

Psychological aspects of risk appraisal in asphyxiation accidents: a review of the factors influencing children's perception and behaviour

Aspetti psicologici nella valutazione del rischio di un incidente da soffocamento: una rassegna sui fattori che influenzano le percezioni e le condotte dei bambini

G. ZIGON, R. CORRADETTI¹, B. MORRA², S. SNIDERO¹, D. GREGORI³, D. PASSALI⁴

Statistics Department "G. Parenti", University of Florence; ¹ Department of Mathematics applied to Human Sciences

"D. De Castro", University of Turin; ² ENT Department, "S. Giovanni Battista" Hospital, Turin;

³ Public Health and Microbiology Department, University of Turin; ⁴ ENT Department, University of Siena, Siena, Italy

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Summary

Psychological aspects determining children's behaviour in response to asphyxiation risk due to ingestion of foreign matter have been rarely and non-systematically examined in the literature. Aim of this report is to highlight – through a review of the most significant psychological research in the literature – which factors influence the behaviour, perception and assessments of children 0 to 14 years of age, in a risk situation. In particular, attention is focused on the direct experience of a child at risk, assuming that this experience can play a significant role in future dangerous situations. Outcomes of studies taken into consideration have highlighted the influence of age, sex, socio-economic status, parents' role, peer group, personal traits, television and personal experience. The latter refutes the initial hypotheses, showing an unexpected and clearly negative effect on future evaluation and behaviour in response to similar contexts of asphyxiation risk. The implications for research on asphyxiation due to ingestion of foreign matter are examined.

Riassunto

Gli aspetti psicologici che determinano gli atteggiamenti e i comportamenti dei bambini nei confronti del rischio di un incidente da soffocamento per ingestione di un corpo estraneo sono stati trattati di rado e in maniera non sistematica in letteratura. Lo scopo del presente lavoro è mettere in luce – attraverso una rassegna degli studi più significativi presenti nella letteratura psicologica – quali sono i fattori che influenzano i comportamenti, le percezioni e le decisioni in un contesto di rischio nei bambini compresi tra gli 0 e i 14 anni. Un interesse particolare è rivolto all'esperienza diretta del bambino col rischio, che si suppone svolga un importante ruolo di maestra per le future occasioni di pericolo. I risultati degli studi considerati hanno evidenziato l'influenza dell'età, del sesso, delle condizioni socio-economiche, il ruolo dei genitori, dei coetanei, delle caratteristiche di personalità, della televisione e dell'esperienza personale. Quest'ultima ha disatteso le ipotesi iniziali evidenziando un inaspettato effetto negativo su stime e comportamenti futuri in un analogo contesto di rischio. Le implicazioni per la ricerca sul rischio di soffocamento da corpo estraneo sono discusse.

Introduction

Accidents are one of the major death factors. In particular, when considering accidents related to specific age groups, it is clear that asphyxiation accidents under the age of 15 years represent a relevant phenomenon¹. Obstruction of the airways is the main cause of death, due to asphyxiation, in children under 4 years of age.

Although the design and shape of objects to be used by children under the age of 3 should be taken into consideration in the attempt to prevent accidents, there are many other products with similar characteristics (peanuts, coins, buttons, ...) that are unsuitable for young children. At this stage, the role of educa-

tion is as important as the role of psychological factors at the basis of a dangerous behaviour, that are not considered with enough attention from an accident prevention point of view.

Moreover, in this phase of their life, children are beginning to conceptualise events, a process that is at the basis of their future risk appraisal. This highlights the even more relevant importance of researching those psychological factors at the basis of decisions and behaviour in the context of risk situations for children, and that can lead to the development of an accident prevention programme including the development of competences that would be adequate for risk appraisal during adulthood. In fact, in order to thrive, the child must gain knowledge of adequate strategies enabling

him/her to achieve a present goal, and must know how to use them in hazardous circumstances.

The object of this study is to highlight the factors behind children's risky behaviour: in particular, the specific asphyxiation accident has been studied in the literature almost exclusively from a medical or legal viewpoint (this in relation to the legislation regarding the production of toys for children under 3 years of age). The aim is to analyse the most important studies in the psychological literature in order to offer an overall reference framework presenting interesting implications concerning asphyxiation accidents.

Factors influencing risk perception and risky behaviour

A particularly relevant factor, at the basis of a person's behaviour, is the objective perception of danger. This is defined as the entirety of human reactions to a decision taken in a risk context, and it implies physiological reactions (heart beat, skin electrical conductance, ...), behavioural reactions (approach to or refusal of hazard, enactment of safety measures, ...), cognitive reactions (opinion, probability and evaluation of effectiveness, ...) ². The relation between risk perception and behaviour has been studied mainly in work environments, and has shown that underestimating an objective hazard leads to careless behaviour and to a higher accident rate; on the other hand, an appropriate evaluation of the objective hazard is conducive of adequate behaviour. The evaluation of hazard levels and its relation to behaviour has been studied, although to a lesser extent, in environments other than the work-place.

One study ³ offers a conceptual model attempting to summarize all factors at the basis of a child's risk evaluation. The model includes the relevance of:

- a. individual preferences;
 - b. age;
 - c. peer group role;
 - d. adult influence in education and socializing process;
- and
- e. the historic and socio-cultural context within which children assess potential hazards arising from objects, people and situations. From this model – including also cognitive and emotional factors about risk perception – a later study ⁴ explored the influence of other factors on children's risk perception, including: experience level with hazard, television influence, history of previous accidents and predisposition and search for new feelings and excitement.

Miller and Byrnes ⁵ proposed a model for children's risk behaviour using two different tests as a guideline.

According to this model, called SRM (Self Regulation Model), there are five factors characterizing the correct behaviour of a person in a hazardous context:

- a. the knowledge of adequate strategies;
 - b. the ability to coordinate multiple goals;
 - c. a balanced, moderately risky behaviour;
 - d. self-adjustment strategies;
- and
- e. the trend to learn from experience.

It is clear that, in order to achieve a certain outcome and to be able to hierarchically coordinate the various goals, it is essential to identify the strategy to employ in a specific situation; however, the model highlights the importance of facing risks in a balanced manner. In fact, according to Miller and Byrnes ⁵, one should have a certain knowledge of accident probability and be neither too hesitant nor over confident in one's own moderately hazardous behaviour. Self-adjustment strategies are important to counteract all natural reactions (impulsiveness, anxiety, search for excitement and constantly new experiences, competition), the decisional heuristics (and of representation and availability) ⁶, the framing effect ⁷, the optimism bias and the illusion of control ⁸ and the memory limits, specific to each person. Finally, the Miller and Byrnes ⁵ model refers to the relevance of each person's experience when facing hazardous situations which is also a basis for learning. The five factors proposed for correct behaviour during hazardous events, are obviously very different from those used by normal people in real life, and even less by children. In fact, the test ⁵ has shown that if children were perfectly self-regulated, according to the SRM theoretical model, then:

- a. the presence of other children of the same age would bear no effect on risk-related choices;
 - b. personality traits would not correlate with hazardous behaviour (because of self-correcting strategies);
 - c. they would always go for the best option (because of the balanced, moderately risky behaviour);
- and
- d. previous experience would appropriately modify behaviour (personal learning from experience). The results have confirmed that children are influenced by a large number of variables, among which the presence of other children, the context of the specific hazard, individual personality traits, sex and age.

AGE

In order to assess how risk appraisal changes over time, a study has been carried out on children and adolescents between 6 and 18 years of age ⁹. Risk appraisal follows a U-shaped curve showing an elevated danger appraisal at the age of 6; it decreases to its lowest point by the age of 8 and rises again until the

age of 11. On the contrary, another study¹⁰ has shown that younger children assess and fear the same hazard more than older children; risk appraisal followed a linear decrease during infancy, while this was not so in late childhood and adolescence. Further proof of these results is offered by Di Lillo et al.¹¹ who showed that age is strongly and negatively related to risk appraisal of those hazardous situations that the child has never experienced directly. The age differences detected in risk appraisal could be due to numerous other factors, such as previous experience, information processes, visual-space ability, control of emotions, social competence, and self control.

SEX

The literature shows that the frequency of accidents varies significantly, depending upon the child's sex¹²⁻¹⁴. The rate of accidents changes significantly after the age of 3 years, and this difference increases during childhood, with a clear predominance of boys^{12 15}.

Boys often engage in more physically active games and take more risks than girls. Moreover, the higher number of accidents is due to the choice of hazardous activities: in fact, when comparing both sexes, in the same context, boys choose the same activities but carry them out in more hazardous ways^{13 14}. There are behavioural differences¹⁴ in a specific, dangerous situation (burning, wounds, falls, poisoning hazards). In a context entailing the threat for burns, girls are more careful than boys; in a situation entailing the risk of injury or poisoning, boys go closer to the source of danger than girls¹⁴. This difference between sexes may be due to many other factors, like boys' greater impulsiveness, a conviction of their own invulnerability, peers' or parents' influence and how they have been educated with respect to dangerous situations. In particular, parents encourage boys to take part in games requiring physical activity, while girls are encouraged towards safer and calmer activities¹⁶. For example, mothers warn girls against falls more often than they warn boys of the same age and in the same contexts¹⁴.

SOCIO-ECONOMIC STATUS

Many studies in the literature have shown that children's low socio-economic status is related to an increased, unintentional, accident rate¹⁷⁻²⁰. Alongside the socio-economic data, the importance of the residential area also emerges; in fact, deprived areas show a higher, accident-related child mortality rate²⁰. The influence of the socio-economic setting is particularly relevant in early childhood, while, starting from the age of 14, it tends to decrease with the onset of adolescence²¹.

One explanation can be seen in boys' greater autonomy and independence from parents' influence; on the

other hand, the influence of factors outside the family – such as school and peers – also increases.

THE PARENTS' ROLE

Parents play a fundamental role in children's education and behaviour in relation to hazards and in their risk appraisal. In fact, according to Badura's²² socio-cognitive theory, parents are the first model children learn from since babyhood. To confirm the relationship between parents' risk appraisal and children's behaviour, it has been shown²³ that parents of children who experienced earlier accidents, assessed their children's activities at a lower risk level as compared to the assessment of parents whose children have never had accidents.

The outcome of another study²⁴ shows that parents' perception of road risks (mainly influenced by the child's age and the sex of the parent²⁵; a higher hazard level is assessed by mothers of very young children living in high-traffic areas) plays a fundamental role in determining children's behaviour and hence, in modelling children's safe behaviour in city traffic.

Besides being a behavioural, safe model for their children, parents intervene with direct control and feedback concerning children's activities. In particular, boys' behaviour is less restricted and controlled¹⁷ and mothers' verbal control is greater for girls²⁶. Hence, the different way a parent addresses a boy or a girl in a risk situation determines a child's different hazardous behaviour. In fact, parents communicate in a different way with boys than with girls, thus creating (given that the basic ability to face risks is equal for both sexes) and promoting the sexual differences of their approach to hazards (encourage boys towards physical activity and girls to quieter games; control and alert girls more than boys)²⁷. Parents' behaviour towards children depends on their sex and developmental stage: when children are younger, parents use physical barriers and adequate strategies to shield them from danger, while, when children are older, parents use rules and instruct children on how to minimize risk of injury²⁸.

Moreover, parents are subject to the so-called "compensation effect", in other words the use of protective equipment makes them assume that the risk of a child's accident no longer exists^{29 30}. In fact, when children wear protective equipment, parents allow them to undertake more dangerous activities (such as wearing a helmet when skiing or cycling); obviously, safety equipment does not offer full protection and the child's activity remains hazardous in certain situations.

PERSONALITY TRAITS

It has been shown³¹ that personal traits, such as the constant search for new and stimulating activities,

are a factor of the under-appraisal of potentially hazardous activities. This attraction to new and dangerous activities is already present in those children who tend to prefer constantly new and intrinsically dangerous activities. In children between 6 and 8 years of age, this personal trait is a good forewarning of really hazardous behaviour³². According to Miller et al.⁵, children who chose the most dangerous option have a high competitive and interest level for new experiences and emotions (sensation seeking). Moreover, it emerged that¹¹ children with high sensation seeking parameters, assess certain situations (that they have never previously experienced) as less dangerous than they objectively are. Anxiety, impulsiveness, self-reliance are also personal traits influencing the enactment of dangerous situations; investigations have shown⁵ the existence of a relation between choosing more dangerous activities and high impulsiveness levels, trust in one's own capability and low deliberation levels, fear of failure and self-reliance (only for girls; boys' ratio is the opposite: more self-reliance equals more hazardous activities).

Other research studies have labelled those children who display aggressive, impulsive, hyperactive and stubborn behaviour^{12 29 33} as "accident prone" and hence with a higher probability of personal injury.

THE ROLE OF PEERS

Various studies have analysed peers' influence on decision-making in the non-hazardous context³⁴, highlighting the persuasion characteristics and techniques used. Moreover, peers' influence is fundamental in decision-making that can jeopardise one's health; it has been shown³⁵ that primary school children's decisions are influenced when undertaking hazardous activities. However, peers' persuasion is greatly moderated by the type of relationship between them and even more by the type of persuasion used. In the latter, there is a difference in convincing friends to undertake a dangerous activity whereby girls stress the existing safety measures while boys are primarily focused on arguments about their possible entertainment. Moreover, peers can influence their friends' risky behaviour with no explicit persuasion, but simply appreciating their behaviour with admiration. In fact, a study³⁶ has shown that boys between 6 and 10 years of age show their old scars with complacency, describing the way they were injured, and are reassured by their peers' interest and admiration. The study by Miller et al.⁵ shows a major result in choosing a more hazardous alternative, when considering the sex and the peers' presence, and even more an interaction between these two variables. In fact, boys choose the dangerous option more frequently than girls and, in particular, such behaviour is further reinforced by the peer's presence, at the moment of

decision-making. This study⁵ has also shown that the presence of peers significantly reduced the rate of adequate responses (low, medium, high risk) by children > 12 years (both boys and girls) and not by those between 8 and 10 years of age.

Older siblings have a decisive role in influencing judgement and decisions about what risk to undertake³⁷. In fact, after persuasion, younger brothers (8 years) changed their initial decisions concerning the risk level to accept in favour of a less risky choice and vice versa. However, again in this case, the type of relationship between siblings was very important; obviously a positive relationship was predictive of a change of decision by the younger brother.

TELEVISION

Television is one of the most widely-spread media, in fact, investigations on its influence on children's behaviour are countless, especially as far as concerns violent behaviour. According to the Bandura socio-cognitive theory²², the child exposed to a model could learn the behaviour embedded in it, without requiring first-hand experience, rather by simply observing the consequences of the behaviour undertaken by the model (vicarious reinforcement). With regard to risk appraisal, in particular, there are countless cartoons that do not show the negative consequences of certain behaviour when it is carried out in real life. This is confirmed by a study¹¹ demonstrating that the daily watching of cartoons leads to lower risk appraisal, especially for those risks only known through the television, while this is not the case for hazards pertaining to the child's more direct and daily experience. Another study³⁸ has examined the consequences of television models on the ability to identify danger and the choice of risk level they would require, using pictorial representations of hazardous scenarios. The results have shown that – following a safety education programme – children:

- were able to identify possible danger and there was a significant decrease in the will to face risk hazards;
- after viewing a cartoon highlighting safe behaviour, the level of identification of hazards in the pictures shown afterwards increased, but there was no effect on the choice of risk level;
- after the same cartoon was shown without the safe behaviour scenes, there was no effect on either risk identification or the choice of the risk to undertake.

Such results can be interpreted as evidence of learning by observation and of the priming of thematic knowledge related to television stimuli. Hence, television can produce negative effects on children's danger appraisal and their subsequent enactment of risky behaviour, but can have positive effects if the programmes have specific goals such as safety pro-

motion. In fact, a study³ exposed children to television viewing of possible negative effects related to fire and water activities; afterwards, their assessment of the importance of safety measures and danger perception rose significantly. Such results suggest that television messages can be very useful to children's awareness to danger.

PERSONAL EXPERIENCE WITH RISK

The study of DiLillo et al.¹¹ has shown that every domain of risk is assessed, in some way, and the appraisal is predicted by a different pattern of factors. The outcome of another study³⁵ has confirmed that – before undertaking a hazardous action – most children evaluate the possibility of being hurt – according to the specific situation – in a different way, and the differences due to the context are also found in the enactment of a different, genuinely dangerous, behaviour⁵. The data are consistent with research³⁹ on adult subjects. In fact, children appraise hazardous situations that they know, either directly or indirectly, and those they could be exposed to, in a different way, compared to others; in other words, risk appraisal is domain-specific. However, it has been found that¹¹ direct exposure to hazard, when not accompanied by any negative consequences, leads to future appraisal that underestimates the actual risk. Children who had a direct, dangerous experience not related to an accident – in other words, a successful performance – afterwards appraise the same situation as less dangerous. Moreover, those who had experienced various types of accidents in the past, showed lower danger appraisal than their peers. Hence, these results support the concept that a previous experience with danger has a de-sensitizing effect on children, leading them to under-estimate a future hazard¹¹.

A study⁴⁰ carried out on University students highlighted the existence of a strong relationship between past and future behaviour. Contrary to what might be expected, those who behaved in a dangerous manner in the past, tended to repeat this behaviour (significantly more frequently) in the future.

Likewise, another study by Jaquess et al.⁴¹, showed that accidents occurring over a lifespan – and, in particular, those recorded at summer camp of children 3 to 11 years of age – explained 50% of the total variance recorded during the following summer camp.

A longitudinal, 5-year study⁴² on more than 10,000 children, has shown that:

- a. children who had three or more accidents between birth and the age of 5 were 5.9-fold more likely to have accidents between the age of 5 and 10 years, compared to those who had never had any accident before school age;
- b. children who had one or more accidents requiring hospitalisation before the age of 5 years, were 2.5-fold more likely to have one or more acci-

dents requiring hospitalisation, between the age of 5 and 10.

An analysis of data has confirmed that the number of previous accidents in children under the age of 5 is the best predictor of future accidents between the age of 5 and 10 years.

Even data on very young children (between 24 and 42 months)²³ have shown that those who already had accidents with negative health consequences, later presented more active behaviour in unstructured playing situations, they were more destructive, were more disruptive and tended to have more contacts with danger than children who had not previously been hurt.

A study on children between 3 and 12 months⁴³ analysed the data-diaries compiled by parents and demonstrated that half of the children who had been close to one or more accidents (falls, burns, wounds, dislocations) had repeated the occurrence some time later. Likewise, two thirds of children who never risked being hurt, did not have other accidents, at later stages. Once more, this relationship shows that the child's past experience, with a certain type of risk and its positive outcome (no accident), does not constitute a deterrent for the enactment of future hazardous behaviour.

The results³⁴ show that children, between 7 and 9 years, are able to compare risks, identify hazards that can lead to an accident and can also predict the negative consequences of certain situations. However, the child's knowledge is not related to his/her decision about undertaking risky behaviour or not. According to the Authors³⁴, this relation would suggest that risk appraisal is only one of the factors influencing the enactment of risky behaviour. In fact, also this study has shown that children's accidents are not to be related to their subsequent, cautious decisions in a risk context. Most of the children (52%) have reported at least one experience or even familiarity with the situations shown to them, Yet this did not influence the choice of a more or less risky option. Similarly, a parent's report of the number of accidents in similar contexts does not relate to the child's initial decision to choose either a risky or a cautious alternative. The only significant relationship is that relating the hazard appraisal to riding a bicycle in traffic and the number of accidents the child has had in a similar situation²⁹.

Conclusion

Many of the factors that appear to influence risk evaluation and appraisal – such as sex, age, socio-economic level and parents' influence – are closely inter-related. The child's developmental stage is itself an indicator of the cognitive ability acquired and naturally developed that influence behaviour appropriate to the requirements of a hazardous situation. Parents shape, either directly or indirectly, children's behaviour, on the basis of children's sex and age and of their own level

of education and type or occupation (socio-economic factors). Moreover, television is often an educator itself, either good or bad, offering models of safe or dangerous behaviours, in hazardous contexts. What remains difficult to understand and escapes common sense, is the lack of importance of children's direct experience, and even its negative effects. In fact, parents themselves believe that children acquainted with certain activities are less at risk of accident and allow them to face hazardous situations²⁹. On the other hand, the literature shows no evidence supporting the belief that children learn correct behaviour, in hazardous situations, from previous experience. One explanation can be seen in Weiner's theory of causal attribution (1983)⁴⁴. In fact, the child could attribute the cause of previous accidents (failure attribution) to unstable, uncontrollable and external factors such as bad luck or specific, unrepeatable situations such as the weather. In this case, the experience of the accident is not a deterrent in a future, similar, situation because the reasons for the mishap are unique, hence cannot be generalized, becoming part of his/her store of experiences. If a child had a negative experience with a hazard but suffered no negative consequences, the nature of success could be drawn with considering stable and controllable factors such as ability or concentration. Along with the events' causal attribution, risk appraisal could play a mediating role: in fact, if a child perceives a low risk level and underestimates the real one, he/she engages in dangerous behaviour; regardless of the outcome of his/her behaviour (either an accident or not), the causal attribution (as described above) allows him/her to continue underestimating the actual risk and persist in the previous behaviour. In the case of failure (no consequences after dangerous behaviour), causal attributions to unstable and external factors are functional to the achievement of good self-esteem. In fact, if the cause of an unpleasant event is always attributed to one's responsibility, this can, with time, become pathological and thus lead to what Seligman⁴⁴ calls learned feel of inadequacy that can later lead to a more or less significant depression syndrome. However, if, on the one hand, the child's causal attribution of the hazardous event is functional to the creation of a positive self-assurance, it is, on the other, not functional to cautious behaviour, in a future dangerous situation. This is confirmed by a study⁴⁵ showing that children with the highest number of accidents were boys that:

- had experienced the same type of accident in the past;

- had assessed their accidents as low level harm;
- were not very keen to report their mishaps to their parents;
- attributed the causes of their accidents to misfortune.

Therefore, they attributed the causes of their accidents to external factors that they could not control. Optimistic bias⁸, i.e., a systematic distortion in judging one's own probability of failure as compared to others' is closely related to the attribution theory; in fact, people tend to overestimate their own invulnerability to negative events as compared to others', feeling less at risk. Supporting explanations, on the theory of attribution and optimistic bias in children's risky behaviour³⁵, is the fact that children between 6 and 10 years of age, who more often than others engage in dangerous behaviour, judge certain situations as less risky than other children do, and attribute their more frequent injury to misfortune, thus assessing that their peers are more at risk of accident than themselves, in similar situations.

In view of the psychological theories examined, so far, the causes of an asphyxiation accident could easily be attributed to external and uncontrollable factors, as they do not constitute a learning stage, necessary for comparable situations.

In relation to other factors influencing children's risk behaviour and appraisal, and in reference to asphyxiation accidents, it can be said that age and sex are equally determinant in the specific case. In particular, children under the age of four are more exposed to such risk, which is closely related to the development of their ability to chew (in case of asphyxiation from food) and to the conclusion of the stage in which the child explores the external world by means of oral mechanisms. Age is itself closely related to cognitive development and to the ability to appropriately evaluate danger in a certain situation, one that either enables a higher level of attention or leads to its refusal. This factor is closely related to the child's natural development, while it is not the same for the socio-economic factor related to the parents' behaviour and perceptions with regard to asphyxiation hazard. Of all the factors examined, this appears to be the most directly controllable from an all-round, preventative viewpoint. In particular, the parents should eliminate the objective cause of the hazard as well as educate the child to avoid potentially dangerous situations, and promote an adequate learning of causal attribution in order to avoid future and similar dangerous situations.

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■ Address for correspondence: Prof. D. Passali, Dipartimento di Scienze Otorinolaringoiatriche, Università di Siena, Policlinico "Le Scotte", viale Bracci, 53100 Siena, Italy. Fax +39 0577 47940. E-mail: passali@unisi.it