Taking online computer-tailoring forward

The potential of tailoring the message frame and delivery mode of online health behaviour change interventions

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Online interventions that are tailored to the individual participant, using computer-tailoring strategies, can effectively improve health related behaviour (Lustria et al., 2013). Computer-tailoring can best be described as adjusting intervention materials to the specific characteristics of an individual person through a computerized process (de Vries & Brug, 1999). In contrast to more static online health communication (e.g. health information websites), tailored interventions provide individuals only with information that is relevant to them and their situation. As a result, this information is more likely to be considered as personally relevant and, consequently, to be read. This is expected to lead to an increased desire to use the intervention, more user engagement, more in-depth processing of information, greater recall and likely initiation or continuation of the desired health behaviour change (Kreuter, Farrell, Olevitch, & Brennan, 1999; Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick, 2009).

Online computer-tailoring to date

Online computer-tailored interventions have most often been matched in terms of their content to individuals' current health behaviour and/or their self-reported scores on known predictors of the desired health behaviour (change) (Rimer & Kreuter, 2006), something we refer to as content tailoring. In these content tailored interventions, information that is provided is for instance tailored to respondents' self-reported intention to change, their attitude towards changing, perceived social influences and self-efficacy levels (for an example see Smit, de Vries, & Hoving, 2012). In addition, these interventions have often been personalised (e.g. using the respondent's name; 'Dear Ms de Jong') and adapted to participants' demographic characteristics (e.g. adjusting intervention materials to the respondent's gender; providing pregnant women with information related to the consequences of smoking for their unborn child) (Dijkstra, 2005; Ritterband et al., 2009). Up to now, online computer-tailored interventions using content tailoring, personalisation and/or adaptation have been shown to be both effective and cost-effective in improving different health related behaviours (Lustria et al., 2013; Schulz et al., 2014; Smit, Evers, de Vries, & Hoving, 2013). Nonetheless, the overall effect sizes of online computer-tailoring remain small (Lustria et al., 2013), suggesting room for further improvement.

A possible explanation for the limited effects of online computer-tailoring may be that differences in personal preferences concerning *how* health related information is presented have so far been largely ignored. This, while people differ in their information processing styles and preferences for information delivery modes (Cacioppo, Petty, Feinstein, & Jarvis, 1996; Maio & Esses, 2001; Soroka et al., 2006; Wright et al., 2008). These individual differences have also been recognized by the Behaviour Change Model for Internet Interventions (Ritterband et al., 2009), that distinguishes several website areas that contain elements that can be manipulated, such as the message frame and delivery mode that are used to get the health information across. Besides, it has been

argued that novel tailoring strategies are needed to enhance the effectiveness of tailored health communication – next to the strategies mentioned above (i.e. content tailoring, personalisation and adaptation) (Rimer & Kreuter, 2006). Yet, only few previous tailoring studies have taken individual differences in information processing styles and delivery mode preferences into account when tailoring health communication interventions. This implies that, even if an intervention is personalised, adapted and provides relevant feedback only, it may remain unclear whether the intervention meets the respondent's preferences for a particular message frame and delivery mode.

In the next two sections, we will further elaborate on how the tailoring of message frame and delivery mode might increase the effectiveness of online health behaviour change interventions.

Tailoring message frame

According to Entman (1993), message framing involves the selection of some aspects of a perceived reality and making them more salient in a communicating text, to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation. It refers to the taking of a certain perspective when formulating a message, highlighting some bits of information while omitting others (Entman, 1993). Based on this definition, we define message frame tailoring as adjusting this perspective based on people's individual needs. To tailor an intervention's message frame to respondents' information processing styles, particularly people's need for cognition, need for affect and need for autonomy seem promising characteristics to tailor on.

The need for cognition represents an individual's tendency to engage in and enjoy effortful cognitive endeavors (Cacioppo et al., 1996). The need for affect represents the motivation to approach or avoid emotion-inducing situations (Maio & Esses, 2001).

Earlier research has shown that significant individual differences exist in individuals' need for cognition and need for affect, resulting in some individuals preferring more instrumentally and others preferring more affectively framed information (Cacioppo et al., 1996; Maio & Esses, 2001). To illustrate, in health messages for respondents with a high need for cognition the benefits of health behaviour change may be framed instrumentally (e.g. smoking cessation will result in greater physical fitness). In contrast, health messages for respondents with a high need for affect may target the same predictors of behaviour, but frame the benefits of health behaviour change rather affectively (e.g. smoking cessation will help you feel less worried about your physical fitness). Due to these individual differences, tailoring information to respondents' personally preferred message frame represents a potentially fruitful gateway for advancing online computer-tailored health communication. This idea is supported by evidence from the field of interpersonal communication. In a study that aimed to reduce patients' perceived barriers to successful medication intake, tailoring the type of information (i.e. framed instrumentally or affectively) to the patient's personal needs was associated with fewer perceived barriers to medication intake (Linn et al., 2012). Also in the context of online health communication, respondents with a high need for cognition might benefit most from instrumentally framed information, whereas respondents with a high need for affect might prefer feedback that is more affectively framed. Although the need for cognition and need for affect are theoretical constructs that have received considerable attention in relation to persuasive communication in general (Haddock, Maio, Arnold, & Huskinson, 2008) and health communication in particular (Conner, Rhodes, Morris, McEachan, & Lawton, 2011), only few previous studies have investigated whether interventions tailored to these individual needs are more effective than non-tailored interventions in changing (intentions for) health behaviour (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003).

These initial findings do, however, suggest an advantage of health communication in which the message frame is tailored to respondents' information processing styles over heatlh communication with no tailored message frame (Williams-Piehota et al., 2003).

The need for autonomy is a construct which is derived from Self-Determination Theory (Ryan & Deci, 2000). Whereas this theory suggests that every person has a basic need for autonomy, individual differences exist in the degree to which the need for autonomy is present that could form the basis for further tailoring health communication interventions (Resnicow et al., 2008; 2014). Examples of strategies that have been suggested to support people's need for autonomy are offering choice and using non-controlling language (Deci, Eghrari, Patrick, & Leone, 2004; Williams, Cox, Kouides, & Deci, 1999). To illustrate, health messages for respondents with a high need for autonomy may be framed as leaving much room to make their own choices; e.g. when providing information about smoking cessation, three possible smoking cessation aids could be described, from which the respondent could choose the option that best suits his or her own preferences. In contrast, health messages for those with a low need for autonomy may be framed using a more directive communication style; the same three smoking cessation aids could be described, but this time the online computer-tailored intervention could suggest a recommended option – based on an individual assessment preceding the tailored advice. This idea finds support in the findings from two studies that investigated the effect of printed health communication materials aimed to increase colorectal cancer screening (Resnicow et al., 2014) and fruit and vegetable intake (Resnicow et al., 2008). Both studies found that only for people with a greater need for autonomy, printed newsletters that were framed in an autonomy-supportive manner were more effective than newsletters with no tailored message frame. To our knowledge, however, no earlier research has used the need for autonomy as a basis to tailor the

message frame of *online* health behaviour change interventions. Considering the individual differences found, as well as the promising results found for printed health communication (Resnicow et al., 2008; 2014) and the tailoring to other types of information processing styles (Williams-Piehota et al., 2003), it appears worthwhile to take into account respondents' needs for autonomy when we aim to advance online computer-tailoring as a health behaviour change strategy.

Tailoring mode of delivery

A second opportunity to further increase the effectiveness of online computer tailoring is to tailor interventions' delivery mode to participants' learning styles and mode preferences, i.e. adjusting whether the online health behaviour change intervention is delivered using text, audio and/or visual information. Practical examples of such (combinations of) delivery modes are animations, sound that either coincides with the screen text or that provides additional content, illustrations or graphics, video's, and vignettes or testimonials (Ritterband et al., 2009).

Previous research has identified individual differences in learning styles; whereas so-called 'verbalisers' were found to learn better from information that is presented visually, 'imaginers' performed better when offered verbal information (Ausburn & Ausburn, 1978). When communicating a health message, a lack of consistency between someone's individual learning style and the message's delivery mode can inhibit the processing of the information (Ausburn & Ausburn, 1978). In contrast, when an intervention's delivery mode is tailored based on an individual's learning style, the congruence between learning style and delivery mode is expected to enhance the motivation to attend to and process the information that is presented (Rimer & Kreuter, 2006). This enhanced processing is subsequently anticipated to facilitate learning and increase message impact in terms of information

recall and health behaviour change (Jensen, King, Carcioppolo, & Davis, 2012). Similarly, to enhance the personal relevance of an online health communication intervention, the delivery mode of this intervention could be tailored to respondents' personal preferences. Previous research has indicated that individual differences exist in delivery mode preferences. For example, among the target group of older adults, significant differences have been identified in preferences for a certain mode of delivery that make it difficult and even undesirable to provide information in a general and non-tailored way (Soroka et al., 2006; Wright et al., 2008).

Online computer-tailored health communication interventions are especially suited to adjust modalities and formats to fit individuals' personal learning styles and preferences (Lustria et al., 2013). Due to the automatic adjustment of intervention materials based on a personal assessment, these interventions could, for instance, easily present textual information with or without illustrations and provide text-based or video-based information and/or feedback (Walthouwer, Oenema, Soetens, Lechner, & de Vries, 2013). Until now, however, surprisingly little research has been conducted to determine the effectiveness of online health communication interventions tailored to respondents' learning styles or delivery mode preferences. The few studies that have been conducted within this respect, however, show promising results. In a breast cancer screening study, for example, participants provided with information tailored to their illustration preferences expressed greater breast cancer screening intentions than participants provided with standard information (Jensen et al., 2012).

Implications for future research

To determine whether the tailoring of an intervention's message frame and delivery mode is indeed able to further increase the effectiveness of existing online computer-tailored health

communication interventions, two important steps should be taken in future research. First, more experimental research needs to be conducted to determine the effectiveness of a single tailoring strategy. Thus, to investigate the effectiveness of online health communication materials that are tailored to respondents' need for cognition, need for affect and need for autonomy, these materials should be compared with non-tailored materials. Similar experiments are required to investigate the effectiveness of mode tailoring, comparing the effectiveness of interventions materials that are tailored and non-tailored to respondents' learning style or delivery mode preferences. Second, studies are needed that aim to disentangle the effects of the different types of tailoring. That is, to untangle the effects of message frame and mode tailoring from each other, as well as from content and other forms of tailoring (e.g. personalisation), and to investigate whether a combination of multiple tailoring strategies outperforms a single strategy. This second step is especially important, as it will provide insight into whether the two strategies that we propose in this paper to be promising for advancing online computer-tailoring, are indeed able to further increases the effectiveness of existing online health communication interventions.

Conclusion

Although online computer-tailoring can be effective in improving different health related behaviours, overall effect sizes remain relatively small. As a result, testing strategies that might increase the effectiveness of online computer-tailored interventions should be deemed a priority. The aim of this paper was to discuss two of these strategies that have so far received relatively little attention in the field of online health communication. We propose that to advance the health behaviour change strategy of online computer-tailoring, we should move beyond content tailoring by additionally tailoring the

message frame and mode of delivery to respondents needs for cognition, affect and autonomy, and personal learning styles and delivery mode preferences, respectively. As the surprisingly few studies that have been conducted to date towards the effectiveness of these tailoring strategies show promising results, we strongly encourage more research is conducted in this area – to ultimately take online computer-tailoring forward.

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