



The development of guidelines for the design and evaluation of warning signs for young children



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ABSTRACT

We report a study which aimed to provide further development and refinement of a set of guidelines (Waterson et al., 2012) for the design and evaluation of warning signs and other visual material for young children (i.e., aged 5–11 years). The study involved a set of semi-structured interviews and focus groups with the parents of young children, teachers, human factors experts and other groups ($n = 38$). The findings from the study provided broad support for the guidelines, as well as highlighting a number of issues which need to be addressed. These included the need to consider the target audience in more detail and provide additional guidance covering possible tie-ins with safety campaigns, sign location, age differences, gender and children's special needs. Similar findings were obtained with regard to the evaluation guidelines and their coverage of methods and activities for testing signs (e.g., simulation, role playing). We discuss our findings within the context of a revised set of guidelines and a set of suggestions aimed at working towards a more comprehensive approach to the design/evaluation of signs for young children. The paper concludes with a set of future topics for research including a discussion of ways forward in terms of improving support for design and evaluation including behavioural testing with children, their parents and other care givers.

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1. Introduction

Drives to reduce the number of accidents which happen to young children represent a major challenge for safety organisations and governments around the world. Every year within the UK one million children under the age of 15 experience accidents of varying degrees of severity in or around their home environments (RoSPA, 2012). Those most at risk from a home accident are children between the ages of 0–4 years (UK Consumer Safety Unit, 2002). A significant number of minor injuries occur in a number of other contexts involving young children (e.g., rail travel – RSSB, 2009). One way of reducing the number of these accidents is the design of warning signs and other types of visual information which can alert young children and their carers to the dangers or hazards involved in hazardous environments or potentially unsafe behaviours.

Our aim in this paper is to outline our attempts to work towards a set of guidelines for the design and evaluation of warning signs for young children. In this paper we refer to 'young children' as children between the ages of 5 and 11 years of age. The work draws on the previous findings of Waterson et al. (2012) and a set of

interviews and focus groups with the parents of young children, teachers and professional book illustrators and authors. In what follows, we first review previous research which has examined the design and evaluation of warning signs for young children, alongside work addressing the types of methods which have been used to carry out research with children under the age of 11.

1.1. The design of visual warning signs for young children

Very few guidelines or standards for the design of warning signs and other materials exist for the children under the age of 11 years (Waterson et al., 2012). This stands in contrast to information of this kind which is available for adults (e.g., BSI, 2002; ANSI, 1998), as well as guidance developed for specific groups of individuals (e.g., visually impaired and other types of disabled users – Barker and Fraser, 2000). A key lesson from the available literature is that because of the limited cognitive abilities of children, particularly the very young, warnings need to be designed very differently as compared to those targeted at adults (Rice Berg and Lueder, 2008). Kashler and Wogalter (2008) suggest that some aspects of guidelines aimed at adult populations can be adopted for use with younger children, these include: the need to make warning 'stand out' (e.g., using bright colours and contrasts); and the use of pictorial symbols (e.g., pictograms).

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Table 1
Summary of the design guidelines developed by Waterson et al. (2012).

Guideline	Sub-component	Details
1. Design prototyping	(i) Preparation (ii) Design and evaluation	Pilot, test and evaluate your methods thoroughly Be prepared to be surprised by what you find (they may contradict your assumptions)
2. General format	(i) Type of signs	Design the sign with objectives and context of use in mind
3. Textual aspects	(ii) Language (iii) Number of words (iv) Use of terminology, concepts (v) Fonts and lettering	Keep the language used in signage as simple as possible. Use a minimum of words Avoid 'abstract' concepts or terminology Use large font sizes and consider the use of uppercase lettering
4. Visual aspects	(i) Pictograms (ii) Examples (iii) Symbolology (iv) Characters (v) Colours	Use pictograms where possible to reinforce the safety message Use examples of pictograms that demonstrate 'good' and 'bad' behaviour Use symbolology that appeals to children Use safety characters to help convey the safety message Use colours to reinforce the safety message

Waterson et al. (2012) carried out a study in collaboration with the UK Rail Safety and Standards Board (RSSB), the aim of which was to develop an outline set of guidelines covering the design and evaluation of warning signs (Table 1 shows a summary of the guidelines as they relate to design). The guidelines were based on a set of classroom discussions with groups of children aged between 5 and 11. One of the conclusions from this work was the need to carry out further evaluation of the guidelines in order to gain feedback regarding their content from a range of different groups. The primary objective of the current study was to evaluate the guidelines with a range of human factors experts, parents of young children, teachers and professional book illustrators and authors.

1.2. Methodological considerations when carrying out research with young children

Carrying out research with young children often proves to be challenging. With children aged 6–7 or under, interviews are difficult to carry out, particularly since children of this age group find it difficult to respond to direct questions about themselves (Backett and Alexander, 1991; Mauthner, 1997). Waterson et al. (2012) found that talking to the younger children in small groups proved to be successful when it was structured around themes and topics which may be of interest to them (e.g., their experience of train travel). In the case of both younger and older children it was important to make the activities fun and interesting for the children. Part of this involved setting out strategies for introducing the researchers and the topics we were interested in (e.g., by using characters and activities for the children to do). The use of a classroom setting and the presence of a teacher also meant that the workshops were not threatening or otherwise intimidating for the children. In general we tried as much as possible to equalize any differences in power relations that may have existed between the researchers and the children. One way of doing this was to ask open-ended questions and allow the children to set their own agenda when evaluating the signs. In some cases this can mean that the children get distracted and the data may prove to be not very useful. In other cases, it had the advantage that it allowed the children to fully express themselves without any fear or inhibitions. On the basis of these and other observations, a second set of guidelines covering the evaluation of warning signs was developed by Waterson et al. (2012, Table 2).

1.3. Study aims and objectives

The chief aim of the present study was to evaluate both sets of guidelines covering design and evaluation developed in the earlier study. The guidelines were developed largely on the basis of a set of

discussion sessions held with children in their classrooms and facilitated by the researchers and teachers. The aim of the current study is to firm up the guidelines by drawing on the opinions of a wider range of people (e.g., human factors experts, parents and children's book illustrators). A second objective was to develop a revised set of guidelines which could be used by designers to develop new signs and later evaluated and tested with children and other groups (e.g., parents, teachers).

2. Methods of study

2.1. Participants

The study was conducted between January and May 2012 and involved two methods of study: a set of 11 individual semi-

Table 2
Summary of the evaluation guidelines developed by Waterson et al. (2012).

Guideline	Details
1. Preparation	Working with children can be challenging and it is essential to pilot materials and activities with small groups before using them to carry out design or testing. A process of iteration and refinement of the content and format of materials/activities and obtaining feedback from children, parents/carers and teachers is strongly recommended. Time spent gathering ideas and trying out activities with parents and teachers is very likely to be well spent.
2. Setting	A setting which places the children at ease and the activity can be integrated into normal, daily life is recommended. We found that a familiar setting such as the classroom worked well within our study. In other cases, playgroups or afterschool clubs may also be worthwhile considerations for design/testing activities.
3. Participants	Children, particularly young children are likely to be shy when in the presence of other adults they do not know. It is worthwhile including a parent or teacher in the study group. The presence of an 'authority' figure can be reassuring for the children and reduce any anxieties they may have. It can also help to maintain discipline when children find it hard to focus on a particular task or when individual children dominate group tasks and the views of quieter children are not allowed to be heard.
4. Methods	We found that the children in our study responded well to classroom discussions rather than a focus group format. They found the discussions to be fun and interesting. Small focus groups may be useful with older children, particularly when prototype designs are well advanced and more specific aspects of the design need to be tested. The use of open-ended questions also helps to stimulate discussion amongst children and may help to generate useful, sometime unexpected design suggestions.
5. Activities	For younger children it is worthwhile integrating design/testing into a story-like format. Younger children often think in terms of stories and enjoy them. Stories also may facilitate their understanding of the task and help them to generate ideas.

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