OBSERVATIONS ON IMPACT ATTENUATION CRITERIA FOR PLAYGROUND SURFACING

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Background

1. This note is prompted by a proposition, originating from the ASTM in the USA but which was also considered by CEN in Europe in 2014, to revise the Head Impact Criterion (HIC) for playground impact absorbing surfacing (IAS) downwards from 1,000 to 700. The stated aim is primarily to reduce the risk of brain injury from headfirst falls to the ground, though some also refer to a reduced risk of long bone fractures as another benefit.

2. Although on the face of it the proposition sounds entirely rational it is a cause of controversy. On the one hand, in support of the proposition, there is evidence from road traffic accidents and other non-play environments that children may sustain brain injury at a HIC of 1,000 or less. For some this immediately implies that action is needed in all settings where children are potentially at risk of head injury. On the other hand, there is concern that an intervention of this nature might have significant and unintended consequences for play provision with knock-on implications for overall child welfare because play is an essential constituent of growing up.

3. Both concerns are legitimate. It can be assumed that all parties want the best for children, but it has not been agreed how this is to be achieved. This discord might be attributable to deficiencies in communication between the parties involved. The situation does indeed appear to resemble a classic stand-off between parties who seek the same ultimate goal - the welfare of children and young people - but approach it from different perspectives.

4. It may be worth pointing out that such situations are relatively common in risk management decision making. For example, Professor John D. Graham, Dean of Indiana University School of Public and Environmental Affairs, wrote a book about it citing numerous examples.[1] The problem is that any one intervention, be it to promote safety from injury, improve health, protect the environment *et cetera*, may adversely affect the achievement of different goals important to other people.

[1] J D Graham and J Wiener, 'Risk versus risk - tradeoffs in protecting health and environment,' Harvard University Press, 1985.

5. In the context of the present example of IAS, it is likely that one element of the controversy revolves around the pursuit of lower head injury rates versus the quest by others for improved physical and emotional health through greater uptake of what they regard as enhanced play opportunities. Some would argue that these two things can be pursued independently, but others see them as connected such that actions to promote one affect the other. The late Howard Margolis, Professor of Public Policy Studies at the University of Chicago, explained such clashes as coming about because some participants in a debate see their quest from an absolutist perspective, that is, 'Nothing can be more important than this,' whereas others believe that all decisions involve tradeoffs and compromises.[2]

Approaches to Public Policy Decision Making

6. It is relevant to be aware that attitudes to public policy decision making have changed markedly over the last half century. In the 1950s there was a tendency to believe that decisions about public policy were best left to technical experts. This is no longer seen as valid nor acceptable in policy making circles, on either side of the Atlantic. The position now, in N. America and Europe, is that decisions that have significant impacts on society should encompass all stakeholder views and be sensitive to the variety of concerns and needs. While it is entirely appropriate that the best technical evidence should be used to inform policy decisions, those decisions should not be driven by purely technical inputs. For example, who would want a hospital to provide patient care with only technical input being permitted in the determination of patient health choices? This shift in thinking is set out by the US National Research Council in its influential book *'Understanding risk - Informing decisions in a democratic society*.' In Europe, one finds equivalent messages in the publications of the Lausanne-based International Risk Governance Council, and in policy documents by individual Member States.

7. This change in approach to decision making has been recognised and adopted within international Standards such as ISO 31000 (2009) which states that risk management: takes human and cultural factors into account; recognizes the capabilities, perceptions and intentions of external and internal people; is transparent and inclusive; incorporates appropriate and timely involvement of stakeholders and, in particular, decision makers at all levels of the organization, ensuring that risk management remains relevant and up-to-date; involvement also allows stakeholders to be properly represented and to have their views taken into account in determining risk criteria.

The Importance of Play and Changing Understandings of What Constitutes Optimal Play

8. Promoting physical activity is now seen by many health exponents and policy makers as not only important but even as "the best buy in public health."[3] Achieving this within a population means starting at an early age and one of the best opportunities is through appropriate play provision. Play providers and some researchers additionally recognise the emotional and social necessity of play for developing children and young people. Play is not just about having fun and nice times, though that is obviously important, but also about behavioural experimentation and the

[2] H Margolis, 'Dealing with risk - why the public and experts disagree on environmental issues,' University of Chicago Press,1996.

[3] e.g. http://www.ukactive.com/downloads/managed/Dr_David_Walker_Deputy_Chief_Medical_Officer_ukactive_Summit.pdf

asking of sometimes scary questions. Coupled together, these understandings emphasise the need for far more forthright policies on the provision of appropriate play opportunities.

9. A second important shift is the recognition that an essential ingredient of play is actual provision of exposure to risk and challenge.[4] After several decades of what has occasionally been described as the 'dumbing down' of play opportunities, the underlying quest has changed from one of the pursuance of lower injury rates to one of how, in the wider public health interest, to optimise the balance between risk exposure and safety.

10. Other factors include the recognition that children of all ages, including older teenagers, need play opportunities i.e. it is divisive to think of play as an activity solely for toddlers or, say, under-twelves. One implication of the latter is that more challenging circumstances are warranted in some situations, and possibly less in others. One size does not fit all. A further shift in thinking which may be observed involves the growing recognition of the importance of exposure to nature.[5] In time, this too is likely to impact on thinking about optimal play provision.[6]

11. Taken together, these developments point to a changing landscape of play provision which is only gradually beginning to take place, together with an enhanced requirement for carefully crafted policy making if these important opportunities are to be realised.

12. In para. 5 it was noted that policy decisions may be approached from different perspectives. The example given was of a single-minded approach focused upon one objective (injury prevention in that case), and the other of trying to optimise amongst a number of sometimes competing objectives. From a public policy perspective the latter approach is invariably the correct one. This is because the aim is to maximise the total good, even if this means tolerating some risk. This is the way public policy decision makers would approach the evaluation of any significant policy intervention. It would not be sufficient, for example, and to use a medical analogy, to automatically sanction the use of a drug X on a National Health Service even if research showed it to reduce the risk of, say, cancer by 90% without first asking a number of important questions. These would include, 'What is the baseline risk of the type of cancer under consideration?' (if it is small, then even a 90% reduction becomes less imposing) and 'What are the other implications of adopting this treatment?' For example, some drugs are enormously expensive and would drain resources from other programs, and some have serious side effects.

<u>Technical Arguments and Counter-arguments</u>

13. In the case of IAS, basic information on its performance has been available for decades and much of what is now being said in support of a revised HIC value is not new although it may not have been common knowledge simply because most people do not have time to read academic tracts or perhaps are disconcerted by the research jargon. For example, in a 1989 publication on playground safety[7] which was widely disseminated in the UK and to some extent abroad, it was reported that a

[4] Play Safety Forum, 'Managing risk in play provision - position statement,' 2004 & 2013.
[5] e.g. Richard Louv's 'The last child in the woods.'
[6] Something of this tendency may be observed in 'Design for play,' published by the National Children's Bureau, 2008.
[7] K L King and D J Ball, 'A holistic approach to accident and injury prevention in children's playgrounds,' London Scientific Services, 1989. See, in particular, Figure 7 p104.

HIC of 1,000 in no way guaranteed a safe playground should you fall on your head. According to the scientific evidence the percentage of the population expected to experience severe brain injury at a HIC of 1,000 was given as 15% (confidence interval of 3-35%) based on the then research.[8] Even at a reduced HIC of 500 the risk of serious brain injury was still present. It has thus been no secret all along that IAS Standards writers had knowingly accept a certain level of risk and, if you believe the percentages, quite a high level. However, the fact has always been that serious head injuries of this kind were exceedingly rare on playgrounds, so the choice of a HIC with a high associated risk would not have had an observable consequence in terms of a statistically significant increase in TBIs (traumatic brain injuries) or fatalities[9] and this may be why it was considered reasonable to select a HIC value which forecast a 15% rate of severe brain injury. Otherwise, it would have been totally unacceptable.

14. In an ASTM document dated 18 November 2013 (WK44118)[10] is an account of the new ASTM rationale for reducing HIC. It has to be said that this document as written lacks clarity from the perspective of an outsider. It seemingly conflates the *science* behind the relationship between HIC values and the risk of TBI with the *value-based policy decision* about what level of risk is tolerable. This suggests the author may be unfamiliar with the US approach to risk-related decision making as described above (para. 6) which separates these functions. The two are quite different things and the issue is not to do with scientific accuracy, as is also inferred, but about the tolerability of a risk. A second issue is that the risk of a TBI is not dependent upon the impact attenuating properties of the surface alone, but upon that in conjunction with a host of other factors which are not mentioned in the ASTM memorandum. For example, how many children get into that situation in the first place? The answer to the latter question must be very, very few. This has been demonstrated by detailed studies of playground accident statistics.[11]

15. Unfortunately, the acceptance of a 15% risk factor for TBIs (and a higher factor for lesser injuries) did not prevent the use of the epithet 'safe' as in 'safe playground' in connection with playgrounds fitted with IAS. The consequence has been a popular notion that playgrounds can be made risk-free. Such notions, wherever encountered, are known to be dangerous because they can instil a lower level of care amongst those exposed, in this case parents, guardians and children themselves, who believe they have been assured of their safety whatever they do or neglect to do. From an educational and safety perspective this is the antithesis of what is needed, for behaviour is a major determinant of risk.

16. Some research published in 2007 has found that during the period when IAS were being installed (1988-2002) the main discernible trend in injuries was not in fact a decrease in injuries, but an increase in the number of lower arm injuries on playgrounds.[12] Although not conclusive on its own, it is consistent with a behavioural change predicated upon false beliefs about safety. IAS were

[8] Essentially the same figure of 15% is reported in the 2011 BSI publication 'Head and neck impact, burn and noise injury criteria - A guide for CEN helmet standards committees.'

[9] The underlying rate of fatalities from falls on US public playgrounds is about 1 per annum according to the CDC (http://www.cdc.gov/homeandrecreationalsafety/playground-injuries/playgroundinjuries-factsheet.htm). In the UK the underlying rate is about 1 fatality per three or four years from all playground causes.

[10] http://www.astm.org/DATABASE.CART/WORKITEMS/WK44118.htm

[11] A UK reference is: http://www.hse.gov.uk/research/crr_pdf/2002/crr02426.pdf

[12] D J Ball, 'Trends in fall injuries associated with children's outdoor climbing frames,' International J Injury Control and Safety Promotion, 14(1): 49-53, 2007.

of course not designed to reduce the risk of limb injuries, although research has found that they do have some positive effect (in the absence of behaviour change) in this regard.[13] Evidence from both Europe and N. America shows that even young children are aware of hazards and respond to changes in the environment which may amount to compensatory behaviour. Thus, seeking to bring about safety by purely engineering adaptations has the potential to fail, which may be why playground injury numbers have remained relatively constant even while all of these safety interventions have been made.

17. Perhaps more important, the target risk which is addressed by IAS is that of life threatening brain injuries attributable to falls from height onto the forehead in playgrounds. As mentioned in para. 13, even before the advent of IAS there were very few such cases and consequently the prior risk, as it can be called, of this type of event was very small. This raises questions about the utility of IAS from a public policy perspective. If the prior risk is very small there is far less to be gained from adopting the measure than if that risk were high. Coupled with the high cost of IAS, the issue of its practicability as a universal requirement is thus called into serious question.[14]

Concluding Remarks

18. It is not easy to argue against any measure which purports to increase safety from injury, especially so when children are involved. The facts are, however, that there are many desirable goals and there is always competition for resources. In this situation, the appropriate path is to seek to maximise overall benefit and in this context of play one must think about health and developmental opportunities as well as safety from injury.

19. As research and experience have progressed, so have the times changed and the significance for children and young person's health of having regular exercise, experiencing and learning to cope with real risk, and encountering natural surroundings, has gained in prominence on the policy agenda. This has major implications for the approach to play provision and although safety from injury will rightly continue to be an important issue it is eclipsed by matters related more to health and wellbeing in the round.

20. Given the lack of direct evidence that a change in HIC would lead to a tangible public health gain, or one which is in any way commensurate with the cost and other implications of such a policy, it is questionable that this route should be taken. Essentially the pursuance of a lower HIC is a conservative strategy which is founded in existing ideologies about the objectives of play, whereas the paradigm which now challenges it seeks to bring about a greater benefit by shifting and broadening the focus.

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[13] D J Chalmers et al., 'Height and surfacing as risk factors for injury in falls from playground equipment,' Injury Prevention, 2: 98-104, 1996.

[14] D J Ball, 'Policy issues and risk-benefit trade-offs of 'safer surfacing' for children's playgrounds,' Accident Analysis & Prevention, 35(4), 417-424, 2004.