talked about an additional action of dressing the child warmly so a blanket is not needed, suggesting that the baby should be depicted wearing more clothing.

Table 8c. Focus group suggestions for Symbol 4.

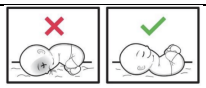
Suggestion	Example Quotes
Be clearer about whether toys or other items are allowed	"In the first frame with the 'X', it could have a toy or something else that you might actually put in a crib other than a pillow or blanket. Because I feel like toys are something I've seen in cribs and I think that's the one other thing I can think of that would logically be in there that maybe I didn't know shouldn't or something." —*Participant in Focus Group 9* "And I do think that if a little stuffed animal icon were included, too, I honestly think that's probably more common than a pillow or blanket in a crib and parents are less likely to recognize the risk of SIDS with a stuffed animal because children always have them." —*Participant in Focus Group 11*
Depict the child wearing more clothing	"A lot of people would just say maybe the reason why they are covering with blankets is because the child will be cold." —*Participant in Focus Group 12*

Symbol 4 Summary

This symbol was easy to understand, resulting in passing comprehension scores for both lenient (98.3%) and strict scoring (87.5%) and no critical confusions. Survey responses and focus group discussions reveal that Symbol 4 tested better than Symbol 3 by showing the baby in the symbol and better communicating the associated hazard of soft bedding. There could be further improvements made by more clearly showing examples of other toys and items that are unsafe for a baby's sleeping environment.

Symbol 5: Place Baby On Back To Sleep (Variant 1)

Cognitive Interview Survey Elements

Table 9a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	Lay baby on his/her back, not his/her stomach to sleep to avoid suffocation.
What do you think this symbol means?	96.5% (76)	Place baby on his/her/their back in a sleeping environment
What should you do or not do in response to this symbol?	100.0% (80)	Child may suffocate and die.
What could happen if you do not follow the symbol's message?	91.3% (73)	Child may suffocate and die.

Overall Comprehension

Table 9b. Count and percent of correct and incorrect responses for Symbol 5.		
	Count (n)	**Percent**
Overall Correct	80	100.0%
Strict Criteria	68	85.0%
Lenient Criteria	80	100.0%
Overall Incorrect	2	2.5%
Critical Confusions	2	
As a % of total responses		2.5%
Total	80	100%
Fully correct response: - Refers to placing a baby on its back to prevent suffocation. *Partially correct response (only mentions one or more of the following):* - Vague consequence.		

Table 9c. Critical Confusion Statements and frequency of occurrence for Symbol 5.	
Critical Confusion Statement	**Frequency**
Thought the symbol referred to only swaddled infants.	*n* = 2

For Symbol 5, both lenient (100.0%) and strict (85.0%) scoring criteria resulted in passing comprehension scores. The strict criteria required the participant identifying a specific consequence of suffocation or death. There were two critical confusions (2.5%) for Symbol 5, both because these participants believed the symbol was referring only to swaddled babies, which may result in a person thinking it is safe for non-swaddled babies to lie face down.

Focus Groups. The red X and green check mark for the negative and positive examples were helpful for participants to deduce the meaning of the symbol. For some participants, the "crumpling" of the fabric near the baby's mouth was also helpful, but others did not recognize that the child in the left image is depicting a suffocation consequence. Some also noticed the shading on the child's face and others did not.

The focus groups talked about a few additional areas of confusion. The lines on the fabric in the left image were confusing to some. Focus Group 5 talked about how they were unsure if the lines denoted the child grabbing the fabric with their hand and pulling it into their mouth. Also, consistent with the critical confusions noted in the survey responses, participants in Focus Group 2 and Focus Group 9 talked about how they were confused about the child appearing to be swaddled.

Table 9d. Focus group suggestions for Symbol 5.

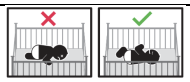
Suggestion	Example Quotes
Make sure the baby does not appear to be swaddled	"It is in the pose of being swaddled but it's not visibly swaddled so I do have that question of like, oh, is this... does this rule only pertain to when the baby is swaddled or can it just be loose and facedown? For that reason, I think it's confusing." — *Participant in Focus Group 9*
Edit the lines on the fabric to more clearly depict suffocation	"I think that the lines that are all crumpled together, you know, like there, they may be going in the baby's mouth. Maybe it would be better to highlight those a little bit. And maybe not have so many of the other mattress lines so close to him." — *Participant in Focus Group 15*
Depict the adult placing the baby	"What would I do to improve it? Maybe have the adult, like, you see an adult's hands placing that child so you can explicitly know, at least for me, that would signify, oh, like it means as an adult, I shouldn't place it downwards versus upwards." — *Participant in Focus Group 11*

Symbol 5 Summary

Symbol 5 overall passed comprehension criteria for both lenient scoring (100.0%) and strict scoring (85.0%) with two critical confusions (2.5%), both of which were because participants believed the warning was specifically for swaddled babies. Adjusting the image of the baby so it is clearly not swaddled would improve the likelihood of correct interpretations. Additional adjustments on the lines in the fabric could also make it easier for users to understand that the hazard is related to the baby suffocating.

Symbol 6: Place Baby On Back To Sleep (Variant 2)

Cognitive Interview Survey Elements

Table 10a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	96.3% (77)	Lay baby on his/her back, not his/her stomach to sleep to avoid suffocation.
What should you do or not do in response to this symbol?	90.0% (72)	Place baby on his/her back in a sleeping environment
What could happen if you do not follow the symbol's message?	82.5% (66)	Child may suffocate and die.

Overall Comprehension

Table 10b. Count and percent of correct and incorrect responses for Symbol 6.		
	Count (n)	**Percent**
Overall Correct	77	96.3%
Strict Criteria	61	76.3%
Lenient Criteria	77	96.3%
Overall Incorrect	3	3.8%
Critical Confusions	6	
As a % of total responses		7.5%
Total	80	100%
Fully correct response: - Refers to placing a baby on its back to prevent suffocation. *Partially correct response (only mentions one or more of the following):* - Vague consequence.		

Table 10c. Critical Confusion Statements and frequency of occurrence for Symbol 6.	
Critical Confusion Statement	**Frequency**
Thought action was to lay baby on its side.	*n* = 5
Thought action was to leave crib gate up	*n* = 1

Symbol 6 did not pass comprehension testing for either the lenient or strict criteria due to the high number of critical confusions. For correct interpretations, a lenient scoring criterion showed 96.3% correct and a strict scoring criterion, requiring a specific suffocation consequence in participants' responses, resulted in 76.3% correct. Of the six critical confusions (7.5%), five were because participants misunderstood the symbol to be communicating that lying a baby on its side is safe. A few such responses were scored as both a critical confusion and as partially correct, because these participants understood that lying a baby on its stomach is dangerous.

Focus Groups. There were a few sources of confusion for Symbol 6. As observed with critical confusions in survey responses, participants were not always sure whether the correct placement of the baby was on its back or its side. Also, Focus Groups 2 and 3 both talked about being unsure whether the baby was crawling or stationary.

In terms of positive feedback, Focus Groups 4, 5, and 6 noted that Symbol 6 did depict the crib setting clearly. Focus Group 11 similarly discussed that this symbol shows more of the context and implied active involvement of a parent placing the child a certain way to sleep in a crib, compared to Symbol 5 which lacks larger context. Participants in Focus Group 4 also talked about preferring this symbol over Symbol 5 because the baby looked less real and it was therefore less upsetting. Focus Group 9 also discussed that, unlike Symbol 5, the baby depicted in Symbol 6 was clearly not swaddled.

Table 10d. Focus group suggestions for Symbol 6.	
Suggestion	**Example Quotes**
Alter the image of the baby so it is more clearly on its back, not on its side	"I thought they put the baby on the side... But I can see now that you guys say this is on its back. It's hard to tell. I couldn't tell." —*Participant in Focus Group 2* "The position of the foot on the right does make it appear it's laying on its side." —*Participant in Focus Group 15*
Alter the image of the baby to make sure it looks like it is lying down and not crawling	"The artwork is not clear. It could be a baby crawling? Don't let them crawl around? Or to be better on their back. It's not as clear as five to me." —*Participant in Focus Group 3*
Show the suffocation hazard more clearly	"That baby looks sad. Not, like, harmed." —*Participant in Focus Group 5*

Symbol 6 Summary

Compared to Symbol 5, Symbol 6 scored more poorly in terms of correct interpretations and level of critical confusions. Although this symbol passed using lenient scoring criteria (96.3%), it did not pass according to strict scoring (76.3%) that required responses to be specific about the potential suffocation consequence. Symbol 6 also showed six critical confusions (7.5%), five of which were because of participant responses indicating the suggested action included lying a baby on its side.

Symbol 7: Magnet Ingestion Hazard (Variant 1)

Cognitive Interview Survey Elements

Table 11a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	95.0% (76)	Ingesting magnets can cause them to attract within the digestive system and compress those tissues.
What should you do or not do in response to this symbol?	95.0% (76)	Do not swallow magnets or do not let children swallow magnets.
What could happen if you do not follow the symbol's message?	87.5% (70)	Serious or life-threatening injury (optional: predominantly in the digestive tract/intestines).

Overall Comprehension

Table 11b. Count and percent of correct and incorrect responses for Symbol 7.		
	Count (n)	**Percent**
Overall Correct	79	98.8%
Strict Criteria	32	40.0%
Lenient Criteria	79	98.8%
Overall Incorrect	1	1.3%
Critical Confusions	2	
As a % of total responses		2.5%
Total	80	100%

Fully correct response:

- Refers to not allowing children to put magnets in their mouth because of a potential hazard of swallowed magnets attracting to one another in the digestive system and causing serious injury.

Partially correct response (only mentions one or more of the following):

- No mention of magnets.
- No reference to magnets attracting together after being swallowed.
- Vague consequence.
- No mention of children.

Table 11c. Critical Confusion Statements and frequency of occurrence for Symbol 7.	
Critical Confusion Statement	**Frequency**
Thought hazard was that child could put it in nostril	*n* = 1
Thought the hazard was related to batteries being harmful	*n* = 1

For Symbol 7, there was a large discrepancy between lenient scoring (98.8%) and strict scoring (40.0%) for correct interpretations. Symbol 7 passed comprehension testing according to the lenient criteria only. The strict criteria required participants to reference magnets and how they might attract in one's digestive system, and must also reference children directly or indirectly (e.g., do not eat or allow others to eat magnets). There were two critical confusions (2.5%) that demonstrated these participants did not understand the symbol communicating a hazard related to swallowing the items.

Focus Groups. Many participants correctly interpreted the meaning of the magnet symbols and the implication to not swallow the items. Fewer participants recognized the arrows and depiction of the two magnets attracting one another. Also, some groups recognized that the image was depicting a child, and others did not until it was brought up in the discussion.

Participants additionally gave feedback on the many smaller elements in Symbol 7. The lightning bolt symbols in the image were sometimes thought to represent magnetism, not pain. Focus Group 15 also extrapolated the meaning that a child could see the warning and think the item will give them a superpower, encouraging them to ingest it. Also, participants in Focus Group 8 responded that in this particular symbol, the red X was not helpful or necessary because there was no "correct" example image to contrast it.

Table 11d. Focus group suggestions for Symbol 7.	
Suggestion	**Example Quotes**
Rather than using lightning bolt symbols to mean different concepts within the same image, use them in one context only	"I wasn't sure if it was pain, or magnetism, because it's the same sort of lightning bolt. Well, I guess that sort of has— It's a larger lightning bolt than what's shown on the left. But it's yellow and has a black stroke rather than being a black fill. So yeah, I wasn't sure about that one." *—Participant in Focus Group 11*
Consider a more standard image to communicate the hazard to children	"I think because there was a lot going on in that image, I didn't really pay too much attention to the age of the boy inside of the red circle. To be honest, I didn't pay attention to that a lot. And to me, I just assumed that no one should eat magnetic toys." *—Participant in Focus Group 10*
Simplify the image by removing some elements	"I'd wonder if it's necessary to keep the little charge marks and just the hand because you have the magnet sign, so as to avoid confusion about it being like, oh, 'painful in hand.'" *—Participant in Focus Group 11*

Symbol 7 Summary

Overall, Symbol 7 passed comprehension testing with lenient criteria (98.8%) and two critical confusions (2.5%), but did not pass when scored with the strict criteria (40.0%). Although many participants partially understood the warning to not to ingest magnets, they frequently did not include in their survey responses that the specific hazard is related to multiple magnets attracting in the digestive tract. Focus group discussions provided more insight into how participants were potentially confused or overwhelmed by the number of elements present in this symbol.

Symbol 8: Magnet Ingestion Hazard (Variant 2)

Cognitive Interview Survey Elements

Table 12a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	96.3% (77)	Ingesting magnets can cause them to attract within the digestive system and compress those tissues.
What should you do or not do in response to this symbol?	93.8% (75)	Do not swallow magnets or do not let children swallow magnets.
What could happen if you do not follow the symbol's message?	86.3% (69)	Serious or life-threatening injury (optional: predominantly in the digestive tract/intestines).

Overall Comprehension

Table 12b. Count and percent of correct and incorrect responses for Symbol 8.		
	Count (n)	**Percent**
Overall Correct	78	97.5%
Strict Criteria	31	38.8%
Lenient Criteria	78	97.5%
Overall Incorrect	0	0.0%
Critical Confusions	0	
As a % of total responses		0.0%
Total	80	100%

Fully correct response:

- Refers to not allowing children to put magnets in their mouth because of a potential hazard of swallowed magnets attracting to one another in the digestive system and causing serious injury.

Partially correct response (only mentions one or more of the following):

- No mention of magnets.
- No reference to magnets attracting together after being swallowed.
- Vague consequence.
- No mention of children.

Similar to Symbol 7, Symbol 8 passed comprehension testing with the lenient criteria (97.5%), whereas strict scoring resulted in only 38.8% correct interpretations. Participants also expressed no critical confusions in their survey responses, compared to two critical confusions with Symbol 7.

Focus Groups. Overall, participants tended to think Symbol 8 was clearer and simpler than Symbol 7. Symbol 8 clearly depicted that the magnets should not be eaten through the use of the magnet warning symbol and the prohibition symbol over the image of the child ingesting the item. Participants had a few minor suggestions for this symbol to simplify the image of the digestive tract and to show the child's mouth more open to emphasize that he or she is ingesting the magnet.

Table 12c. Focus group suggestions for Symbol 8.

Suggestion	Example Quotes
Simplify the image of the digestive tract	"I can see the lungs and I think part of the heart too, like, that's not really relevant to the danger that the magnets are causing, I don't think. I think the main issue is that the magnets can pinch your organs, when it's like sitting in the stomach. So, you don't really need that part." *—Participant in Focus Group 8*
Make the person's mouth more open to more clearly show they are eating the magnet	"Maybe the only thing, maybe to make it a little bit clearer, have the mouth a little bit more open. It looks closed. Just, that could be maybe one improvement. Tiny." *—Participant in Focus Group 16*

Symbol 8 Summary

With lenient scoring, Symbol 8 passed comprehension testing with 97.5% correct interpretations and no critical confusions. However, with strict scoring, this symbol did not pass (38.8%). As with Symbol 7, many participants did not correctly identify the specific hazard of magnets attracting in the digestive tract but they did tend to generally understand the symbol was communicating that the magnets should not be ingested.

Symbol 9: Furniture Tip Over Hazard (Variant 1)

Cognitive Interview Survey Elements

Table 13a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	93.8% (75)	Secure wall restraint between the wall and piece of furniture to prevent tip over.
What should you do or not do in response to this symbol?	91.3% (73)	Install the wall restraint (implied but not essential: Make sure the restraint is secure).
What could happen if you do not follow the symbol's message?	98.8% (79)	The furniture could fall/tip over onto the child.

Overall Comprehension

Table 13b. Count and percent of correct and incorrect responses for Symbol 9.		
	Count (n)	**Percent**
Overall Correct	76	95.0%
Strict Criteria	70	87.5%
Lenient Criteria	76	95.0%
Overall Incorrect	4	5.0%
Critical Confusions	0	
As a % of total responses		0.0%
Total	80	100%
Fully correct response: - Refers to securing large furniture to the wall to prevent children climbing it and tipping it onto themselves. *Partially correct response (only mentions one or more of the following):* - Focused on drawers being open more than climbing. - Did not mention children.		

Symbol 9 passed comprehension testing with both lenient (95.0%) and strict (87.5%) scoring criteria, with no critical confusions. Interpretations that scored leniently included responses that focused

on taking action around the drawers or did not mention children, while still referring to securing or attaching the furniture to the wall.

Focus Groups. Participants tended to explain that the image clearly communicated that attaching the furniture to the wall was the suggested action to prevent tip-over. In particular, the green checkmark and red X were also helpful components of the symbol to communicate the hazard and how to address it. The black lines in the left image also clearly depicted motion, indicating that the furniture was tipping over. However, participants in Focus Group 9 and Focus Group 16 mentioned that they thought the symbol might communicate that it's safe for children to climb furniture if it is attached to the wall. Some participants also thought the symbol was communicating the importance of keeping drawers shut, but also seemed to understand the overall hazard of securing furniture to avoid injury from climbing.

Table 13c. Focus group suggestions for Symbol 9.

Suggestion	Example Quotes
Be clearer about not allowing children to climb	"The thing on the right side kind of made me think 'Yeah, that's a safety precaution' and then this would allow kids to climb on the furniture. And not have that consequence of it falling." —*Participant in Focus Group 9*
Keep the dresser color consistent between images	"This is like a minor thing, but the color of the dresser changed from the first set of panels to the last one with the green checkmark. I'm not sure if that's supposed to denote that the darker one is more secure than the light color dresser, but for continuity's sake, I would keep the dresser color the same mid tone gray. Just so that way they know like this is the same product. It's just a more secure way of having the product." —*Participant in Focus Group 8*

Symbol 9 Summary

Symbol 9 passed comprehension testing when scored with both lenient (95.0%) and strict (87.5%) criteria, with no critical confusions. The depiction of the wall attachment clearly communicated how to avoid the tip-over hazard, though focus groups revealed some ambiguity about whether attaching furniture to the wall would make it safe to allow children to climb.

Symbol 10: Furniture Tip Over Hazard (Variant 2)

Cognitive Interview Survey Elements

Table 14a. Percentage and frequency of correct responses to each element according to the grading rubric.		
	**Percent Correct** (# correct)	**Grading Rubric**
What do you think this symbol means?	88.8% (71)	If a child climbs on this piece of furniture, the furniture may tip over
What should you do or not do in response to this symbol?	68.8% (55)	Do not allow children to climb on the furniture
What could happen if you do not follow the symbol's message?	98.8% (79)	The furniture could fall/tip over onto the child.

Overall Comprehension

Table 14b. Count and percent of correct and incorrect responses for Symbol 10.		
	Count (n)	**Percent**
Overall Correct	79	98.8%
Strict Criteria	50	62.5%
Lenient Criteria	79	98.8%
Overall Incorrect	1	1.3%
Critical Confusions	0	
As a % of total responses		0.0%
Total	80	100%
Fully correct response: - Refers to not allowing children to climb furniture, which can be a tip-over hazard. *Partially correct response (only mentions one or more of the following):* - Focused on drawers being open more than climbing. - Did not mention children.		

Symbol 10 passed comprehension testing for only the lenient scoring criteria (98.8%) but not the strict scoring criteria (62.5%). There were no critical confusions for this symbol. Compared to Symbol 9,

this symbol scored lower for correct interpretations because the strict criteria required participants to specifically understand that the symbol was communicating a warning to not let children climb, regardless of whether it is securely attached (as in Symbol 9). Responses to the questions for this symbol were likely influenced by participants who have seen Symbol 9 prior to Symbol 10.

Focus Groups. Participants tended to assume that Symbol 10 was intended to communicate the same hazard as Symbol 9, and thus this symbol was seen as missing the element to communicate the importance of attaching the furniture to the wall to prevent tip-over. However, as a warning to communicate the danger of climbing on furniture, participants responded that this symbol was clear.

Table 14c. Focus group suggestions for Symbol 10.

Suggestion	Example Quotes
Show lines to depict movement in the left image	"I think maybe showing the cabinet to be wobbly could help. Because then it would show, like, your babies climb on top, the furniture is going to wobble. And then boom, the consequences on the right side." *—Participant in Focus Group 10*
Keep a consistent perspective in both images	"I do think it's interesting that the perspective changes, like from being sort of 3D, and to, like, 1D. I think that it should, I don't know, maybe they were trying to show more of the baby's body visible than more of the dresser. But yeah, like, not switching perspectives, I think, helps your mind to be like this is the exact same thing. And like one thing changed. That was bad. Something like that." *—Participant in Focus Group 11*

Symbol 10 Summary

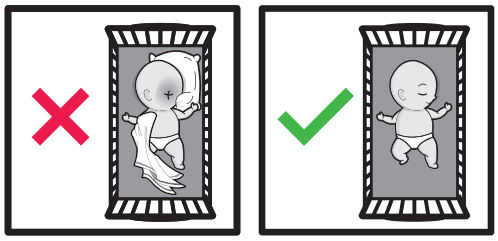
As noted previously, Symbol 10 passed comprehension testing for only the lenient scoring criteria (98.8%) but not the strict scoring criteria (62.5%). The interpretation of Symbol 10 appeared to be influenced, at least in part, by having seen Symbol 9 first. Both symbols included an admonition not to let children climb on the furniture and the potential consequences of doing so (i.e., that it could fall/tip over on them). Symbol 9, but not Symbol 10, had the additional component depicting securing the furniture to the wall. Some participants who viewed Symbol 9 before viewing Symbol 10 referred to the need to attach the furniture, even though this element was absent in Symbol 10. There were no critical confusions.

Discussion

The goal of this project was to evaluate the comprehensibility of a set of ten graphical safety symbols intended to communicate information pertaining to hazards that primarily affect young children. The five topics, or safety messages, were the following: (1) *Stay within arm's reach*; (2) *Never add soft bedding* (to a baby's sleep environment); (3) *Place baby on back to sleep*; (4) *Magnet ingestion hazard*; and (5) *Furniture tip-over hazard*. There were two symbol variants for each of the five hazard concepts. The open comprehension test procedures described in ANSI Z535.3 (2011; R2017) were used to assess participants' interpretations of the symbols, and subsequent focus group discussions provided additional information concerning each symbol's strengths and weaknesses, along with specific recommendations for improvement.

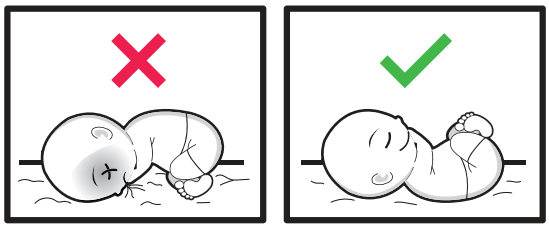
When evaluated according to the strict criteria, the following three symbols achieved passing comprehension scores of 85% correct comprehension, or better, and fewer than 5% critical confusions:

Symbol 4. Never add soft bedding (to a baby's sleep environment), variant 2. This symbol passed overall comprehension testing criteria when scored strictly (87.5%), with no critical confusions. This symbol incorporated features to communicate the consequence of having loose items in a crib with a baby, including a baby with "*X*'s" for eyes and shading on the baby's face that reinforced the intended suffocation hazard message.



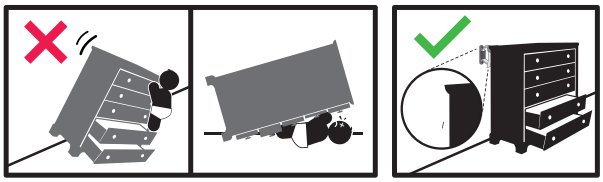
Symbol 4

Symbol 5. Place baby on back to sleep, variant 1. This symbol passed overall comprehension criteria when scored strictly (85.0%), with two critical confusions (2.5%). The use of the green check mark and red X (connoting *what-to-do* and *what-<u>not</u>-to-do*, respectively*)* were particularly helpful to participants.



Symbol 5

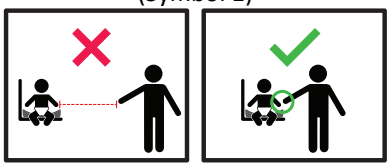
Symbol 9. Furniture tip-over hazard, variant 1. This three-panel symbol passed comprehension testing when scored strictly (87.5%), with no critical confusions. The use of the green check mark and red X features were helpful, as were the lines depicting motion, indicating that the furniture was tipping over.



Symbol 9

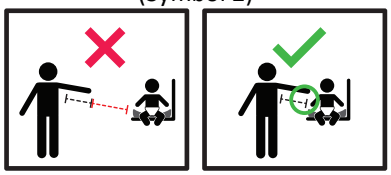
Recommendations for Stay Within Arm's Length Symbols

Variant 1
(Symbol 1)



Failed
Strict overall comprehension score: 62.3%
% Critical confusions: 3.8%

Variant 2
(Symbol 2)



Failed
Strict overall comprehension score: 68.8%
% Critical confusions: 2.5%

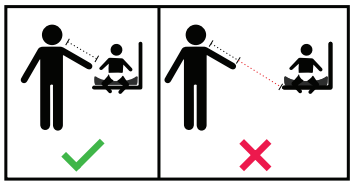
Both variants failed overall comprehension testing according to the strict criteria. For both variants, a fully correct response had to specifically mention staying within arm's reach of the baby or staying in contact with the baby at all times. Less specific answers concerning distance, such as "stay close" were scored as only partially correct.

Participants reported that the green check, indicating "what-to-do", and the red X, indicating "what-not-to-do" included in both variants were especially helpful, as were the contrasting features of the red dotted lines depicting distance and green circle emphasizing the need to remain within an arm's distance from the child.

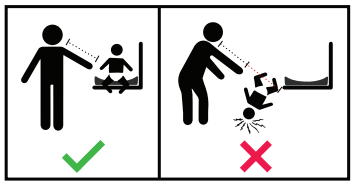
For Variant 2, some participants interpreted the dashed-lines as a recommendation for correct angle rather than distance. Eliminating the angle of the arms in both panels (i.e., arms out at a 90-degree angle from the adult's body) could help to alleviate this potential misperception. For both variants, the main recommendation for improvement was to include a depiction of consequences (e.g., the child shown falling or getting hurt) when the adult is too far away.

The design of these symbols was informed by the results of a previous project in which the two original design variants presented below were comprehension-tested.[2] The variants differed in that the original design Variant 2 (at right) depicted consequences. Original design Variant 1 earned a strict overall comprehension score of 70.0%, with no critical confusions; Variant 2 earned the score of 72.5%, with no critical confusions. Focus group discussions revealed that some participants believed the dotted lines connoted line of sight or keeping one's eyes on the child. There were three main recommendations for improvement: (1) make depiction of "arm's length" clearer; (2) show consequences; and (3) show the baby lying down, as would be the case on a changing table, rather than sitting up.

[2] Ibid, Table 4, Symbols 8 and 9, p. 15.



Original "Arm's length" Symbol Variant 1

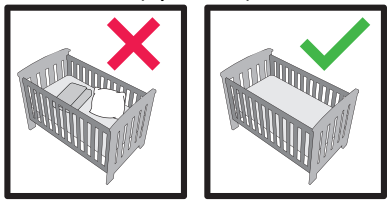


Original "Arm's length" Symbol Variant 2

Conclusion: A revised variant that incorporates the feedback from both projects, particularly depicting the consequences and eliminating the arm angle, would likely improve comprehension and might pass comprehension testing.

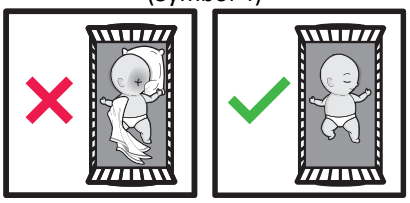
Recommendations for Soft Bedding Symbols

Variant 1
(Symbol 3)



Failed
Strict overall comprehension score: 62.5%
% Critical confusions: 0%

Variant 2
(Symbol 4)

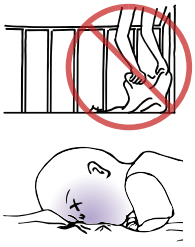


Passed
Strict overall comprehension score: 87.5%
% Critical confusions: 0%

For both variants, a fully correct response had to specifically mention removing blankets and pillows, loose objects, and/or soft objects from the crib to prevent a baby from suffocating. Answers that did not included the potential consequences were scored as only partially correct.

The design of these variants was informed by the results of a previous project in which the original design variant, depicted below, was comprehension-tested.[3] The original design variant failed comprehension testing, earning a strict overall comprehension score of 56.3% with 23.8% critical confusions. The intended message was unclear to many participants. In particular, the connection between the first and second image was not clear — the blanket and arms in the first image were not understood to be related to the baby in the second image. Some positive feedback was that the coloring of the child's face tended to convey that the child had suffocated and that this consequence was clearer than the actual hazard.

[3] Ibid, Table 4, Symbol 5, p. 15.



Original "No Soft Bedding" Symbol Variant

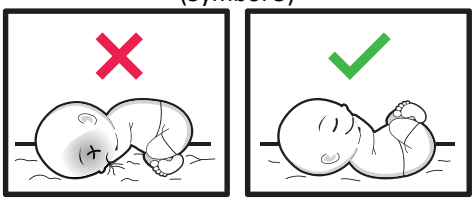
For Variant 1, which failed overall comprehension testing according to the strict criteria, the main criticism centered around the absence of a child from the crib and the associated consequences (suffocation). Indeed, focus group discussions confirmed that this image did not communicate much information about the hazard itself or what could happen if the message is not followed. One participant questioned that, given the absence of a child from the scene, what difference would it make to have objects in the crib.

Variant 2 passed comprehension testing according to the strict criteria. Participants thought the symbol's intended message was clear. They noted that the use of the red "X" and green check mark to communicate "what-not-to-do" and "what-to-do", respectively, was effective, as was the facial features used to connote death/suffocation (i.e., the use of "X's" for eyes and facial shading in the "what-not-to-do" panel). Participants thought the symbol could be improved by more clearly showing examples of other toys and items that are unsafe for a baby's sleeping environment (e.g., toys, stuffed animals). One suggestion was to show the child wearing more clothing, thereby obviating the need for a blanket.

Conclusion: Variant 1 offers a more dimensionally complete depiction of a crib, than in Variant 2. If revised for further testing, Variant 1 should include the two ways of depicting the child (i.e., sleeping peacefully vs. inclusion of features denoting death/suffocation) as in Variant 2. Variant 2 passed comprehension testing, but might be improved by including additional potentially dangerous items in the "what-not-to-do" panel and depicting the child wearing more clothing.

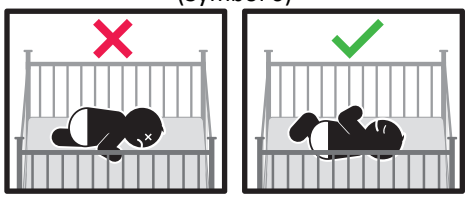
Recommendations for Baby on Back Symbols

Variant 1
(Symbol 5)



Passed
Strict overall comprehension score: 85.0%
% Critical confusions: 2.5%

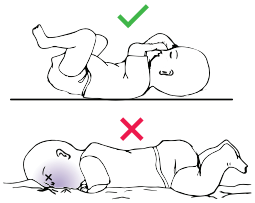
Variant 2
(Symbol 6)



Failed
Strict overall comprehension score: 76.3%
% Critical confusions: 7.5%

For both variants, a fully correct response had to specifically mention placing a baby on its back to prevent suffocation. Less specific answers that did not mention the potential consequences were scored as only partially correct. Participants thought that the green check, indicating "what-to-do", and the red X, indicating "what-not-to-do" included in both variants were helpful.

The design of Variants 1 and 2 was informed by the results of a previous project in which the original design variant, depicted on the following page, was comprehension-tested.[4] The original design variant passed comprehension testing, earning a strict overall comprehension score of 87.5% with only one instance of a critical confusion (1.3%).



Original "Place baby on back to sleep" Symbol Variant

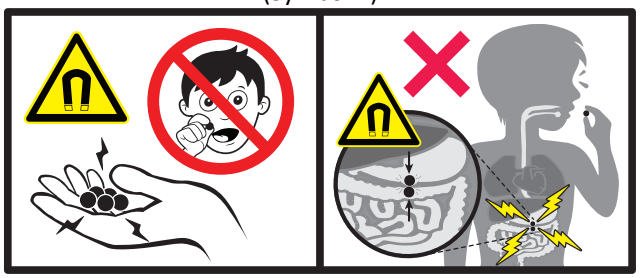
Variant 1 passed comprehension testing according to the strict criteria. Focus group discussions provided the following recommendations for improvement: (1) edit the lines on the fabric to more clearly communicate the suffocation hazard; (2) depict an adult placing the baby into the sleeping environment; and (3) make sure the baby does not appear to be swaddled. Regarding the last recommendation, two participants believed the symbol was referring only to swaddled babies, a critical confusion, which may result in a person thinking it is safe for non-swaddled babies to lie on their side or face down.

Variant 2 failed overall comprehension testing according to the strict criteria. Participants noted that this variant offers a clearer, more complete depiction of a crib, as compared to Variant 1. Participants in one focus group also mentioned preferring Variant 2 because the baby looked less "real" and it was therefore less upsetting to them. Recommendations for improving Variant 2 included: (1) altering the image of the baby so it is more clearly on its back and not on its side or crawling; and (2) show the suffocation hazard and consequences more clearly.

Conclusion: Both Variant 1 and the original design variant passed comprehension testing. The original design variant might be the better option since the child depicted is a bit more realistic and it doesn't have the potential issue of looking like the baby is swaddled. Incorporating the focus group recommendations could potentially make both Variant 1 and the original symbol variant even better. Participants preferred the crib depicted in Variant 2, so one possibility is to synthesize the best attributes of all variants into a new revised symbol.

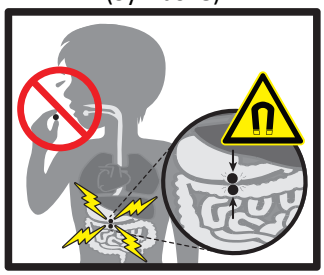
[4] Ibid, Table 4, Symbol 6, p. 15.

Variant 1
(Symbol 7)



Failed
Strict overall comprehension score: 40.0%
% Critical confusions: 2.5%

Variant 2
(Symbol 8)

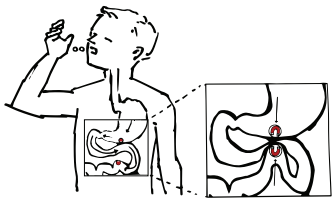


Failed
Strict overall comprehension score: 38.8%
% Critical confusions: 0%

Both variants failed overall comprehension testing according to the strict criteria. For both variants, a fully correct response had to specifically mention not allowing children to put magnets in their mouth because of a potential hazard of swallowed magnets attracting to one another in the digestive system and causing serious injury. Overall, participants tended to believe Variant 2 was clearer and simpler than Variant 1.

For both variants, the main criticisms centered around the symbols' complexity and number of features. Although many participants partially understood that both variants are intended to warn against ingesting magnets, they frequently did not include in their survey responses that the specific hazard is related to multiple magnets attracting in the digestive tract and causing injury.

The design of Variants 1 and 2 was informed by the results of a previous project in which the original design variant depicted below was comprehension-tested.[5] The original design variant, which is much simpler in its design, also failed comprehension testing, but earned a higher strict overall comprehension score than either Variant 1 or 2 (i.e., 62.5% with only one instance of a critical confusion). Feedback for the original variant included the following recommendations for improvement: (1) change how the person is shown eating the magnets; (2) use the prohibition symbol; (3) make adjustments to the look of the intestines, and in particular, the magnets attracting one another; and (4) use the horseshoe magnet symbol. These recommendations were incorporated into the present variants.



Original "Magnet ingestion" Variant

[5] Ibid, Table 4, Symbol 3, p. 15.

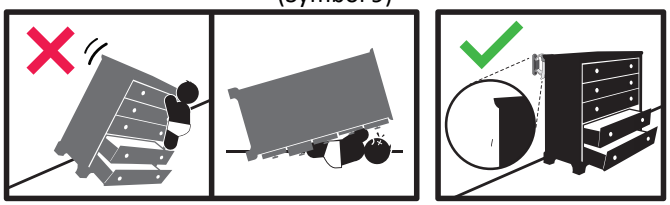
The main focus of recommendations for improving the current magnet ingestion Variants 1 and 2 centered around: (1) simplifying the images, and in particular, the digestive tract; and (2) increasing the prominence/details of the child ingesting the magnets and the magnets attracting one another in the intestines.

A separate issue not investigated in the present research was sizing. Participants used a variety of electronic devices to complete the online survey, and therefore, viewing size of the symbols likely varied considerably. Although this issue applies to all of the tested symbols, due to the requirement to collect the data online, this may be especially pertinent to the magnet ingestion symbol variants. More specifically, given that the packaging for magnet products, typically toys for children, are relatively small, future testing should be carried out under circumstances in which the viewing size of this symbol can be controlled.

Conclusion: The magnet ingestion symbols performed poorly, and more poorly than the original magnet ingestion variant. The results of both comprehension-testing efforts suggest this is a hazard that is difficult to communicate graphically. This may be due, at least in part, to the small size of the object and uncommon injury mechanism. Future efforts should take an iterative, rapid prototyping approach to symbol development before formal testing is attempted. However, it is possible that further iterations may not succeed in communicating the magnet ingestion hazard, the consequences and avoidance information using pictograms alone.

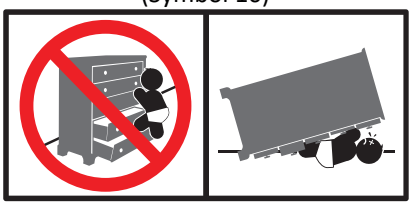
Recommendations for Furniture Tip Over Symbols

Variant 1
(Symbol 9)



Passed
Strict overall comprehension score: 87.5%
% Critical confusions: 0%

Variant 2
(Symbol 10)



Failed
Strict overall comprehension score: 62.5%
% Critical confusions: 0%

For Variant 1, a fully correct response had to specifically mention securing large/tall furniture to prevent the furniture from falling onto children who attempt to climb it.

Variant 1 earned a passing strict overall comprehension score. Participants tended to explain that the image clearly communicated that attaching the furniture to the wall was the suggested action to prevent tip-over. They reported that the green checkmark and red X were helpful components of the symbol, as were the black lines in the left image intended to communicate motion (the furniture tipping over). Recommendations for improvement centered around being clearer about not allowing children to climb on the furniture. One participant also noted differences in the coloring

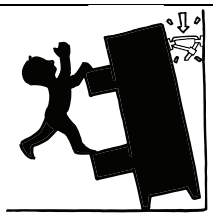
in the dressers (the dresser in the right-most image was black, whereas the two at left were a lighter gray) and suggested keeping the coloring consistent.

For Variant 2, a fully correct response had to specifically mention not to allow children to climb furniture, which can be a tip-over hazard.

Variant 2 failed to earn a passing overall strict comprehension score, although there were no instances of critical confusion. The interpretation of Symbol 10 appeared to be influenced, at least in part, by having seen Symbol 9 first. This perception was likely fueled by the repeated-measures design used for the study. More specifically, all participants viewed all ten symbols, but in four different orderings, and so some participants viewed Variant 1, which included the furniture-anchoring panel, before viewing Variant 2 which did not. Indeed, some participants who viewed Variant 1 before viewing Variant 2 referred to the need to attach the furniture, even though this element was absent in Variant 2.

Suggestions for improvement of Variant 2 included: (1) including lines to depict movement in the left-most image (e.g., the furniture tipping over); and (2) keeping a consistent perspective of the furniture in both images.

The design of Variants 1 and 2 was informed by the results of a previous project in which the three symbols depicted below—all intended to communicate aspects of a furniture tip-over hazard—were comprehension-tested.[6] Symbols "a" and "b" were newly designed, whereas symbol "c" was an existing safety symbol already in commercial use. All of the original designs failed comprehension testing, although symbol "c" outperformed its counterparts.

		
Strict comprehension score: 56.3% % Critical confusions: 2.5%	Strict comprehension score: 55.0% % Critical confusions: 6.3%	Strict comprehension score: 63.8% % Critical confusions: 0%
(a)	(b)	(c)

Participants tended to correctly understand that image "a" depicts a dresser that is falling and that a person or child is climbing it. However, they were less clear about what to do in response to this symbol. Recommendations for improvement were to incorporate the (red) prohibition symbol and use an arrow to convey the motion of falling. One focus group mentioned depicting the person as more clearly in danger, as opposed to having fun. For image "b", participants recommended showing a comparison of the furniture with and without the anti-tip restraint and improving the look of the bracket/restraint. Participants also noted that showing the child standing on the open drawers sends a mixed message, implying the need to incorporate the prohibition symbol into this variant. With

[6] Ibid, Table 4, Symbols 1, 7 and 12, p. 15.

regard to image “c”, participants liked how this symbol contained a prohibition symbol to communicate what not to do, although some thought the prohibition symbol should be colored red instead of black.

Conclusion: Variant 1 was well understood and passed comprehension-testing according to the strict criterion with no critical confusions. Variant 2 failed comprehension testing, but might pass with relatively minor changes to a future variant. In particular, participants recommended incorporating features to depict movement (tipping) of the dresser in the left image and keeping a consistent visual perspective in both images.

Appendix A: Cognitive Interview Survey

1.

Warning Label Safety Symbol Research: Version 1

COGNITIVE INTERVIEW BOOKLET

Name: 0

Please enter today's date in a mm/dd/yyyy format: 0

OMB Control Number 3041-0136
Expiration Date: 01/31/2024
OMB Burden Statement: For participants who elect to take part in the cognitive interview, the task is expected to take 1 hour. For participants who elect to take part in both the cognitive interview and the focus group, the task is expected to take 2 hours. 0

2.

Warning Label Safety Symbol Research: Version 1

Survey Navigation

To navigate this survey, **please use the "Prev" and "Next" options at the bottom of each page.**

Using other methods, such as the "Back" button on browsers, may result in an error page and incomplete responses. If you encounter an error page, please contact the researcher for further instructions. 0

OMB Control Number 3041-0136 0

3.

Warning Label Safety Symbol Research: Version 1

Informed Consent Form

Consent to Participate in Research

You are invited to participate in a research study that has been approved by the Rensselaer Institutional Review Board (IRB). The IRB reviews and approves all human subject research in accordance with applicable state law and federal law governing human subject research.

Research study title: Warning Label Safety Symbol Research

Principal investigator: Michael J. Kalsher, Ph.D., Cognitive Science Department, 301-F Carnegie Bldg., kalshm@rpi.edu, (518) 330-3336.

Purpose of the research study: The purpose of this research is to assess the extent to which safety symbols effectively communicate hazards associated with the use of or exposure to products and equipment. The project is being carried out in cooperation with staff from the U.S. Consumer Product Safety Commission (CSPC). The overall goal is to develop a family of safety symbols that can be used to effectively communicate safety-related information to diverse audiences. Given the growing diversity of the U.S. population, in concert with the rapid expansion in global trade, this is an important goal. The safety symbols that you will be asked to evaluate were selected based on injury data associated with consumer products and equipment and the severity of the non-obvious hazards that threaten consumers.

What you will do in the study: You will be asked to evaluate a set of ten safety symbols, depicted as they might look on an actual product. You will write answers to the following three questions for each symbol: "Exactly what do you think this symbol means?"; "What actions should you take in response to seeing the symbol?"; "What might happen if the action(s) is not taken?". It is important to remember that it is the symbols that are being evaluated—not you. You will also be asked to answer some basic demographic questions.

Time required: The symbol evaluation task should take no more than one hour to complete.

Risks: The risks associated with this study are minimal, as your answers are a matter of your own experience or opinion.

Benefits: You will receive a $45 Visa gift card for completing the symbol evaluation task. If you choose to terminate your participation before completing the evaluation task, you will be paid for the portion of the task you have completed.

Confidentiality/Anonymous data: The information you give in the study will be handled confidentially. Your rating data will be anonymous, which means that your name will not be linked to the data you provide.

Right to withdraw from the study: Your participation in this research is completely voluntary. You may refuse to participate or stop participating at any time and for any reason. If you choose to stop participating before completing the symbol evaluation task, you will be paid on a pro-rata basis for the portion of the task you have completed up to that point.

If you have questions about the study, contact:

Michael J. Kalsher
Department of Cognitive Science
301-F Carnegie Bldg.
110 8 th Street
RPI, Troy, NY 12180.
Telephone: 518-330-3336
kalshm@rpi.edu

Chair
Institutional Review Board
Rensselaer Polytechnic Institute
CII 9015
110 8 th Street
Troy, NY 12180
Telephone: 518-276-4873
irb@rpi.edu

☐ I have read and understand the information. I consent to participating in the research described above.

OMB Control Number 3041-0136

4.

Warning Label Safety Symbol Research: Version 1

Overview of Format

This survey dedicates two pages to each of the 10 safety symbols: a Context page and a Question page. Each Context page is formatted as follows:

Example Symbol

This symbol might appear on certain types of unguarded machinery.

On the next page, you will view the symbol by itself and answer questions about it.

Then, each Question page appears as follows:

Symbol:

Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

OMB Control Number 3041-0136

5.

Warning Label Safety Symbol Research: Version 1

Sample Answers

EXAMPLE OF AN INADEQUATE ANSWER:

Example Symbol

Questions:

1. Exactly what do you think this symbol means?

Gears and hand

2. What action should you take in response to this symbol?

Be careful

3. What could happen if you ignore the symbol's message?

Could get hurt

EXAMPLE OF A GOOD ANSWER:

Example Symbol

Questions:

1. Exactly what do you think this symbol means?

Caution. Moving Gears. Do not stick hand near machine while it is running.

2. What action should you take in response to this symbol?

I would stay away and not put my hand near the machine until someone stopped it.

3. What could happen if you ignore the symbol's message?

My fingers or hand could be crushed by the moving gears.

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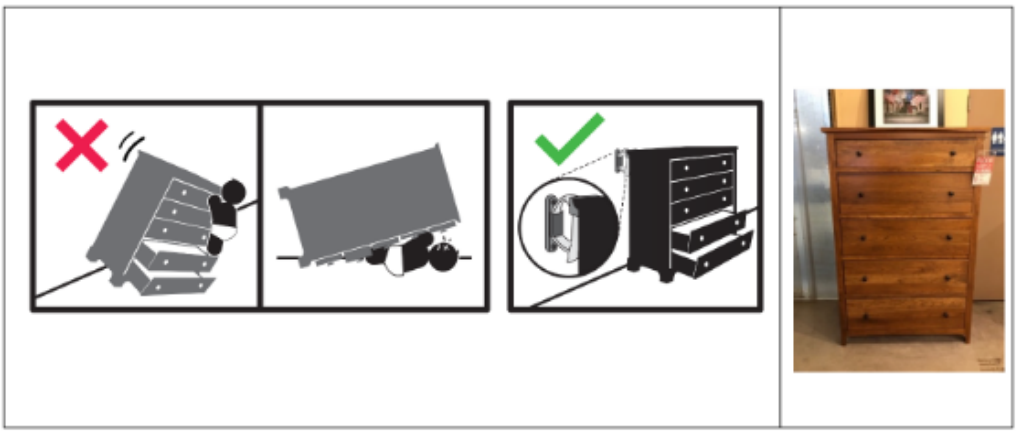
6.

Warning Label Safety Symbol Research: Version 1

Symbol 1 and Context

Symbol 1



This symbol might appear on certain types of furniture, such as a dresser, chest, or clothing storage unit.

On the next page, you will view the symbol by itself and answer questions about it.

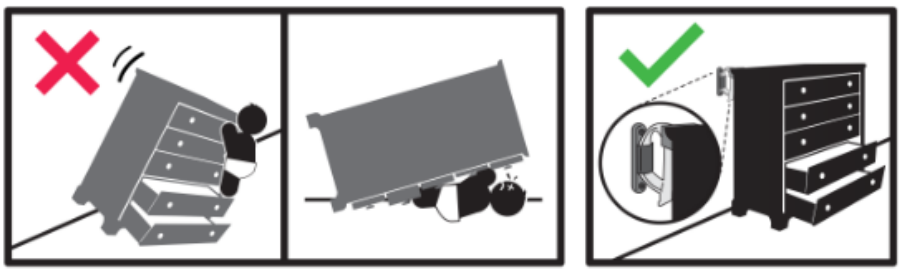
OMB Control Number 3041-0136

7.

Warning Label Safety Symbol Research: Version 1

Symbol 1 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

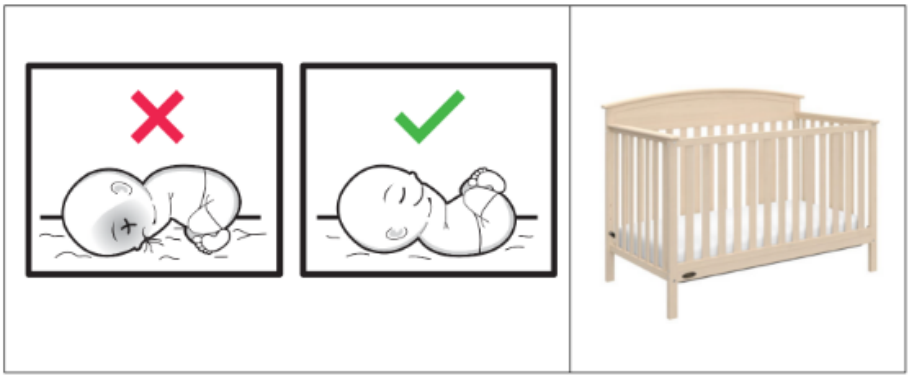
OMB Control Number 3041-0136

8.

Warning Label Safety Symbol Research: Version 1

Symbol 2 and Context

Symbol 2



This symbol might appear on infant sleep products, such as cribs, bassinets, and play yards.

On the next page, you will view the symbol by itself and answer questions about it.

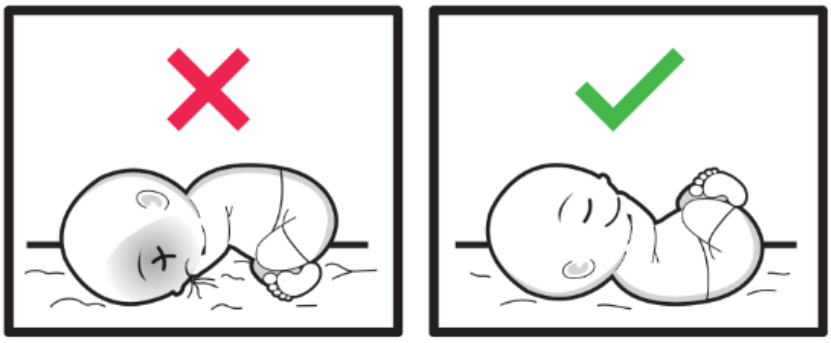
OMB Control Number 3041-0136

9.

Warning Label Safety Symbol Research: Version 1

Symbol 2 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

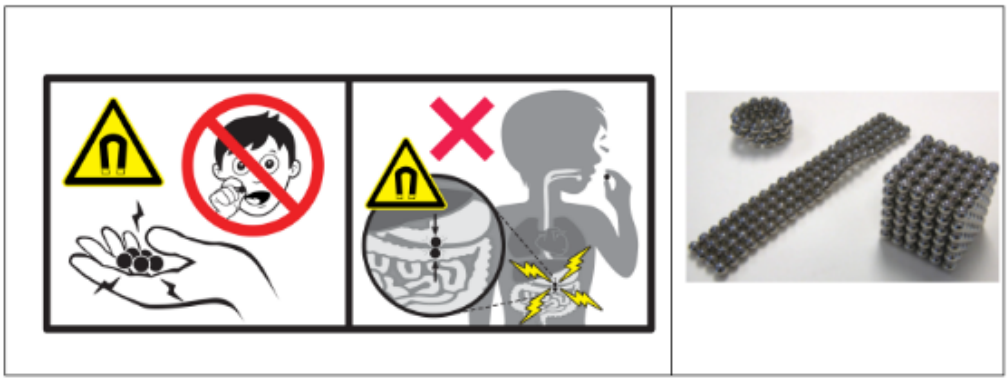
OMB Control Number 3041-0136

10.

Warning Label Safety Symbol Research: Version 1

Symbol 3 and Context

Symbol 3



This symbol might appear on magnetic building sets or toys that contain small magnets.

On the next page, you will view the symbol by itself and answer questions about it.

OMB Control Number 3041-0136

11.

Warning Label Safety Symbol Research: Version 1

Symbol 3 and Questions

Symbol:

Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

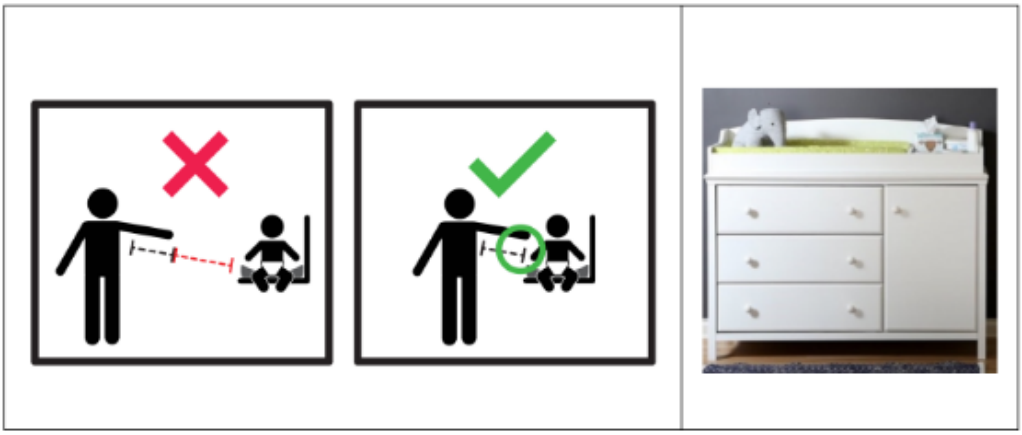
OMB Control Number 3041-0136

12.

Warning Label Safety Symbol Research: Version 1

Symbol 4 and Context

Symbol 4



This symbol might appear on baby changing tables or changing pads.

On the next page, you will view the symbol by itself and answer questions about it.

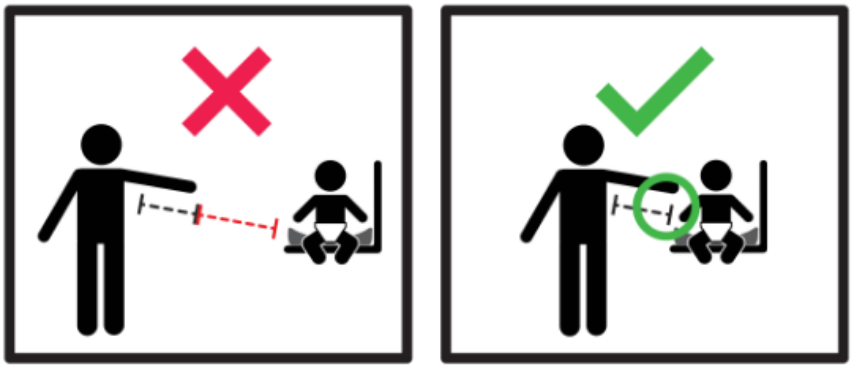
OMB Control Number 3041-0136

13.

Warning Label Safety Symbol Research: Version 1

Symbol 4 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

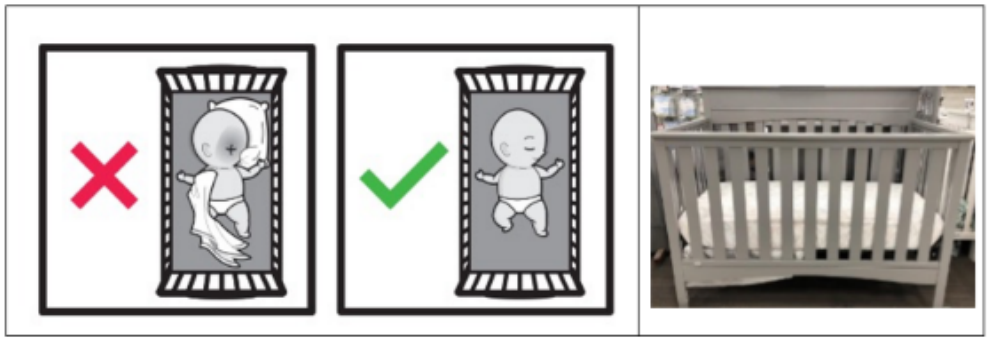
OMB Control Number 3041-0136

14.

Warning Label Safety Symbol Research: Version 1

Symbol 5 and Context

Symbol 5



This symbol might appear on infant sleep products, such as cribs, bassinets, and play yards

On the next page, you will view the symbol by itself and answer questions about it.

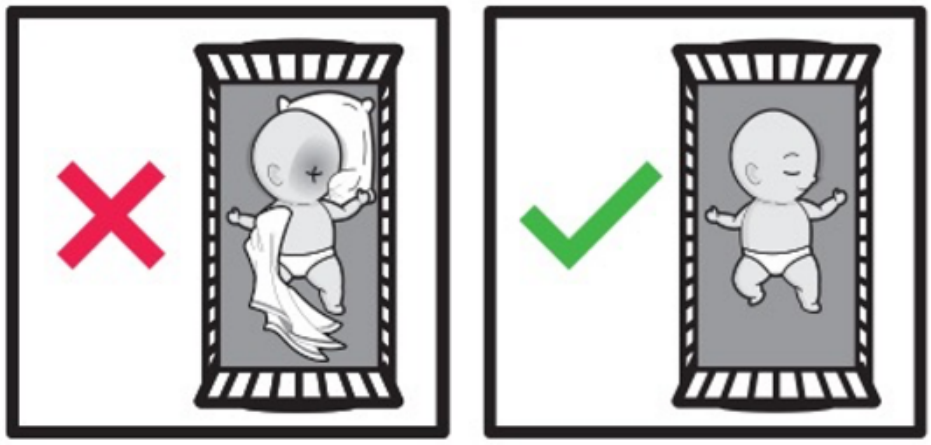
OMB Control Number 3041-0136

15.

Warning Label Safety Symbol Research: Version 1

Symbol 5 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

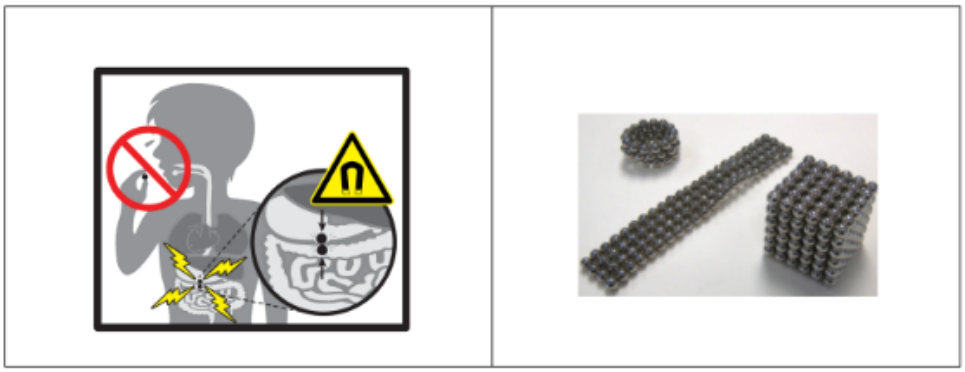
OMB Control Number 3041-0136

16.

Warning Label Safety Symbol Research: Version 1

Symbol 6 and Context

Symbol 6



This symbol might appear on magnetic building sets or toys that contain small magnets.

On the next page, you will view the symbol by itself and answer questions about it.

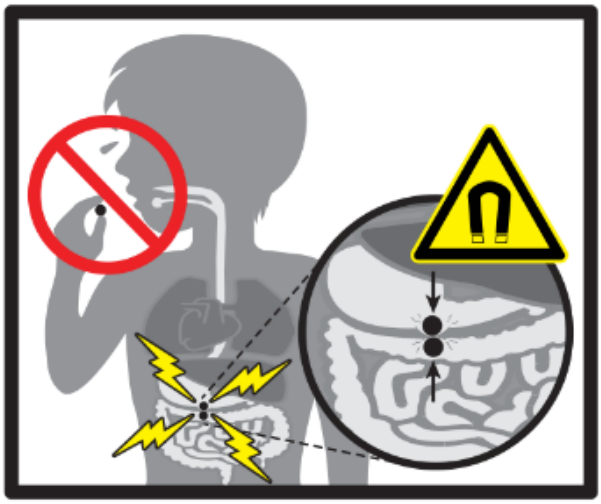
OMB Control Number 3041-0136

17.

Warning Label Safety Symbol Research: Version 1

Symbol 6 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

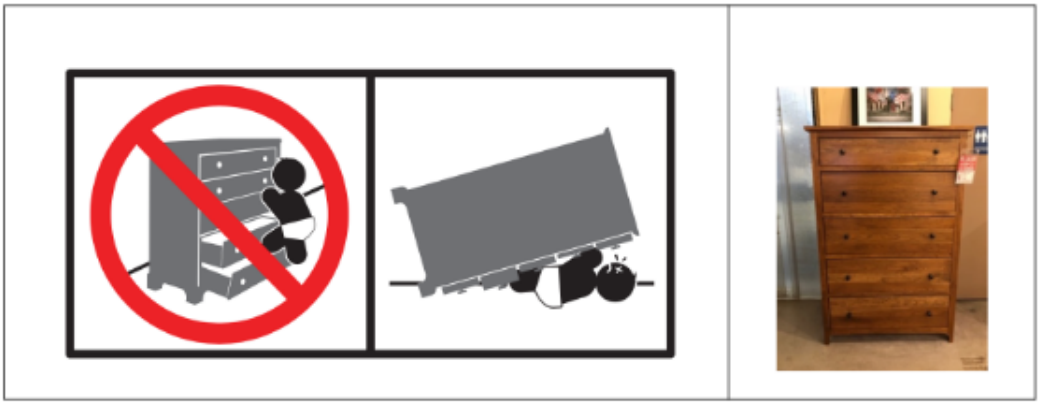
OMB Control Number 3041-0136

18.

Warning Label Safety Symbol Research: Version 1

Symbol 7 and Context

Symbol 7



This symbol might appear on certain types of furniture, such as a dresser, chest, or clothing storage unit.

On the next page, you will view the symbol by itself and answer questions about it.

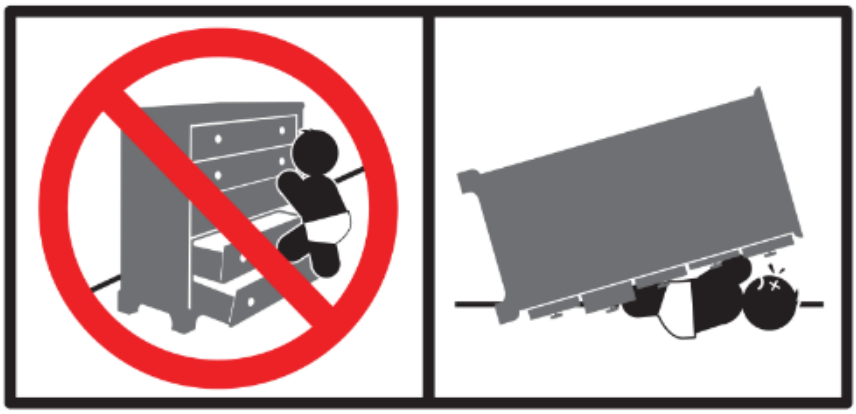
OMB Control Number 3041-0136

19.

Warning Label Safety Symbol Research: Version 1

Symbol 7 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

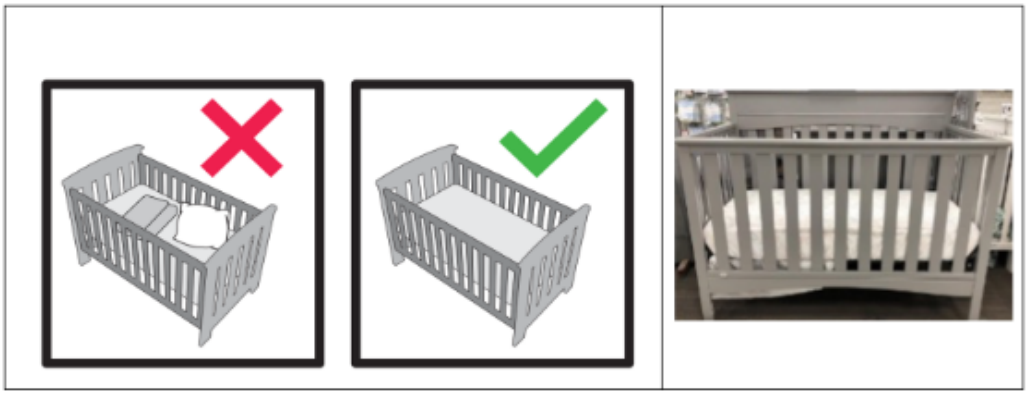
OMB Control Number 3041-0136

20.

Warning Label Safety Symbol Research: Version 1

Symbol 8 and Context

Symbol 8



This symbol might appear on infant sleep products, such as cribs, bassinets, and play yards.

On the next page, you will view the symbol by itself and answer questions about it.

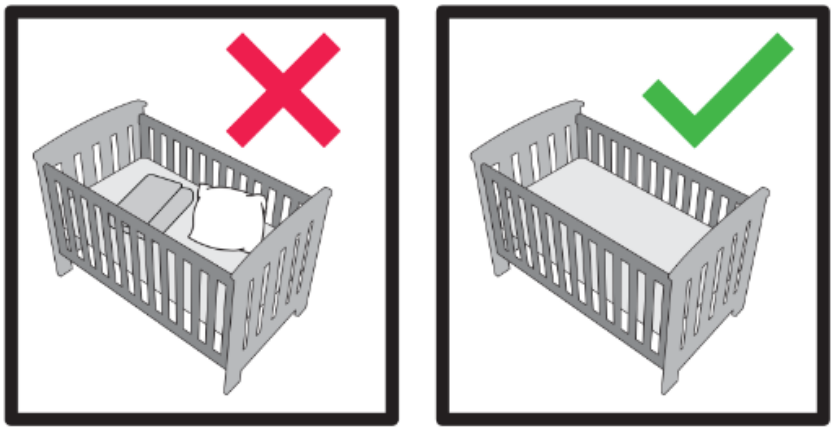
OMB Control Number 3041-0136

21.

Warning Label Safety Symbol Research: Version 1

Symbol 8 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

OMB Control Number 3041-0136

22.

Warning Label Safety Symbol Research: Version 1

Symbol 9 and Context

Symbol 9

This symbol might appear on baby changing tables or changing pads.

On the next page, you will view the symbol by itself and answer questions about it.

OMB Control Number 3041-0136

23.

Warning Label Safety Symbol Research: Version 1

Symbol 9 and Questions

Symbol:

Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

OMB Control Number 3041-0136

24.

Warning Label Safety Symbol Research: Version 1

Symbol 10 and Context

Symbol 10

This symbol might appear on infant sleep products, such as cribs, bassinets, and play yards.

On the next page, you will view the symbol by itself and answer questions about it.

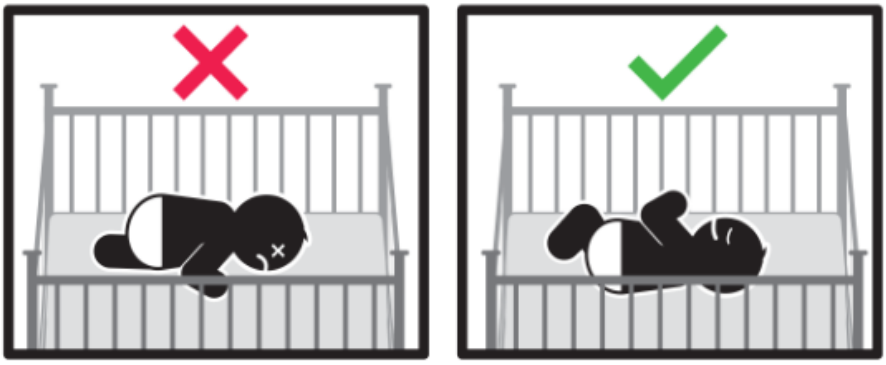
OMB Control Number 3041-0136

25.

Warning Label Safety Symbol Research: Version 1

Symbol 10 and Questions

Symbol:



Questions:

1. Exactly what do you think this symbol means?

2. What action should you take in response to this symbol?

3. What could happen if you ignore the symbol's message?

OMB Control Number 3041-0136

26.

Warning Label Safety Symbol Research: Version 1

Biographical Information

Please answer the following questions about yourself:

Age:

Sex:

- ○ Male
- ○ Female
- ○ Prefer not to answer

Education: (check the option that best describes the highest level of education you have attained)

- ○ Some High School
- ○ High School Degree
- ○ Some college
- ○ 2-year college degree
- ○ 4-year college degree
- ○ Master's degree
- ○ Doctoral or professional degree
- ○ Other (please specify)

Martial Status

- ○ Single
- ○ Married
- ○ Legally Separated
- ○ Divorced

Children:

- ◯ Yes
- ◯ No

(If yes: Please indicate the number of children that live in your home, either full-time or part-time, and their ages in the space provided):

Ethnicity:

- ◯ Hispanic or Latino
- ◯ Not Hispanic or Latino
- ◯ Prefer not to answer

Race:

- ◯ American Indian or Alaska Native
- ◯ Asian
- ◯ Black or African American
- ◯ Native Hawaiian or Other Pacific Islander
- ◯ White
- ◯ Mixed Race
- ◯ Prefer not to answer

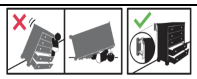
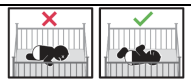
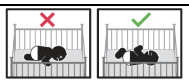
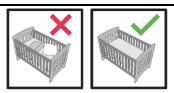
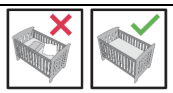
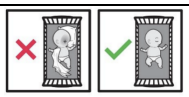
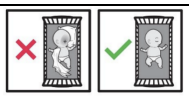
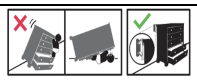
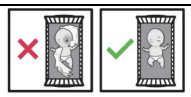
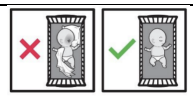
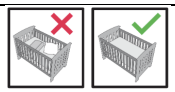
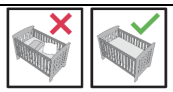
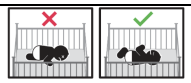
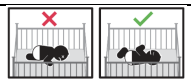
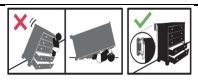
Current Occupation:

What type of device did you use to take this survey?

- ◯ Smartphone
- ◯ Tablet
- ◯ Laptop/Desktop

OMB Control Number 3041-0136

Appendix B: Survey Orderings

Symbol Position	Version 1	Version 2	Version 3	Version 4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Appendix C: IRB Approved Consent Form for Cognitive Interview

Consent to Participate in Research

You are invited to participate in a research study that has been approved by the Rensselaer Institutional Review Board (IRB). The IRB reviews and approves all human subject research in accordance with applicable state law and federal law governing human subject research.

Research study title: **Warning Label Safety Symbol Research**

Principal investigator: **Michael J. Kalsher, Ph.D., Cognitive Science Department, 301-F Carnegie Bldg., kalshm@rpi.edu**

Purpose of the research study: **The purpose of this research is to assess the extent to which safety symbols effectively communicate hazards associated with the use of or exposure to products and equipment. The project is being carried out in cooperation with staff from the U.S. Consumer Product Safety Commission (CSPC). The overall goal is to develop a family of safety symbols that can be used to effectively communicate safety-related information to diverse audiences. Given the growing diversity of the U.S. population, in concert with the rapid expansion in global trade, this is an important goal. The safety symbols that you will be asked to evaluate were selected based on injury data associated with consumer products and equipment and the severity of the non-obvious hazards that threaten consumers.**

What you will do in the study: **You will be asked to evaluate a set of ten safety symbols, depicted as they might look on an actual product. You will write answers to the following three questions for each symbol: "Exactly what do you think this symbol means?"; "What actions should you take in response to seeing the symbol?"; "What might happen if the action(s) is not taken?". It is important to remember that it is the symbols that are being evaluated—not you. You will also be asked to answer some basic demographic questions.**

Time required: **The symbol evaluation task should take no more than one hour to complete.**

Risks: **The risks associated with this study are minimal, as your answers are a matter of your own experience or opinion.**

Benefits: **You will receive a $45 Visa gift card for completing the symbol evaluation task. If you choose to terminate your participation before completing the evaluation task, you will be paid for the portion of the task you have completed.**

Confidentiality/Anonymous data: **The information you give in the study will be handled confidentially. Your rating data will be anonymous, which means that your name will not be linked to the data you provide.**

Right to withdraw from the study: **Your participation in this research is completely voluntary. You may refuse to participate or stop participating at any time and for any reason. If you choose to stop participating before completing the symbol evaluation task, you will be paid on a pro-rata basis for the portion of the task you have completed up to that point.**

If you have questions about the study, contact:

Michael J. Kalsher
Department of Cognitive Science
301-F Carnegie Bldg.
110 8 th Street
RPI, Troy, NY 12180.
kalshm@rpi.edu

Chair
Institutional Review Board
Rensselaer Polytechnic Institute
CII 9015
110 8 th Street
Troy, NY 12180
irb@rpi.edu

Appendix D: Focus Group Details

Date, time, and number of participants in each of the 16 focus group sessions			
Focus Group Number	**Date**	**Time (ET)**	**Number of Participants**
1	5/26/21	6:00 pm	2
2	6/8/21	6:00 pm	5
3	6/11/21	3:00 pm	3
4	6/24/21	6:00 pm	2
5	6/27/21	6:00 pm	3
6	7/1/21	10:00 am	1
7	7/9/21	10:00 am	2
8	7/14/21	12:00 pm	2
9	7/15/21	4:00 pm	3
10	7/18/21	2:00 pm	2
11	7/22/21	6:00 pm	2
12	7/26/21	10:00 am	1
13	7/26/21	4:00 pm	1
14	8/17/21	8:30 pm	4
15	8/19/21	12:00 pm	4
16	8/21/21	6:00 pm	3
		Total	**40**

Appendix E: IRB Approved Consent Form for Focus Group

Consent to Participate in Research

You are invited to participate in a research study that has been approved by the Rensselaer Institutional Review Board (IRB). The IRB reviews and approves all human subject research in accordance with applicable state law and federal law governing human subject research.

Research study title: **Warning Label Safety Symbol Research**

Principal investigator: **Michael J. Kalsher, Ph.D., Cognitive Science Department, 301-F Carnegie Bldg., kalshm@rpi.edu**

Purpose of the research study: **The purpose of this research is to assess the extent to which safety symbols effectively communicate hazards associated with the use of or exposure to products and equipment. The project is being carried out in cooperation with staff from the U.S. Consumer Product Safety Commission (CSPC). The overall goal is to develop a family of safety symbols that can be used to effectively communicate safety-related information to diverse audiences. Given the growing diversity of the U.S. population, in concert with the rapid expansion in global trade, this is an important goal. The safety symbols that you will be asked to evaluate were selected based on injury data associated with consumer products and equipment and the severity of the non-obvious hazards that threaten consumers.**

What you will do in the study: **You will be asked to evaluate a set of ten safety symbols, depicted as they might look on an actual product. You will write answers to the following three questions for each symbol: "Exactly what do you think this symbol means?"; "What actions should you take in response to seeing the symbol?"; "What might happen if the action(s) is not taken?". It is important to remember that it is the symbols that are being evaluated—not you. You will also be asked to answer some basic demographic questions.**

Time required: **The symbol evaluation task should take no more than one hour to complete.**

Risks: **The risks associated with this study are minimal, as your answers are a matter of your own experience or opinion.**

Benefits: **You will receive a $45 Visa gift card for completing the symbol evaluation task. If you choose to terminate your participation before completing the evaluation task, you will be paid for the portion of the task you have completed.**

Confidentiality/Anonymous data: **The information you give in the study will be handled confidentially. Your rating data will be anonymous, which means that your name will not be linked to the data you provide.**

Right to withdraw from the study: **Your participation in this research is completely voluntary. You may refuse to participate or stop participating at any time and for any reason. If you choose to stop participating before completing the symbol evaluation task, you will be paid on a pro-rata**

basis for the portion of the task you have completed up to that point.

If you have questions about the study, contact:

Michael J. Kalsher
Department of Cognitive Science
301-F Carnegie Bldg.
110 8 th Street
RPI, Troy, NY 12180.
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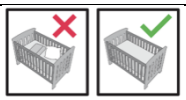
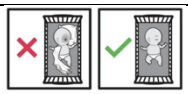
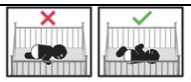
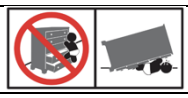
Appendix F: Symbol Comprehension Testing Scoring Rubric

Symbols		Test Questions		
		What do you think this symbol means?	**What should you do or not do in response to this symbol?**	**What could happen if you do not follow the symbol's message?**
1		Stay within arm's reach	Stay within arm's reach (Implied but not essential: Do not walk away from changing table).	Baby may fall and user would be too far to safely catch the baby.
2		Stay within arm's reach	Stay within arm's reach (Implied but not essential: Do not walk away from changing table).	Baby may fall and user would be too far to safely catch the baby.
3		Do not put soft materials, such as blankets or pillows, in a baby's sleep environment. They may suffocate the baby.	Do not put blankets, pillows or other soft materials into a baby's sleep environment.	Child may suffocate and die.
4		Do not put soft materials, such as blankets or pillows, in a baby's sleep environment. They may suffocate the baby.	Do not put blankets, pillows or other soft materials into a baby's sleep environment.	Child may suffocate and die.
5		Lay baby on his/her back, not his/her stomach to sleep to avoid suffocation.	Place baby on his/her/their back in a sleeping environment.	Child may suffocate and die.
6		Lay baby on his/her back, not his/her stomach to sleep to avoid suffocation.	Place baby on his/her/their back in a sleeping environment.	Child may suffocate and die.
7		Ingesting magnets can cause them to attract within the digestive system and compress those tissues.	Do not swallow the magnets or do not let children swallow magnets.	Serious or life-threatening injury (optional: predominantly in the digestive tract/intestines).
8		Ingesting magnets can cause them to attract within the digestive system and compress those tissues.	Do not swallow the magnets or do not let children swallow magnets.	Serious or life-threatening injury (optional: predominantly in the digestive tract/intestines).
9		Secure wall restraint between the wall and piece of furniture to prevent tip over.	Install the wall restraint (implied but not essential: Make sure the restraint is secure).	The furniture could fall/tip over onto the child.
10		If a child climbs on this piece of furniture, the furniture may tip over.	Do not allow children to climb on the furniture.	The furniture could fall/tip over onto the child.