Assessing spectator safety in seated areas at a football stadium

This item was submitted to Loughborough University’s Institutional Repository by the/an author.


Additional Information:

- Presented at the The Ergonomics Society Annual Conference, Swansea, UK 2004. This is an Accepted Manuscript of a book chapter published by Routledge in Contemporary Ergonomics 2004 on 8 April 2004, available online: http://www.routledge.com/9780203494172

Metadata Record: https://dspace.lboro.ac.uk/2134/34149

Version: Accepted for publication

Publisher: CRC Press

Rights: This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: https://creativecommons.org/licenses/by-nc-nd/4.0/

Please cite the published version.
ASSESSING SPECTATOR SAFETY IN SEATED AREAS AT A FOOTBALL STADIUM

S. Y. Zachary Au¹, Jenny Gilroy², Andrew D. Livingston², Roger A. Haslam³

¹Independent Consultant, 13 Meadow Lane, Warrington, Cheshire, UK. WA2 0PR
²Atkins Consultants Limited, WS Atkins House, Birchwood Boulevard, Warrington, Cheshire, UK. WA3 7WA
³Health & Safety Ergonomics Unit, Department of Human Sciences, Loughborough University, Loughborough, Leicestershire, UK. LE11 3TU

All UK Premier League and First Division football clubs are required to provide only seated accommodation at their stadia. However, many spectators do stand up in seated areas, sometimes persistently for long periods of time. This paper looks at a study to assess the hazards and risks of such behaviour and the methodological issues involved, including the risk assessment method used and the collection of risk data and information for the study.

Introduction

Following the Taylor Report into the 1989 Hillsborough Disaster, all UK Premier League and First Division grounds are required to be all-seated. The intention is that spectators should be seated for the duration of the match although it is expected that seated spectators could “move from their seats” at moments of excitement (Lord Justice Taylor, 1990). However, at football grounds up and down the country many spectators do stand up during matches and sometimes they do so persistently for long periods of time. The enforcing authorities have been concerned about the safety implications of such behaviour. Persistent standing in areas designed for sitting has been deemed to be “less safe”, but to what extent this is so had not been entirely clear. In order to determine this, and to establish what actions are justifiably required, it is necessary to examine the hazards and the risks involved. A study was therefore commissioned to assess the risks of standing in seated areas at a major football stadium.

Assessing crowd safety risks – the methodological issues

The risk assessment principles are clear; essentially it involves the identification of hazards and the evaluation of the extent of the risks involved (e.g. HSC, 2000). However, how they should be applied to the context of crowds at public venues requires careful consideration. Under the Management of Health and Safety at Works Regulations 1999, it is necessary to ensure that the risk assessment is “suitable and sufficient”. This means that it should be appropriate to the nature of the operations concerned and the types of hazards and risks that may arise.
To an extent, crowd management is a human factors issue. It is about dealing with people and their interactions with each other, with the physical environment and with the circumstances. But at the same time, it is also very different to a workplace or other contexts to which human factors and risk assessment are normally applied. For example, in conventional ergonomics the work activities or the manner in which equipment or products are used are restricted by the work procedures, rules, the tasks that people are required to do, the functions of the equipment/ product, etc. These types of restrictions are far less prevalent and stringent for crowd activities and people are much freer to do as they wish. This makes their “tasks” less predictable and far harder to define and analyse in a highly systematic manner - established human factors techniques such as task analysis are, therefore, not applicable in this context.

The presence of large crowds can also pose a range of hazards that are unique to the public venue environments. For example, past crowd disasters (e.g. Dickie, 1993) have shown that people could be seriously harmed by crushing, human pile-up, structural failure and other such hazards that are not found in other contexts. Therefore, a suitable and sufficient risk assessment method for crowds should adequately reflect the complexity of the subject matter and facilitate the assessors to identify the types and range of hazards that could arise.

Conventional assessment methods range from a simple approach based on subjective judgement for offices, shops light industrial premises, etc. (e.g. HSE, 1998) to the highly sophisticated quantified risk assessment (QRA) for complex high hazard systems. There is also a range of “semi-quantified” methods. However, recent research (Au, 2001) suggested that none of them are suitable for assessing crowds. The basic approach is not sufficiently robust given the complexity of the subject matter and the severe consequences a crowding accident could have. The QRA method might be desirable in principle but the lack of relevant risk data means that it is not feasible to conduct. Semi-quantified methods, on the other hand, are considered as fundamentally flawed because of the ways in which ratings, which are qualitative in nature, are used as something quantitative for mathematical calculations. Also, all of these methods are intended for the work environments and are not particularly appropriate to the kind of hazards and risks that could arise in a public venue. A survey of the same research has found that by using the conventional methods, some assessors were able to identify the “physical hazards” posed by the buildings but were not able to identify the “behavioural hazards” that arise from the crowding.

For assessing crowd safety, what is required is a method that is qualitative, structured and encourages lateral thinking. A structured approach is necessary where the subject matter is complex, to ensure that all key areas are covered in the assessment. Lateral thinking and being able to think beyond normal conventions is important because crowd safety is not a precise science and past disasters have also shown us that even relatively minor changes to the make-up of the crowd, the physical environment and/or the circumstances could result in a very different outcome. Based on this principle, a methodology was developed (Au, 1998) specifically for assessing crowd safety risks. Designed to encourage a structured and robust assessment, it contains key features such as (a) generic keywords for behavioural related and physical hazards that can arise in the public venue environments, and (b) a risk rating regime that consists of separate ratings for likelihood and severity and a likelihood-severity matrix for determining the extent of risk. The keywords are similar in nature to the HAZOP1 keywords;

---

1 HAZOP stands for Hazard and Operability Study. It is widely used in the high hazard industries for hazard identification. A human factors version (i.e. Human HAZOP) is also available for human error analysis.
they were designed to be thought provoking and to provide a structured approach for hazard identification. The risk rating regime allows a wide spectrum of risks, ranging from high-magnitude low-probability to low-magnitude high-probability risks, to be accounted for whilst limiting each rating scale to a manageable size. This methodology was therefore adopted, with slight modifications made to cater for the specific needs of this assessment.

The risk assessment of standing in seated areas

The assessment consisted of three key elements: data and information gathering, ergonomics assessment of the physical design, and risk assessment based on the said methodology.

Risk data and information

Risk data and information is essential for identifying the hazards and establishing their causes, consequences and risks. The better the data/information is, the more objective the assessment can become. In those industries where QRA has been used extensively, much effort has been devoted to the collection of risk data (e.g. failure rates of system components). In human factors, human reliability techniques (e.g. Williams, 1988) are available for estimating human error probabilities. Even for a qualitative assessment, data and information is needed to provide evidence, indications or guidance on the types of hazards that may arise and the extent of the risks involved.

There has been no published scientific research or other direct evidence on how much risk people are exposed to when standing in seated areas. Hence, as a key part of the assessment, an extensive information gathering exercise was conducted to obtain information from a variety of sources. They include: (a) review of past records to collect historical data, (b) observations of crowd activities during matches, (c) consultation meetings to gauge the views and experience of the supporter associations and stakeholders (i.e. the football club, the licensing and enforcing authorities, emergency services), and (d) questionnaire survey targeting the spectators and the front line staff (e.g. stewards).

The review of past records involved an examination of the post-match reports produced by the club following each match. The reports contain a combination of numerical data (e.g. injury figures, number of ejections and arrests) and qualitative information (e.g. extent of persistent standing, description of crowd behaviour and the circumstances surrounding the match). A number of interesting findings were revealed. For example, persistent standing tended to occur mostly in certain sections of the stadium and more frequently in certain types of matches (e.g. European matches). But there does not appear to be a relationship between the overall injury figures and persistent standing, which suggests that the risk of persistent standing could be fairly low. Furthermore, probably contrary to popular believe, there were more matches with widespread persistent standing and drunkenness related problems when alcohol was not sold inside the stadium.

The aim of the observations was to look at spectators’ behaviour and movements and their interaction with the built environment in various parts of the stadium. It is necessary to observe different parts of the stadium because they were built at different times and have different characteristics. The observations covered a range of matches including European matches, domestic matches, important matches (to the club) and less high profile matches. The findings suggest that although persistent standing is generally deemed to be less safe,
people normally stood relatively still without significant movements or crowd surge. But the observations have also identified a number of associated activities that could give rise to some concerns, such as people standing close to the edge and standing on seats. Standing up at moments of excitement (e.g. when a goal is scored), however, is deemed to be more dangerous because of the vigorous movements involved.

The consultation meetings provided a valuable opportunity for open discussions with people of different backgrounds and viewpoints on issues of standing in seated areas. These meetings enabled the assessors to gain an in-depth and more revealing understanding of the nature, the causes (and historical background) and the extent of the problem. The meetings also served to highlight the needs and expectations of all parties and areas of misunderstanding between them. This can be particularly useful for formulating remedial measures to encourage mutual understanding and closer cooperation.

The survey of the wider spectator population and front line staff also generated a wealth of information on the extent of the problem. A total of 1,100 questionnaires were sent out and the response rate was good, at 38% overall. On the whole, the survey results have supported that the likelihood of an accident, such as falling over, due to persistent standing per se is relatively low, although standing on seats is more problematic. But the danger increases when there are significant movements, such as at moments of excitement and during celebrations. Spectators entering and leaving their seats and the seated areas was also found to be rather problematic because of the physical design of the stands.

Site survey and ergonomics assessment
In addition to information gathering, the designs and the built environment of the seated areas were also assessed. A survey was carried out when the stadium was not in use to examine the seated areas and collect measurements and data about the physical design. This was followed by an ergonomics assessment to determine whether and how key design features such as seat dimensions, clearways, rear seat height, flooring, gangway stairs, seating layout and front barriers could affect safety when spectators stand. Ergonomics is an important consideration in this study for various reasons. Firstly, even though the stadium was designed in accordance with relevant guidance (i.e. Guide to Safety at Sports Grounds), it was intended for seated accommodation. Persistent standing represents a deviation from this intention. Hence, it is necessary to examine whether and to what extent the design is still adequate. Secondly, space is often at a premium at many stadia. This, in combination with the movements that could take place in that space, could give rise to a number of hazards such as slips, trips and falls. Finally, the fact that some seated areas are built at a relatively steep angle (to maximise the use of space and ensure unrestricted viewing) could exacerbate the problem. Details of the ergonomics assessment and the types of hazards that cold arise in a stadium environment are discussed in a separate paper by the same authors.

Together with the information generated above, the output of the ergonomics assessment was fed into the risk assessment to assist in the evaluation of risks and establishing how the physical design of the stadium could be improved to control the risks.

Assessment of risks
Based on the methodology described at the beginning of this paper, an assessment was carried out to establish the following: the hazards, the causes (of hazards), the consequences, existing
mitigating factors and precautions, the level of risk posed by each hazard, and possible remedial measures.

Although it is a qualitative method, the variation and extent of the data collection methods used has enabled the assessors to identify the hazards and evaluate the risks in a more objective and impartial manner. Using the risk rating regime mentioned above, each hazard was allocated one of the following six risk levels: ranging from A (most serious risk) to E (trivial risk). This was done based on the likelihood of harm as a result of the hazard and its severity. The risk level helps the assessor to determine the extent and priority of the measure(s) required to control the risk.

Conclusions

This paper gives an overview of a study undertaken to assess the risks of standing in seated areas at a football stadium. The methodology for the risk assessment is an important consideration. It must be appropriate to the activities and the environment involved and the types of hazards and risks that may arise. In this study, the nature of the assessment called for the use of a specific methodology that is different to the conventional methods. The gathering of information about the risks is also important to ensure that the assessment is as objective as possible. In this study, information was collected from a range of sources and an ergonomics assessment was also carried out to provide a specialist analysis of the physical design of the stadium. In the event, the study has found that the safety risk of persistent standing per se is relatively low, but it could give rise to other hazards such as people standing on seats. What is of more concern, however, is when there are active movements in the crowd such as at moments of excitement and, to a lesser extent, when people are entering and leaving. The risk assessment has provided an indication of the risk associated with each key hazard. It has highlighted the more important risks and led to the identification of risk reduction measures covering stadium design, crowd safety management and public education/awareness issues.

References