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Barriers to Wearing Bicycle Safety Helmets in the Netherlands

Gerard H. P. Seijts, MPH; Gerjo Kok, PhD; Lex M. Bouter, PhD; Helen A. J. Klip, MPH

Objective: To explore behavioral factors that determine whether children (aged 7 to 13 years) wear bicycle safety helmets.

Design: Cross-sectional survey.

Setting: Three Dutch primary schools in Breda, Maastricht, and Terneuzen, the Netherlands.

Participants: Two hundred fifty-nine children aged 7 to 13 years.

Intervention: Wearing a bicycle safety helmet for 6 consecutive weeks.

Results: Information about experiences with the bicycle safety helmet was gathered via questionnaires. Wearing a bicycle safety helmet was described as inconvenient, time-consuming, and uncomfortable. Children also perceived negative reactions from their social environment.

Conclusions: Planned health promotion activities will be essential for the introduction of bicycle safety helmets to be successful. These activities should focus particularly on developing a comfortable bicycle safety helmet, creating facilities to store bicycle safety helmets, and changing negative social norms regarding wearing a bicycle safety helmet.

(*Arch Pediatr Adolesc Med.* 1995;149:174-180)

WE DESCRIBE a study conducted to explore factors that determine whether children (aged 7 to 13 years) wear bicycle safety helmets. Head trauma and brain damage commonly occur in victims of bicycle accidents. From a road safety point of view, it would be useful to introduce bicycle safety helmets in the Netherlands. Planned health promotion programs will be essential for this introduction to be successful. For a period of 6 weeks, 259 children attending primary school wore a bicycle safety helmet while cycling. Afterward, information about their experiences with the safety helmet was gathered via questionnaires. Wearing a bicycle safety helmet was described as inconvenient, time-consuming, and uncomfortable. Children also perceived negative reactions from their social environment (eg, they were laughed at or taunted). Health promotion programs should focus particularly on developing a comfortable bicycle safety helmet, creating facilities to store these helmets, and changing negative social norms regarding wearing bicycle safety helmets.

Cycling is immensely popular in the Netherlands. Not only is cycling a popular sport and an excellent means of recreation but it is also one of the most important means of transportation. Cycling is popular, but it has its hazards. Epidemiologic data reveal that cyclists are extremely vulnerable to traffic accidents.¹⁻⁷ Of a population of approximately 15 million, hundreds of cyclists die and thousands more are admitted to hospitals because of traffic accidents each year.

The number of cyclists (including "passengers") who die annually as a result of a traffic accident has remained rather stable (according to data from 1985 to 1990), at approximately 300.⁵ The registration of injured people who have to be admitted to hospitals is almost complete.⁴ In 1989, the Information Center for Health Care (Stichting Informatiecentrum Gezondheidszorg) registered 4571 admissions that were related to bicycle accidents. Children and adolescents (aged

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See Subjects and Methods on next page

SUBJECTS AND METHODS

SUBJECTS

Three primary public schools in Breda, Maastricht, and Terneuzen were willing to participate in the study. The school in Maastricht was asked to participate by one of the researchers (G.K.); the schools in Breda and Terneuzen were asked to participate by the Regionaal Ziekenfonds in Breda. The Regionaal Ziekenfonds is a Dutch health insurance organization. Children were considered for participation in the study if they could be characterized as frequent cyclists, ie, if they cycled to school or if they rode their bicycles regularly during their leisure time. Eventually, 259 children voluntarily participated in the study; only three children, all from Maastricht, did not want to participate. Children were 7 to 13 years old (average age, 10 years). Forty-three children (19%) had previously been involved in a bicycle accident before the study was begun. Injuries differed from grazes and cuts to the chin and/or head, a broken bone in the head, tooth damage, and a severe concussion. No child was wearing a safety helmet at the time their injury occurred. As a matter of fact, no child had ever worn a bicycle safety helmet before they enrolled in the study. No bicycle accidents occurred during the course of the study.

PROCEDURES AND DATA COLLECTION

Children and their parents were informed about the purpose and design of the study in four different ways, namely, via (1) "safety traffic" lessons at school, (2) an information evening at school, (3) an information folder distributed at school, and (4) a letter with some additional information intended for parents who did not attend the evening meeting at which the additional information was given or did not look at the information folder. All children were

given the same brand of bicycle safety helmet when they (and their parents) agreed to participate in the study. The bicycle safety helmet used met international safety standards. Children were asked to wear the bicycle safety helmet whenever they rode their bicycles for a period of at least 6 weeks. In our opinion, this time span would be long enough for the children to get used to wearing the bicycle safety helmet. Children were allowed to quit wearing the bicycle safety helmet during the course of the study, if desired. However, they had to give explicit explanation of what made them decide to do so. The children were promised that they could keep the bicycle safety helmet as a reward for participating in the study.

At the end of the 6-week period, data were gathered via questionnaires. The questions (partly open and partly forced) focused on determinants of bicycle safety helmet usage and the intention to wear a bicycle safety helmet. The questionnaire was based partly on previous research conducted to determine factors affecting bicycle safety helmet usage and partly on some short discussions with both the children and the teachers who participated in the study.

One teacher (at the Maastricht school) analyzed the questionnaire and checked whether the questions and different comments were comprehensible to all children, and the questionnaire was improved based on the teacher's suggestions (eg, a reformulation of some questions). This revision took place before the questionnaire was handed out to the children.

Ajzen's model of planned behavior served as the framework for this study of the determinants of behavior.³⁵⁻³⁷ The attitude toward wearing a safety helmet was measured by eight items. Three of those items focused on risk perception; the other five items focused on experienced "pros" and "cons" when wearing a bicycle safety helmet (eg, in terms of heat production or shape). Cronbach's α for the

Continued on next page

5 to 20 years) and adults older than 65 years are at highest risk. The official number, provided by the police, of people injured in traffic accidents is far from complete and representative.³ Numbers vary from 9574 to 211 000.^{3,5,7} Harris³ showed that a substantial number of the slightly injured cyclists are not included in the official registration. As a result, a rather large group of injured cyclists remains unnoticed. This particularly concerns cyclists aged 10 to 14 years.

The upper and lower extremities (30% to 44%) and the head and/or brain (17% to 46%) are the parts of the body most often injured while cycling.^{1,3,8,9} Head trauma and brain injuries are common causes of death, serious disability, and admissions to hospitals because of bicycle accidents.¹⁰⁻¹⁷ Furthermore, as Passies⁹ reported, head trauma that initially seems to be only minor may later prove more serious (eg, recurring headaches, concentration difficulties, or dizziness).

Figures on the number of bicycle accidents and especially the number of children involved are a source of concern in the Netherlands. Moreover, considering the incidence and severity of head trauma and brain injuries among cyclists, prevention of these injuries is desirable.

Preventive measures should be directed at children and (young) adolescents; both groups are at high risk of having bicycle accidents. This finding might not be that surprising because many children cycle. Not only is the bicycle the most important means of transportation for many children but it is also a favorite plaything. Moreover, because children's cycling skills (eg, steadiness or concentration) are rather limited, it is to be expected that children are rather vulnerable to bicycle accidents.

Bicycle safety helmets are widely recommended for cyclists. Several studies have attempted to assess the effectiveness of bicycle safety helmets. Different lines of research (eg, retrospective studies and time series) have found strong indications for a preventive effect of bicycle safety helmets on head trauma and brain injuries.^{15,16,18,19} The risk of facial injuries, however, is only slightly reduced while wearing a bicycle safety helmet.²⁰ The use of bicycle safety helmets is an obvious way to prevent head trauma and brain injuries. It could save the cyclist and the health system misery and money.

The vast majority of cycling injuries occur in built-up residential areas (about 70%).^{3,5} Falls from the bicycle, without any other traffic participants being directly in-

measure of attitude toward bicycle safety helmets was .46. Because this value was rather low, items concerning risk perception were removed from the attitude construct. After this deletion, Cronbach's α was .55, which is considered an acceptable value.

Social norm was considered a function of two factors: normative beliefs about what significant others expect one to do and motivation to comply with those normative expectations. Normative beliefs were obtained regarding what eight referents thought the child ought to do with respect to wearing or not wearing the bicycle safety helmet. The potential significant others included father, mother, brother/sister, teacher, friends from school, friends outside school, relatives, and people in the street. The three-point scale ranged from -1 ("nonsupportive") to 1 ("supportive"). Children were also asked to assess how important each of these referents' opinion was to them when making their decision whether to wear the bicycle safety helmet. Answers were obtained with use of a three-point scale, with categories ranging from "not at all important" (scored 0) to "very important" (scored 2). Cronbach's α for the measure of social norms about wearing bicycle safety helmets was .78.

Children were asked to answer five items regarding perceived self-efficacy for wearing the bicycle safety helmet in different situations, namely, cycling in general, when playing on their bicycles, when cycling to school, when cycling to (and in) the city, and when cycling to the youth center, scout meetings, swimming pool, etc. Bandura³⁸ defines self-efficacy as "the judgment of one's abilities to accomplish a certain behavior or level of performance." Responses to these items were measured with a five-point scale, ranging from "not at all sure" (scored -2) to "very sure" (scored 2). Cronbach's α for the self-efficacy measure of bicycle safety helmet use was .81.

Intention was also measured with five items. Children were asked if they intended to wear the bicycle safety helmet after the study was completed for five dif-

ferent situations (cycling in general, when playing on their bicycles, when cycling to school, when cycling to [and in] the city, and when cycling to the youth center, scout meetings, swimming pool, etc). Scores ranged from -1 ("certainly not") to 1 ("certainly yes"). Cronbach's α was .88 for the intention to wear the bicycle safety helmet. The item concerning "cycling in general" will be elaborated further, because a large part of the analysis of the open-ended questions is based on this item. The participants were directly asked the following question: "Do you intend to keep wearing the bicycle safety helmet after this study?" Next, they were asked to give reasons why they did or did not intend to keep wearing the bicycle safety helmet. The aim of this question was to construct an inventory of all possible reasons that might play a role in the decision as to whether the cyclist would intend to wear a bicycle safety helmet.

Besides these questions focusing on determinants of behavior, some additional questions were asked. These questions dealt, for example, with possible bicycle accidents in the past and demographic variables.

Three months after the study had ended, a short questionnaire was handed out to the children who had participated in the study. The purpose of the questionnaire was to make an inventory of how many children were still wearing the bicycle safety helmet and how many of them had quit wearing the helmet. The children were also asked their reasons for doing so.

ANALYSIS

The analysis of results was partially qualitative (open questions) and partially quantitative (forced questions). Analysis of variance was applied when testing for differences in attitude, social norms, and self-efficacy between children who do intend to wear a bicycle safety helmet and children who do not.

involved, are the most common type of accident (35% to 40% of all bicycle accidents).^{3,9} Therefore, based on the assumption that solo bicycle accidents will inevitably occur (for example, cyclists do not ride only on roads or established bicycle routes when playing), there is a justification for wearing bicycle safety helmets regardless of whether automobile drivers cause a considerable number of accidents involving cyclists. However, it is obvious that measures directed at, for example, other traffic participants and the infrastructure of the road system will also help to reduce the number of cycling accidents and related injuries.

Bicycle safety helmets have already been successfully introduced in countries such as Australia, Denmark, Sweden, and the United States.²¹⁻²⁶ Australian studies have reported a spectacular decrease in the number of cyclists killed or admitted to the hospital with head trauma and brain injuries, with figures ranging from 25% to 30% during the period from 1983 to 1990.^{10,27,28} Planned health promotion activities are indispensable for the successful introduction of bicycle safety helmets. The modification of behavior in a different, healthier direction requires familiarity with the determinants of the intended

behavior.²⁹ In other words, one needs to know the underlying reasons why a cyclist will or will not wear a bicycle safety helmet before one can develop and implement health promotion activities. Several studies that focus on determinants of bicycle safety helmet usage have already been conducted.^{17,23-25,30-34} An important question is, of course, whether these research findings are applicable to the Netherlands. To our knowledge, no studies of the determinants of bicycle safety helmet usage have been conducted in the Netherlands. Some major differences seem to exist between the culture of cycling between, for example, Australia and the United States and the Netherlands. The Netherlands can be labeled a true "bike country." Almost every Dutch person will cycle at some time during his or her lifetime. The bicycle is first and foremost an important means of transportation and recreation. This contrasts with, for example, Australia or the United States, where only limited numbers of people ride a bicycle and where the bicycle mainly serves a sporting function. This difference can be seen in facilities for cyclists. For example, in the Netherlands, many roads are separated from cycling tracks, whereas in the United States, this is rarely the case.

Table 1. Percentage of Children (N=233) Wearing Bicycle Safety Helmets Under Several Conditions

	% of Children Wearing Bicycle Helmets				
	In General	To School	While Playing	To/in City	To Youth Center, Scout Meetings, etc
Always	21	48	21	34	29
Nearly always	47	12	23	19	28
Occasionally	22	12	20	13	15
Seldom	6	9	8	10	9
Never	3	11	21	20	16

It can be concluded that the results discussed above cannot be translated automatically to the Netherlands. Therefore, a separate study of the determinants of bicycle safety helmet usage was performed in the Netherlands.

An assumption when doing research into determinants of behavior is that respondents are familiar with the "pros" and "cons" of the behavior concerned. In the Netherlands, however, few cyclists are acquainted with bicycle safety helmets. Therefore, cyclists were asked to wear a bicycle safety helmet for a period of time. Via this protocol, it was hoped that more insight would be gained into the behavior determinants that predict whether cyclists would wear a bicycle safety helmet.

The research was conducted in the spring of 1991 (March through May) at three primary schools in Breda, Maastricht, and Terneuzen.

RESULTS

Ninety percent of the questionnaires (n=233) were returned. The number of boys (n=117) was roughly equal to the number of girls (n=116).

As shown in **Table 1**, the participants did wear the bicycle safety helmet rather frequently during the 6-week period. A substantial number of children, however, seldom or never wore the safety helmet when playing on their bikes (29%), when cycling to (and in) the city (30%), and when cycling to the youth center, scout meetings, the swimming pool, etc (25%).

OPEN-ENDED QUESTIONS

Seventy-six participants (33%) stated after the 6-week study period that they intended to keep wearing the bicycle safety helmet after the study had finished, a large group (n=123) was still unsure, and 32 participants (14%) stated that they intended to quit wearing the helmet. The five most commonly given reasons for intending to keep wearing the bicycle safety helmet are given below (children were allowed to give more than one answer [n=57]).

Reason	No. of Times Mentioned
Sensible and for safety reasons	45
Looks sturdy, trendy	17
Its color and/or shape	10
Offers protection	9
Fits well	8

The five most commonly given reasons for intending to quit wearing the bicycle safety helmet are given below (children were allowed to give more than one answer [n=126]).

Reason	No. of Times Mentioned
Teasing (jeering, abusing, hitting)	46
"I am almost the only person in my environment (eg, in the street) who wears one"	25
Too hot/causes perspiring	22
Fits poorly (too small, scratchy, tickles)	22
Looks foolish/childish	13

Only the reasons mentioned by participants from the Breda and Terneuzen schools are presented because some questions were reformulated after the questionnaire had been administered at the Maastricht school.

DIFFERENCES BETWEEN PARTICIPANTS WHO DID AND DID NOT INTEND TO WEAR A BICYCLE SAFETY HELMET

Differences in attitude toward bicycle safety helmets, social norms about wearing one, and self-efficacy for wearing one between participants who intend to wear a bicycle safety helmet and those who do not are shown in **Table 2** and **Table 3**. The figures indicated are the average sum scores on each construct or item.

A participant is considered to have a positive intention to wear a bicycle safety helmet if the sum score on the five intention items is equal to or higher than 1; a negative intention is defined as a sum score that is equal to or lower than 0. In this way, the group of participants was split into two subgroups. On the basis of this criterion, 106 participants had a positive intention to wear a bicycle safety helmet; the remaining 127 participants had a negative intention to wear one.

Wearing a bicycle safety helmet is clearly experienced as less inconvenient by participants who had a positive intention to wear one. It is obvious, however, that even participants who have a positive intention experience considerable difficulties and/or drawbacks when wearing a bicycle safety helmet (eg, storing the helmet or hair getting tangled due to wearing a helmet). The normative beliefs about wearing bicycle safety helmets are, in general, strikingly positive. Participants with a positive intention to wear one scored higher on all normative belief items than did participants with a negative intention. The fact that the normative beliefs perceived at school do not differ significantly between the two groups can be explained quite easily. After all, both the teacher and the participants themselves agreed to participate in the study and to wear a bicycle safety helmet. In other words, wearing a bicycle safety helmet was broadly supported at school from the very beginning. The perceived social norms about wearing the helmets are systematically higher, although not always significant, among participants who had a positive intention to wear one than among participants who had a negative intention to do so. Self-efficacy of wearing a bicycle safety helmet is dis-

Table 2. Reported Mean Scores of Perceived Social Norms: Comparison of Children Who Do (Positive Intention) (n=106) and Do Not (Negative Intention) (n=127) Intend to Wear the Bicycle Safety Helmet

	Normative Beliefs (-1, +1)		Motivation to Comply (0, +2)		Normative Beliefs and Motivation to Comply (2, +2)	
	Positive Intention	Negative Intention	Positive Intention	Negative Intention	Positive Intention	Negative Intention
Friends at school	0.64	0.57	0.60	0.50	0.49	0.28*
Friends outside school	0.00	-0.30†	0.42	0.46	0.13	-0.17†
Teacher	0.92	0.85	0.86	0.76	0.86	0.75
Father	0.83	0.57†	0.89	0.78	0.82	0.61
Mother	0.88	0.69†	0.93	0.80	0.86	0.65
Brother/sister	0.46	0.10†	0.54	0.43	0.35	0.12*
Family	0.59	0.30†	0.54	0.46	0.42	0.24
People in the street	0.03	-0.19*	0.37	0.38	0.13	-0.16*

*P<.05.

†P<.01.

tinctly higher among participants with a positive intention compared with those with a negative intention. No differences were found regarding risk perception. Both the chance of a bicycle accident and the chance that head injuries will occur accordingly is estimated as "average" by both groups. Both groups of participants are similarly convinced about the effectiveness of bicycle safety helmets in protecting against head trauma and/or brain injuries.

FOLLOW-UP

Only eight of the initial 259 participants were still wearing the bicycle safety helmet 3 months after the study had ended. Even the participants with an initial positive intention to wear a bicycle safety helmet had quit wearing it. Their reasons for doing so were very much the same as the reasons mentioned by participants who had decided to quit at an earlier stage.

COMMENT

The aim of our study was to gain insight into the determinants of whether a cyclist would or would not wear a bicycle safety helmet to prevent head trauma and brain injuries. Our results are consistent with results from other studies conducted in, for example, Australia, Sweden, and the United States. Our study shows that participants are strongly convinced about the effectiveness of bicycle safety helmets to protect against head trauma and brain injuries when involved in a bicycle accident. The most important determinant of wearing a bicycle safety helmet is its safety or protection. Although the bicycle safety helmet was worn frequently at the very beginning of the study, the motivation to do so decreased rapidly. The initial positive response to the bicycle safety helmet quickly faded away after a few weeks. Principally, two factors are responsible for this phenomenon.

First, the bicycle safety helmet is somewhat uncomfortable. (It is important to note that only one bicycle safety helmet was evaluated. Other bicycle safety helmets might be more comfortable.) Participants got hot and started to perspire quite easily. Moreover, their hair got tangled.

Table 3. Reported Mean Scores of Risk Perception, Attitude, and Self-Efficacy and the Corresponding Items: Comparison of Children Who Do (Positive Intention) (n=106) and Do Not (Negative Intention) (n=127) Intend to Wear the Bicycle Safety Helmet

Variable	Intention	
	Positive	Negative
Construct		
Attitude (-8, 4)	1.52	-0.35*
Social norms (-18, 18)	4.06	2.43*
Self-efficacy (-9, 9)	5.07	1.04*
Items		
Risk perception		
Change at bicycle accident (-2, 2)	-0.24	-0.23
Change at head injury (-2, 2)	0.02	-0.08
Change at head injury if wearing a helmet (0, 3)	2.39	2.39
Attitude		
Convenience (-1, 1)	0.41	0.03*
Storage (-2, 0)	-0.52	-0.80*
Consequences for the hair (-2, 0)	-0.75	-0.87
Attractive (-1, 1)	0.72	0.30*
Sensible (-2, 2)	1.67	0.98*
Self-efficacy		
In general (-1, 1)	0.58	0.17*
To school (-2, 2)	1.30	0.69*
Playing in the street (-2, 2)	0.95	-0.06*
In the city (-2, 2)	1.11	0.09*
To the youth center, scout meetings, etc (-2, 2)	1.12	0.14*

*P<.01.

Bicycle safety helmets are also considered a millstone around the neck on many occasions; participants did not know where to leave their helmet (safely!) when, for example, shopping or going to the swimming pool, library, or scout meetings. Second, negative social pressure constitutes a major barrier to wearing the bicycle safety helmet. Participants felt stared at and were laughed at, taunted, and nagged. Partly owing to the design of the study (ie, highly motivated children, parents, and teachers), social norms about wearing bicycle safety helmets were almost totally positive. It can be expected that nega-

tive social pressure will be much higher in an environment where social norms about wearing bicycle safety helmets are variable and/or unfavorable.

Our study was innovative because it gave insight into the underlying reasons why a cyclist will or will not wear a bicycle safety helmet. The next step within the planning process to motivate young cyclists to wear a bicycle safety helmet is translating the research findings into health promotion activities and implementing them. Our results lead to the conclusion that the successful introduction of bicycle safety helmets will be a hard mission and will therefore require considerable effort.

Various campaigns to promote the use of bicycle safety helmets have been developed and implemented in a number of countries, including Australia, Denmark, Sweden, and the United States. At least six different approaches have been followed. First, children were provided with information regarding the risks associated with riding a bicycle and the preventive effects of wearing a bicycle safety helmet from school,^{22,24,39} their parents,^{22,24} and pediatricians, nurses, and health centers.^{23,24,26,40} Second, parents acted as intermediaries. Parents should see to it that their children wear a bicycle safety helmet when they first start riding their bicycle. Parents should motivate

the successful introduction of bicycle safety helmets will be a hard mission

their children to wear a bicycle safety helmet and should act as role models by doing so themselves.^{21,24,26} Third, discounts on the purchase of a bicycle safety helmet were offered.^{22,24,26,40} Fourth, projects at school (eg, safety traffic lessons) offer excellent opportunities to devote attention to the bicycle safety helmet.^{22-24,26,39} Children, parents, and teachers participated in such projects together. A referendum was frequently conducted concerning whether wearing a bicycle safety helmet should be compulsory during school-related activities. Fifth, in some areas in Australia, Sweden, and the United States, wearing a bicycle safety helmet is compulsory, imposed by legislation.^{22,25,41} Sixth, community projects have been important.^{22-24,26,40-42} This is first and foremost because of social influences that play a role in children's decision whether to wear a bicycle safety helmet. Multidisciplinary teams consisting of pediatricians, manufacturers of bicycle safety helmets, bicycle dealers, bicycle safety organizations, the police, educational and health organizations, and the media all can play an important role in providing broad support for wearing bicycle safety helmets and developing and implementing campaigns to promote their use. This method has been successful in, for example, Victoria, Australia,²² and Seattle, Wash.^{24,26}

As the results of our study demonstrated, children perceived considerable negative reactions from the social environment; therefore, a community intervention program should be favored. However, the establishment of broad participation from the diverse organiza-

tions that should be involved to create a supportive social environment will take considerable time. Such community programs need to be pretested first on a small scale; if successful, they can be implemented nationwide.⁴³ A second component of an intervention program should be the development of a comfortable and affordable bicycle safety helmet.

Our study has its limitations. Innovations have, in many cases, some attractive power, especially when the mass media covers such an innovation on television and radio on large scale. The question is, however, whether participants are still enthusiastic about wearing a bicycle safety helmet after a longer period. It is further important to realize that our study is mainly based on self-reported behavior. It is not known with certainty how frequently the bicycle safety helmets were actually worn (some unannounced checks have been executed, however) and whether the participants really intend to continue wearing the bicycle safety helmet. Social desirability effects might, of course, play a role. It is likely that some participants tried to make their answers fit in with both the perceived expectation of the experimenter and those of significant others in their direct environment (eg, teacher, parents, or friends from school). The results might also be biased by the tendency to strive for consistencies in one's answers. Furthermore, one has to keep in mind the fact that wearing a bicycle safety helmet was, in this sample, a result of a research "manipulation." This implies that both attitude toward the bicycle safety helmet and the intention to wear it will, to a certain degree, adapt to this situation in line with Festinger's⁴⁴ cognitive dissonance theory.

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Reprint requests to the Department of Health Education, University of Limburg, PO Box 616, 6200 MD Maastricht, the Netherlands (Mr Seijts).

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