This paper is in press at the Journal of Health Psychology.

Title: Encouraging foot care in people with and without diabetes through narrative communication

Running Title: Narrative communication to encourage foot care

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Abstract

In order to minimize risk of infection and potential foot complications, it is recommended that people with and without diabetes check their feet regularly for problems such as cuts, sores, blisters or calluses. Hence, an understanding of how to craft effective messages to encourage people to check their feet is important. Two studies investigated the use of narrative stories to encourage foot problem detection behaviour; Study 1 in a general population sample (*N*=193), and Study 2 in a sample of people with type 1 or type 2 diabetes (*N*=129). In both studies participants were randomised to either (a) receive an information sheet written in first-person narrative; (b) the same in non-narrative format; or (c) no information sheet. Changes in weekly detection behaviour was the outcome of interest. In both studies, greater detection behaviour was observed in the narrative message condition vs. non-narrative condition and the non-narrative condition vs. no information condition. Our findings have implications for the design of health messages in delivering effective foot care education to people with and without diabetes, suggesting that narrative information sheets may be more effective than non-narrative information sheets.

Keywords: Foot care, narratives

Data availability: Data submitted with manuscript

Introduction

Between 20 and 78% of the general population suffer from some form of foot problems, including corns, calluses and bunions; and up to 49% have lesser toe deformities (Farndon, Vernon & Parry, 2006). In a prospective study of older adults in the USA, 38% of people older than age 60 had peripheral neuropathy (PN; nerve damage) or peripheral vascular disease (PVD; blood circulation issues) (Plummer & Albert, 1996). Prevalence of PN or PVD may be as high as 66% in a population over the age of 75 (Pataky, Herrmann, Regat & Vuagnat, 2008) and these people would be considered at high risk for the development of problems such as foot ulcers. Foot ulcers are serious. Between 60 and 80% of foot ulcers will heal, but 10–15% will remain active, and 5–24% will lead to limb amputation within a period of 6–18 months (Alexaidou & Doupis, 2012).

The high prevalence of PN and PVD in the general population may in part be a function of a marked increase in the proportion of adults with pre-diabetes and diabetes in recent years (IDF, 2015). Approximately half of the population in England who are over 40 years of age and overweight (body mass index [BMI] >25) are thought to have pre-diabetes (Mainous, Tanner, Baker, Zayas & Harle, 2014), while approximately 6% of the population in England have diabetes (Diabetes UK, 2020). People who have diabetes are 15 times more likely to undergo amputations than those without the condition (National Health Service, 2017).

Clinical guidelines advise that people with diabetes should check their feet daily for cuts, blisters, sores, calluses, and red patches to detect any foot problems early (NICE, 2019). Up to 80% of amputations can be avoided through these behaviours (Diabetes UK, 2015). However, people with diabetes are often not aware of the threat of foot complications (Gale, Vedhara, Searle, Kemple & Campbell, 2008) and do not systematically and regularly engage in the recommended behaviours (Schmidt, Mayer & Panfil, 2008; Chin, Huang & Hsu, 2013). The aforementioned guidelines concern foot care for individuals who have diabetes, but

routine checking of feet can also minimize or delay foot problems even among those without diabetes (NICE, 2019). A recent review of interventions promoting diabetes foot self-management (Paton et al., 2021) identified no studies specifically targeting people without diabetes. Educating people with and without diabetes about the risk of foot problems and how they can minimise their risk through recommended foot care behaviours is important (Lipsky et al., 2012; Schaper et al., 2020; Powers et al., 2020).

The way in which the education is organised and communicated can impact the persuasive nature of the education and determine the ease by which the knowledge gained is retained and translated into attitude/belief formation, and subsequently, into behaviour (Michie et al., 2013). Traditionally information about health threats is provided in expository or didactic message formats that present claims based on evidence (Kreuter et al., 2007). They appeal to reason and therefore depend on the readers motivation to rationally process the information in the message (Kreuter et al., 2010; Dahlstrom, 2014). Provision of education in a didactic format generally enhances psychological capability (knowing how to do something) and reflective motivation (holding beliefs that a behaviour has benefits) (Michie, Atkins & Gainforth, 2016), but while this has long been a focus as an outcome for diabetes self-management education (Rickheim, Weaver, Flader & Kendall, 2002; Davies, Dixon, Currie, Davis & Peters, 2001; Noël et al., 1998; O'Connor et al., 1992), it does not always translate into behaviour change (Fisher Fisher, Amico & Harman, 2006; Fisher & Fisher, 1992). Indeed didactic messages may be subject to resistance/low engagement as individuals seek to distance themselves from the health threats (Walter, Demetriades & Murphy, 2019).

Recent research has demonstrated the persuasive effects of presenting health threat information in a narrative message format (Murphy et al., 2015) where messages convey information about health risks embedded within a coherent story to engage the reader and

reduce resistance (Dahlstrom & Ho, 2012). A narrative should be ‘‘a cohesive and coherent story with an identifiable beginning, middle, and end that provides information about scene, characters and conflict” (Hinyard & Kreuter, 2007, p. 778) which is “bounded in space and time’’ (Kreuter et al., 2007, p. 222). There are numerous theories which support the suggestion that narrative presentations may be a powerful persuasive tool in healthcare education to improve health behaviours, including the Transportation-Imagery Model (Green & Brock, 2000), Exemplification Theory (Zillman, 2006), and the Extended Elaboration Likelihood Model (Slater & Rouner, 2002).

Identification with characters and absorption/transportation into an engaging narrative are the most likely processes by which narratives exert their effect; the Transportation-Imagery Model (Green & Brock, 2000) contends that stories can be effective because they “transport” or immerse the audience in the text through imagery and character identification. Transportation may reduce negative cognitive responding and counter-argumentation whereas identification (adopting the perspective of the character and seeing the events through their eyes) may evoke feelings towards the characters which may influence beliefs. The Extended Elaboration Likelihood Model (Slater & Rouner, 2002) concurs that transportation into the narrative may affect beliefs, provided that the message is engaging and entertaining. Exemplification Theory (Zillman, 2006) also suggests that characters with vivid stories can enhance emotional engagement and increase emotional message recall. Such influence is exerted through or mediated by imaginability (Janssen, van Osch, de Vries & Lechner, 2013).

Previous research has found health threat information presented in narrative format to be more effective in changing beliefs, attitudes, and detection behaviour than similar information presented in didactic format in a variety of areas (Murphy, Frank, Chatterjee & Baezconde-Garbanati, 2013; McQueen, Kreuter, Kalesan & Alcaraz, 2011; Kreuter et al.,

2010; Love, Mouttapa & Tanjasiri, 2009; de Wit, Das & Vet, 2008). However, other research has suggested no benefit of narrative formatting (Jensen et al., 2014; Lemal and Van den Bulck, 2010). A recent meta-analysis of 25 health intervention studies by Shen, Sheer & Li (2015) suggested a slightly greater persuasive effect of narrative interventions compared to non-narrative ones. When synthesizing only the 9 studies examining detection behaviours, a small but significant effect of narrative messages was observed ($r = 0.091$, $p < .05$). One further review by Zebregs, van den Putte, Neijens P & de Graaf (2015) suggested that non-narrative interventions were more effective for changing beliefs and attitudes, whereas narrative interventions were more effective for changing behavioural intention.

To date the effects of narrative messages on audience responses have not been explored in detecting foot problems. This paper presents two research studies which explore the effect of narrative vs non-narrative (didactic) messages on foot care detection behaviour; one among people in the general population, and one among people with diabetes. The research was designed to first test the intervention in a general population before a population with diabetes to mitigate any undue burden on a clinical sample.

Study 1

Given that a significant proportion of the population have peripheral neuropathy or peripheral vascular disease and may not be fully aware, public health campaigns are needed to improve knowledge about good foot care practices among the general public to detect the early signs of foot problems. However, the threat of foot problems is neither immediate nor obvious to many people in the general population without a diagnosis of diabetes or pre-diabetes or who do not know whether they have elevated blood glucose. The presentation of information about foot problems and encouraging people to engage in foot care detection behaviour may therefore be met with low engagement. The use of a narrative format in a

communication outlining the health threat of poor foot care may be more effective in encouraging engagement in foot care behaviour, particularly if it presents a character with which the audience can identify and an engaging story which encourages absorption/transportation. The first study therefore tested the following hypothesis in a general population sample:

> *Foot problem detection behaviour will be higher following (i) provision of a foot care information sheet written in narrative format compared to non-narrative format; and (ii) provision of information sheets written in narrative format and non-narrative formats compared to no information sheet (control).*

Methods

Participants

The inclusion criteria for all participants were ≥18 years of age, able to read and speak the English language, and have no cognitive impairment/acute psychopathology.

Materials and procedure

Participants were invited to participate through an online advert placed on research forums and social media sites including facebook.com, callforparticipants.com, and twitter.com. The advert contained a link to the T1 questionnaire hosted on the Qualtrics platform (Qualtrics, Provo, UT).

T1 questionnaire

Demographic information. Participants reported their age, gender, relationship status, and the country they lived in.

Baseline foot problem detection behaviour. Participants reported the number of days that they had engaged in five detection behaviours in the past week; checking feet for cuts,

blisters, sores, calluses, and red patches. Responses were given on 8-point Likert scales ranging from ‘no days in the previous 7’ (0) to ‘7 days in the previous 7’ (7). Items were summed to create a formative measure of “detection behaviour” (range of possible scores 0-35 with higher scores indicating more engagement in detection behaviour; $r = 0.905$).

Baseline perceived severity of foot ulcer or infection: Measured by one item; (“A foot ulcer or infection is a severe health problem).Responses were given on 5-point Likert scales ranging from 1 (strongly agree) to 5 (strongly disagree). Higher scores indicated greater perceived severity of foot infection and ulceration.

Baseline perceived severity of leg amputation: Measured by one item (“A foot or leg amputation is a severe health problem”). Responses were given on 5-point Likert scales ranging from 1 (strongly agree) to 5 (strongly disagree). Higher scores indicated greater perceived severity of leg amputation.

Baseline perceived susceptibility to foot ulcer and infections: Measured by one item (“How likely will you be to develop a foot ulcer or infection if you don’t check your feet?”) Responses were given on 5-point Likert scales ranging from 1 (very unlikely) to 5 (very likely).

Baseline perceived susceptibility to leg amputation: measured by one item (“How likely will you be to need a foot or leg amputation if you don’t check your feet?”). Responses were given on 5-point Likert scales ranging from 1 (very unlikely) to 5 (very likely). Higher scores indicated greater perceived susceptibility to leg amputation

Information sheet: Participants were then randomly allocated to one of the three experimental conditions: a narrative information sheet condition (n = 61), a non-narrative information sheet condition (n = 68), or no information sheet condition (the control group) (n = 64). Randomization was achieved via the Qualtrics system in real time and did not use any

participant characteristics. The narrative and non-narrative messages contained identical information on the threat of inadequate foot care and recommended behaviours for detecting foot problems. The text length was similar in both of the narrative and non-narrative message conditions. Participants in the narrative message condition read information from the perspective of "Pat" a character who could be perceived as male or female and who required an amputation because of neuropathy, while participants in the non-narrative message condition read the same information about amputation and neuropathy but told in a factual manner. The full text of both is presented in Figure 1. The design of the information sheet was standardized to minimise the variability and the sensitivity to features of the local context (Hawe, Shiell & Riley, 2004).

T2 questionnaire

Participants who included their e-mail address in the T1 questionnaire were contacted 7 days later and asked to access a link to the T2 questionnaire which asked about *follow-up foot problem detection behaviour* using the same items as at T1 (recalling the past week; r = 0.961).

Participants were sent weekly reminders up to 6 weeks post-T1, at which point they were discontinued from the study if they had still not completed the T2 questionnaire.

Ethics statement

The study was approved by the Ethics Review Board at the University of Chichester. All participants gave written informed consent.

Data Analysis

Participant characteristics were compared between the three message format groups at T1 using one-way between subjects analyses of variance models (ANOVAs) for continuous variables and Chi-squared tests for categorical variables.

To test the effects of message format on foot problem detection behaviour a one-way between subjects analysis of covariance (ANCOVA) was used with a p-value below 0.05 denoting statistical significance. Information sheet condition was entered as the independent variable. The dependent variable was *follow-up foot problem detection behaviour*. Age, gender, perceived susceptibility to foot ulcer/infection, perceived susceptibility to foot/leg amputation, perceived severity of foot ulcer/infection, perceived severity of foot/leg amputation, and baseline foot problem detection behaviour were included as covariates as these variables were considered to potentially have an effect on message behaviour independently of the intervention. Bivariate correlations are presented in Table 3 to show correlations between covariates, and dependent variables. The dependent variable showed a significant departure from normality ($W(192) = 0.86$, $p < 0.001$), however we used ANCOVA over non-parametric methods as per the recommendations of Norman (2010).

Data sharing statement

The de-identified dataset for the current study is made available on FigShare. Syntax and log files are presented as supplemental material on the SAGE Journals platform.

Results

Two hundred and eighty-four participants completed the Time 1 (T1) questionnaire and received an information sheet; 193 (68.0%) completed the Time 2 (T2) questionnaire (32.0% attrition). These 193 participants make up the analysis sample. Participant age ranged from 18 to 88, with a mean (SD) of 49.2 (18.1) years, 59.4% were female, 52.8% were married and a further 6.2% were cohabiting. The majority of participants resided in either the UK or the USA (see Table 1). The participants who completed the baseline (T1) questionnaire but not the follow-up (T2) questionnaire ($n = 91$) did not differ significantly to the participants who completed both questionnaires ($n = 193$) on any of the variables in Table

1. Among the analysis sample (who completed both questionnaires), there were no statistically significant differences between the intervention groups except a higher prevalence of hammer toes (as a risk factor) in the control group (Table 1). The time between T1 and T2 – intended as 7 days – ranged between 7 and 44, with a mean of 9.0 and a standard deviation of 4.6. A third of participants (33%) completed T2 on day 7; 89% completed T2 within 10 days of T1.

Mean and standard deviation foot care behaviour scores by message format group are shown in Table 2. Bivariate correlations between baseline variables are detailed in Table 3. There was a significant effect of message format on follow-up foot problem detection behaviour at T2 ($F(2,155) = 22.23$, $p < 0.001$, $\eta_p^2 = 0.22$), with pairwise comparisons revealing a significantly higher score in participants who received the narrative information sheet compared to those who received the non-narrative information sheet (difference between groups (*D*) *(SE)* = 3.90 (1.32); 95% CI [0.69, 7.10]; $p = 0.01$); a significantly higher score in participants who received the narrative information sheet compared to those who received no information sheet (*D (SE)* = 9.02 (1.36); 95% CI [5.74, 12.31]; $p < 0.001$); and in participants who received the non-narrative information sheet compared to those who received no information sheet (*D (SE)* = 5.13 (1.35); 95% CI [1.87, 8.39]; $p = 0.001$).

[Table 1 about here]

[Table 2 about here]

[Table 3 about here]

Discussion

Given that a significant proportion of the population have peripheral neuropathy or peripheral vascular disease and may not be fully aware, public health campaigns are needed

to improve knowledge about good foot care practices among the general public to detect the early signs of foot problems. The current study was designed to explore the effects of narrative message formatting in health communication advocating regular foot detection behaviour to reduce risks to foot health among the general population. It tested two versions of a health information sheet; one written in first-person narrative format telling the story about Pat who lost his/her foot - and the other containing the same information written in didactic format. As a further comparison, a control group received no information sheet. We hypothesized that narrative formatting would be more effective than didactic presentations of information about foot problems.

Results revealed that participants receiving information sheets in narrative or non-narrative conditions reported greater levels of detection behaviour compared to participants allocated to receive no information sheet (control) showing the benefit of providing people in the general population with information about foot care. Results also revealed, in line with the hypothesis, that the narrative information sheet produced more engagement in detection behaviour than the non-narrative information sheet. This is the first study to explore the use of narrative framing to encourage good foot care detection behaviour and findings are supportive of previous studies in other detection behaviours such a pap tests (Love, Mouttapa & Tanjasiri, 2009) and mammography (McQueen, Kreuter, Kalesan & Alcaraz, 2011; Kreuter et al., 2010).

Study 2

Study 1 found that participants allocated to a narrative message condition reported greater detection behaviour than participants allocated to a didactic message condition, and a no message condition. Information about foot care is likely to be even more relevant for those

with a clinical diagnosis of diabetes - a known clinical risk factor for foot problems - and so it seems reasonable to conjecture that participants with diabetes will also engage with the message. Indeed presenting an information sheet about foot problems in narrative format to people with diabetes who are at an amplified risk of foot problems compared to the general population and who should know about the enhanced risks, offers further opportunities for identification with Pat (who has elevated blood glucose), thereby potentially increasing engagement with the message and subsequent behaviour change (Zillman, 2006; Slater & Rouner, 2002; Green & Brock, 2000). The second study therefore tests the same hypothesis as Study 1:

> *Foot problem detection behaviour will be higher following (i) provision of an foot care information sheet written in narrative format compared to non-narrative format; and (ii) provision of information sheets written in narrative format and non-narrative formats compared to no information sheet (control).*

Methods

Participants

The inclusion criteria for all participants were ≥18 years of age, able to read and speak the English language, a diagnosis of diabetes (Type 1 or Type 2) and have no cognitive impairment/acute psychopathology.

Materials and procedure

An invitation to participate was shared through an online advert on various research forums and social media sites including facebook.com, callforparticipants.com, and twitter.com, and through specific social media forums for people with diabetes (https://beyondtype1.org/). Adults with a self-reported formal diagnosis of diabetes (type 1 or

type 2) were invited to participate. The recruitment message contained a link to the T1 questionnaire.

Participants received the same information sheets and completed the same questionnaires at the same timepoints as participants in Study 1. The Cronbach's alphas for the *baseline foot problem detection behaviour* and *follow-up foot problem detection behaviour* score were $r = 0.961$ and $r = 0.985$ respectively. Fifty-one participants were randomly allocated to receive the narrative information sheet, 37 the didactic information sheet, and 41 no information sheet.

Ethics statement

The study was approved by the Ethics Review Board at the University of Chichester.

Data Analysis

This study followed the same analytical strategy as Study 1. The dependent variable showed a significant departure from normality ($W(129) = 0.91$, $p < 0.001$), however we used ANCOVA over non-parametric methods as per the recommendations of Norman (2010).

Results

One hundred and sixty-eight participants completed the Time 1 (T1) questionnaire; 129 (76.8%) completed the Time 2 (T2) questionnaire one week later (23.2% attrition). These 129 participants make up the analysis sample (see Table 4). Participant age ranged from 19 to 83, with a mean (*SD*) of 55.1 (13.8) years. 59.7% were female, 55.0% were married and a further 10.9% were cohabiting. Just over half of the sample lived in the UK with a further third in the USA. Approximately 80% of the sample had Type 2 diabetes and 20% had Type 1 diabetes. Mean (SD) duration of diabetes was 10.1 (9.8) years. There were no statistically significant differences between the intervention groups on any of the variables shown except ingrown toenails (as a risk factor) which were more prevalent in the narrative group. In

addition, there were no differences between the analysis sample and participants who completed the T1 questionnaire but not the T2 questionnaire (n = 39). The time between T1 and T2 – intended as 7 days – ranged between 7 and 30, with a mean (SD) of 9.5 (3.2). Only 14% completed T2 on day 7; but 90% completed T2 within 10 days of T1.

Mean and standard deviation foot care behaviour scores by message format group are shown in Table 5. Bivariate correlations between baseline variables are detailed in Table 6. There was a significant effect of message format on follow-up foot problem detection behaviour at T2 ($F(2,117) = 16.70$, $p < 0.001$, $\eta_p^2 = 0.22$), with pairwise comparisons revealing a significantly greater detection behaviour in participants who received the narrative information sheet compared to those who received the didactic information sheet (*D (SE)* = 5.01 (1.78); 95% CI [0.69, 9.33]; $p = 0.02$); a significantly higher score in participants who received the narrative information sheet compared to those who received no information sheet (*D (SE)* = 9.99 (1.73); 95% CI [5.79, 14.19]; $p < 0.001$); and in participants who received the didactic information sheet compared to those who received no information sheet (*D (SE)* = 4.97 (1.83); 95% CI [0.52, 9.43]; $p = 0.02$).

[Table 4 about here]

[Table 5 about here]

[Table 6 about here]

Discussion

Although structured education programmes are offered to people with diabetes upon diagnosis, many do not include foot care education, instead focusing on glucose control (Dorresteijn, Kriegsman, Assendelft & Valk, 2010; Hoogveen, Dorresteijn, Kriegsman & Valk, 2015). Further, structured diabetes education programmes are attended by only a minority of patients; as low as 2% newly diagnosed with Type 1 and 6% newly diagnosed

with Type 2 diabetes in the UK (Calder, 2017). The need for easily accessible interventions about foot care which require low time involvement from the person with diabetes is paramount.

The aim of study 2 was to test for replication of the findings of study 1 in a diabetes sample. Specifically, study 2 tested the same two versions of an information sheet outlining recommended foot care behaviour to people with diabetes – one written in first-person narrative format telling the story about Pat who lost his/her foot - and the other containing the same information written in didactic (non-narrative) format. As a comparison, a control group received no information sheet.

In line with the study hypothesis, study 1 in a general population sample and previous research in other detection behaviours (McQueen et al., 2011; Kreuter et al., 2010; Love, Mouttapa & Tanjasiri, 2009), the narrative information sheet produced more engagement in detection behaviour than the non-narrative information sheet. Both information sheets (narrative, non-narrative) produced more engagement than no information sheet (control).

General discussion

It is important to improve knowledge about good foot care practices among the general public, and particularly among people with diabetes due to the risk of damage to blood vessels and peripheral nerves in the feet associated with elevated blood glucose which, if untreated, may require lower extremity amputation (Moss et al., 1996; Larsson et al., 1995; Apelqvist et al., 1994). Health educators are challenged to develop impactful messaging strategies to engage people in foot detection behaviour. The aim of the studies reported in this paper was to investigate the effects of a messaging strategy that has been used to engage people and promote detection behaviour in other behavioural domains; narrative story telling.

The studies tested a brief online text-based information sheet written in a first-person narrative outlining recommended foot problem detection behaviour. The information sheet told the story about Pat who lost his/her foot. This was compared to another information sheet containing the same information written in non-narrative format, and no information sheet (control). A first study was undertaken in a general population sample. It was hypothesized that the narrative information sheet would produce more positive engagement in detection behaviour than the non-narrative information sheet, and this is what was observed – though with relatively short follow up. Given the findings in a non-clinical sample, the study was replicated in a clinical sample with diabetes (study 2). It was hypothesized that the effects of the narrative information sheet would be amplified as participants with a formal diagnosis of diabetes may be better able to identify with Pat. As with the general population sample, the narrative information sheet did produce more positive engagement in detection behaviour than the non-narrative information sheet in the diabetes sample. While the effect in the diabetes sample was not numerically greater than seen in the general population sample, future research would benefit from recruiting people with and without diabetes to a single study to allow statistical comparisons between the populations.

The findings are in line with the Transportation-Imagery Model (Green & Brock, 2000), Exemplification Theory (Zillman, 2006), and the Extended Elaboration Likelihood Model (Slater & Rouner, 2002) which purport benefits of narrative formats over didactic ones, and findings from a meta-analysis of 9 studies examining detection behaviours, including mammography, skin exams and pap tests (Shen, Sheer & Li, 2015) which showed a small but significant effect of narrative messages on behaviour ($r = 0.091$, $p < .05$). Not all studies unequivocally support the benefits of narrative framing in detection behaviours however (e.g. Jensen et al., 2014; Lemal and Van den Bulck, 2010).

The aforementioned theories suggest that this effect may be a consequence of increasing knowledge and facilitating processing of new and/or difficult information through absorption into a narrative which provides surrogate social connections through an identifiable character (in this case, Pat) and represents vivid emotional and existential issues (losing a foot through a small infected cut). This may aid people to reduce negative cognitive responding and overcome resistance to messages that they may otherwise feel are irrelevant to them (Janssen et al., 2013; Zillman, 2006; Slater & Rouner, 2002; Green & Brock, 2000). In the current studies, mean detection behaviour at T2 in the narrative group was higher than at T1 even though the majority of the sample were at low (current) risk for foot problems (<25% with any current foot problems which are a risk factor for ulceration in both studies). Given that the information presented in the non-narrative message was identical to that presented in the narrative message, it may be suggested that raw knowledge gain was similar in the narrative and non-narrative groups and that the difference was a function of engagement with the message and/or reduced resistance to the content owing to the presentation of Pats story. This is consistent with research conveying cancer information, where researchers have noted that narratives reduce counterarguments and help individuals overcome barriers to screening and treatment seeking (Kreuter et al., 2007; Green, 2006). Knowledge, engagement with the message and resistance were not assessed in the two studies presented and thus this suggestion cannot be tested using existing data.

Although there was no attempt to match participants across the two studies, it is interesting to make some observations. For example, foot problem detection behaviour among people with diabetes was unsurprisingly higher on average at T1 than among the general population. Similarly, perceived susceptibility to foot problems was much higher in the diabetes sample, although the range of scores was similar. Perceived severity of foot problems was similar in the two studies, and high. It should however be noted that there were

some differences in the populations, with the diabetes sample older than the general population sample, with a greater prevalence and incidence of many foot problems. Statistical comparisons between the diabetes and general population samples were not conducted.

The results of the two studies has two implications for encouraging foot care. First, engagement in foot problem detection behaviour among the general population (where perceived susceptibility to foot problems is relatively low) and the diabetes population can be increased through the provision of information sheets which meet the need for an easily accessible and effective intervention about foot care which requires low time involvement from the person with diabetes. Second, although non-narrative information sheets are the mainstay education tool in the UK National Health Service, narrative information sheets may be more effective than non-narrative information sheets in delivering persuasive education about foot care behaviour. The narrative information sheet used in the 2 studies presented should be considered for use where relevant to improve behaviour with the intent to decrease foot problems and associated humanistic and economic burdens.

Limitations

These were the first studies to investigate the effects of narrative message formatting in health communication advocating regular foot detection behaviour to reduce risks to foot health, offering novel insight for clinical care. However, some limitations should be acknowledged. Both studies 1 and 2 were conducted with relatively small convenience samples recruited from advocacy and social media. Participants are older than the general population and females are over represented (ONS, 2017). This may limit the generalisability of the data and the findings should be considered preliminary until confirmed in a more diverse sample. For study 2 it should be noted that participants self-reported their diabetes diagnosis and were not asked to present clinical confirmation or evidence. The current studies employed 7-day follow up intervals. However, participants reported their behaviour at follow

up an average of 9.0 (study 1) and 9.5 days (study 2) after completing the T1 materials. In future research, data collection methods could be employed to increase timely reporting of foot care behaviour: via mobile apps or text message prompts (see Schwebel & Larimer, 2018 and Badawy & Kuhns, 2017). Further, we employed a relatively short follow up period. In line with recommendations (e.g., Goodall et al., 2020), future research may explore whether the benefits of the narrative information sheet over the non-narrative information sheet found in the current study are maintained over time. Future research would also benefit from exploring the mechanisms that may be underpinning the observed benefits of narrative communication in foot care and from recruiting people with and without diabetes to a single study to allow statistical comparisons between the populations.

Conclusion

The current studies provide evidence that foot care behaviour in a clinical (people with diabetes) and a non-clinical (general population) sample can be modified through an information sheet providing information on risks and what constitutes good foot care behaviours for detecting any problems. Providing this information in a first person narrative leads to higher levels of foot problem detection behaviour when compared to the same information presented in non-narrative format. This has implications for the design of health messages in delivering effective foot care education to people with and without diabetes.

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Figure 1: Narrative and non-narrative information sheet text[1]

Narrative information sheet	Non-narrative information sheet
Last year Pat lost a leg because of neuropathy. Here's what Pat told us: *I've always loved dancing. I've never been very sporty, but I always make an impression on the dancefloor.* *Well, I did.* *Last year, my right foot was amputated.* *You see I have something called neuropathy – where the nerves which carry messages around my body have gotten damaged. Often, the first part of the body to be affected is the feet; changes to the feelings and the circulation in the feet can be the first signs of neuropathy. These changes can be very gradual and I did not notice them straight away. However, neuropathy in the feet can quickly cause foot ulcers and infections which may lead to foot or leg amputations. That's exactly what happened to me. I had a small cut on my big toe but I didn't notice until it started swelling. I only went to see the doctor once I had an infection. By then, it was too late. They rushed me to hospital and I had my foot taken off soon after. Apparently neuropathy affects one in 50 people and high blood sugars contribute significantly to it. About half of people with diabetes get neuropathy.* *I didn't know this before. Now I know I check my left foot **every day** for problems - things like cuts which are not healing as quickly as they should, blisters on any part of the foot or toes, sores, thick hard skin on the base of the foot, and any signs of infection such as red patches. Not checking my feet every day will significantly increase the chance of getting more infections and foot ulcers and I cannot imagine losing the other foot.* *If only I had done this before, I might still be able to dance.* Please contact your GP or your local podiatry centre for advice if you discover any foot problems yourself, you are concerned about your feet, you find it difficult to check your feet or you have any questions about caring for your feet. Remember, if you don't check your feet every day, you can significantly increase the chance of something bad happening to them. Just ask Pat.	Neuropathy is the term used when the nerves which carry messages around your body are damaged. Often, the first part of the body to be affected is the feet; changes to the feelings and the circulation in the feet can be the first signs of neuropathy. These changes can be very gradual and you may not notice them straight away. However, neuropathy in the feet can quickly cause foot ulcers and infections which may lead to foot or leg amputations soon after. You can significantly increase the chance of getting foot ulcers and infections by not dealing with problems as they happen. Neuropathy affects one in 50 people and high blood sugars contribute significantly to it. About half of people with diabetes get neuropathy. To identify any problems with your feet you should ***check your feet every day***. Look for the following: • cuts, which are not healing as quickly as they should • blisters on any part of the foot or toes • sores, which you may not otherwise notice without looking • calluses (thick, hard skin), particularly on the base of the foot • any signs of infection such as red patches Not checking your feet every day will significantly increase the chance of getting infections and foot ulcers requiring intensive treatment or amputation. Please contact your GP or your local podiatry centre for advice if you discover any foot problems, you are concerned about your feet, you find it difficult to check your feet or you have any questions about caring for your feet. Remember, if you don't check your feet every day, you can significantly increase the chance of something bad happening to them.

[1] Highlighting added to emphasise differences. Not included on patient-facing versions

Table 1: Study 1 participant characteristics at T1 (baseline)

Variable	Total (n = 193)	Message format			
		Narrative information sheet (n = 61)	Non-narrative information sheet (n = 68)	Control (n = 64)	Comparison[1]
Age; mean (*SD*)	49.24 (18.06)	48.77 (18.33)	48.34 (17.09)	50.64 (18.98)	$F(2,192) = 0.30$, $p = 0.74$
% female	59.4	59.0	54.4	65.1	X^2 (2, N = 192) = 1.55, $p = 0.46$
Relationship status (%)					X^2 (10, N = 193) = 13.03, $p = 0.22$
Single	23.3	21.3	22.1	26.6	
In a relationship but not cohabiting	5.2	6.6	5.9	3.1	
In a relationship and cohabiting	6.2	8.2	8.8	1.6	
Married	52.8	54.1	52.9	51.6	
Separated / divorced	7.8	8.2	8.8	6.3	
Widowed	4.7	1.6	1.5	10.9	
% with children	62.0	60.0	61.8	64.1	X^2 (2, N = 192) = 0.22, $p = 0.90$
Country					X^2 (6, N = 193) = 3.77, $p = 0.71$

Variable	Total (n = 193)	Message format			
		Narrative information sheet (n = 61)	Non-narrative information sheet (n = 68)	Control (n = 64)	Comparison[1]
United Kingdom	67.9	72.1	60.3	71.9	
United States of America	26.4	23.0	33.8	21.9	
Canada	3.6	3.3	2.9	4.7	
Other[2]	2.1	1.6	2.9	1.6	
% with diabetes or pre-diabetes					X^2 (2, N = 192) = 1.36, p = 0.51
Pre-diabetes	14.1	18.0	13.2	10.9	
Type 1 diabetes	0	0	0	0	
Type 2 diabetes	0	0	0	0	
% with foot problems					
Foot ulcer now / in the past	1.0 / 1.0	1.6 / 1.6	1.5 / 1.5	0 / 0	X^2 (4, N = 193) = 2.05, p = 0.73
Corns now / in the past	4.7 / 19.2	8.2 / 16.4	0 / 25.0	6.3 / 15.6	X^2 (4, N = 193) = 7.07, p = 0.13
Calluses now / in the past	9.3 / 19.2	11.5 / 21.3	11.8 / 19.1	4.7 / 17.2	X^2 (4, N = 193) = 3.09, p = 0.54
Hammer toes now / in the past	3.6 / 1.6	1.6 / 0	0 / 4.4	9.4 / 0	X^2 (4, N = 193) = 14.68, p = 0.01

Variable	Total (n = 193)	Message format			
		Narrative information sheet (n = 61)	Non-narrative information sheet (n = 68)	Control (n = 64)	Comparison[1]
Fungal infections now / in the past	4.1 / 23.8	8.2 / 18.0	1.5 / 30.9	3.1 / 21.9	X^2 (4, N = 193) = 6.42, p = 0.17
Dry skin now / in the past	20.7 / 25.4	21.3 / 26.2	19.1 / 20.6	21.9 / 29.7	X^2 (4, N = 193) = 2.13, p = 0.71
Ingrown toenails now / in the past	7.3 / 29.0	8.2 / 39.3	5.9 / 20.6	7.8 / 28.1	X^2 (4, N = 193) = 6.45, p = 0.17
Cellulitis now / in the past	1.6 / 5.7	0 / 9.8	1.5 / 5.9	3.1 / 1.6	X^2 (4, N = 193) = 5.81, p = 0.21
Osteomyelitis now / in the past	0 / 2.1	0 / 1.6	0 / 4.4	0 / 0	X^2 (2, N = 193) = 3.24, p = 0.20
Sepsis now / in the past	0 / 1.0	0 / 0	0 / 2.9	0 / 0	X^2 (2, N = 193) = 3.72, p = 0.16
Gangrene now / in the past	0 / 1.6	0 / 0	0 / 2.9	0 / 1.6	X^2 (2, N = 193) = 1.81, p = 0.40
Perceived susceptibility to foot ulcer/infection; mean (SD)[3]	1.69 (0.91)	1.63 (0.89)	1.73 (0.88)	1.70 (0.96)	F(2,180) = 0.21, p = 0.81
Perceived susceptibility to foot/leg amputation; mean (SD)[3]	1.43 (0.72)	1.42 (0.71)	1.43 (0.67)	1.42 (0.77)	F(2,171) = 0.07, p = 0.99
Perceived severity of foot ulcer/infection; mean (SD)[3]	3.92 (0.92)	3.97 (0.98)	3.85 (0.76)	3.95 (1.02)	F(2,190) = 0.30, p = 0.74

Variable	Total (n = 193)	Message format			
		Narrative information sheet (n = 61)	Non-narrative information sheet (n = 68)	Control (n = 64)	Comparison[1]
Perceived severity of foot/leg amputation; mean (*SD*)[3]	4.62 (0.72)	4.64 (0.73)	4.74 (0.48)	4.47 (0.89)	$F(2,190) = 2.33$, $p = 0.10$

[1] Analysis of differences between message format cohorts via oneway between subjects ANOVA for continuous variables; Chi-squared tests for categorical variables

[2] Includes Russia (n=1), India (n=1), Mexico (n=1) and France (n=1)

[3] Score range: 1-5. Lower is better (less perceived susceptibility/severity).

N = number of participants; *SD* = Standard Deviation; T1 = Baseline (before intervention)

Table 2: Study 1 foot problem detection behaviour at T1 and T2

Message format		T1	T2
Overall	*N*	185	192
	Mean (*SD*)	2.89 (5.89)	7.91 (8.42)
Narrative information sheet	*N*	61	61
	Mean (*SD*)	2.66 (4.49)	11.82 (9.12)
Non-narrative information sheet	*N*	65	68
	Mean (*SD*)	3.02 (6.73)	8.40 (8.27)
Control	*N*	59	64
	Mean (*SD*)	3.00 (6.26)	3.60 (5.48)

N = number of participants; *SD* = Standard Deviation; T1 = Baseline (pre-intervention); T2 = Follow-up (after intervention)

Table 3: Study 1 bivariate correlations between variables at T1 and with foot problem detection behaviour at T2

	Age	Perceived severity of foot ulcer/infection	Perceived severity of foot/leg amputation	Perceived susceptibility to foot ulcer/infection	Perceived susceptibility to foot/leg amputation	Foot problem detection behaviour (T1)	Foot problem detection behaviour (T2)
Age	-	0.04	-0.07	0.10	0.07	0.02	0.04
Perceived severity of foot ulcer/infection	-	-	0.47**	0.14	0.18*	0.09	0.14
Perceived severity of foot/leg amputation	-	-	-	0.12	0.09	0.08	0.18*
Perceived susceptibility to foot ulcer/infection	-	-	-	-	0.68**	0.37**	0.33**
Perceived susceptibility to foot/leg amputation	-	-	-	-	-	0.18*	0.16*
Foot problem detection behaviour (T1)	-	-	-	-	-	-	0.37**
Foot problem detection behaviour (T2)	-	-	-	-	-	-	-

T1 = Baseline (pre-intervention); T2 = Follow-up (after intervention)

* $p < 0.05$; ** $p < 0.001$

Table 4: Study 2 participant characteristics at T1 (baseline)

Variable	Total (n = 129)	Message format			
		Narrative information sheet (n = 51)	Didactic information sheet (n = 37)	Control (n = 41)	Comparison[1]
Age; mean (*SD*)	55.11 (13.87)	56.51 (13.15)	55.11 (12.12)	53.37 (16.18)	$F(2,126) = 0.58$, $p = 0.56$
% female	59.7	56.9	67.6	56.1	X^2 (2, N = 129) = 1.34, $p = 0.51$
Relationship status (%)					X^2 (10, N = 129) = 5.32, $p = 0.87$
Single	14.7	15.7	18.9	9.8	
In a relationship but not cohabiting	7.0	7.8	2.7	9.8	
In a relationship and cohabiting	10.9	7.8	10.8	14.6	
Married	55.0	52.9	59.5	53.7	
Separated / divorced	10.1	13.7	5.4	9.8	
Widowed	2.3	2.0	2.7	2.4	
% with children	62.0	60.8	62.2	63.4	X^2 (2, N = 129) = 0.07, $p = 0.97$
Country					X^2 (4, N = 129) = 1.05, $p = 0.90$
United Kingdom	55.8	60.8	54.1	51.2	

Variable	Total (n = 129)	Message format			
		Narrative information sheet (n = 51)	Didactic information sheet (n = 37)	Control (n = 41)	Comparison[1]
United States of America	34.1	31.4	35.1	36.6	
Canada	10.1	7.8	10.8	12.2	
% with diabetes					X^2 (2, N = 129) = 1.72, p = 0.42
Type 1 diabetes	20.9	15.7	21.6	26.8	
Type 2 diabetes	79.1	84.3	78.4	73.2	
% ever attended self-management course	43.8	44.0	40.5	46.3	X^2 (2, N = 128) = 0.27, p = 0.88
Mean (*SD*) age of diabetes diagnosis	45.02 (19.25)	47.02 (17.66)	44.43 (19.27)	43.05 (21.27)	F(2,126) = 0.50, p = 0.61
Confident in ability to manage diabetes[2]	67.4	68.6	59.4	73.2	X^2 (8, N = 129) = 5.14, p = 0.74
% with foot problems					
Foot ulcer now / in the past	2.3 / 7.0	5.9 / 5.9	0 / 8.1	0 / 7.3	X^2 (4, N = 129) = 4.81, p = 0.31
Corns now / in the past	10.9 / 21.7	13.7 / 27.5	8.1 / 16.2	9.8 / 19.5	X^2 (4, N = 129) = 3.07, p = 0.55
Calluses now / in the past	10.1 / 15.5	13.7 / 15.7	2.7 / 16.2	12.2 / 14.6	X^2 (4, N = 129) = 3.22, p = 0.52

Variable	Total (n = 129)	Message format			
		Narrative information sheet (n = 51)	Didactic information sheet (n = 37)	Control (n = 41)	Comparison[1]
Hammer toes now / in the past	2.3 / 4.7	5.9 / 3.9	0 / 5.4	0 / 4.9	X^2 (4, N = 129) = 4.77, p = 0.31
Fungal infections now / in the past	7.0 / 22.5	9.8 / 29.4	2.7 / 24.3	7.3 / 12.2	X^2 (4, N = 129) = 5.93, p = 0.20
Dry skin now / in the past	19.4 / 31.8	23.5 / 35.3	13.5 / 32.4	19.5 / 26.8	X^2 (4, N = 129) = 2.64, p = 0.62
Ingrown toenails now / in the past	7.8 / 10.1	15.7 / 13.7	5.4 / 10.8	0 / 4.9	X^2 (4, N = 129) = 11.06, p = 0.03
Cellulitis now / in the past	0.8 / 11.6	2.0 / 15.7	0 / 13.5	0 / 4.9	X^2 (4, N = 129) = 4.40, p = 0.35
Osteomyelitis now / in the past	0 / 6.2	0 / 3.9	0 / 10.8	0 / 4.9	X^2 (2, N = 129) = 1.93, p = 0.38
Sepsis now / in the past	0 / 3.9	0 / 2.0	0 / 2.7	0 / 7.3	X^2 (2, N = 129) = 1.94, p = 0.38
Gangrene now / in the past	0 / 3.9	0 / 5.9	0 / 2.7	0 / 2.4	X^2 (2, N = 129) = 0.92, p = 0.63
Perceived susceptibility to foot ulcer/infection; mean (SD)[3]	2.69 (1.03)	2.69 (1.03)	2.62 (1.06)	2.75 (1.01)	F(2,125) = 0.15, p= 0.86
Perceived susceptibility to foot/leg amputation; mean (SD)[3]	2.50 (1.06)	2.56 (1.15)	2.41 (0.96)	2.53 (1.06)	F(2,124) = 0.24, p= 0.79

Variable	Total (n = 129)	Message format			
		Narrative information sheet (n = 51)	Didactic information sheet (n = 37)	Control (n = 41)	Comparison[1]
Perceived severity of foot ulcer/infection; mean (SD)[3]	4.02 (0.80)	4.06 (0.76)	3.97 (0.80)	4.02 (0.85)	$F(2,126) = 0.12$ $p = 0.88$
Perceived severity of foot/leg amputation; mean (SD)[3]	4.70 (0.48)	4.61 (0.53)	4.73 (0.45)	4.78 (0.42)	$F(2,126) = 1.62$, $p = 0.20$

[1] Analysis of differences between message format cohorts via oneway between subjects ANOVA for continuous variables; Chi-squared tests for categorical variables

[2] Replied "agree" or "strongly agree" to the statement "I feel confident in my ability to manage my diabetes"

[3] Score range: 1-5. Lower is better (less perceived susceptibility/severity).

N = number of participants; *SD* = Standard Deviation; T1 = Baseline (before intervention)

Table 5: Study 2 foot problem detection behaviour at T1 and T2

Message format		T1	T2
Overall	*N*	129	129
	Mean (*SD*)	6.72 (9.75)	13.19 (11.00)
Narrative information sheet	*N*	51	51
	Mean (*SD*)	8.12 (10.59)	18.61 (11.69)
Didactic information sheet	*N*	37	37
	Mean (*SD*)	4.84 (8.42)	11.73 (10.55)
Control	*N*	41	41
	Mean (*SD*)	6.68 (9.72)	7.78 (6.88)

N = number of participants; *SD* = Standard Deviation; T1 = Baseline (pre-intervention); T2 = Follow-up (after intervention)

Table 6: Study 2 bivariate correlations between variables at T1 and with foot problem detection behaviour at T2

	Age	Perceived severity of foot ulcer/infection	Perceived severity of foot/leg amputation	Perceived susceptibility to foot ulcer/infection	Perceived susceptibility to foot/leg amputation	Foot problem detection behaviour (T1)	Foot problem detection behaviour (T2)
Age	-	0.08	-0.14	-0.00	0.04	-0.06	-0.02
Perceived severity of foot ulcer/infection	-	-	0.18*	0.38**	0.31**	0.34**	0.31**
Perceived severity of foot/leg amputation	-	-	-	0.24**	0.29**	0.26**	0.18*
Perceived susceptibility to foot ulcer/infection	-	-	-	-	0.79**	0.46**	0.26**
Perceived susceptibility to foot/leg amputation	-	-	-	-	-	0.41**	0.27**
Foot problem detection behaviour (T1)	-	-	-	-	-	-	0.58**
Foot problem detection behaviour (T2)	-	-	-	-	-	-	-

T1 = Baseline (pre-intervention); T2 = Follow-up (after intervention)

* $p < 0.05$; ** $p < 0.001$