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Spiralling into control?

A review of the development of children's understanding of safety related concepts
Dr Jenny McWhirter, University of Southampton

This paper should be considered as a preliminary review, a more comprehensive review of the literature not being possible in the time scale available. Nevertheless recommendations for both further review of the literature and for further basic research emerge from this paper.

This review was prepared for RoSPA's National Safety Education Committee. It shows how we can link:

- models for the development of safety related concepts; with
- models of child development

and so help:

- understand child behaviour in the context of risk; and
- inform curriculum development in the field of safety education.

The review draws heavily from recent research carried out by the Health Education Unit at the University of Southampton.

In terms of safety education, the review highlights a number of issues drawn from research findings, including:

- importance of understanding child's starting point;
- need to teach the practical skill ('keeping safe') in a practical way;
- need for children to consider a range of strategies in new and unfamiliar contexts;
- the role of language in developing children's understanding
- the importance of using active and concrete examples alongside abstract nouns like: health, safety and risk;
- importance of encouraging progression from one stage to another by providing linking opportunities to build on understanding from one stage to develop ideas at the next stage;
- need to manage the shift of responsibility from the adult to the child and to recognise the role of emotion in influencing behaviour;
- need for more qualitative data on adolescents' views of risk

The next steps:

RoSPA is planning to encourage further work to:

- develop our understanding of adolescents' views of risk;
- explore linkage with work in other areas (e.g. judgement under uncertainty);
- develop guidance for safety education practice based on this research.

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Spiralling into control?

A review of the development of children's understanding of safety related concepts.

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Introduction

This review has been carried out to:

- determine if it is possible to assemble a spiral of the changing perceptions of safety and safety related concepts from childhood through adolescence to adulthood, based on current research information.
- relate this to theories of child development
- inform curriculum development in the field of safety education

The review will draw heavily on research carried out by the Health Education Unit at the University of Southampton, and by researchers in the field of child accident prevention. It will also draw on published statistics for safety and on well known theoretical models of health and child development.

This paper should be considered as a preliminary review, a more comprehensive review of the literature not being possible in the time scale available. Nevertheless recommendations for both further review of the literature and for further basic research emerge from this paper.

Accidents to children and young people – the phenomenon.

Nationally and internationally accidents are a major cause of death and injury for young people between the ages of 1 and 24 years. The risk of death from accidental injury in the UK, is the highest for those aged 1-14 and exceeds other causes of death (RoSPA, 1994). In the US accidents are responsible for almost 60% of the deaths of 10-14 year olds and for almost 80% of the deaths of 15-19 year olds (Millstein et al. 1993) with the risk of death peaking at age 21.

Figures for non-fatal accidental injury are harder to establish, since not all injuries require attendance at accident and emergency departments and

hospital admission figures reflect many factors including socio-economic circumstances of the patient, and availability of beds. However, between 6% and 10% of children attending accident and emergency departments are admitted to hospital. Figures for the period 1991-1994, for one health authority (West Sussex) reveal that falls are the largest single cause of accident admissions for children in the 5-14 age group, with pedestrian, cycle and other road traffic accidents the next most common (Ashwell, 1996). These figures reflect national trends from previous years.

While falls are the commonest cause of injury, road traffic accidents account for the largest proportion of fatal accidents to children. In the UK in 1992 for example, 258 children under 15 years were killed on the roads: 170 were pedestrians, 38 were cyclists and 50 children were killed while travelling in road vehicles (RoSPA, 1994).

Traffic accident rates are falling overall in the UK, but the child accident rate remains one of the worst in Europe. The Health of the Nation White Paper (1993) has set targets to reduce the death rate from accidents amongst children aged under 14 by 33% and amongst young people aged 15- 24 by at least 25% by 2005.

In order to prevent accidents, much attention has been focused on their aetiology and epidemiology. An examination of the records suggests that boys are more prone to accidental injury: Twice as many boys are killed in pedestrian accidents and 6 times as many boys die in cycling accidents (DoT 1990). In a study in Birmingham, Lawson (1990) found that over one third of fatal road accidents occurred just outside the child's home or on routes used at least 3 times per week. Accidents are more likely to occur on the journey home from school.

Towner, (1994) examined the risk exposure of children aged 11-14 in

Newcastle upon Tyne, using a questionnaire. She found that boys were more likely to travel long distances to play outdoors and to travel by bicycle, increasing their risk exposure relative to girls by five fold. Children aged 11-12 were less exposed to traffic on journeys to school. They were more likely to travel by car or school bus and travelled shorter distances than older pupils (aged 13- 14). Socio-economic factors also affected risk exposure, with less affluent children less likely to travel to school by car, or to be accompanied by an adult.

This confirms other studies of socio-economic influences on child safety. (Townsend at al1988, Lawson 1990, OPCS. Children from social class 5 are six times more likely to die of burns than children of social class 1 (CAPT, 1991). Lawson has also identified a disproportionately high number of Asian children represented within the fatal accident statistics. The reasons for this are unknown, but a study by Aucott (1992) may shed some light on this. In a case study of an inner city area of Birmingham, she found that Asian children were making twice as many journeys to and from home each day compared with white children in similar neighbourhoods. These journeys, to the mosque or religious education classes were often unaccompanied, and in the late afternoon or evening.

It is clear that accidental injury is very common amongst children and young people. Thankfully the majority of injuries are not fatal, but the prevention of accidental injury is uppermost in the minds of parents, teachers and health professionals who hope to teach children how to keep themselves safe.

What has been done to help children to keep safe?

Traditionally three approaches to accidental injury prevention have been employed. Known as the three 'E's', these consist of Engineering, Enforcement and Education.

Systematic reviews of studies designed to measure the efficacy of the three E's suggest that beneficial effects of enforcement and engineering are readily demonstrated. For example the seat belt laws introduced in the UK in the 1980's have reduced driver and passenger fatalities (Christian and Bullimore, 1989). In contrast, educational initiatives alone appear to have little effect, although in reality many campaigns operate on more than one level. The seat belt legislation was preceded and supported by a mass media campaign with an easily recalled slogan - "clunk click every trip" and contributed to the compliance of the public with the new legislation. Likewise campaigns to promote cycle helmet use within schools are most likely to be effective if accompanied by discount schemes to make the helmets more affordable. (Morris et al, 1991) Several community-based campaigns have also demonstrated their efficacy in randomised controlled trials (RCT's).

It is perhaps the reliance on the RCT which makes it so difficult to evaluate educational initiatives. The conditions for an RCT are rigorous and control of confounding variables paramount. Yet it is almost impossible to control the many variables which exist within one group of children - socio-economic status, access to the media, parental interest and involvement, leisure activities, physical development and cognitive differences may all affect the impact and outcomes of safety education initiatives.

In her review of effective measures to prevent unintentional injuries to children and adolescents (1994) Towner rejects all studies which do not approximate to RCT standards, but argues in a later article (Towner 1995) for more attention to be paid to studies of the processes of safety education, something which is more likely to be achieved in small scale case studies where statistical significance is difficult to demonstrate.

RCT's are also less likely to detect unexpected or unintended consequences of an intervention, since outcome measures are predetermined and measured with precision. Adams (1995) argues that while seat belt legislation and other safety measures have reduced the incidence of fatal injuries to drivers and passengers it has increased the proportion of pedestrians and cyclists who are injured. He claims that drivers wearing seat belts feel safer and

therefore drive faster, taking more risks and becoming involved in more accidents. An RCT which examines only the incidence of fatalities to drivers and passengers would fail to detect this, while a more qualitative study would reveal aspects of driver behaviour with and without seat belt use which would shed light on the wider implications for safety.

Adams proposes that individuals and communities have a 'risk thermostat' which evolves under a number of influences. If an individual's risk thermostat is set high and many measures are taken by a community to reduce the risk to that individual, she or he will go to greater and greater extremes to achieve the level of risk at which they feel most comfortable. This suggests that there may be a limit beyond which engineering and enforcement measures may be ineffective. This work also suggests that education initiatives should pay more attention to how young people feel when they are exposed to risk.

Why are children so susceptible to risk of accidents?

While children are under 5 years old and under constant supervision by parents or other adult carers, the accident rate is relatively low, but as children gain greater and greater independence they encounter many more risky situations. Risk is defined as the probability of harm, and the statistics suggest that children and young people take more risks with their safety than adults. This may be for a number of reasons:

They may not be aware of the hazards in familiar situations where they are normally supervised by an adult, or they may find themselves in an unfamiliar situation, where the hazards are new to them.

They may be inexperienced at assessing the probability of negative consequences of their behaviour or of the severity of harm which they face.

They may be able to recognise the hazard and realise the probability and severity of the harm but be unable either physically or cognitively to manage the risk and to reduce the probability or severity of the consequences.

They may be aware of all the risks, but believe that the benefits of the activity outweigh the possible harmful consequences.

Education of children about safety should take all of these possibilities into account.

Can an understanding of child development help us to develop good practice in safety education?

Cognitive Development

The spiral in Figure 1 (page 3) summarises the stages of cognitive development in children and young people. This spiral has been drawn mainly from the work of Piaget and Bruner, psychologists who spent many years observing the behaviour of children under laboratory conditions. In these artificial circumstances children responded to tests devised to demonstrate various stages of development. Although there has been considerable argument about the exact ages related to each stage, the appropriateness of the tasks for the linguistic abilities of the children, and about the gender-bias of some of the tests, the stages have been shown to be remarkably robust across different cultures, (see Gross, 1993) suggesting that the stages of development are to some extent biologically determined.

The most famous of all of these theories are those of Piaget who painstakingly described his observations of children (his own, and his experimental subjects) over many years. Piaget described four stages of the development of intelligence - the *sensorimotor stage* (birth to two years), the *pre-operational stage*, (two to seven years) the *concrete operational stage* (seven to eleven years) and the *formal operational stage* (eleven to fifteen years).

Those belonging to the 'environmentalist' school of thought point out that cognitive development is impaired if the child's environment is limited. Piagetian scholars acknowledge the important influence of the environment on intellectual development, but conclude that each child still progresses through the stages described; a child cannot miss out a stage, or reach a higher stage before passing through each of its predecessors in order. There is some evidence (see Gross, 1993) that children may attain a 'higher' stage through appropriate training, but this seems to be limited to accelerating the transition to the stage beyond the one they have already reached.

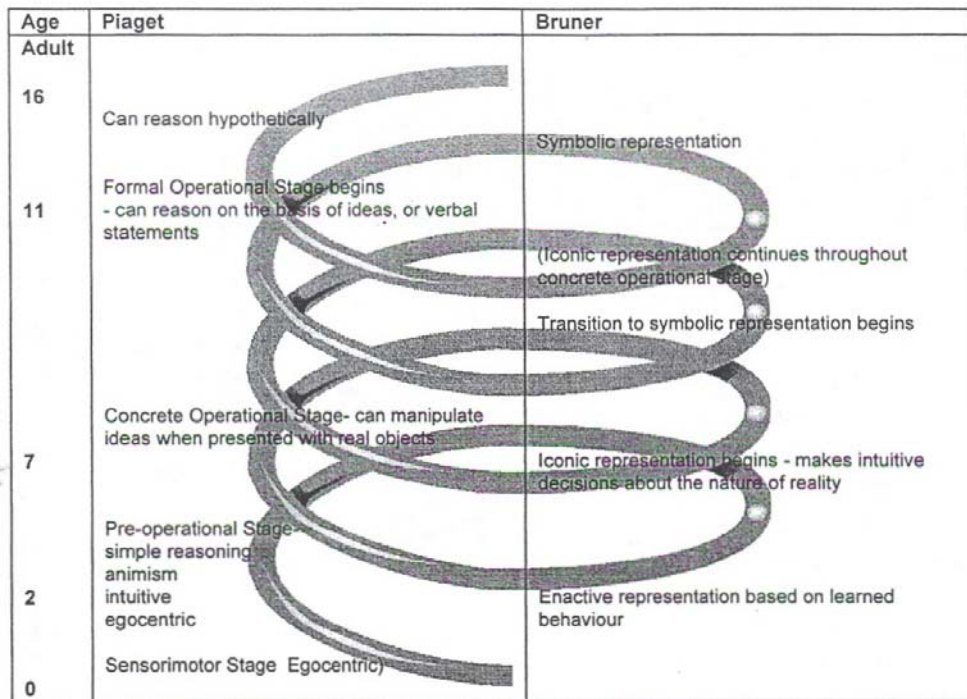


Figure 1 A spiral of children's cognitive development, based on the work by Piaget and Bruner (as summarised by Gross, 1993)

Some psychologists argue that while formal operational reasoning (Piaget's final stage) emerges during adolescence it may not be the typical way of thinking and that in some cultures it may not appear at all. Piaget himself concluded that training and experience may influence the development within this final stage.

The model described by Bruner, also shown in Figure 1 corresponds to how he believed children to represent the world as she/he developed cognitively. This model of development may be of further help in explaining the behaviour of children and young people who have been involved in accidents.

During Bruner's en active mode (overlapping Piaget's sensorimotor and pre-operational stages) children typically repeat learned behaviour in an increasingly wide range of situations, sometimes inappropriately. In the iconic stage, corresponding to the concrete operational stage of Piaget, they respond intuitively, enabling greater flexibility in problem solving, but also increasing the chances of error in unfamiliar or complex situations.

A major difference between the two major theories lies in the beliefs of Piaget and Bruner with regard to the role of language in cognitive development. Piaget held the view that language development reflects

the development of logical structures in the child, while Bruner believed that training in the use of symbols could encourage the development of logical thinking.

The debate about language development is relevant to this review since much of the research evidence summarised in later sections relies on children's ability to articulate their ideas.

While these theories differ in detail they share the same implications for teaching and learning:

- what is taught should be related to the child's developmental stage.

Thus mathematics education can be organised according to Piaget's discovery that children understand the conservation of quantity, before they grasp the conservation of weight or volume.

- for transition between two consecutive stages, the child must be an active participant in the learning process, not merely a passive observer.

This is the basis of the active learning or 'discovery' method of learning.

Moral Development

Moral development is relevant to safety education since the behaviour of one child may have an impact on the safety of others. The ability of children to understand this enables them to make decisions which may prevent accidents to others. Fig 2 shows a summary of the stages of moral development as described by Piaget and by Kohlberg. Other theories of moral development (based on psychoanalytic models and social learning theory) are not considered here.

Piaget concluded that children aged approximately five to ten are heteronomous, meaning that they are subject to external rules or laws, while children of ten and over are subject to their own rules and laws. For younger children morality is objective (moral realism), while for older children and adults, moral rules emerge from human experience [100 relationships and may differ according to your point of view (moral relativism), However, Piaget acknowledged that the moral thinking of an adult will contain elements of both realism and relativism.

The transition from realism to relativism is linked by Piaget to his stages of cognitive development. A child who cannot operationalise his or her thinking cannot perceive a situation from another's point of view.

Age	Piaget	Kohlberg
Adult		Post conventional morality (10-15% of 30 year olds) Stage 6 (Universal ethical principle orientation)
16	Moral relativism <u>Autonomous morality</u>	Stage 5 (Social contract- legalistic orientation) <u>Conventional morality</u> (most adolescents and adults)
11	Largely heteronomous Autonomous morality may begin	Stage 4 (Law and order orientation) Stage 3 (Interpersonal concordance orientation)
7	Moral realism	Preconventional (most 9 year olds and below) Stage 2 Instrumental relativist orientation
4	<u>Heteronomous</u>	Stage 1 Punishment and obedience orientation

Figure 2 A spiral of the development of morality, based on the work by Piaget and Kohlberg (as summarized by Gross, 1993)

Piaget argued that cognitive development is a necessary but not a sufficient condition for moral development and that moral development cannot be cognitive development.

Kohlberg redefined and extended Piaget's theory by presenting moral dilemmas to subjects from a wide age range, up to and including middle age. As with other theoreticians Kohlberg was not concerned with the conclusion which the subjects reached, but the reasoning process which emerged. Kohlberg's six stages are shown in Fig 2. Longitudinal studies in a number of countries have demonstrated good evidence for the first four stages, but even Kohlberg himself could find little evidence for the existence of the sixth stage, which might exist in exceptional individuals who devote their lives to ethical causes.

As with theories of cognitive development there are many counter theories and criticisms. However, these theories provide us with a perspective from which to view experimental evidence of children's understanding of health and safety related concepts.

Can models of health related behaviour help us to develop good practice in safety education?

Many models have been developed to explain health related behaviour. The

health belief model described by Maimen and Becker (1974) suggests that health decisions are determined by two factors:

- the individual's perception of the value of the goal;
- the belief that a specific health action will result in relief or prevention of ill health.

These two factors may be further subdivided as follows:

- *Perceived susceptibility* - How likely is it that this will happen to me?
- *Perceived severity* - If it does happen how bad will it be?
- *Perceived benefits* - How will I gain, if I follow the healthy option?
- *Perceived barriers* - How will I lose if I follow the healthy option?

Ajzen and Fishbein (1980) extended this model to include the individual's perception of the opinion of others (*the subjective norm*), which may affect each of the four dimensions described.

Hamilton (1994) reviewed the health belief model with respect to the

literature on children's attitudes to wearing cycle helmets:

She found that children aged 8-11 believed injury following cycling accidents was unlikely, and that if an injury were to occur, it would be minor and survivable. Cyclists believed that head injuries could be prevented by wearing a cycle helmet, but children reported not wearing cycle helmets for a variety of reasons including discomfort, forgetfulness, because they didn't consider wearing one or consider there was a need. The opinions of others also had a big effect - fear of teasing was a large factor in the children's attitudes to cycle helmets.

Similarly Hamilton reviewed the evidence for injuries following cycling accidents.

Amongst ten to fourteen year olds, 25% of all deaths are caused by cycling accidents, and almost all of these deaths are due to head injury. There has been controversy about the benefits of cycle helmets but some studies (e.g. Thompson et al 1989) appear to show that bicycle helmets can reduce the chance of head and brain injuries by 80-90%. The cost of cycle helmets has been highlighted as an actual barrier to helmet use. Low cost schemes combined with education seem to be effective. Discomfort is also a considerable barrier to use.

Interestingly, although children feared being teased by others for wearing cycle helmets they did not themselves hold negative views of those who did.

Hamilton concluded that the differences between perceived and actual risk was a barrier to successful prevention of head injuries amongst young cyclists.

One further model may be of help in untangling the puzzle of children's health and safety related behaviour. Rotter (1966) proposed the concept of locus of control, which describes an individual's *belief* about what controls events in everyday life. Rotter described two groups of individuals: 'externals' and 'internals'. Those with an external locus of control believe that success or failure in everyday life are the result of chance or the involvement of some powerful 'other', while those with an internal locus of control believe that all life events are controlled by themselves, whether for good or bad. So someone with an internal locus of control might blame themselves for an accident, while someone with an external locus might blame the road conditions, another driver or even fate.

Recent health promotion strategies rely on the concept of self efficacy which is linked to locus of control (Tones and Tilford, 1993) Approaches which seek to empower individuals to take action to improve their health and safety rest on the individuals concerned *believing* they can control their behaviour or their environment. Aucott's study in inner city Birmingham in 1992 revealed that Asian parents, particularly mothers, felt unable to take action to improve the safety of their children. Indeed they were unable even to imagine how some accidents might be prevented.

There could be many reasons for such powerlessness, but locus of control has been linked to the way adults perceive risks by various authors (Englander, 1986; Gibbons, 1995) and some cultural differences are apparent.

Little appears to have been written about the development of locus of control in children. Neuhauser (1978), suggests that children at the concrete operational stage are developing an internal locus of control. This would appear to parallel the development of moral reasoning.

Can research into children's understanding of health and safety help us to develop good practice in safety education?

Researchers at Southampton and in other institutions have attempted to shed some light on children's developing abilities to recognise hazards, assess risk and manage risk in a number of studies in the last ten years.

A novel research technique, known as 'draw and write', developed by Noreen Wetton in the 1980's has provided a considerable quantity of data into children's understanding of health and health related concepts (Williams, Wetton and Moon, 1989 a,b). The technique enables the researcher to gather a large amount of data from children aged 4+, in a way which can be standardised, analysed and if necessary interpreted statistically, while at the same time providing a wealth of qualitative data, providing rare insights into the world perceived by children.

In a study which has been repeated many times in different parts of the country, Wetton et al investigated children's perceptions of keeping safe.

Almost a thousand children aged 4-11 in Nottingham schools were asked to draw and write about themselves *keeping themselves safe* indoors and outdoors. They were asked to draw and write about what they were keeping safe from, and what they were doing to keep themselves safe. Finally they were asked to write about whose job it was (whose responsibility it was) to keep them safe wherever they were.

From the responses to these questions Wetton and her colleagues were able to draw up a spiral of the children's changing perceptions of 'safety'. The study revealed that young children may be concerned about imaginary dangers, such as ghosts and monsters, exaggerated hazards such as giant spiders, or rare hazards (for the UK!) such as crocodiles and tigers. Other imaginary fears included characters from the television, many of whom were the 'goodies' but were larger than life and therefore feared by the children.

Their response to these hazards was to hide or run away, (or to watch TV!), but the response to more realistic hazards also included hiding and

running away, often in situations where this would be most inappropriate way to manage the risk.

Common in the younger age group was also the concept that objects had intentions to harm, so children might record that they were keeping safe from 'knives to cut you and fires to burn you'. Children under 7 also perceived authority, particularly the disapproval or anger of their parents, as something to keep safe from. This suggests that children might try to conceal risky activities to avoid punishment, increasing the probability of harm.

The work of Williams et al revealed that as the children mature they are able to recognise a wider range of hazards and to propose a wider range of strategies for keeping themselves safe. At the age of 8 or 9 they begin to show concern for others, and some of their responses suggest that it is safer to be in a group. Some of these pupils also recognise that friends can influence them to take part in unsafe activities.

One of the most interesting aspects of the research is the revelation that at the age of ten, 50% of the children think it is someone else's responsibility to keep them safe. By the age of eleven 70 % of the children recognise that they are also responsible for keeping themselves safe.

This research, which I have described in some detail, forms the backbone of the spiral depicted in Fig 3.

Further research, also using draw and write techniques has illuminated or extended the spiral.

Hamilton, (1994), used a draw and write technique to tap into children's perceptions of injury awareness in order to evaluate the effectiveness of an intervention by a primary care team in local schools. In a pilot of the technique, Hamilton noted that when the children were asked to describe the injuries to Sam (a girl or a boy) who had been involved in an accident on the road. The injuries described tended to be minor with few or no long term consequences. The 'invitations' were subsequently modified to stress that Sam had been very seriously injured. This appeared to have been understood by the children, 55 of whom described accidents which happened at more than 40 miles per hour.

Williams, Wetton and Moon, 1989 b; Hamilton, 1994	Coombes, 1991; Hamilton, 1994; Aucott, 1992	McWhirter and others, 1994, 1996
Adult		Risk is associated with everyday events, it may be long term and cumulative.
16 Increasing practical skill	Emerging understanding of accident prevention	Risk may involve conflict with authority
11 Acceptance of some personal responsibility	Shows concern for the safety of others	Risk has a wider meaning but is largely short term
Begins to generalise about safety issues	Can understand the consequences of serious accidents	Risk is commonly equated with extreme danger or minor criminal activity
Fewer imaginary fears expressed	Believe the consequences of serious accidents are minor injuries	There is a simple relationship between cause and effect
Some understanding of personal responsibility	Can understand or articulate the meaning of the word accident	Misbehaviour may be risky
Emerging awareness of simple cause and effect		
7 Knowledge of specific safety issues increasing		
Objects may have intention to harm	Objects may have intention to harm	
Authority seen as a danger to avoid		Most have no understanding of risk. Some can relate personal risk to everyday events
Confusion about real and imaginary dangers - and about how to respond	Accidents may be caused by imaginary or fantasy characters	
4	No understanding of the word accident	

Figure 3 A spiral of children's changing perceptions of keeping safe, of accidents and of risk, based on the work of Williams, Wetton and Moon, Hamilton, Coombes, Aucott, McWhirter, King and Mortimer.

(Much of this evidence was gathered using the draw and write technique, developed by Noreen Wetton at the University of Southampton.)

In spite of this almost 80% of children aged 8-9 years described injuries which would have no implications for even short term disability. This fell to approximately 33% for pupils aged 11-12 years. This age group were most likely to describe injuries with medium term disability, while none of the younger group described Sam as being seriously injured or killed in the accident. Immediately after the intervention children were asked to write 'a message to me' summarising the important parts of the session. The strongest message which came across to the children appears to have been the importance of protecting the body to reduce injuries, rather than thinking ahead to prevent injuries.

Since the focus of the intervention was on the fragility of the skull and the usefulness of cycle helmets, this indicates some success for the programme, but suggests that the more abstract idea of prevention was poorly understood.

Education for keeping safe is underpinned by a number of abstractions including safety and risk. The National Curriculum (September, 1995) requires that we teach young people to recognise hazards, assess risk and manage risk. However, we tend to teach children about how to behave in response to specific hazards, and hope that they will learn to generalise to other unforeseen and often unfamiliar circumstances.

In order to discover the children's perceptions of risk, McWhirter and others (1994) have begun a series of studies using the draw and write technique. Children and adults are asked to draw and write about someone their own age, doing something risky. They are asked to write about what is happening in the picture and to say what makes it risky. Finally they are asked to draw themselves in the picture and write what they would be doing or saying or thinking if they were there.

Children in the studies (approximately 1,000 in total) have drawn a variety of situations - some everyday hazards, some unusual and even unrealistic.

Features of an immature perception of risk	Features of a mature perception of risk
immediate, short term outcome no perception of long term outcomes high probability of harm very severe outcomes disproportionate lack of awareness of everyday hazards simplistic cause and effect little or no inclusion of danger to others risk associated with misbehaviour, revealing fear of authority external locus of control – no personal responsibility little awareness of peer influence on personal behaviour	awareness of long term consequences awareness of cumulative risk risks with both high and low probability depicted a range of outcomes depicted awareness of everyday hazards multiple cause and effect scenarios concern for the safety of others, as well as self fear of the actions of others, especially as a result of crime internal locus of control – personal responsibility high awareness of peer influence on personal behaviour

Figure 4 Comparison between features which characterize perception of risk by 9-10 year olds and adults.

By drawing themselves in the picture the children expressed their approval or disapproval of the activity.

The most recent study of 9-10 year old pupils in Dorset and Hampshire (McWhirter and King, unpublished data) has enabled us to draw up a series of features which characterise their perception of risk. These may be contrasted with the features of adult perceptions determined by McWhirter and Mortimer (unpublished MSc data 1996, Figure 4).

Over a third of children in the studies by McWhirter depict a person jumping or falling from a very high place, often into deep water. It is clear that the outcome is both immediate and severe and there is a clear cause and effect between the event and the outcome. Often these pictures are accompanied by phrases such as:

"It is risky because it is dangerous",

suggesting that the two are synonymous. Fewer children (less than 10%) depict cycle or pedestrian accidents (common in the age group investigated). Few children depict incidents where others are also put at risk. Adults by contrast depict complicated road traffic incidents which include drunken driving, with clear statements about the harm the driver might do to others as well as themselves.

Almost one quarter of the children involved in these recent studies depicted themselves misbehaving or doing something for which they might be punished. This varied from cheating at games to running across a railway line and shoplifting. In each situation the child indicated that the risk was of being caught, or of being told off. None of the adults in the parallel study gave this kind of response. Where criminal behaviour was depicted it was drug abuse, or drinking and driving, where the risks

were to the health and safety of the individual or others. Alternatively, adults depicted themselves as the victims of crime such as assault.

Only a small group of adolescents (12-13 year old pupils) have so far participated in this research. In this small sample, risk continues to be associated with short term outcomes. Many of the situations depicted would bring the young person into conflict with authority figures - smoking, alcohol, and drug misuse.

How do the results of this research relate to what is understood about child development?

It is interesting to note that the findings of work inspired by Wetton using the draw and write technique, and other qualitative approaches appear to corroborate the earlier, laboratory based findings. This is even more remarkable since much of the research was carried out for the purposes of curriculum development, or of evaluation of educational initiatives, and not in the interests of demonstrating any link with the earlier research. The parallels can be seen by comparing the spirals in Figures. 1, 2 and 3.

Williams et al (1989b) have noted that children aged 4-5 report that they keep safe from harm by hiding. This appears to be further substantiated by accounts which describe the behaviour of young children in buildings on fire. Young children may be found hiding under beds and in cupboards, while older children are by doors and windows trying to escape the flames and smoke. This is consistent with the transition from sensorimotor stage to the preoperational stage as described by Piaget and with Bruner's enactive stage - the children are repeating a learned response in an inappropriate situation.

The research by Aucott into children's experience of accidents also seems to reflect Burner's' view that children in the iconic may respond intuitively when presented with a novel hazard. Some of the near misses the children reported were due to the children behaving in an inappropriate way in response to a hazard - resulting in greater harm:

"When I was playing and I saw a dog and got scared and ran and my ankle got twisted. I had to go to hospital and I had to have a bandage" (age unknown)

"... At one time my brother and sister went to the shops and left me at the edge of the road. I saw some big punks coming along. I got scared and ran across-the road. I was five at this time plus the road was a main road. I had bruises and cuts but I never broke any bones."

In the studies by Williams et al children frequently referred to objects as though they had the intention to harm - 'fires to burn you', 'knives to cut you'!

A study by Coombes (1991) of pre-school children's understanding of accidents reveals children using the same linguistic construction:

"Two naughty motorbikes were coming and I fell over."

"The table, it bumped into you, it wants to talk to you."

It is difficult to tell if these responses are determined by the child's linguistic or cognitive ability. Further work would be needed to illuminate this. However, the same phenomenon was also recorded by Piaget, who called it animism and noted that it was characteristic of the preoperational stage.

The study by Hamilton warns us that while children may appear to have understood a particular safety message, they may have failed to internalise the meaning or to be able to generalise to other situations.

Aucott, and Williams et al found that children begin to express concern for the safety of others around the age when children transfer to secondary school. This ties in with the views of Piaget and Kohlberg that in order to transfer from the heteronomous to the autonomous stage of moral development the child must first begin to perceive situations from the point of view of others.

The recent research on children's perceptions of risk can also be related to the earlier work on child development. McWhirter and colleagues have revealed that while children have an understanding of risk, it is rather different from that of adults.

'Risk' or 'risky' are abstract terms and can be expected to require considerable linguistic ability for a child to understand and/or to convey their meaning. In view of the work by Piaget and Bruner it should not be surprising then that before the age of nine or ten years children's perceptions of risk are inconsistent and muddled, with many children writing 'I don't know' in response to a request to draw and write about someone their own age doing something risky. By the age of nine however, the majority of children can respond and their views have been described earlier.

Many of the children chose to draw a simple, extreme event where cause and effect were clearly linked, such as jumping from a cliff into shark infested waters, suggesting these children were in the concrete operational stage. Moving from this view of risk to that characterised by adults may require more formal operational (Piaget) or symbolic (Bruner) thinking.

There is evidence too, for the stages of moral development described by Kohlberg and Piaget. Children who perceive risk of wrong doing primarily from the perspective of being caught, rather than from the perspective of the physical or moral harm that might ensue, may be said to be in the heteronomous stage. There may also be some links with Rotter's work on locus of control. Children's pictures include many elements of inevitability, while events described by adults

suggest that the events could be prevented, often in a number of ways.

Can models of health related behaviour be related to the research evidence presented here?

It is clear that health related behaviour of children and adults can be described by the health belief model. However, more recent models suggest that self efficacy and locus of control are also important factors. Aucott's study revealed how adults in the Asian community were disempowered - even to the extent of being unable to imagine solutions to the problems they faced. If children are to be able to keep themselves safe they need to be able to feel or believe that they can take action to keep themselves safe. This seems to emerge at about the age of 10 or 11 years - and coincides with a rise the accident figures. Parents and teachers of children in this age group face the dilemma of sharing the responsibility for safety with the child, while the child may seem lacking in the skills and overconfident about their abilities.

What recommendations can we make about teaching and learning styles to be adopted in safety education?

Children's cognitive and moral development occurs in small steps and the transition from one stage to another might take many months or years, thus understanding a child's actual starting point is a vital step in planning any curriculum for health and safety. Strategies such as the draw and write technique provide teachers and health professionals with one way to do this for a group of children.

The curriculum should provide opportunities for pupils to develop their knowledge, understanding, skills and attitudes building on the stages they have already reached. This will certainly involve challenging their understanding by providing appropriate information and activity tailored to their needs. It is essential that young people have had the opportunity to master earlier stages of development if they are to progress to a more sophisticated stage.

Keeping safe is a practical skill and should be taught in an active way. Learning by your mistakes in the real world is risky, but teachers and health professionals can provide controlled, structured settings which challenge

children's strategies for keeping safe and extend their knowledge and skills.

The youngest children in our care can learn from concrete examples and can apply a learned response to an appropriate situation. Older children (7 and above) may need help to see that a previously learned response is not always appropriate. These pupils need time to consider a range of strategies and opportunities to decide which is appropriate in new and unfamiliar contexts. They also need to relate the consequences of these actions to their outcomes. Teachers and health professionals might consider structured play as one approach to this.

Words such as health, safety and risk are all abstract nouns, and adults should use phrases such as keeping safe, being healthy, when working with primary school age children. The use of the word risk or risky should be introduced by the use of concrete examples for example "It is risky to run when you are carrying scissors, because you might fall and cut yourself" The youngest children (4-7), understand danger is an extreme event and where possible we should not use the word *dangerous* when we mean *risky*. The word accident is understood by 5-6 year olds but children need more information if they are to understand the consequences of an accident. A limited understanding of accident prevention appears to develop at around 10 or 11 years.

Wherever possible we should avoid implying that objects have intentions saying, for example "Come away from the fire you will burn yourself" rather than "Come away from the fire, it will burn you". The careful use of language by adults will at least avoid reinforcing a child's misconceptions, and at best help to develop their understanding.

At around the age of 9 or 10 children can be encouraged to begin to recognise health and safety issues from the perspective of others, although this transition may be lengthy. Use of concrete examples from everyday life will reinforce these attempts.

Older children (11 and over) not only cope with abstract concepts more easily, they actually find them useful in predicting their own behaviour and that of others. If we are to empower children we should be offering them planned opportunities to articulate

their understanding of these abstract concepts at an early stage and in a variety of ways, through discussion, written work and role play, relating the classroom activity to real life situations whenever possible.

While we want to empower children and encourage them to take responsibility for their own safety, and that of others, we must recognise that children up to the age of ten believe it is the responsibility of adults to keep children safe. As adults we must avoid blaming children for accidents in which they are involved, helping them to learn from their mistakes. The shift of responsibility from an adult to the young person's needs to be carefully managed and cannot be expected to occur abruptly. Schools and road safety officers could offer workshops to help parents recognise the changing needs of the children and to relate this to the local traffic conditions.

It is important that we do not overlook the affective aspects of safety education. Emotional reactions often over rule a carefully learned response, or encourage children to follow the crowd. An inappropriate response to a hazard may be governed more by how a child feels than by rational decision making.

What about adolescents?

Adolescent risk taking behaviour is complicated by:

- the transition from concrete operational to formal operational stages of reasoning (or iconic to symbolic),

- the emergence of the autonomous stage of moral development which challenges the absolutes of the external rules and laws,
- the development of an internal locus of control.

It is unlikely that these changes, while linked, will occur simultaneously, resulting in contradictory behaviour for the adolescent, and confusion for their parents and teachers.

An adolescent's growing and changing physical shape and skills can make them more accident prone for a time and peer influence is powerful at this age.

Conflict with authority is a characteristic feature of adolescence and this makes health and safety education more challenging. Banning risky activities does not simplify matters for adolescents, but instead challenges their growing sense of autonomy and control. Education strategies which include positive, consistent messages help to reinforce the adolescent's sense of control and may be of benefit.

Likewise, activities which develop social competencies such as recognising and resisting peer and media influences can empower the emerging adult to take responsibility for his/her own safety.

It is this stage, when the young person is most vulnerable, when our knowledge base is least complete. There are gaps in our understanding of the adolescent's views of risk using qualitative techniques such as the

draw and write. The transition from a child's view of risk to that of an adults has not been examined by this technique and such a study could prove very valuable.

There has been no systematic study of education initiatives where the focus of the programme is to develop a young person's understanding of risk. An exploration of programmes and classroom strategies which aim to do this would be worthwhile.

A further search of the literature on the cognitive and moral development of adolescents, as well as more information on the development of focus of control is needed.

And finally

We must conclude from this review that children have accidents because they are children! Our failure to understand the world from a child's point of view will result in more preventable accidents.

The adolescent's view of the world is as complex as the child's view is remote and we need to address this through more qualitative research, if we are to meet the Health of the Nation targets.

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