
The efficacy of social role models to increase motivation to obtain vaccination against hepatitis B among men who have sex with men

R. Vet^{1*}, J. B. F. de Wit^{1,2} and E. Das³

¹Department of Social and Organizational Psychology, Utrecht University, 3508 TC Utrecht, The Netherlands, ²National Centre in HIV Social Research, The University of New South Wales, Sydney, NSW 2052, Australia and ³Department of Communication Science, VU University, 1081 HV Amsterdam, The Netherlands.

*Correspondence to: R. Vet. Department of Student Services, Amsterdam University of Applied Sciences, 1000 BA, Amsterdam, The Netherlands. E-mail: r.vet@hva.nl

Received on March 13, 2010; accepted on October 18, 2010

Abstract

This study assessed the effects of role models in persuasive messages about risk and social norms to increase motivation to obtain hepatitis B virus (HBV) vaccination in men who have sex with men (MSM). MSM at risk for HBV in The Netherlands ($N = 168$) were recruited online via a range of websites and were randomly assigned to one of four conditions in a 2 (risk communication: yes and no) x 2 (social norms communication: yes and no) factorial design. In each condition, participants subsequently provided self-completed assessments of their perceived risk of HBV infection, perceived social norms regarding HBV vaccination and their intention to obtain vaccination against HBV. Risk communication and social norms communication that used social role models were effective in significantly increasing men's intention to obtain vaccination against HBV. No additive effect was found for a combined message. Mediation analyses showed that communications influenced intention via perceived risk and social norms. Findings extend previous theorizing and research and show that both role model-based risk communication and social norms communication can be effective in increasing intentions to obtain HBV vaccination in MSM. This knowledge contributes to the development

of effective health promotion to increase HBV vaccination in MSM.

Introduction

Approximately 2 billion people worldwide have been infected with the hepatitis B virus (HBV) and about 350 million people live with chronic HBV infection [1]. Vaccination is a safe and effective method to prevent HBV infection among at-risk populations, such as men who have sex with men (MSM) [2]. Prevalence rates of HBV among MSM in industrial countries are high, and around 15–25% of all new HBV infections in the United States are among MSM [3]. In The Netherlands, HBV vaccination has been offered free of charge to risk groups, but coverage of vaccination is low among MSM [4], and more than half of MSM remain unvaccinated against HBV [5]. This limited uptake underscores the continuing need to develop effective health promotion programs that stimulate HBV vaccination among MSM.

Health promotion programs are most likely to be effective when they influence social cognitive factors that are directly related to behavior and amenable to change [6]. One key social cognitive factor in promoting behavioral change is perceived risk, which is generally seen as a personal subjective assessment of the likelihood of negative outcomes

or as the subjective susceptibility to a health threat [7, 8]. Recent studies also show that perceived risk is an important social cognitive predictor of HBV vaccination uptake [9, 10].

Although risk perception is an important condition for enacting protective health behavior, it is not the only factor to promote health behavior change [11, 12]. Notably, as people do not live in a social vacuum, they are strongly influenced by social expectations and evaluations of other people. These influences of significant others are reflected in perceived social norms, that is, socially shared expectancies and evaluations about how members of a social group ought to behave in a given situation [13, 14]. Perceived social norms can act as a facilitator of behavior change when an expected outcome is perceived as positive but can also act as a barrier to behavior change when an expected outcome is perceived as negative. Recent research acknowledges that some barriers to enacting behaviors are not so much practical or skill-based in nature but rather reflect important normative social processes [15]. For example, fear of a possible negative social evaluation by significant others of one's personal lifestyle, such as being labeled promiscuous, can hinder condom use [16, 17]. Importantly, recent research demonstrates that perceived social norms play an important role in the motivation to obtain HBV vaccination [18]. Furthermore, the fear that one's lifestyle may become known acts as a barrier for HBV vaccination uptake among MSM [9].

While perceived social norms influence a range of behaviors [19] and feature centrally in classic theories of behavior change [6], they have thus far received only limited attention in health promotion research and practice. Effective strategies are needed to influence perceived social norms in ways that support protective health behavior. To date, there is little understanding of approaches to effectively influence perceived social norms through persuasive communication.

Social role models in health communication

Social role models are relevant others with whom an individual can identify and who provide an in-

spiring example for personal achievement [20]. Role models can be friends, family members or members of one's social group (e.g. gay men). Role modeling can be defined as direct or indirect interactions with significant others that potentially influence an individual's beliefs, attitudes and behaviors [21] through the process of modeling [22]. Individuals generally compare themselves with similar others to evaluate their own behavior [23], in particular to others who are better off [24], and this process can inspire people to pursue important goals simply by observing a role model [25].

Research provides evidence of the importance of both positive and negative role models [20]. Negative role models may inspire individuals not to do the same as they did [26], while positive role models can stimulate to perform a similar behavior. Positive role models who engage in protective health behavior may act as normative facilitators of different kinds of health behavior. For example, perceiving a role model from the persons' reference group not drinking alcohol can be effective in decreasing one's own alcohol use [27].

Research from our group suggests that using role model narratives in persuasive communication is effective to increase perceived risk as well as behavioral intention [28]. In particular, presenting a role model narrative was more effective in increasing perceptions of risk and intentions to obtain HBV vaccination than presenting detailed statistical information regarding the likelihood of HBV infection in MSM [28]. The rationale behind this effect is that role model narratives are more vivid, easy to imagine and emotionally involving than other types of evidence, such as abstract facts and figures [29, 30]. Other important requisites for the efficacy of role models in persuasive communication are the relevance of the situation to the recipient, the similarity of the role model and the attainability of outcomes [25]. To effectively use role models in persuasive communication to promote perceived social norms that support HBV vaccination, we further posit that the role model has to reflect a fear of perceived negative social consequences and at the same time highlight the positive social consequences that occurred.

The present study extends previous theorizing and findings regarding the efficacy of role models in persuasive communication about the risk of HBV infection by also testing a role model approach to persuasive communication regarding social norms about vaccination. We expect both role model-based risk and social norms communication to be effective in increasing motivation for HBV vaccination among MSM and explore potential additive effects of these communications.

Methods

Procedure

Participants were recruited online via banners and links placed on popular websites for MSM in The Netherlands and routed to the homepage of the study. Here, men were asked to participate in an anonymous study of health behaviors in MSM, which involved reading a short text online about HBV vaccination and filling out an online questionnaire. In total, 330 men visited the study website and men at risk for HBV infection were included in the online study if they matched the following inclusion criteria: (i) having had sex with at least one other man in the previous year, (ii) not having been infected with HBV and (iii) not having been vaccinated against HBV. Men who did not fulfill these criteria ($n = 162$) were excluded from participation. This procedure resulted in a sample of 168 men who completed the online study.

After inclusion criteria checks and the presentation of an online informed consent form participants were asked to provide some information regarding their demographic characteristics. Participants were then randomly assigned to one of four online conditions in a 2 (risk communication: yes or no) \times 2 (social norms communication: yes or no) factorial design. Participants then filled out assessments of the dependent social cognitive variables.

Under prevailing laws in The Netherlands, this low risk study protocol was exempt from formal medical–ethical approval. Nevertheless, the study was conducted in full compliance with available ethical guidelines for psychological research

[31]. Participation was entirely voluntary and participants were informed that they could terminate participation at any time and without any consequences. No financial or other incentives were given.

Materials

A professional text writer developed two experimental persuasive communications, based on detailed instructions from the authors. Both communications presented a scenario appropriate for MSM, and in both communications, the scenario was presented in the form of a narrative of a role model from the reference group, that is, MSM. The risk communication message was identical to the one used in a previous study that showed its efficacy in increasing perceptions of risk of HBV infection [28]. The social norms communication was newly developed. Both communications were presented online.

Risk communication

The risk communication message presented a recognizable first-person account by a member of the reference group who acts as a negative role model. This individual explained that he had become infected with HBV, although he considered himself to be at low risk; for instance: ‘I discovered by chance that I was infected with the hepatitis B virus, which made the news hit me even harder. I thought this only happened to people who have unsafe sex frequently’. The message ended with the following statement: ‘If only I had known that vaccination against hepatitis B is the only way to prevent myself against the hepatitis B virus’.

Social norms communication

The social norms message also presented a recognizable first-person account by a different member of the reference group, who in this message acted as a positive role model. This individual explained how he had experienced normative barriers to HBV vaccination, in particular a fear of negative reactions of significant others to obtaining HBV vaccination; for instance: ‘Perhaps it sounds a bit

odd, but I was afraid that, because of getting vaccinated, friends would get a negative image of me. They could think: he must be getting protection because he is very promiscuous and has unprotected sex'. The message ended with the following statement: 'I talked about my fears with a friend who had been vaccinated. Then I felt stupid to worry about what others might think and got the vaccination. Now I'm glad that I got vaccinated against the hepatitis B virus'. The messages were matched with respect to length (194 and 187 words, respectively).

Manipulation checks

To check whether the role model-based risk and social norms communication were perceived as persuasive, manipulation checks were conducted for both communications. The manipulation check of risk communication was composed of three items (Cronbach's alpha = 0.71), for instance: 'I can imagine myself getting infected with hepatitis B virus, (1 = totally disagree to 7 = totally agree). The manipulation check of social norms communication also consisted of three items (Cronbach's alpha = 0.56), for instance: 'Significant others will respond positively when I tell them that I obtained vaccination against hepatitis B virus' (1 = totally disagree to 7 = totally agree).

Dependent measures

'Perceived risk' was assessed with three items (Cronbach's alpha = 0.95), for instance: 'The likelihood of me becoming infected with hepatitis B virus because of my sexual behavior is substantial' (1 = totally disagree to 7 = totally agree).

'Perceived social norms' were also assessed with three items (Cronbach's alpha = 0.75), for instance: 'What would be the opinion of your friends about you obtaining vaccination against hepatitis B virus?' (1 = certainly do not do it to 7 = certainly do it).

'Behavioral intention' was similarly assessed with three items (Cronbach's alpha = 0.94), e.g. 'Are you planning to obtain vaccination against hepatitis B virus in the future?' (1 = certainly not to 7 = certainly).

Statistical analyses

Unifactorial analyses of variance (ANOVA) were conducted on the manipulation checks of risk and social norms communication. A 2 (risk communication: yes or no) \times 2 (social norms communication: yes or no) factorial ANOVA was used to test the effects of risk and social norms communication on the dependent variables. Simple effect tests were used to explore the nature of significant interactions.

To assess whether perceived risk and perceived social norms mediated the effects of risk and social norms communication on behavioral intention, formal tests of mediation were conducted following the procedures specified by Baron and Kenny [32]. Three dummy variables were computed to represent the message conditions (risk communication versus other conditions, social norms communication versus other conditions and combined communication versus other conditions).

Results

Participants

The mean age of participants was 33.8 years (SD = 11.2), the majority was ethnically Dutch (5% had an ethnic minority background) and 44% had at least a Bachelor degree. A minority of participants (37.5%) was in a stable relationship with another man, with an average duration of 4 years. The average number of casual sex partners participants had in the last 6 months was 4 (range 0–35).

Of the 168 participants, 37 men were randomly assigned to the risk communication condition, 37 men were randomly assigned to the social norms communication condition, 46 men were randomly assigned to the combined communications condition and 48 men were randomly assigned to the no communication (control) condition.

Manipulation checks

A test of the manipulation of risk communication yielded a main effect of risk communication, $F(1,164) = 10.57$, $P < 0.000$. Participants who had received the risk communication could more easily

imagine themselves to be at-risk for HBV (mean = 4.59, SD = 1.46) than participants in the control condition (mean = 3.24, SD = 1.15).

A test of the manipulation of social norms communication revealed a main effect of social norms communication, $F(1,164) = 5.72, P < 0.001$. Participants who had received the social norms communication thought that significant others would respond more favorably to vaccination against HBV (mean = 4.72, SD = 1.43) than participants who had not received the social norms communication (mean = 3.81, SD = 0.96).

Dependent variables

Perceived risk

There was a significant main effect for social norms communication, $F(1,164) = 18.28, P < 0.011$, and a significant interaction between risk communication and social norms communication, $F(1,164) = 4.89, P < 0.028$ (see Table I). Simple effects analyses revealed that risk communication influenced perceived risk only for participants who did not receive social norms communication, $F(1,165) = 5.41, P < 0.021$. Similarly, social norms communi-

cation influenced perceived risk only for participants who did not receive risk communication, $F(1,165) = 12.16, P < 0.001$.

Perceived social norms

There was a significant main effect for social norms communication, $F(1,164) = 7.45, P < 0.007$, as well as a significant interaction between risk communication and social norms communication, $F(1,164) = 5.97, P < 0.016$ (see Table I). Simple effects analyses revealed that social norms communication influenced the perception of social norms only for participants who did not receive risk communication, $F(1,165) = 13.43, P < 0.000$. No further effects were found.

Behavioral intention

There were no main effects for risk communication or social norms communication. However, a significant interaction was found between risk communication and social norms communication, $F(1,164) = 6.17, P < 0.014$ (see Table I). Simple effects revealed that risk communication influenced intention to obtain HBV vaccination only for participants who did not receive social norms communication, $F(1,165) = 6.27, P < 0.013$. Conversely, social norms communication influenced intention only for participants who did not receive risk communication, $F(1,165) = 9.17, P < 0.003$.

Table I. Means (SDs) of perceived risk, perceived norms and intention by message condition

	Risk communication	No risk communication
Perceived risk		
Social norms communication	3.61 (1.94)	4.08 (1.76)
No social norms communication	3.66 (2.05)	2.58 (1.58)
Perceived norms		
Social norms communication	5.78 (0.98)	6.24 (0.89)
No social norms communication	5.83 (0.98)	5.48 (1.03)
Intention		
Social norms communication	5.51 (1.38)	5.71 (1.33)
No social norms communication	5.31 (1.58)	4.71 (1.83)

Mediation analyses

We first regressed intention to obtain vaccination (i.e. the dependent variable) on each of the three dummy variables representing the independent variable and observed a significant effect of the dummy variable coding risk communication ($\beta = 0.24, P < 0.007$) a significant effect of the dummy variable coding social norms communication ($\beta = 0.29, P < 0.001$) and a significant effect of the dummy variable coding the combined communication ($\beta = 0.20, P < 0.03$).

Next, we separately regressed perceived risk and perceived social norms (i.e. the proposed mediators) on the three dummy variables coding the

independent variable. The analysis of perceived risk showed significant effects of the dummy variable coding the risk communication ($\beta = 0.21, P < 0.02$), the dummy variable coding the social norms communication ($\beta = 0.34, P < 0.00$) and the dummy variable coding the combined communication ($\beta = 0.23, P < 0.01$). The analysis for perceived social norms showed a significant effect of the dummy variable coding the effect of social norms communication ($\beta = 0.32, P < 0.00$).

In a third set of regression analyses, we separately regressed intention to obtain vaccination on perceived risk and perceived social norms. The effect of perceived risk on intention to obtain vaccination was significant ($\beta = 0.34, P < 0.00$), as was the effect of perceived social norms ($\beta = 0.44, P < 0.00$).

Finally, we separately regressed intention on the dummy variables coding risk communication or social norms communication and included the potential mediator in these analyses (perceived risk and perceived social norms, respectively). In the analysis of risk communication, the previously significant effect of the dummy variable that coded risk communication failed to achieve conventional levels of statistical significance ($\beta = 0.12, ns$), while the effect of perceived risk was significant ($\beta = 0.32, P < 0.00$). A subsequent Sobel test of mediation (Aroian version, $z = a \times b / \sqrt{b^2 \times sa^2 + a^2 \times sb^2 + sa^2 \times sb^2}$) [31]) proved significant ($Z = 2.21, P < 0.001$). In the analysis pertaining to social norms communication, the previously significant effect of the dummy variable that coded the social norms communication equally failed to achieve conventional levels of statistical significance ($\beta = 0.04, ns$), while the effect of perceived social norms was significant ($\beta = 0.43, P < 0.00$). A subsequent Sobel test of mediation also proved significant ($Z = 3.2, P < 0.00$). Thus, the effect of risk communication on intention to obtain vaccination against HBV was indeed mediated by communication-induced differences in perceived risk, while the effect of social norms communication on intention was mediated by communication-induced differences in perceived social norms.

Discussion

The present study suggests that risk and social norms communication that use role models are effective in increasing intentions to obtain vaccination against HBV among MSM. Information provided by a role model who regretted not having obtained vaccination against HBV increased perceived risk and intentions to obtain HBV vaccination, in particular among participants who had not received a social norms communication. Information provided by a role model that suggested that others would approve of them obtaining vaccination against HBV increased perceived supportive social norms and intentions to obtain HBV vaccination, in particular among participants who had not received a risk communication.

To the best of our knowledge, our findings are the first to show that social norms communication can be successful in breaking down perceived normative barriers as well as increasing behavioral intentions to obtain vaccination against HBV. Individuals at risk for HBV who received a supportive social norm message regarding vaccination against HBV also perceived themselves to be more at risk for HBV. An explanation for this effect could be that MSM have incorrect social ideas about what they ought to do (i.e. not to obtain vaccination) because of the fear what other people might think of them when obtaining vaccination [33]. When exposed to a positive appraisal of a significant other from the reference group, this normative barrier is taken away and the personal risk can be accepted.

Mediation analyses showed that the effects of the specific types of health communication on intention to obtain vaccination were mediated by communication-induced differences in the corresponding social cognitive factor, that is, in perceived risk or perceived social norms. These findings also confirm that the two different hypothesized processes, perceived risk and social norms, are indeed at stake in the promotion of intention to obtain vaccination against HBV among MSM.

This study observed no additive effects of risk communication and social norms communication,

suggesting that in health promotion practice these distinct persuasive communications are best presented separately to individuals at risk for HBV infection. This can be achieved by offering tailored messages as an effective strategy to promote health protective behavior. Tailoring is as an assessment-based communication strategy, in which the message is individually focused [34]. Tailoring of communication has been shown to be effective in stimulating a range of health behaviors, including physical activity, quitting smoking and STI prevention [35, 36].

Limitations and future directions

The main focus of this study was to increase intention to obtain HBV vaccination among MSM by increasing perceived risk and supportive perceived social norms. Although intentions are key predictors of behavior, there often is a gap between intending and doing [37–39]. Therefore, it is important for future research to assess effects of persuasive communications on actual vaccination behaviors of MSM. In addition, future research in the domain of HBV vaccination could also evaluate the efficacy of behavior change strategies that support turning motivation into action. The formation of implementation intentions is a good example of a simple strategy to bridge the intention-behavior gap [40, 41]. Implementation intentions have been shown to be effective in stimulating a range of health behaviors, including engaging in physical exercise or increased fruit intake [42, 43].

The relative large percentage of high-educated participants in the study sample may have influenced the study outcomes. This high-educated group could have processed the information presented in this study more thoroughly than participants with a lower educational level. Because of the overrepresentation percentage of high-educated MSM, the results cannot simply be generalized to all MSM in The Netherlands. In addition, many countries have a universal HBV vaccination policy instead of the Dutch risk group policy. If universal HBV vaccination were introduced in The Netherlands, the problem and research questions would be different. Therefore, the results cannot be easily

generalized to other social groups and other countries with a different HBV vaccination policy.

The data for this experimental study were collected online, which has both advantages and disadvantages. A disadvantage could be that it is unclear who filled out the assessment. It could be that respondents included individuals who did not fulfill the selection criteria, such as women or MSM, who were already vaccinated against HBV. An advantage of online data collection is that samples collected through the Internet can be as diverse and of good quality as traditional data collection with its own advantages and disadvantages [44]. Importantly, (broad band) access to the Internet is very high in The Netherlands [45] and almost universal in the target group [46]. Because the communications assessed in this study can easily be used in online interventions to promote HBV vaccination in MSM, we considered online research to be appropriate. Moreover, in addition to the large reach, tailoring strategies can easily be implemented in online interventions, making the Internet a well-suited medium for interventions to increase motivation to obtain HBV vaccination in MSM.

Two inclusion criteria were HBV infection status and HBV vaccination status. Both were self-reported by respondents and not optimal because it remains unknown if respondents were actually not infected with HBV and unvaccinated against HBV. On the other hand, because of the self-reported status, we assume that respondents perceived themselves as not infected and unvaccinated. Dutch nationality was not an inclusion criterion, although proficiency of the Dutch language was a requirement, and, unlike the English language, not many foreign people speak Dutch. Nevertheless, we cannot be sure that all participants actually lived in The Netherlands.

Conclusions

Although perceived risk is generally seen as an important and perhaps necessary social cognitive determinant of health protective behavior, including HBV vaccination among MSM, it is not the

only factor that is of influence. Previous research has shown that perceived social norms may play a pivotal role in explaining HBV vaccination in MSM. In the present study, we assessed the efficacy of risk and social norms communication to increase intentions to obtain vaccination against HBV among MSM. Our findings suggest that both risk communication and social norms communication are effective in increasing intentions to obtain HBV vaccination. This knowledge of effective persuasive communication can contribute to the development of effective health promotion programs to increase HBV vaccination in MSM. The results may have substantial relevance for health promotion practice in countries with a risk group policy where HBV prevalence among risk groups is high and vaccination uptake is low.

Funding

The Netherlands Organization for Health Research and Development (23000032).

Conflict of interest statement

None declared.

References

- World Health Organization. *Hepatitis B Fact sheet No 204*. Available at: <http://www.who.int>. Accessed: 18, December 2009.
- Kahn J. Preventing hepatitis A and hepatitis B virus infections among men who have sex with men. *Clin Infect Dis* 2002; **35**: 1382–7.
- Centers for Disease Control and Prevention. Viral Hepatitis and men who have sex with men. Available at: <http://www.cdc.gov/hepatitis/populations/msm>. Accessed: 18, December 2009.
- Van Houdt R, Koedijk FDH, Bruisten SM *et al*. Hepatitis B vaccination targeted at behavioral risk groups in the Netherlands: does it work? *Vaccine* 2009; **27**: 3530–5.
- Vet R, Boon B. *Gratis Hepatitis B vaccinatie campagne voor mannen die seks hebben met mannen. Bevindingen uit onderzoek 2001–2007*. Rotterdam, The Netherlands: IVO, 2007.
- Conner M, Norman P. The role of social cognition in health behaviours. In: Conner M, Norman P (eds). *Predicting Health Behaviour*. Maidenhead, UK: Open University Press, 2005.
- Weinstein N. Testing four competing theories of health-protective behavior. *Health Psychol* 1993; **12**: 324–33.
- Brewer NT, Chapman GB, Gibbons FX *et al*. Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. *Health Psychol* 2007; **26**: 136–45.
- De Wit JBF, Vet R, Schutten M *et al*. Social-cognitive determinants of vaccination behavior against hepatitis B: an assessment among men who have sex with men. *Prev Med* 2005; **40**: 795–802.
- Ma GX, Fang CY, Shive SE *et al*. Risk perceptions and barriers to Hepatitis B screening and vaccination among Vietnamese immigrants. *J Immigr Minor Health* 2007; **9**: 213–20.
- Ahem J, Galea S, Hubbard A *et al*. Neighborhood smoking norms modify the relation between collective efficacy and smoking behavior. *Drug Alcohol Depend* 2009; **100**: 138–45.
- Crocker H, Whitaker KL, Wardle J. Do social norms affect intended food choice? *Prev Med* 2009; **49**: 190–3.
- Perkins HW. Social norms and the prevention of alcohol misuse in collegiate contexts. *J Stud Alcohol* 2002; **14**: 164–72.
- Lapinski MK, Rimal RN. An explication of social norms. *Commun Theory* 2005; **15**: 127–47.
- Yanovitzky I, Rimal RN. Communication and normative influence: an introduction to the special issue. *Commun Theory* 2006; **16**: 1–6.
- Fortenberry JD, McFarlane M, Bleakley A *et al*. Relationships of stigma and shame to gonorrhoea and HIV screening. *Am J Public Health* 2002; **92**: 378–81.
- Crosby RA, Holtgrave DR, Bryant L *et al*. Factors associated with the acceptance of an AIDS vaccine: an exploratory study. *Prev Med* 2004; **39**: 804–8.
- Schutten M, de Wit JBF, Van Steenberghe JE. Why do gay men want to be vaccinated against hepatitis B? An assessment of psychosocial determinants of vaccination intention. *Int J STD AIDS* 2002; **13**: 86–90.
- Cialdini RB, Goldstein NJ. Social influence: compliance and conformity. *Annu Rev Psychol* 2004; **55**: 591–621.
- Lockwood P, Marshall TC, Sadler P. Promoting success or preventing failure: cultural differences in motivation by positive and negative role models. *Pers Soc Psychol Bull* 2005; **31**: 379–92.
- Martin AA, Bush AJ. Do role models influence teenager purchase intentions and behavior? *J Consum Marketing* 2000; **17**: 441–54.
- Bandura AJ. *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall, 1977.
- Festinger L. A theory of social comparison processes. *Hum Relat* 1954; **7**: 117–40.
- Suls J, Martin R, Wheeler L. Social comparison: why, with whom, and with what effect? *Curr Dir Psychol Sci* 2002; **11**: 159–63.
- Lockwood P, Kunda Z. Superstars and me: predicting the impact of role models on the self. *J Pers Soc Psychol* 1997; **73**: 91–103.
- Lockwood P, Jordan CH, Kunda Z. Motivation by positive or negative role models: regulatory focus determines who will best inspire us. *J Per Soc Psychol* 2002; **83**: 854–64.

27. Dams-O'Connor K, Martin JL, Martens MP. Social norms and alcohol consumption among intercollegiate athletes: the role of athlete and nonathlete reference groups. *Addict Behav* 2007; **32**: 2657–66.
28. De Wit JBF, Das E, Vet R. What works best: objective statistics or a personal testimonial? An assessment of the persuasive effects of different types of message evidence on risk perception. *Health Psychol* 2008; **27**: 110–5.
29. Taylor SE, Thomson SC. Stalking the elusive “vividness” effect. *Psychol Rev* 1982; **89**: 155–81.
30. Broemer P. Ease of imagination moderates reactions to differently framed health messages. *Eur J Soc Psychol* 2004; **34**: 103–19.
31. American Psychological Association. *Publication Manual of the American Psychological Association*, 6th edn. Washington, DC: American Psychological Association, 2009.
32. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986; **51**: 1173–82.
33. Borsari B, Carey KB. Descriptive and injunctive norms in college drinking: a meta analytic integration. *J Stud Alcohol* 2003; **64**: 331–41.
34. Kreuter MW, Farrell D, Olevitch L *et al.* What is tailored communication? In: Bryant J, Zillmann D (eds). *Tailoring Health Messages: Customizing Communication with Computer Technology*. Mahwah, NJ: Lawrence Erlbaum Association, 2000.
35. Vandelanotte C, De Bourdeaudhuij I. Acceptability and feasibility of a computer-tailored physical activity intervention using stages of change project faith. *Health Educ Res* 2003; **18**: 304–17.
36. Brug J, Steenhuis I, van Assema P *et al.* Computer-tailored nutrition education: differences between two interventions. *Health Educ Res* 1999; **14**: 249–56.
37. Web TL, Sheeran P. Identifying good opportunities to act: implementation intentions and cue discrimination. *Eur J Soc Psychol* 2004; **34**: 407–19.
38. Sheeran P. Intention-behaviour relations: a conceptual and empirical review. In: Hemstone M, Stroebe W (eds). *European Review of Social Psychology* 12. Chichester, UK: Wiley, 2002.
39. Conner M, Armitage CJ. The theory of planned behavior: a review and avenues for further research. *J Appl Soc Psychol* 1998; **28**: 1430–64.
40. Gollwitzer PM. Implementation intentions: strong effects of simple plans. *Am Psychol* 1999; **54**: 493–503.
41. Gollwitzer PM, Sheeran P. Implementations intentions and goal achievement: a meta-analysis of effects and processes. *Adv Exp Soc Psychol* 2006; **38**: 69–119.
42. Milne S, Orbell S, Sheeran P. Combining motivational and volitional interventions to promote exercise participation: protection motivation theory and implementation intentions. *Br J Health Psychol* 2002; **7**: 163–85.
43. De Nooijer JD, Brug J, De Vries NKD. Do implementation intentions help to turn good intentions into higher fruit intakes? *J Nutr Educ Behav* 2006; **38**: 25–9.
44. Gosling SD, Vazire S, Srivastava S *et al.* Should we trust web-based studies? *Am Psychol* 2004; **59**: 93–104.
45. Centraal Bureau voor de Statistiek. ICT gebruik van personen naar persoonskenmerk. Available at: <http://statline.cbs.nl/StatWeb/publication>. Accessed: 18, December 2009.
46. Hospers HJ, Dorfler TT, Zuilhof W. *Schorer Monitor 2008*. Amsterdam, The Netherland: Schorer, 2008.