

Transport Research Laboratory



**Frontal impact airbag warning label –
scientific assessment of comprehension**

by A M Weare

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PROJECT REPORT



CLIENT PROJECT REPORT CPR1009

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by A M Weare (TRL)

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Frontal impact airbag warning label – scientific assessment of comprehension

Client: European Commission, DG Enterprise and Industry
(Peter Broertjes)

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Executive summary

A passenger airbag can kill or seriously injure children placed in rear-facing child seats mounted in the front passenger seat of cars. Hence, if such seats are fitted in the front passenger seat the airbag must first be deactivated. This is not a new issue and there are existing warning labels that are required to be fitted to cars to help ensure that rear-facing child seats are not used in the front passenger seat without the airbag been disabled.

Vehicles sold within the EU are often built to specification allowing their sale and usage in multiple countries, which has resulted in the existing warning label containing multiple language translations and being 'text-heavy'. It is believed that this may make the label difficult to interpret for some people, or that it may discourage some from properly reading the warning message. In addition, it is difficult for vehicle manufacturers to display all relevant EU languages on a single label and there are therefore logistical challenges making sure that certain countries receive vehicles with the correct warning label languages. In an effort to address these issues, two new designs have been proposed that rely almost exclusively on symbols/pictograms to convey a message that is universally comprehensible, and visually more striking and therefore recognisable. This report details a study carried out to determine if the current label is well understood and whether any of the proposed new designs may offer an improvement. It should be noted that the findings of this report relate solely to the label provided inside passenger vehicles sold in the EU; not for labels conveying similar messages that may be found on child restraint systems. Any proposed changes to these labels should be assessed independently.

The study was carried out according to the basic methodology described in ISO 9186-1:2007 'Graphical symbols – test methods – part 1: Methods for testing comprehensibility', with a few minor alterations to convert the methodology for use with labels rather than symbols. A questionnaire survey was conducted in three European countries: the UK, Sweden and Lithuania (representing a western, northern and eastern European country respectively). The surveys were conducted in shopping centres and respondents chosen based on whether they were seen entering/leaving a child-orientated shop or had small children with them. They were asked to look at a label (one of the three Variants being tested), first for 5 seconds and then 30 seconds, and to write down what they thought the label meant and what action they should take after each viewing. Variant A was the original label with text and Variants B and C the new labels with just one word ('Airbag') and otherwise just using symbols/pictograms. B and C differed in the symbols used.

The participant responses were coded according to two coding formats. The primary method assessed how well respondents were deemed to have understood the key messages from the label (the risk to a child, the hazard being the airbag, and the fact that it is specifically rear-facing seats that are affected). The secondary method assessed whether respondents had understood the instruction to 'refer to the user manual for further information' as appears on label Variants B and C. Both coding systems were based on that specified in ISO 9186.

In Sweden and Lithuania the same pattern emerged: label Variant A was most comprehensible, followed by Variant C, followed by Variant B (for both viewing times). The UK results differed in that the order was Variant C, Variant B, then Variant A, following a 5-second viewing; all three were roughly equal following a 30-second viewing. The combined results for all three countries showed that Variant A was most comprehensible with Variant C a reasonably close second; there was not a statistically significant difference between the combined scores for A and C following a 5-second viewing although there was a statistically significant difference for a 30 second viewing. Variant B scored the lowest.

Although Variant A scored highest, it is believed that this can be attributed to some extent to respondents having previously seen the label in actual use and therefore

already knowing its meaning. Given that Variant C came a close second it is felt that there would be value in conducting further testing of Variant A against Variant C, but excluding any respondents who state that they have previously seen Variant A. Such an exclusion policy was not possible for this study given the time available to collect the data.

There may also be value in conducting comprehension of the individual symbols used on Variants B and C as some respondents correctly identified some or all of the three core message components, yet expressed confusion at the symbols relating to the need to consult the information manuals. It should be noted that Variant A (the current label) does not contain a message component to consult the information manuals. Of the two variants, label C scored highest in this respect, yet still only achieved a low 'correct' comprehension score of 4.7% after the 5-second viewing and 27.3% after the 30-second viewing.

In summary, the study finds that the existing label was the most easily comprehensible but that one of the alternative designs (Variant C) was close. It should be recommended that further testing is undertaken to potentially improve the design and to account for possible confounding factors identified in this study.

1 Introduction

A passenger airbag can kill or seriously injure children placed in rear-facing child seats mounted in the front passenger seat of cars. Hence, if such seats are fitted in the front passenger seat the airbag must first be deactivated. This is not a new issue and there are existing warning labels that are required to be fitted to cars to help ensure that rear-facing child seats are not used in the front passenger seat without the airbag been disabled.

Vehicles sold within the EU are often built to specifications allowing their sale and usage in multiple countries across the EU, which results in airbag warning labels necessarily being provided in multiple languages within each vehicle. These labels are 'text-heavy' and it is not clear whether the labels are properly recognised and understood by users. In addition, it is difficult for vehicle manufacturers to display all relevant EU languages on a single label and there are therefore logistical challenges making sure that certain countries receive vehicles with the correct warning label languages. By way of addressing these issues, two new potential label designs have been developed in an attempt to provide for a label that has a more graphical approach (i.e. pictograms) and that should therefore be recognisable by individuals of different nationalities without the need for extensive accompanying text. It is hoped that this approach will make the warning message more easily comprehensible than is currently the case.

Frontal impact crash protection is currently legislated for in Europe by EC Directive 96/79/EEC or optionally by UNECE Regulation 94. However, under the terms of the recently adopted General Safety Regulation, the existing Directive will be repealed and replaced by direct reference to the UNECE Regulation and its contents in 2014, making compliance to Regulation 94 mandatory. UNECE Regulation 94 specifies a requirement for a warning label that uses text in the national languages of the country where the vehicle will be put into service. It should be established to what extent the current label is understood (i.e. if vehicle operators take the effort to comprehensively read and take notice of the warning label and the appropriate actions to take). In addition, the proposed labels, which do not have any text, must be assessed in comparison with the baseline set by the aforementioned text-based label. This report details the study carried out by TRL in response to these research needs. It should be noted that this report relates solely to the label provided inside passenger vehicles sold in the EU; not for labels conveying similar messages that may be found on child restraint systems. Any proposed changes to these labels should be assessed independently as the circumstances in which people will encounter these labels are different and there may be different restrictions on the available space in which to display such a label.

The research was carried out in accordance with ISO 9186-1:2007 'Graphical symbols – test methods – part 1: Methods for testing comprehensibility', with a few minor alterations to adapt the methodology for use with labels rather than symbols.

The assessment of the labels was conducted in two parts. One looked at the overall respondent comprehension of the label 'messages' common to all three labels (the risk to a child, the hazard being the airbag, and the fact that it is specifically rear-facing seats that are affected); the second looked only at respondent comprehension of the instruction to refer to the user manual for further information, as appears on label Variants B and C only.

The labels tested within this study are as follows (labels are actual size when printed):

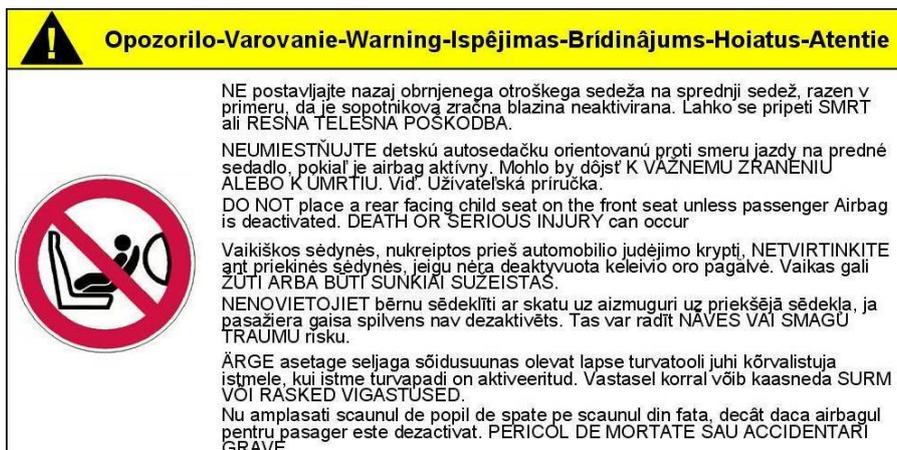


Figure 1 - Current label (Variant A)



Figure 2 - Proposed label (Variant B)



Figure 3 - Proposed label (Variant C)

2 Method

2.1 Choice of methodology

No international standard was identified regarding a methodology for determining label comprehension. However, ISO 9186-1:2007 'Graphical symbols – test methods – part 1: Methods for testing comprehensibility' details a methodology for testing the comprehension of symbols. Symbols are closely related to labels; however two key implications were identified relating to the differences between typical symbols and the labels being tested:

- The labels being tested contain greater levels of complexity than most symbols used in isolation. They contain multiple individual symbols and accompanying text. There is therefore more information for an observer to comprehend.
- One criticism of the current label is that it may not easily be understood in a quick glance, but that given enough time, it is quite clear to interpret. It was therefore necessary to be able to assess the ease of interpreting each sign under 'glance' conditions.

It was decided that the methodology chosen for this study should follow as closely as possible that laid down in ISO 9186, but with some minor alterations to account for the greater complexity of the labels. All such changes made to the methodology specified in the standard are highlighted as such within the remainder of this chapter.

It was also stated within the specification that at least three European countries should be accounted for in the study, within the aim of achieving a representative sample of the EU as a whole. The UK, Sweden and Lithuania were chosen as these represent examples of Western, Northern and Eastern European nations respectively.

2.2 Data collection

As per the recommendation in ISO 9186, it was decided that the labels be tested using a questionnaire format, which would allow for each label to be presented in a controlled and repeatable manner and with standardised instructions. The questionnaire was developed in accordance with the format provided within ISO 9186, save for a few alterations to reflect the additional requirements for the label testing. The key alteration was to have the test label on a separate card that would be presented to participants by the researcher. This label would be presented twice:

- for 5 seconds to allow a short inspection (representing a 'quick glance')
- for 30 seconds to allow a more thorough inspection

The instructions on the front page were modified to reflect the change to the procedure. A copy of each of the questionnaires used in the trials is presented in the appendices.

The questionnaire was piloted to ensure that the instructions were clear and that the changes had not affected the practicality of delivering the questionnaire. Following the successful pilot the questionnaire was translated into Swedish and Lithuanian by in-house native speakers of these languages.

The chosen method dictated that the questionnaire be delivered in person. A suitable location was therefore sought in each country for researchers to visit. It was important to target the appropriate demographic for the label (i.e. those who may be responsible for the transport of young children: parents / grandparents). It was decided that the survey teams should ideally stand outside a shop specialising in children's clothes, toys etc. Given the time of year (late November) and therefore the likely weather conditions, it was also necessary to have the researchers stand indoors. This was both for their own comfort and to maximise the likelihood of passers-by agreeing to stop and participate. The surveys were therefore carried out inside shopping centres, as near to a children's

store as possible. Participants were selected either because they were seen to enter/leave the children's store or because they had young children with them. Surveys were carried out over four to five person-days (approximately 9:00-5:30) in each country.

Note – an additional survey was carried out in Sweden in January 2011 to achieve the full 150 respondents required by the standard, and to redo the data collection for Variant A, with a slightly modified design. The ramifications of this are discussed later in the document.

2.3 Data coding

Following data-collection, the responses were translated back into English, where necessary, to allow for coding. Coding was carried out in two stages according to a primary method and a secondary method. This was because not all the labels contained the same message. Specifically, the original label (Variant A) refers to the option of deactivating the airbag, and the two new labels (B and C) advise the reader to consult with the instruction manual. Since none of the labels contains all these elements it was not deemed a valid comparison between the labels to include the respondents' comprehension of these additional elements in a single combined score. The primary coding therefore deals with the common elements and the secondary coding deals with the element additional to B and C. The specifics are explained in sections 2.3.1 and 2.3.2.

2.3.1 Primary coding

Three information elements were identified as common to each of the three variants:

1. A potential risk to a child travelling in the front seat
2. The risk posed is due to the passenger airbag
3. The risk only applies to certain rear-facing child seats

The original coding method, as specified within ISO 9186, provides the following coding options:

- 1 correct
- 2a wrong
- 2b wrong and the response given is the opposite of the intended meaning
- 3 the response given is "don't know"
- 4 no response is given

The additional complexity of the labels, compared to a typical symbol, meant that to simply state a response as correct or incorrect, as is essentially the case with the above coding options, ignored the fact that varying levels of comprehension were possible, with people potentially identifying correctly some aspects of the label but not others. As such some additional coding options were added by further coding 'correct' responses as 1a, 1b or 1c – relating to 'complete', 'partial' or 'basic' understanding respectively. It was determined that a minimum 'correct' response (i.e. '1c') required the respondent to ultimately identify a safe course of action (e.g. that they would not place a child in the front seat), with the recognition of the risk posed by the airbag and the specific problem with rear-facing child seats being 'bonus' elements.

The following modified coding system was therefore implemented:

- 1a 'complete' understanding (respondent identified a safe course of action, plus also identified that the risk was posed due to the airbag and that only rear-facing child seats are affected)
- 1b 'partial' understanding (respondent identified a safe course of action, plus either the airbag element or the rear-facing element)

- 1c 'basic' understanding (respondent identified a safe course of action, but not the airbag element nor the rear-facing element)
- 2a 'wrong' (respondent did not identify the potential risk posed to a child using the front passenger seat, or failed to identify a safe course of action)
- 2b 'wrong and opposite' (respondent identified a course of action specifically conflicting with that intended, e.g. "I would only place my child in a rear-facing direction when using the front passenger seat")
- 3 the response given is "don't know"
- 4 no response is given

Full tables of the coded data are presented in the appendices. These tables all refer to the primary coding categories defined above.

2.3.2 Secondary coding

Of interest to this study was the public comprehension of the newly introduced label element - that which instructs the individual to refer to the user manual for further information (as appears on Variants B and C). The secondary coding method was introduced as a means to record respondent comprehension of this element.

Given that the element is quite simple in its meaning, it was not considered necessary to subdivide responses in levels of 'correctness', nor was it considered practical to subdivide incorrect responses or blank responses. Instead, the coding would simply record whether or not that the respondent had correctly identified the instruction to refer to additional sources of information for further advice.; coded as '1' or '0' respectively.

During initial efforts at coding it became clear that many of the respondents' answers were rather ambiguous and did not clearly indicate the presence or lack of comprehension. To prevent coder subjectivity becoming a possible confounding factor, the following conventions were adopted in interpreting a 'correct' (1) response:

- Any reference by the respondent to a book/leaflet/manual etc.
- A reference to 'car' or 'seat' information
- A statement that they should 'read the instructions'

Any statement that the respondent would 'follow the instructions' would be coded as 'ambiguous' (2). Any other response would be coded as 'wrong' (0). The secondary coding system was therefore as follows:

- 0 'wrong' response
- 1 'correct' response
- 2 'ambiguous' response

Note – although label Variant A does not contain any instruction to refer to a manual, responses to A were still coded in order to provide a control group.

2.4 Label Evaluation

The three label variants were assessed based on their total 'correct' score and a breakdown of the proportion of responses in the subcategories. Ultimately, the method specified in ISO 9186 does not identify a means for determining the suitability of a symbol (or label in this case) based on its overall score meeting a pre-determined level of acceptability. It simply states that whichever variant scores highest should be considered the most suitable. This convention has been adopted here, with recommendations based on the relative overall scores of the three Variants.

3 Results

3.1 Swedish Results

3.1.1 Primary coding

Label Variant A achieved the highest number of 'correct' responses following both the 5-second and 30-second viewings (as shown in Figure 4). Variant B achieved the lowest score for both and Variant C scored roughly midway between the two. The percentage of correct responses increased from the 5-second to 30-second viewing for all label Variants. Note that 'correct' refers to any response that met the minimum requirement of identifying a safe course of action (i.e. it includes all responses coded as 1a, 1b or 1c).

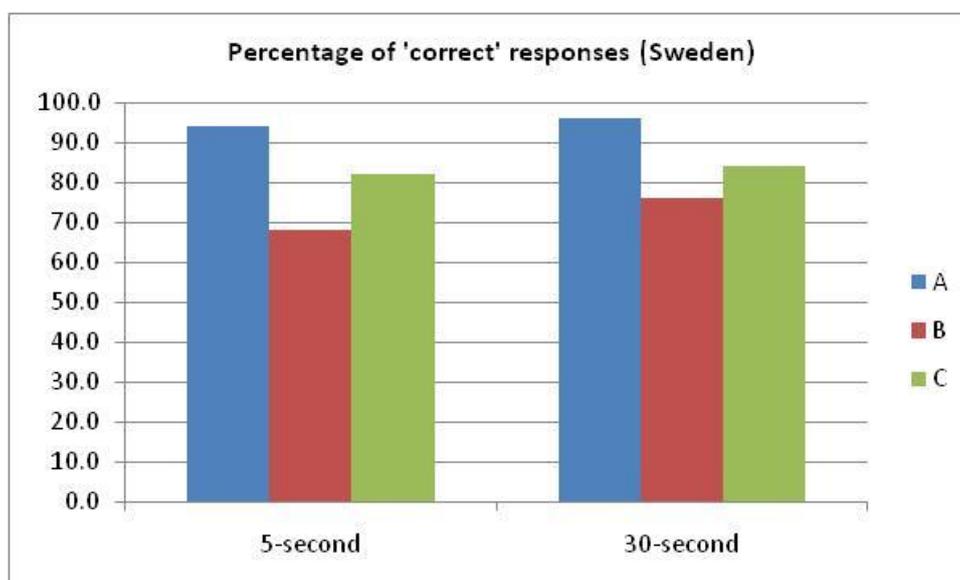


Figure 4 - Percentage of 'correct' Swedish responses to each label Variant after both the 5-second and 30-second viewings

Applying a chi-square test of independence to the various possible pairings within data gives the following results (✓ means significant at the $p=0.05$ level):

Within 5-second		Within 30-second		Within Variant (5-second vs. 30-second)	
A-B	✓	A-B	✓	A-A	-
B-C	-	B-C	-	B-B	-
A-C	-	A-C	✓	C-C	-

Figure 5 shows the percentage of respondents in each coding category, as a cumulative score. (please refer to page 4 for the definitions of the codings).

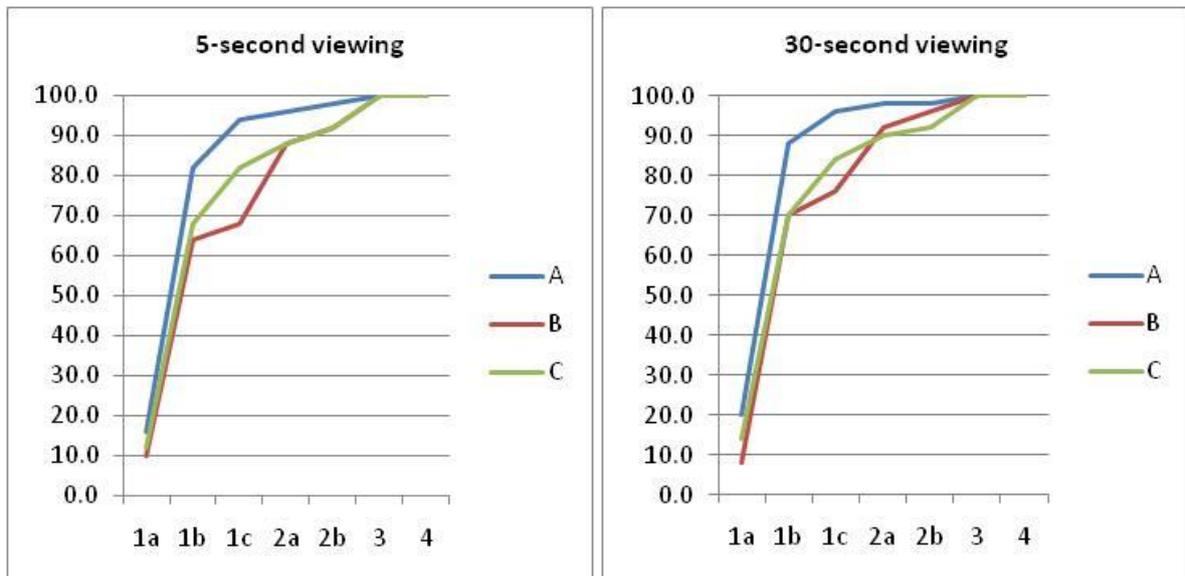


Figure 5 – Swedish cumulative response percentage, by coding category

3.1.2 Secondary coding

Responses to the three label Variants were as follows:

Category	5-second viewing			30-second viewing		
	A	B	C	A	B	C
0 - Wrong	49	50	48	49	45	44
1 - Correct	0	0	1	0	4	5
2 - Ambiguous	1	0	1	1	1	1

3.2 Lithuanian Results

3.2.1 Primary coding

The percentage of respondents 'correctly' comprehending each label Variant follows a similar profile to that for Sweden, with A highest, followed by C, followed by B (shown in Figure 6). However, the disparity between the Variants is more pronounced than for Sweden.

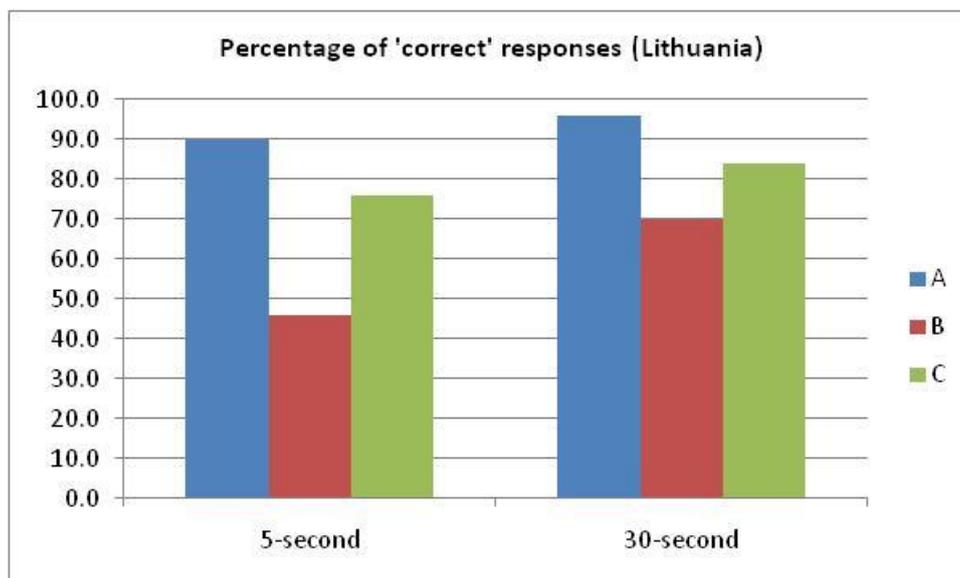


Figure 6 - Percentage of 'correct' Lithuanian responses to each label Variant after both the 5-second and 30-second viewings

Applying a chi-square test of independence to the various possible pairings within data gives the following results (✓ means significant at the p=0.05 level):

Within 5-second		Within 30-second		Within Variant (5-second vs. 30-second)	
A-B	✓	A-B	✓	A-A	-
B-C	✓	B-C	-	B-B	✓
A-C	-	A-C	✓	C-C	-

Figure 7 shows that despite the percentage of overall correct responses being seemingly quite different for each Variant, Variants A and C are actually very similar with respect to the percentage of respondents achieving 'complete' or 'partial' understanding (codes 1a and 1b respectively), particularly 'complete' understanding. This applies to the data from both the 5-second and 30-second viewings.

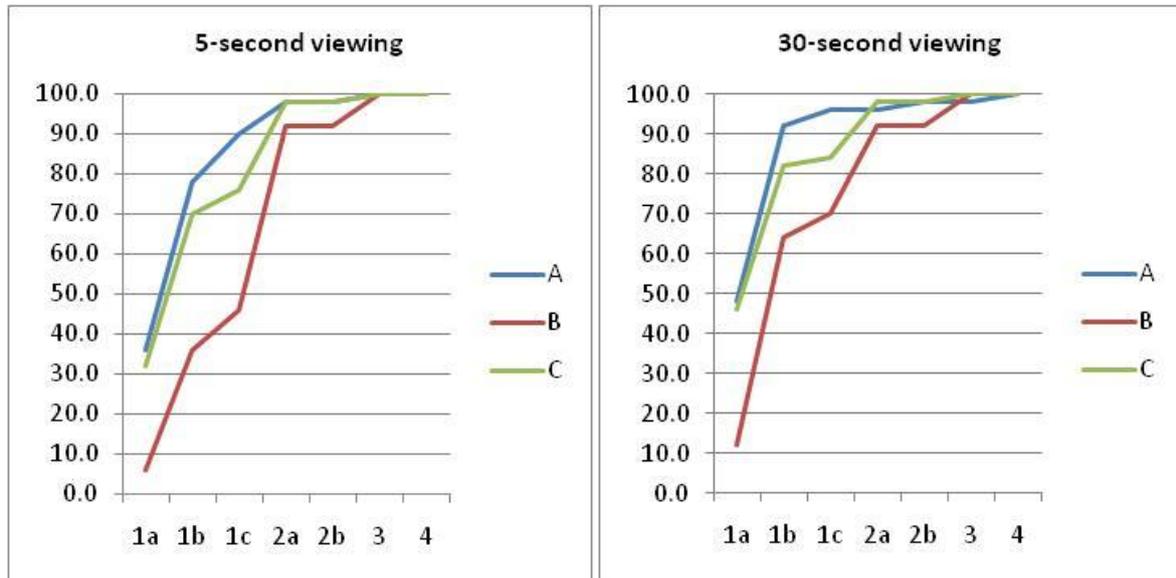


Figure 7 – Lithuanian cumulative response percentage, by coding category

3.2.2 Secondary coding

Responses to the three label Variants were as follows:

Category	5-second viewing			30-second viewing		
	A	B	C	A	B	C
0 - Wrong	50	46	46	50	40	29
1 - Correct	0	2	1	0	4	18
2 - Ambiguous	0	2	3	0	6	3

3.3 UK Results

3.3.1 Primary coding

Figure 8 shows that respondents to the UK survey achieved a noticeably different profile for label comprehension scores compared to the Swedish and Lithuanian respondents. In fact, for the 5-second viewing, label Variant A has gone from being the most comprehensible to the least. The reason for this difference between the UK and the other nations is not known, however some possible reasons are explored in Chapter 4. For the 30-second viewing, all three label Variants achieved an identical score, with 90% of respondents achieving at least 'basic' comprehension for each. Note that the difference between the number of correct responses to Variant A after the 5-second and 30-second viewings is the only one shown to be statistically significant at the $p=0.05$ level using a Chi-square test of independence.

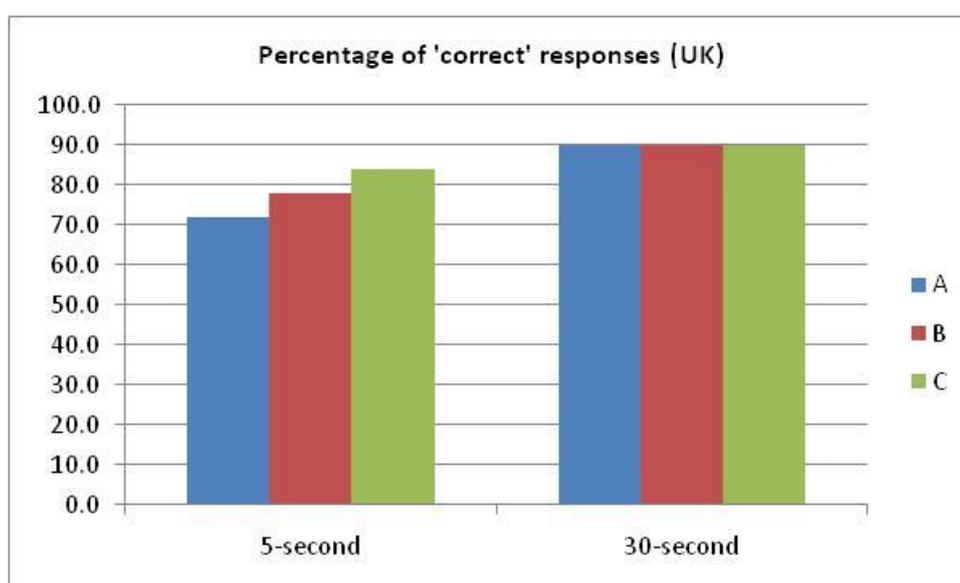


Figure 8 - Percentage of 'correct' UK responses to each label Variant after both the 5-second and 30-second viewings

Figure 9 shows notably that, although all three Variants achieved an overall comprehension score of 90% following the 30-second viewing (as shown in Figure 8), the proportion of these achieving the three different levels of comprehension differ. Variant A had a higher proportion of respondents achieving 'complete' understanding, but also a higher proportion only achieving 'basic' understanding. Variants B and C both had a more pronounced concentration of respondents achieving 'partial' understanding.

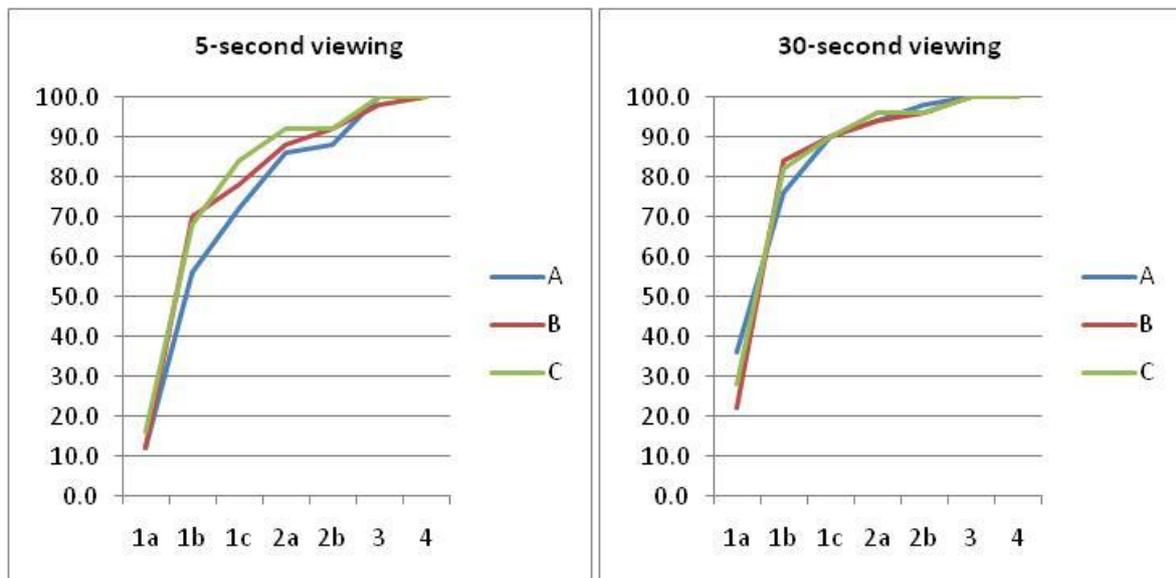


Figure 9 – UK cumulative response percentage, by coding category

3.3.2 Secondary coding

Responses to the three label Variants were as follows:

Category	5-second viewing			30-second viewing		
	A	B	C	A	B	C
0 - Wrong	49	47	45	49	38	32
1 - Correct	0	3	5	0	12	18
2 - Ambiguous	1	0	0	1	0	0

3.4 Overall/Combined Results

3.4.1 Primary coding

The overall/combined results were obtained by adding the percentage of respondents in each coding category, for each country, and dividing by three. For example, the percentages of responses to label Variant A coded '1a' in each country, after a 5-second viewing, were 12%, 16% and 36%, giving a combined mean of 21.3%.

Figure 10 shows that, following only a 5-second viewing, label Variant B was clearly the least well understood, but Variants A and C gained broadly similar scores. The same pattern can be seen in Figure 11; in fact the cumulative response profiles of both Variants follow a very similar trend. Following a 30-second viewing, the differences between Variants A and C become more pronounced and Variant A stands out as being the most comprehensible.

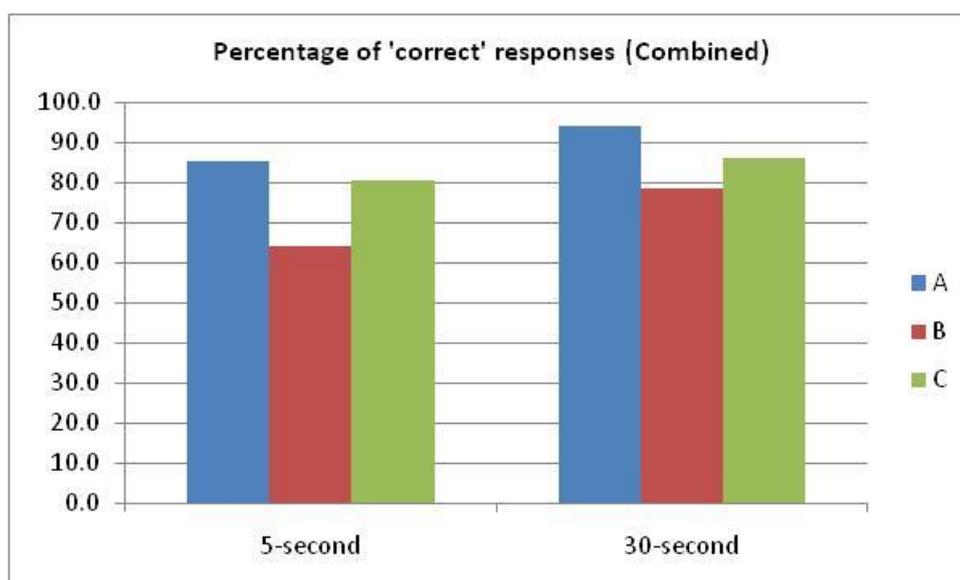


Figure 10 – Overall percentage of 'correct' responses to each label Variant after both the 5-second and 30-second viewings

Applying a chi-square test of independence to the various possible pairings within data gives the following results (✓ means significant at the $p=0.05$ level):

Within 5-second		Within 30-second		Within Variant (5-second vs. 30-second)	
A-B	✓	A-B	✓	A-A	✓
B-C	✓	B-C	-	B-B	✓
A-C	-	A-C	✓	C-C	-

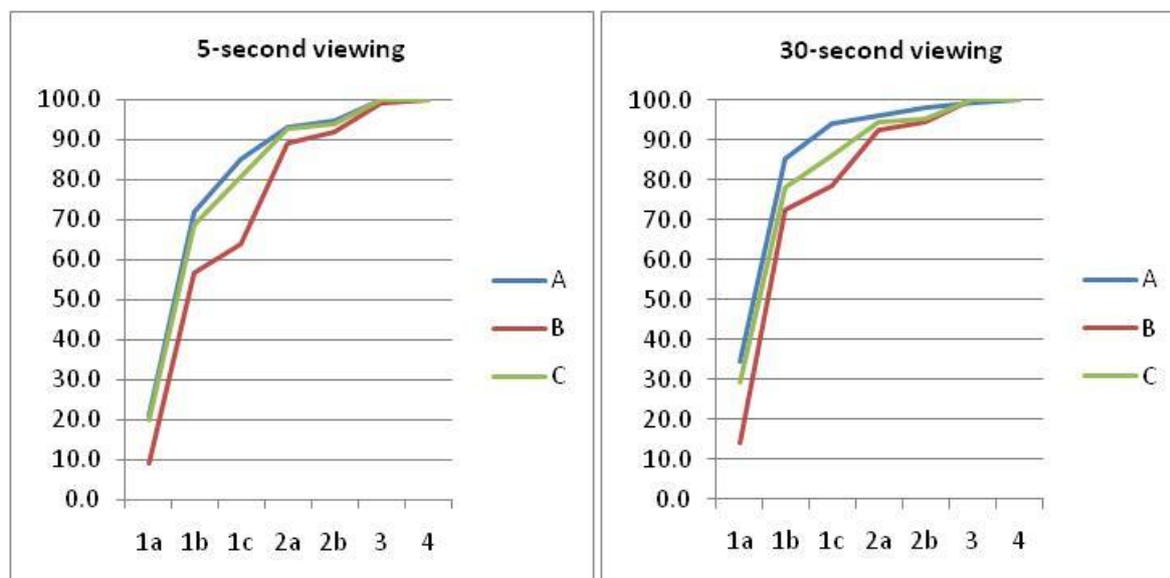


Figure 11 – Combined cumulative response percentage, by coding category

3.4.2 Secondary coding

Responses to the three label Variants were as follows, with values shown as percentages (note that totals do not always add up to 100% due to rounding):

Category	5-second viewing			30-second viewing		
	A	B	C	A	B	C
0 - Wrong	98.7	95.3	92.7	98.7	82.0	70.0
1 - Correct	0.0	3.3	4.7	0.0	13.3	27.3
2 - Ambiguous	1.3	1.3	2.7	1.3	4.7	2.7

As expected, very few responses were made to Variant A regarding the need to refer to alternative sources of information, and the only ones that were made were coded as 'ambiguous'. Variant C received the largest number of 'correct' responses, and even if the 'ambiguous' responses are also included, Variant C still stands out as the winner. The data therefore clearly indicate that the message was most comprehended by respondents to Variant C.

However, it is interesting to note that even though C scored highest, the scores were still fairly low (4.7% and 27.3% 'correct' responses for the 5-second and 30-second viewings respectively). This suggests that the majority of respondents either failed to comprehend the meaning of the symbol or regarded the message as secondary to that of the rest of the label and so neglected to mention it.

It is also interesting to note that the distribution of responses varied noticeably between the three countries. Figure 12 shows the percentages of 'correct' responses, in each country, for Variants B and C (Variant A received no 'correct' responses in any country).

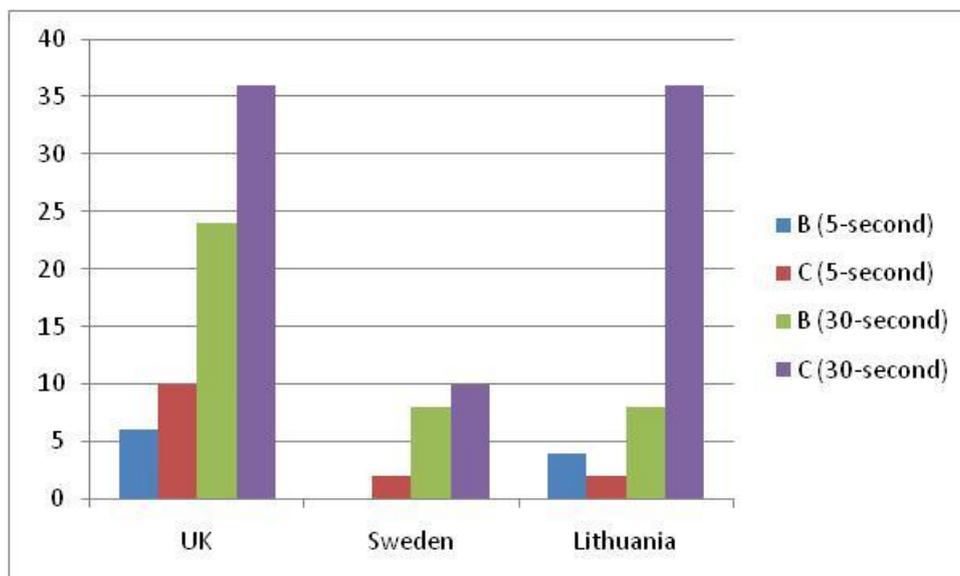


Figure 12 - Percentage of respondents giving a 'correct' response to Variants B and C, in each country and for both viewing times

It is clear across all three countries, even though the proportions differ, that label C was, overall, the most comprehensible*. It is not clear why, in Sweden, so few respondents identified the message compared to the other two countries (especially with regard to Label C under the 30-second viewing condition). It is speculated that this could be partly due to the fact that many of the Swedish respondents simply wrote 'same' as their response following the 30-second viewing (i.e. no change in their answer to what they wrote following the 5-second viewing) and appeared to be confident that they knew the meaning of the label early on. This may be why they neglected to mention any need to seek further information.

**The difference between the 30-second scores for Variants B and C was shown to be statistically significant at the $p=0.05$ level for Lithuania (using a chi-square test of independence), but not for the UK or for Sweden.*

4 Discussion

4.1 Assessment of the methodology

It is clear that the findings from a study such as this rely heavily on the validity of the coding and the accuracy of the scoring. The rules established in section 2.3 were considered distinct enough to prevent such issues arising; however the coding was tested to make sure that this was indeed the case. A second researcher was asked to code a sample of the responses (every tenth respondent from each country) to see how much variability there was in the codes allocated. Cronbach's Alpha and Cohen's Kappa statistical tests were conducted on the sample, the scores for both indicating that the inter-rater variability was slight enough to be confident that it is not a significant confounding factor.

4.2 Confounding factors

It should be noted that the data for Sweden were collected over two separate surveying periods. An initial survey (conducted in November 2010) failed to collect the full 150 responses recommended in ISO 9186. Instead a total of 118 were collected, with the distribution between label Variants A, B and C being 42, 40 and 36 responses respectively. The Variant A example shown to respondents did not have Swedish as one of the translations (although it did have English at the top, which is understood to be fairly widely spoken by Swedish residents). Neither of these factors was believed to have affected the results significantly as the results broadly matched the results from Lithuania and indeed most closely matched the overall/combined results of all three countries surveyed. However, an additional survey was conducted in Sweden (in January 2011) to ensure that both potential confounding factors, highlighted above, would be eliminated from the final results. The survey therefore collected the additional 10 and 14 responses required for Variants B and C respectively, and a full 50 responses for the revised Variant A. It was found that respondents in the latter survey scored generally higher, which had the overall effect of boosting the score for Variant A when compared to the previous survey results. It is speculated by the author that this could be a product of the differing demographics of the respondents between the surveys, with the latter survey incorporating a far higher proportion of respondents with degree-level education. This could potentially suggest an effect due to a higher level of intelligence amongst these respondents, or possibly that these respondents had higher paid jobs and therefore could afford newer cars in which the current warning label would be displayed. Regardless of the possible confounding effects of the differing survey demographics, the overall conclusions of the report remain unchanged and so the significance of these effects is considered to be minimal.

Based on anecdotal reports from the surveyors in each country, a significant number of respondents are believed to have previously seen the currently used label (Variant A) and to have been familiar with its meaning. This is seemingly reflected in the data, with a notable proportion of respondents achieving a 'perfect' score of 1a ('complete' understanding) even after only a 5-second viewing of a label that relies primarily on text to convey information and which was presented 'hidden' amongst other translations. Given that, with the time available to collect data, it was only just possible to achieve the required 150 respondents in each country - and indeed not even this number in Sweden first time around - it was simply not a viable option to exclude potential respondents based on their previous encounters with the current label. However, the suggestion is that this did prove to be a confounding factor in the data by skewing the proportion of correct responses to Variant A in its favour. It is not possible to say by how much at this time, nor even if this is the case at all, but there are grounds to suspect that Variant A's score was, to some extent, higher due to respondents' previous experience of the label.

The potential issue of a confounding effect due to having previously encountered the label raises the question of how easily recognisable the label is. It is not clear how important such a feature would be with this label, as it could be suggested that once the message has been read and understood once, the individual would then be aware of the risk and would know what to do in situations therein. However, the ability for the label to be a constant reminder to individuals is probably a very useful feature, and so should be promoted in any design. No evaluation of this sort has been carried out as part of this study, however a well constructed pictogram/symbol will be far more recognisable - as a visual image - than a block of text, and so any label comprising such symbols should be more recognisable, at a glance, than one comprising text. It is therefore suggested by the author that label Variants B and C would be preferable to Variant A in this respect.

4.3 Differences between countries / language issues

It was raised in section 3.3 that the UK primary-coding results followed a different trend to those from the Swedish and Lithuanian data, and that the reasons for this would be explored. Based on the responses given on the questionnaires it is clear that some respondents struggled to find the English translation within label Variant A. Few such comments were recorded in the Lithuanian and Swedish responses, despite similar label versions being used and with the Lithuanian, Swedish and English being equally 'hidden' amongst the text.

It is speculated by the author that this could be due to the fact that English speakers are often likely to find the required translation at the top of a label and so may have become conditioned to this. Conversely, non-English speakers may be more accustomed to searching through text to find the required translation. Respondents in the UK survey may have become fixated on not being able to read the text and failed to take in the other sources of information, including the symbol present on the label. This may be why they scored worse on Variant A after the 5-second viewing than for the other Variants.

An additional point with respect to language is the perhaps surprising finding that some people got the meaning of Variant A wrong, even after a full 30-second viewing, despite the exact meaning being printed word for word on the label. It is speculated that this could be due to a number of possible reasons, including:

- The respondent having poor language skills
- The respondent simply not bothering to read the label properly
- The respondent wrongly assuming that, as their language was not at the top, it was not on there at all and therefore not reading the text at all

All three potential reasons are arguments against using labels that rely heavily on text to convey the message being presented.

4.4 Further questions

In addition to the three informative elements common to all three labels (risk to child in front seat, airbag hazard and specific directionality), Variants B and C both included information directing the observer to consult the appropriate handbook for more specific guidance. It was clear from the low number of responses correctly identifying this message that this element was sometimes misunderstood or generally found to be confusing.

It raises the issue that the labels were tested for their overall comprehensibility, which does not allow for the comprehensibility of the individual symbols to be tested. For example, Variant C contains two symbols that both carry a similar meaning. It cannot be determined confidently whether a respondent's interpretation of the label was based on one symbol in particular or if the combination of both presented together was key. Given that a number of respondents scored well in their comprehension of the label, yet still

expressed confusion, suggests that there may be scope to alter some of the symbols on the proposed labels to generate a label that is even more easily comprehensible by a larger number of individuals.

5 Conclusions and Recommendations

1. Overall, the current label (Variant A) scored highest for respondent comprehension after both the 5-second and 30-second viewings, although the difference between the scores for A and C was not shown to be statistically significant for the 5-second viewing.
2. Variant A's high scores are believed to be partly attributable to some respondents having previously seen the label and therefore already knowing its meaning. It is speculated that, were this bias removed, Variant C may actually score higher than Variant A, especially under the 5-second viewing conditions.
3. Some respondents struggled to identify the relevant translation on Variant A and this is further evidence that a minimal reliance on text to convey the message of a label is desirable.
4. Of the two proposed alternative designs (Variants B and C), Variant C achieved the highest comprehension scores in both the primary and secondary coding categories.
5. Although Variant C scored highest in the secondary coding category (relating to the instruction to refer to the user manual for further information), it still did not achieve a particularly high score and there may be scope to further improve the way this message is conveyed.
6. Variants B and C both contain symbols that it is believed may not have been tested individually and there may be value in testing public comprehension of these individual symbols to identify the best designs.
7. Variant B did not score highly in any country tested and received the least supportive feedback.
8. It may be possible to develop Variant C further to the point that it achieves higher comprehension scores than Variant A.
9. It is believed there would be value in conducting further testing to:
 - a. Refine the symbols used in Variant C
 - b. Test the refined Variant C against Variant A, excluding respondents with previous experience of Variant A

In summary, the study finds that the existing label was the most easily comprehensible but that one of the alternative designs (Variant C) was close. It should be recommended that further testing is undertaken to potentially improve the design and to account for possible confounding factors identified in this study.

Acknowledgements

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References

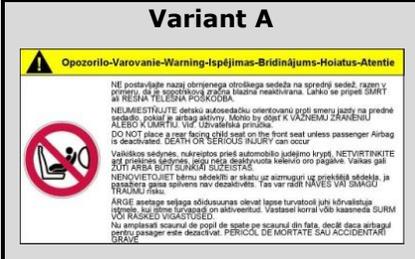
ISO 9186-1:2007 'Graphical symbols – test methods – part 1: Methods for testing comprehensibility'

Appendices

A.1 UK results

Table 1 - Breakdown of UK survey respondent demographics

Total number of responses = 150

				
Total number of respondents		50	50	50
age	15-30	11	17	20
	31-50	36	29	24
	51+	3	4	6
sex	Male	6	8	4*
	Female	44	42	45*
Education level (equivalent)	GCSE	14	17	19*
	A-level	19	13	11*
	Degree	17	20	19*
Number reporting physical disability		0	1	0

*numbers do not add up to 50 as there was one 'no response' for each question

Table 2 - Breakdown of UK survey label responses (5 second viewing)

		Variant A			Variant B			Variant C		
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	36	72	72	39	78	78	42	84	84
2	Wrong	8	16	88	7	14	92	4	8	92
3	Don't know	6	12	100	3	6	98	4	8	100
4	No response	0	0	100	1	2	100	0	0	100
total		50	100	360	50	100	368	50	100	376
Modified coding										
1a	Complete understanding	6	12	12	6	12	12	8	16	16
1b	Partial understanding	22	44	56	29	58	70	26	52	68
1c	Basic understanding	8	16	72	4	8	78	8	16	84
2a	Wrong	7	14	86	5	10	88	4	8	92
2b	Wrong and opposite	1	2	88	2	4	92	0	0	92
3	Don't know	6	12	100	3	6	98	4	8	100
4	No response	0	0	100	1	2	100	0	0	100
Total		50	100	514	50	100	538	50	100	552

Table 3 - Breakdown of UK survey label responses (30 second viewing)

		Variant A			Variant B			Variant C		
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	45	90	90	45	90	90	45	90	90
2	Wrong	4	8	98	3	6	96	3	6	96
3	Don't know	1	2	100	2	4	100	2	4	100
4	No response	0	0	100	0	0	100	0	0	100
total		50	100	388	50	100	386	50	100	386
Modified coding										
1a	Complete understanding	18	36	36	11	22	22	14	28	28
1b	Partial understanding	20	40	76	31	62	84	27	54	82
1c	Basic understanding	7	14	90	3	6	90	4	8	90
2a	Wrong	2	4	94	2	4	94	3	6	96
2b	Wrong and opposite	2	4	98	1	2	96	0	0	96
3	Don't know	1	2	100	2	4	100	2	4	100
4	No response	0	0	100	0	0	100	0	0	100
Total		50	100	594	50	100	586	50	100	592

A.2 Swedish results

Table 4 - Breakdown of Swedish survey respondent demographics

Total number of responses = 150

Total number of respondents		50	50	50
age	15-30	10*	5	10
	31-50	34*	33	32
	51+	5*	12	8
sex	Male	11*	21	22
	Female	38*	29	28
Education level (equivalent)	GCSE	2	2	1*
	A-level	13	28	20*
	Degree	35	20	28*
Number reporting physical disability		0	0	0

*numbers do not add up to 50 as there was one 'no response' for each question

Table 5 - Breakdown of Swedish survey label responses (5 second viewing)

		Variant A			Variant B			Variant C		
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	47	94	94	34	68	68	41	82	82
2	Wrong	2	4	98	12	24	92	5	10	92
3	Don't know	1	2	100	4	8	100	4	8	100
4	No response	0	0	100	0	0	100	0	0.0	100
total		50	100	392	50	100	360	50	100	374
Modified coding										
1a	Complete understanding	8	16	16	5	10	10	6	12	12
1b	Partial understanding	33	66	82	27	54	64	28	56	68
1c	Basic understanding	6	12	94	2	4	68	7	14	82
2a	Wrong	1	2	96	10	20	88	3	6	88
2b	Wrong and opposite	1	2	98	2	4	92	2	4	92
3	Don't know	1	2	100	4	8	100	4	8	100
4	No response	0	0	100	0	0	100	0	0.0	100
Total		50	100	586	50	100	522	50	100	542

Table 6 - Breakdown of Swedish survey label responses (30 second viewing)

		Variant A			Variant B			Variant C		
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	48	96	96	38	76	76	42	84	84
2	Wrong	1	2	98	10	20	96	4	8	92
3	Don't know	1	2	100	2	4	100	4	8	100
4	No response	0	0	100	0	0	100	0	0	100
total		50	100		50	100		50	100	
Modified coding										
1a	Complete understanding	10	20	20	4	8	8	7	14	14
1b	Partial understanding	34	68	88	31	62	70	28	56	70
1c	Basic understanding	4	8	96	3	6	76	7	14	84
2a	Wrong	1	2	98	8	16	92	3	6	90
2b	Wrong and opposite	0	0	98	2	4	96	1	2	92
3	Don't know	1	2	100	2	4	100	4	8	100
4	No response	0	0	100	0	0	100	0	0	100
Total		50	100	600	40	100	542	50	100	550

A.3 Lithuanian results

Table 7 - Breakdown of Lithuanian survey respondent demographics

Total number of responses = 150

				
Total number of respondents		50	50	50
age	15-30	21	13	21
	31-50	28	36	29
	51+	1	1	0
sex	Male	27	20	14
	Female	23	30	36
Education level (equivalent)	GCSE	5	12	5
	A-level	13	6	3
	Degree	32	32	42
Number reporting physical disability		1	1	1

Table 8 - Breakdown of Lithuanian survey label responses (5 second viewing)

		Variant A			Variant B			Variant C		
										
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	45	90	90	23	46	46	38	76	76
2	Wrong	4	8	98	23	46	92	11	22	98
3	Don't know	1	2	100	4	8	100	1	2	100
4	No response	0	0	100	0	0	100	0	0	100
total		50	100	388	50	100	338	50	100	374
Modified coding										
1a	Complete understanding	18	36	36	2	4	4	16	32	32
1b	Partial understanding	21	42	78	15	30	34	19	38	70
1c	Basic understanding	6	12	90	6	12	46	3	6	76
2a	Wrong	4	8	98	23	46	92	11	22	98
2b	Wrong and opposite	0	0	98	0	0	92	0	0	98
3	Don't know	1	2	100	4	8	100	1	2	100
4	No response	0	0	100	0	0	100	0	0	100
Total		50	100	600	50	100	468	50	100	574

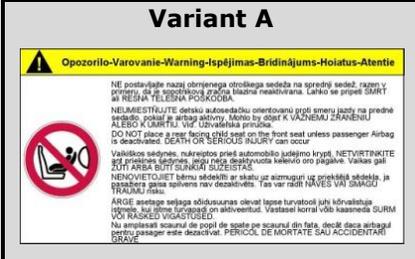
Table 9 - Breakdown of Lithuanian survey label responses (30 second viewing)

		Variant A			Variant B			Variant C		
										
		Freq.	%	Cum %	Freq.	%	Cum %	Freq.	%	Cum %
Original coding										
1	Correct	48	96	96	35	70	70	42	84	84
2	Wrong	1	2	98	11	22	92	7	14	98
3	Don't know	1	2	100	4	8	100	1	2	100
4	No response	0	0	100	0	0	100	0	0	100
total		50	100	394	50	100	362	50	100	382
Modified coding										
1a	Complete understanding	24	48	48	5	12	12	23	46	46
1b	Partial understanding	22	44	92	26	52	64	18	36	82
1c	Basic understanding	2	4	96	4	8	70	1	2	84
2a	Wrong	0	0	96	11	22	92	7	14	98
2b	Wrong and opposite	1	2	98	0	0	92	0	0	98
3	Don't know	1	2	98	4	8	100	1	2	100
4	No response	0	0	100	0	0	100	0	0	100
Total		50	100	628	50	100	530	50	100	608

A.4 Combined results

Table 10 - Breakdown of overall survey respondent demographics

Total number of responses = 418

				
Total number of respondents		150	150	150
age	15-30	42* (28.0%)	35 (23.3%)	51 (34.0%)
	31-50	98* (65.3%)	98 (65.3%)	85 (56.7%)
	51+	9* (6.0%)	17 (11.3%)	14 (9.3%)
sex	Male	44* (29.3%)	49 (32.7%)	40* (26.7%)
	Female	105* (70.0%)	101 (67.3%)	109* (72.7%)
Education level (equivalent)	GCSE	21 (14.0%)	31 (20.7%)	25* (16.7%)
	A-level	45 (30.0%)	47 (31.3%)	34* (22.7%)
	Degree	84 (56.0%)	72 (48.0%)	89* (59.3%)
Number reporting physical disability		1	2	1

*numbers do not add up to 150 as there was one or more 'no response' for each question

A.5 Copy of UK Questionnaire

Label Comprehension Questionnaire

This booklet contains an example of a label. We want to see how well this label is understood. You will be helping us do this by writing down what you think the label means.

It is very important that you write down exactly what, according to you, the message is. If your answer is too vague or general, we will not be able to determine if the correct message is getting across.

Before you are shown the label being tested, you will first be shown an example. This is presented here purely to show you what sort of response we are looking for. It is only the second label that is being tested.

For the example label, you will be shown the label and will be told where you might find it (such as at an airport, on a container, on a factory wall).

There then follows two probing questions:

- 1) Exactly what do you think this label means?
- 2) What action should you take in response to this label?

You do not need to answer these questions. Instead, examples of appropriate responses to these questions are provided as a guide.

For the actual test label you will again be told where you might find it. However, you will then be given two opportunities to view the label and to give your own responses to the probing questions. The first time you will have only five seconds to view the label, before then giving your responses. The second time you will have up to 30 seconds to view the label before giving your responses.

You may find the test label easy to understand; you may find it difficult. Just do the best you can. If you can't figure out what the label means, write down "don't know". Don't leave a blank.

It is important you work alone. Do not talk to anyone or make comments out loud.

Remember, it is the label that is being tested not you.

The next page asks you for some information about yourself. Please do not give your name.

The page after that is the example sheet showing a label and written below it what it means. It shows examples of appropriate responses to the probing questions.

The test pages come after the example sheet.

Thank you for taking part in this study.

Section 1: Questions about the respondent

Test administrator: _____

This is a study of the meaning of symbols. First we would be grateful if you would provide some information about yourself. Please do NOT give your name; the data is entirely anonymous.

Date: _____ / 11 / 2010

Age (please put a tick against whichever age group you are in):

15 – 30 _____

31 – 50 _____

over 50 _____

Sex (please put a tick to show which sex you are): Male _____ Female _____

Educational level (please put a tick against whichever one alternative best describes the level of education you completed or the qualification you obtained):

Left school at normal school-leaving age _____

Post-school qualification which is not a degree _____

Degree or degree equivalent _____

How would you describe your ethnic or cultural background? _____

Are you disabled? Yes _____ No _____

If you are disabled, which of the following describes your disability? (please put a tick against whichever is appropriate):

Problems with physical mobility _____

Problems with hearing _____

Problems with your sight _____

Section 2: Example of label comprehension test

This label might appear on a box. You might find it in a medical centre or a vehicle.



1) Exactly what do you think this label means?

It shows that the box contains 'first aid' materials

2) What action should you take in response to this label?

I should leave the box alone unless I need to use the medical kit, in which case I would open the box

Section 3: Actual label comprehension test (5 seconds)

The label you are about to be shown would appear in passenger cars sold in the EU. You might find it on the passenger seat sun visor.

You will now have 5 seconds to view the label.

1) Exactly what do you think this label means?

2) What action should you take in response to this label?

Section 4: Actual label comprehension test (up to 30 seconds)

You will now have the chance to view the label again. You will have up to 30 seconds to view the label this time.

As before, this label would appear in passenger cars sold in the EU. You might find it on the passenger seat sun visor.

1) Exactly what do you think this label means?

2) What action should you take in response to this label?

**This is the end of the questionnaire
Thank-you for your participation**

A.6 Copy of Swedish Questionnaire

Skyltförståelse Frågeformulär

Detta häfte innehåller exempel på en skylt. Vi vill se hur bra denna skylt förstås. Du kan hjälpa oss genom att skriva ner vad du tror att skylten betyder. Det är mycket viktigt att du skriver ner precis vad just du tror att den betyder. Om ditt svar är oklart eller för allmänt, kommer vi inte kunna fastställa om rätt budskap når fram. Innan vi visar dig skylten vi testar, kommer vi att visa dig ett exempel. Detta endast för att visa dig vad för slags svar vi hoppas på.

Det är endast den andra skylten vi testar. För exempelskylten kommer vi att visa dig skylten med och tala om var du kan tänkas se den (på en flygplats, på en låda, på en fabriksvägg)

Efter att du har sett skylten, kommer två frågor:

1. Exakt, vad tror du att skylten betyder?
2. Hur skulle du reagera på skylten?

Du behöver inte svara på frågorna om exempelskylten. Vi kommer att visa dig lämpliga svar som ledtrådar.

För den riktiga testskylten kommer vi att tala om var den kan tänkas vara placerad. Du får sedan två tillfällen att se skylten och får själv svara på frågan vad du tror att skylten betyder.

Första gången får du bara fem sekunder att se skylten och den andra gången får du upp till 30 sekunder att se skylten innan du svarar.

Du kanske tycker att det lätt att förstå vad skylten betyder, eller så kanske du tycker att det är svårt. Gör bara det bästa du kan, om du inte vet vad skylten betyder så skriv "jag vet inte", lämna inte ett blankt svar.

Det är viktigt att du svarar själv. Prata eller kommentera inte högt.

Kom ihåg, det är skylten vi testar och inte dig.

På nästa sida ställer vi några frågor om dig. Var snäll och skriv INTE ditt namn. På sidan efter får du se exempelskylten med förklarande text. Du får också se passande svar på de två frågorna. Testsidan kommer efter exempelsidan.

Tack så mycket att du medverkade i denna studie.

.

Del1 Frågor om svarande

Testadministratör: _____

Detta är en studie om meningen av skyltar/symboler. Först skulle vi vilja veta lite om dig själv. Skriv INTE ditt namn, studien ska vara helt anonym.

Datum: _____ / 11 / 2010

Datum

Ålder (kryssa för din åldersgrupp)

15 – 30 _____

31 – 50 _____

Över 50 _____

Kön (kryssa för) Man _____ Kvinna _____

Utbildning (kryssa för den rad som bäst beskriver din högsta avslutade utbildning)

Grundskola _____

Gymnasieskola _____

Högskola _____

Hur skulle du beskriva din etniska bakgrund? _____

Är du handikappad Ja _____ nej _____

Om du har handikapp är detta relaterat till något av följande områden?

Rörelsehinder _____

Problem med hörsel _____

Problem med syn _____

Del 2 Försåelsetest av exempelskylten

Denna skylt kan finnas på en låda. Du kan hitta den på vårdcentraler, sjukhus eller i bilar.



1. Exakt, vad tror du att skylten betyder?

Den visar att lådan innehåller utrustning för första hjälpen

2. Hur skulle du reagera på skylten?

Jag skulle låta lådan vara, utom i situationer då medicinsk utrustning behövs. Då skulle jag öppna lådan

Del 3 Förståelsetestet (5 sekunder)

Skylden du kommer att se, kan ses i passagerarbilar sålda i EU. Du kan hitta den på solskyddet på passagerarsidan.

Du kommer att se skylten i 5 sekunder.

1. Exakt, vad tror du att skylten betyder?

2. Hur skulle du reagera på skylten?

Del 4 Förståelsetestet (upp till 30 sekunder)

Du kommer nu att få en chans till att se skylten. Denna gång har du up till 30 sekunder att titta på skylten.

Som tidigare kan skylten ses i passagerarbilar sålda i EU. Du kan hitta den på solskyddet på passagerarsidan.

1. Exakt, vad tror du att skylten betyder?

2. Hur skulle du reagera på skylten?

**Detta är slutet på Frågeformuläret
Tack så mycket att du medverkade i denna studie**

A.7 Copy of Lithuanian Questionnaire

Simbolio Suvokimo Apklausa

Gerbiamas respondente,

Kreipiamės į Jus, prašydami užpildyti apklausos anketą. Tyrimo rezultatų analizė padės atskleisti simbolių, randamų keleivinių automobilių salone, efektyvumą.

Ši anketa - anoniminė. Prašome užpildyti asmens duomenis, nenurodant vardo ir pavardės.

Butinai susipažinkite su antrojoje dalyje pateikiamu apklausos anketos pavyzdžiu.

Užpildykite trečiojoje ir ketvirtojoje dalyse pateiktą anketą. Apibūdinami trečiojoje dalyje pateiktą simbolį, susipažinimui su juo skirkite **5** sekundes, pildydami ketvirtą dalį- **30** sekundžių.

Atsakinėkite savarankiškai, nepalikdami neužpildytų vietų. Jei simbolis ar jo paskirtis Jums atrodo neaiškūs, užrašykite: „nesuprantu“, „neaišku“.

Atminkite, kad mes tiriamo simbolį, o ne Jūsų sugebėjimus.

Dėkojame už dalyvavimą šioje apklausoje.

1 Skirsnis: Klausimai apie respondentą

Apklausos administratorius: Kastytis Stučinskas

Šiuo tyrimu siekiama išsiaiškinti simboliais perteikiamos informacijos efektyvumą. Užpildydami informaciją apie save, prašome, nenurodykite vardo ir pavardės.

Data: 2010/ 11 / _____

Amžius (pažymėkite varnele amžiaus grupę, kuriai priklausote):

15 – 30 _____

31 – 50 _____

virš 50 _____

Lytis: Vyr. _____ Mot. _____

Išsilavinimas (pažymėkite varnele grupę, geriausiai apibūdinančia jūsų išsilavinimą):

Vidurinis _____

Profesinis/ Aukštesnysis _____

Aukštasis _____

Tautybė _____

Ar esate neįgalus? Taip _____ Ne _____

Jei esate neįgalus, kuris iš šių aprašymų apibūdina jūsų negalia?:

Negalia, susijusi su fiziniu mobilumu _____

Negalia, susijusi su klausa _____

Negalia, susijusi su regejimu _____

2 Skirsnis: **PAVYZDYS** – simbolio suvokimas

Šį simbolį galite pamatyti ant dėžutės, esančios gydymo įstaigoje ar transporto priemonėje.



1) Ką būtent, Jūsų nuomone, šis simbolis reiškia?

Jis rodo, kad dėžutėje yra laikomos pirmosios medicininės pagalbos priemonės.

2) Kokių veiksmų turėtumėte imtis, pamatę šį simbolį?

Jokių, nebent man reiktų suteikinti pirmąją pagalbą. Tokiu atveju atidaryčiau dėžutę.

3 skirsnis: Faktinis simbolio suvokimo testas (5 sekundės)

Simbolį, kuris netrukus bus rodomas, galėtumėte rasti keleivinio automobilio salone. Jis priklijuotas ant skydelio nuo saulės, esančio priešais keleivio sėdyne (skydelis yra atverčiamas, kad saulė nešviestų į akis).

Šio simbolio peržiūrai skiriamos 5 sekundės.

1) Ką būtent, Jūsų nuomone, šis simbolis reiškia?

2) Kokių veiksmų turėtumėte imtis, pamatę šį simbolį?

4 skirsnis: Faktinis simbolio suvokimo testas (30 sekundžių)

Jūs turite galimybę peržiūrėti simbolį dar kartą. Dabar tam skiriamos 30 sekundžių.

Kaip ir anksčiau, šis simbolis priklijuotas automobilyje ant skydelio nuo saulės, esančio priešais keleivio sėdyne.

1) Ką būtent, Jūsų nuomone, šis simbolis reiškia?

2) Kokių veiksmų turėtumėte imtis, pamatę šį simbolį?

**Anketos pabaiga.
Dėkojame už dalyvavimą apklausoje.**