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Importance of planned health education for burn injury prevention

L. M. Bouter¹, Olga J. L. van Rijn² and G. Kok²

¹Department of Epidemiology and Health Care Research and ²Department of Health Education, University of Limburg, The Netherlands

The planning of health education in the prevention of burn injuries is typically incomplete and not stated explicitly, while the evaluation is executed only partially or is altogether non-existent. This article presents a theoretical framework for planning and evaluating health education for those at risk for burns. Systematic planning consists of an assessment of the magnitude and severity of the problem, an analysis of the behavioural risk factors, a study of the determinants of the most risky modes of behaviour, the design of an optimal intervention, and the implementation of this intervention. The evaluation phase deals with the effects on these five levels (implementation, intervention, determinants, behaviour and injury risk). Some common pitfalls are mentioned and special attention is given to the study of determinants of behaviour and to the design of the intervention. Furthermore, the importance of pretesting health education material is underlined. There appears to be a strong need for further research on the aetiology of burn injury and the relevant determinants of behaviour, before effective prevention can be realized.

Available data on the incidence of burn injuries indicate that the problem is a substantial one in terms of morbidity, medical consumption and absence from work (van Rijn et al., 1989b). Burn injuries are among the most serious injuries, because the long-term physical and psychological consequences are often considerable (van Rijn et al., 1989a). As a solution, prevention is usually advocated, often in the form of health education. The planning of these health education activities is typically incomplete and not stated explicitly, while the evaluation is executed only partially or is altogether non-existent.

The central thesis in this article is that the effectiveness of health education in preventing burns is determined by the quality of the planning process (Green et al., 1980; Green and Lewis, 1986). A thorough evaluation of the health education intervention is a condition *sine qua non* for establishing this effectiveness. Therefore, the process of planning and evaluation of health education aimed at the prevention of burn injuries is discussed below. The theoretical considerations will be illustrated by examples from our research project dealing with burn injury prevention among young children. Firstly, an overview of the several phases of the process will be presented, in addition to which several common pitfalls are mentioned. Secondly, special attention

will be given to the study of the determinants of behaviour and to the design of the behavioural intervention itself. Thirdly, a number of conclusions are drawn and some priorities for future research are mentioned.

Planning health education

A model for explicit planning and evaluation of health education is presented in *Figure 1*. In planning as well as in evaluation five related steps can be discriminated. These ten steps in total can be indicated by their central questions. These questions are presented below and (partially) answered with respect to burn injury among young children.

Step 1: How serious is the problem?

This question deals with the incidence, sites and severity of burn injuries. Besides, some information on the personal characteristics of the injured patients is necessary in order to define specific risk groups. Although there are still some gaps in the literature (van Rijn et al., 1989b), nowadays a global consensus exists on the main points. As an example *Table I* presents the basic epidemiological data on burns in The Netherlands (van Rijn et al., 1990a). The overall incidence of medically treated burns is probably about 2.5 per 1000 persons per year. This figure seems to be three times as high among 0–4 year-old children, of which scalds account for almost 60 per cent. These data suggest that health education could reasonably focus first on the prevention of scalds among young children.

Step 2: What behaviour is involved?

In the literature an abundance of putative behavioural risk factors for burn injury are mentioned (van Rijn et al., 1989b). However, studies adequately establishing and quantifying the aetiological role of these factors are very sparse. In an earlier article in this journal (Bouter et al., 1989), we discussed the methodological principles of aetiological studies. Recently a case-control study investigating the risk factors for burns among young children was performed based on these principles (van Rijn et al., 1989a). *Table II* presents some of the main risk factors identified in this study.

The odds ratios presented in *Table II* provide an estimate

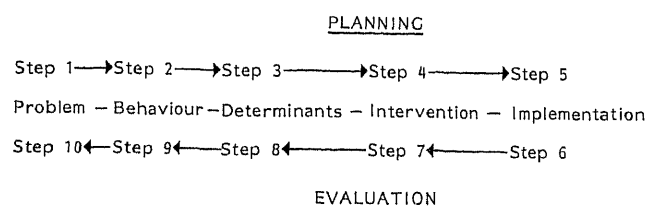


Figure 1. Model of planning and evaluation of health education.

Table I. Incidence* of medically treated burns in The Netherlands

	General practitioner†	Hospital‡
All ages	1.7	0.8
0–4 years	5.6	2.0
0–4 years, scalds only	3.2	1.2

*Incidence per 1000 persons per year.

†Data from the Netherlands Institute of Primary Health Care.

‡Data from the Consumer Safety Institute, including inpatients and patients seen at emergency departments of general hospitals.

of the relative risks (Bouter et al., 1989). This is the ratio of the incidence of burns when the risk factor at issue is present and when it is absent. It appears that an impressive number of behavioural risk factors for burns among young children deal with the use and the preparation of coffee and tea. *Table II* also presents information on the proportion of the population for which a risk factor is present, and on the aetiological fractions. The latter is an estimate of the theoretical maximal reduction of burns that would be the consequence of a total elimination of the risk factor at issue (Rothman, 1986). Aetiological fractions should be looked upon as rough indicators of the importance of a factor from a preventive viewpoint.

Step 3: What are the determinants of the behaviour?

Recently a study was conducted among Dutch and Turkish parents that tried to identify the determinants of desirable behaviour (for instance, avoiding drinking hot beverages with a child on your lap) in nine common situations or activities that appeared to be associated with the risk of burn injuries among children. To collect this information the parents of the children were asked to implement these desirable forms of behaviour in a consistent way at home over a period of 2 weeks. After this period they were asked to mention the most important advantages and disadvantages of the desirable behaviour (van Rijn et al. 1990b). Preliminary results from this study of the determinants of the behavioural risk factors for burns among children aged 0–4 years indicate that parents fail to recognize dangerous situations which could provoke burn injuries. Parents were often not aware of risk factors (van Rijn et al., 1990b), like those presented in *Table II*. Almost all parents believed that their children had a risk for burns below the average (van Rijn et al., 1989a).

Step 4: What options are there for change?

This step deals with the modification of the behaviour in a safer direction. In this context two decisions have to be made.

1. The behavioural targets and the target group of the intervention have to be defined.
2. A decision has to be made about which strategy will be the most effective for the desired behavioural change.

Table II. Behavioural risk factors for burns among young children*

Risk factor	Odds ratio	Prevalence†	Aetiological fraction (%)
Making coffee by hand vs automatic	1.5	0.12	6
Coffee pot placed far from vs near stove	1.6	0.13	7
Hot drinks in original pot vs vacuum flask	1.6	0.53	24
Oven window gets hot vs stays cold during use	2.0	0.35	26
Separate hot water tap vs mixing tap			
In kitchen	1.4	0.12	5
In bathroom	2.9	0.05	9

*From a recent case-control study (van Rijn et al., 1989a) including 124 cases of burn injury and 217 controls.

†Proportion of households with 0–4-year old children.

Health education intervention could stress the relevant empirical findings and clarify the relation between certain modes of behaviour and injury risk. Special attention might be given to explaining that all burns happen unexpectedly and that the risk is equal for all young children. Furthermore, the message should contain practical and feasible guidelines for the desirable preventive behaviour, and should deal with the barriers that are likely to arise.

Step 5: How can that be implemented?

Next the channel and the moment of the health education intervention have to be decided upon. In The Netherlands parents of young children can be contacted easily through the health care system. For instance, the education could be provided simultaneously with the vaccination programme that starts when the child is 3 months old. The message could be contained in leaflets, posters or video tapes. In the problem analysis (van Rijn et al., 1989b) it appeared that children of ethnic minorities (e.g. Turks) were at higher risk compared to children of Dutch origin. Therefore special efforts ought to be made in reaching parents from such subgroups.

Step 6: Has the implementation been carried out as planned?

This step is designed to ensure that the intended population of parents of young children actually received the health education intervention. It is evident that this is a necessary, although not a sufficient, condition for effectiveness.

Step 7: Has the intervention been released as planned?

The central question in this step is whether the parents, including those of the ethnic minorities, understood the message contained in the health education intervention. Failure to clarify fully the modes of preventive behaviour that are expected and could be another source of ineffective prevention of burns.

Step 8: Have the determinants of the behaviour changed?

This phase is concerned with establishing whether the prevalence of the determinants of the desired behaviour has risen satisfactorily. In our example this part of the evaluation should focus on knowledge of the magnitude of the risk factors.

burns and on ways of avoiding the dangers. Special attention ought to be given to the experiences of the parents with respect to the advantages and disadvantages in carrying out the desirable behaviour.

Step 9: Has the behaviour changed?

Health education aims at modifying behaviour. Therefore, quantifying behavioural change is important in the evaluation process. In our example, this entails analysing whether the target population engages in preventive behaviour which conforms to the message of the programme.

Step 10: Has the problem been lessened?

Of course, this is the ultimate measure of efficacy: steps 6–9 can be considered the intermediate steps. In the example the postintervention incidence of burn injury, more specifically of medically treated scalds among young children, will indicate the overall effectiveness of the health education intervention. For methodological reasons this straightforward measure is often not presented. It can be calculated that even a 50 per cent decrease in incidence from four to two injuries per 1000 young children per year fails to reach statistical significance (at $\alpha = 0.05$) in a study involving 5000 parents, half of them receiving the intervention and the other half being the control group (Bouter et al., 1989).

Pitfalls

Unfortunately, the 10 steps mentioned above are often not given appropriate attention. The most common mistake is that people jump from the problem to the intervention without answering the planning questions in between. Furthermore, because evaluation is rare, the ineffectiveness of such interventions remains hidden. Evaluation is necessary for testing previous decisions and for making corrections to improve the intervention. Careful planning can avoid a number of potential pitfalls that we will describe and illustrate with examples.

Pitfall 1

The development of an intervention for a problem that does not exist In our example burn injuries are clearly a substantial problem, especially when analysed in terms of incidence figures and severity of the injuries. However, failure to conduct a thorough problem analysis could have led us to develop an intervention for an activity with a very low injury figure or relatively minor injuries. Similarly, insufficient knowledge about the personal characteristics of burn patients and the nature of their injuries could have led to the choice of a wrong target population. An example of the latter would have been a choice for preventing chemically induced burns among adults in the general population.

Pitfall 2

The development of an intervention addressing behaviour lacking a clear relationship with the problem This would be the case when health education focuses on behaviour for which the odds ratio has a value around one and/or the prevalence is low (see step 2). For such modes of behaviour the aetiological fraction will always be very minor, indicating that even the maximum yield of health education aimed at these factors will be insignificant. Examples of this from our case-control study (van Rijn et al., 1989a) are: using a teapot with a loose lid (OR (odds ratio) = 1.0; prevalence = 43 per cent) and boiling water in an electric kettle (OR = 2.0; prevalence = 4 per cent).

Pitfall 3

The development of an intervention that is based on a misconceived or incomplete idea about the determinants of behaviour A general finding in health education research is that when a relation is shown between a health problem and behaviour, knowledge about that relation is enough for some people to change their behaviour. For a substantial group, however, knowledge is not enough. This means that health education for the parents of young children should supplement information on the risky forms of behaviour with arguments dealing with the other determinants of behaviour. For instance, parents may be well aware that cups of coffee or tea should be kept out of reach of young children, but still feel uncomfortable about explaining this to every visitor (van Rijn et al., 1990b).

Pitfall 4

The development of a wrong intervention, for instance an intervention aimed at the wrong group An example of this would be school health education with the message that children should not play with matches. This would probably turn out to be ineffective, because firstly the children most at risk for burns do not yet attend school, and secondly playing with matches has not been identified as an important cause of burns in older children (pitfall 2).

Pitfall 5

The development of a potentially effective intervention with a wrong implementation For example, suppose that health education would be made available to the subscribers to a popular magazine for the parents of young children. Consequently, the information about the dangers of hot beverages would not reach the majority of parents. Furthermore, it is probable that the subscribers to such a magazine form a selected group of parents who are already well aware of the dangers described in the information that is provided.

Pitfall 6

Unjustified satisfaction about the intervention This concerns the failure to evaluate the intervention thoroughly. For instance, it could take the form of satisfaction about the large numbers of brochures on burn injury prevention handed out to parents in the context of the vaccination programme, with no notice taken of whether the number of burns actually has been reduced and whether this reduction is due to the health education campaign.

Determinants of behaviour

In general, health educators have to rely on the epidemiological literature (Bouter et al., 1989) identifying the magnitude of the problem and the behaviour that is (causally) involved (steps 1 and 2 in *Figure 1*). When such behaviour is indeed identified, the next step for the health educator consists of the clarification of its determinants. *Figure 2* presents a recently developed model of behaviour determinants (de Vries et al., 1988). This model states that external variables can influence behaviour along three different pathways:

1. An attitude is the weighing of all the advantages and disadvantages of performance of the behaviour, as seen by the individual. Health (injury prevention) is only one of the possible considerations and often an unimportant one. When health is a part of the attitude, we may suppose that health motivation is a combination of the perceived

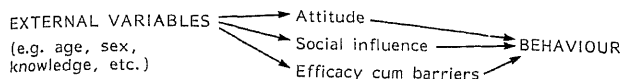


Figure 2. Model of behaviour determinants.

	Source	Message	Channel	Receiver
Attention and comprehension				
Change in attitudes, social influence, efficacy cum barriers				
Maintenance of behaviour change				

Figure 3. The health education matrix.

severity of the health risk, the perceived susceptibility to the health risk, and the perceived effectiveness of the preventive behaviour. But again, health considerations are mostly not dominant and other considerations like costs, (dis)like, status, etc., are often more important. As said before, knowledge about risk is, for most people, not enough. A painful example is the unhealthy lifestyle of many doctors.

2. Social influence is the influence of others; directly by what others expect, indirectly by what others do (modelling). Social influence is often underestimated as a determinant of behaviour. Social psychological studies show that social influence can lead to behaviour that conflicts with previous attitudes. The basis for social influence lies in two principles. First, people like to have the right information, while the ideas of other people are sources of this information. Secondly, people like to be socially rewarded, such as by receiving compliments from others and by belonging to a group.
3. Efficacy cum barriers stands for the determinant whether one is able to perform the (desirable) behaviour. Efficacy cum barriers involves an estimation of the ability to perform the desirable behaviour, taking into account possible barriers inside or outside the person (inside: insufficient knowledge, skills or endurance, etc.; outside: resistance from others, time and money not available, conflicting lifestyle, etc.). If, for instance, parents of young children have the intention to put a safety ring around the cooking place, but when such a device is not for sale in their neighbourhood, it is unlikely that they will indeed behave as they intended to do.

Self-efficacy relates to beliefs about capabilities of performing specific behaviours in specific situations (de Vries et al., 1988). Efficacy is people's perception of their ability to perform the behaviour, while barriers are the real problems they face in actually behaving. Efficacy is shaped by experiences with barriers. There is a logical relation between (perceived) efficacy and (real) barriers, but besides that there is also an important relation between efficacy and success in performing the behaviour. People with a higher efficacy have a higher chance of succeeding, independent of the existing barriers. But the discrepancy between (perceived) efficacy and (real) barriers should not become too large. Health educators can try to increase the efficacy in order to motivate people to adopt the preventive behaviour. At the same

time, however, they should help people to overcome barriers to performing that behaviour.

We have described in theory the three kinds of determinants of behaviour. With the exception of our own pilot study (van Rijn et al., 1990b) there are, to our knowledge, no systematic empirical studies on the determinants of most putative behavioural risk factors for burns. This is clearly an omission in research and the gap needs filling urgently. Assuming that in the near future this kind of research will be conducted and specific determinants of behaviour will be known, how do we get from determinants to interventions?

Behavioural intervention

Changing by health education means by communication. Therefore the first goal is to gain attention and comprehension. Having achieved this and subsequently a change in determinants, the third and last goal is the maintenance of the change in behaviour. A once-only change is not enough; we want the desired behaviour to become a habit. The major problem in achieving maintenance of change in behaviour is the possible negative experiences people have when performing the desired behaviour (e.g. screaming children when they are barred from entering the kitchen during cooking). Health educators should always be realistic about the experiences following the change to the desired behaviour. Often these experiences are in the short term not very positive. Sometimes it is possible to present 'organized' positive experiences, for instance by presenting data about the number of burn injuries among young children that are prevented related to the year before.

Figure 3 combines the three health education goals with four communication variables in the so-called health education matrix, adapted from that devised by McGuire (1985). The cells of this matrix indicate decisions that have to be made, e.g. which source attracts the most attention, which channel is able to change social norms, which group of receivers should be specially prepared for negative experiences, etc. In the literature (McGuire, 1985) a rich quantity of empirical data can be found with respect to every possible decision.

Pretesting of educational materials is meant to check whether the materials have the intended effect on the receivers, especially with respect to attention and comprehension (Damoiseaux, 1989). It is not enough that all kinds of specialists on burn injuries agree that the information in the materials is correct. The next step is to have communication specialists judge the materials, and a final step is to try out the materials on a sample of the target group (Damoiseaux, 1989). Only then is it possible to prevent all kinds of possible unwanted side-effects that have not been recognized by the health educators themselves. Pretesting is therefore very much needed and should be integrated in the materials development process. To our knowledge no study exists dealing with pretesting health education material on the prevention of burns.

One of the most promising intervention strategies, that is becoming increasingly popular in health education, is the community approach (de Leeuw, 1989). Community approaches are characterized by five elements:

1. They are directed at the existing social networks, neighbourhoods, social clubs, worksites, schools, etc. That social network is essential in achieving the educational goals: attention, comprehension, change of determinants, maintenance of behaviour change.

2. They are multisectoral, involving health educators, national and local health services, national and local governments, industry, housing and building organizations, etc. Health educational activities should be supported by regulations and facilities.
3. They are multi-media activities: mass media as general facilitators followed by interpersonal communication, local mass communication and the use of intermediaries, such as general practitioners or teachers.
4. They see health as a part of lifestyle. Programmes on burn injury prevention should not deal with burn injuries as an isolated issue but as a part of a healthy lifestyle for the persons themselves or their children. This concerns risk-taking behaviour, responsibility, exemplary role, etc.
5. They can be very effective by using paraprofessionals as a source. The basic idea of paraprofessionals entails the training of volunteers from the target group itself to become educators, since they can more easily reach the education goals by a better understanding of the needs of the target group, their psychological characteristics, the social organization and the structural limitations.

Community interventions are seen as the only effective strategy to reach the so-called 'difficult-to-reach' groups like immigrants or low socio-economic status groups.

Conclusions

Until now prevention of burn injuries has been dominated by medical and technical experts. To be effective these efforts should be supplemented by health education specialists. It seems possible to achieve a reduction of burns within the next 10–20 years. In the field of burn injury prevention, health education seems to be a promising tool for behavioural change, because burn injuries appear to have some specific behavioural causes that can be manipulated. It is important, however, to realize that the effectiveness of health education depends on the quality of the planning. That means a careful analysis of the problem, the behaviour, the determinants, the intervention, the implementation, and of the strength of the relationship between these five aspects. It is our opinion that with respect to the prevention of burn injuries we still have not yet reached the stage that we know exactly what to advise people. Epidemiological studies on the aetiology followed by research on the determinants of the behaviour at issue are necessary to fill in the gaps in our knowledge.

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Correspondence should be addressed to: Dr L. M. Bouter, Department of Epidemiology and Health Care Research, University of Limburg, PO Box 616, 6200 MD Maastricht, The Netherlands.