Informatics for Health and Social Care, January 2013; 38(1): 67–78

ISSN 1753-8157 print/ISSN 1753-8165 online
DOI: 10.3109/17538157.2012.710685

informa
healthcare

Language use in an internet support group for smoking cessation: development of sense of community

SARA M. VAMBHEIM[1,2], SILJE C. WANGBERG[2,3,4], JAN-ARE K. JOHNSEN[2,3,4] & ROLF WYNN[3,4]

[1]Department of Psychology, University of Tromsø, Tromsø, Norway, [2]Norwegian Centre for Integrated Care and Telemedicine, University Hospital of North Norway, Tromsø, Norway, [3]Division of Addictions and Specialized Psychiatry, University Hospital of North Norway, Tromsø, Norway and [4]Telemedicine Research Group, Department of Clinical Medicine, University of Tromsø, Tromsø, Norway

Abstract
The use of the internet for health purposes is increasing, as is the number of sites and online communities aimed at helping people to stop smoking. Some of the effects of online communities may be mediated through a sense of community. By using the computer-program Linguistic Inquiry and Word Count with a Norwegian dictionary, we investigated whether there was a development of sense of community in a forum related to a Norwegian smoking cessation intervention, by examining the use of self-referencing *vs*. collective referencing words. Data from a 4-year period, including in total *5242 web pages*, were included. There was a significant increase in the use of collective words over time and a significant decrease in the use of self-referencing words. The increase in the use of collective words suggests that there appears to be a development of a sense of community in the forum over time. More research is needed to study the importance of an online sense of community.

Keywords: *Internet support group*, *language use*, *LIWC*, *sense of community*, *smoking cessation*

1. Introduction

The internet is playing an increasingly important role in health-related matters. People use the internet to search for health-related information, and increasingly to discuss health-related topics and find support, and help for problems they are facing [1–3]. One central type of web-based application is that of internet support groups (ISGs), where people can discuss common health challenges and support each other [4–6]. ISGs have many features in common with face-to-face support groups, but have the added advantages of a high degree of accessibility, confidentiality, and a low cost [7]. Although increasingly popular, few have studied how ISGs work, i.e. which mechanisms that may underlie their popularity.

Correspondence: Rolf Wynn, UNN-Åsgård, N-9291 Tromsø, Norway. Tel: + 47 77620888. E-mail: rolf.wynn@gmail.com

In the present study, we draw on the case of an ISG for smoking cessation. Clearly, such groups have an important health objective – to help people stop smoking. While some internet-based smoking cessation interventions have demonstrated that they can help people stop smoking, especially if tailored to the users or combined with telephone interventions [7–10], it is still unclear what the underlying mechanisms are, i.e. how the effects are mediated [11,12].

One way to explain what is going on in online communities is to use the concept of 'social support'. Social support can be defined as the degree to which basic social needs are met through the interaction with others [13]. Several have pointed out that the internet offers a strong source of social support, especially as it easily may be used to gain access to other people's experiences [14]. ISGs provide an opportunity to share experiences, information, and emotional support online. Such groups appear to increase the sense of normalcy, enhance the sense of self, and increase the social network of those participating [15,16]. Enhancing informal networks may increase the participants' feeling of social support and thereby well-being [17,18]. In addition, the sense of belonging to a larger group that shares a commitment to a collective cause might possibly help initiate and sustain new, healthy behaviors. A central dilemma of using social support as the main process measure of ISGs is that it is an individual measure, while the facilitating actions within such forums possibly are on the online community level. In the present study, we therefore instead draw on the theoretical framework 'sense of community'.

'Community' has been defined in various ways, but most definitions share the elements of area, common ties, and social interaction [19–21]. A 'community' can also be defined as any set of social relations that are bound together by a sense of community. McMillan and Chavis [22] defined sense of community as including four elements: (1) membership – a feeling that members have of belonging; (2) influence – a sense that members matter to one another and to the group; (3) reinforcement, integration, and the fulfillment of needs – a shared faith that members' needs will be met through their commitment to be together; and (4) shared emotional connection – 'the commitment and belief that members have shared and will share history, common places, time spent together, and similar experiences' (p. 4). When these elements are present in an online setting; for instance, by having people gather in a group to discuss shared interests, this is often referred to as a 'virtual' community [23]. We prefer the term 'online' community, as 'virtual' may appear to imply that these are somehow not real.

However, several authors have made a distinction between the concept of 'community' and the geographical concept of 'neighborhood'. They emphasize that not all geographical neighborhoods are communities in the sense that people living there share feelings of belonging and attachment [23,24]. Actually, people may define their own personal community as consisting of people living in other places than in their geographical neighborhood [25]. Following this reasoning, not all online gatherings or groups of people are likely to be communities in the sense that there is a shared feeling of belonging and attachment [24,26]. As the very nature of an online community differs from that of a physical community, there are some differences between the two types of communities, relating to the differences in communicating face-to-face *vs.* electronically [24]. However, it seems clear that factors such as a feeling of membership, a feeling of influence, the exchange of support as well as shared emotional connections all can be present in online communities [24,27]. In some sense, online communities may, by virtue of implying participation by choice, be expected to be even more fertile grounds for support and change than their geographically fixed counterparts. Sense of community in online communities may be characterized by processes such as the exchange of support, the creation of identities and the making of identifications, and the production of trust [24]. Blanchard and

Marcus [24] suggest that a sense of community develops online when members begin enacting community-like behaviors for instance to share information about a topic. However, because a sense of community is intrinsically satisfying, the members will continue to perform the behaviors that sustain it. In some cases though, undesired behavior, including harassment and the propagation of extremism, may occur in anonymous online groups. These phenomena are probably more likely to occur in groups without a defined health objective and in groups without moderators overseeing netiquette [28,29].

Earlier studies suggest that there is a positive relationship between a sense of community and empowerment and well-being [30–32]. Chavis and Wandersman [19] found that the sense of community influenced the degree to which a person became involved in local action and participated in the local community. A sense of 'virtual' or 'online' community has also been described and has been found to be associated with positive outcomes such as sense of belonging and well-being [18,24,33].

Quantitative content analysis is widely used in the social sciences, and provides easy access to quantified data from text. Through quantitative content analysis, it is possible to describe and make inferences related to aspects of written speech. By examining written speech, for instance in ISGs, it may be possible to gain access to emotional and cognitive processes. Moreover, there appears to be an association between how people talk and write and cognitive functioning and neurological and mental illness [34–36]. According to Pennebaker and colleagues, even minor language elements can reveal insights into psychological processes as well as health outcomes [37–40]. Studies investigating the content of online activity in ISGs often have access to large amounts of text. Quantitative content analysis tools help to convey text to quantitative data, which can then be analyzed in statistical programs.

Prior studies have suggested that a change in the use of personal pronouns (I/me *vs.* we/us) may reflect important psychological changes, indicating a change in 'voice' from the individual to the collective. This may involve, for instance, how specific topics are talked about [37,41]. Illustrative examples would be 'Today *I* have decided to quit smoking once and for all' (self-referencing) *vs.* '*We* are all together in this' (collective referencing). A change in the use of pronouns over time could reflect a development of sense of community (i.e. an increased sense of membership, influence, integration, and emotional connection) in the ISG. The aim of the present study is to examine if there is a change in the use of self-references and/or collective references in the ISG 'slutta.no' during the study period.

2. Methods

2.1. Participants and materials

The study was based on data collected from the Norwegian smoking cessation ISG 'slutta.no'. The ISG 'slutta.no' was developed in cooperation between several agencies, including the Norwegian Directorate for Health, the Norwegian Cancer Fund, the software company PMAB, and the Norwegian Centre for Telemedicine and Integrated Care. The development of 'slutta.no' was based on various prior web-based smoking cessation applications. 'Slutta.no' opened in the form described in this study on 15 August 2006. People who registered on the site in order to participate (i.e. post) in the ISG during the period 15 August 2006 to 3 July 2009 were invited to participate in the study. It was not possible to participate in the ISG without participating in the study. Those who chose to participate signed an informed consent form. All data were studied in an anonymous form, and we therefore lack information about the degree and length of participation of individual members. The study

was approved by the Regional Medical Ethics Committee for North Norway (approval code REK Nord 83/2005).

In the ISG, interference from professionals was kept to a minimum. The ISG was unstructured in that there were no sub-groups, no instructions as to how to use the forum (except that it was for smoking cessation), and posts were listed chronologically. The second author, who also participated in the development of the ISG, acted as a moderator, answering practical questions and looking out for messages breaching normal netiquette (e.g. harassment). None of the other authors had any involvement in the development or running of the ISG.

Data were collected from 7906 registered users and study participants, 71% females and 29% males. We lack information about which proportion of the registered users and study participants that actually made posts. Mean age of participants was 36.45. All posts made by the study participants from 15 August 2006 to 3 July 2009 were included in the analysis. The web pages (html-format) that contained discussion forum threads were downloaded and stored on a local hard drive. In all, 5242 web pages were downloaded. Threads were converted from html-format to text-format using the HTMLasText software [42].

2.2. Measures and data analysis

The Linguistic Inquiry and Word Count (LIWC) program, developed by Pennebaker and colleagues [43,44], is a computer-based text analysis tool, which enables the examination of different aspects of expression in written speech, and facilitates analysis of discourse and changes in discourse over time. One application of LIWC is the examination of how different words are used in different periods of time.

The analysis used Pennebaker and colleagues' LIWC software (LIWC2007) [44], and utilized a Norwegian translation of the LIWC dictionary. The LIWC dictionary may be used to assess a range of linguistic categories, and has previously been found suitable for tracking changes in both emotional and cognitive processes, and the LIWC appears to be a valid instrument for the measurement of the verbal expression of emotion as well as other states and processes [43–45].

Two categories, each consisting of two sets of words, were used in the present study. These categories were intended to indicate either self-references or collective references. The 'Self-Reference' word-set included LIWC-dimensions 'I' and 'Self' ($r = 0.95$, $p < 0.05$), while the 'Collective' word-set included dimensions 'We' and 'Other-References' ($r = 0.43$, $p < 0.05$). It was assumed that an increase in sense of community would be accompanied by an increase in language containing collective references.

The posts were divided into four blocks; one block for each year. Analyses were performed using non-parametric (Kruskal–Wallis) and parametric tests (ANOVA/T-test), corresponding to other investigations of the LIWC dictionary [46,47]. All analyses were performed using Statistica 7.0 [48].

3. Results

3.1. Activity and word count (WC)

Overall the activity appeared to increase over the years, as shown by the number of threads per year: year 1 (559 threads, *204,023 words*), year 2 (1,122 *threads, 500,363 words*), year 3 (*1,843 threads, 970,105 words*), and year 4 (1,718 *threads, 960,240 words*). In order to investigate the development of WC over time, an ANOVA was performed. The result showed that the WC increased significantly over time, $F(3, 5238) = 9.62$, $p < 0.0001$. Similarly, a *t*-test of the yearly word counts showed a significant change in the activity through the study period

(t = 4.4, p < 0.05). However, since the LIWC2007 application includes WC in the calculation of mean percentage scores (LIWC scores are percentages of words of the total text analyzed belonging to a predefined category), WC was not included in further analyses.

3.2. Analyses of collective references and self-references

Overall, participants used more self-references (M = 4.32) than collective references (M = 1.33) (Figures 1 and 2). Analyses related to development of sense of community were performed on the two word-sets, collective references *vs.* self-references. Analyses were run as non-parametric Kruskal–Wallis tests, with either word-set as dependent variables and time as an independent variable. The tests sought to evaluate differences over years 1–4 for median changes in proportions of self-references and collective references.

The analyses showed significant results for both word-sets, implying that at least one of the years were different from the others: collective references, χ^2 = 127.65, d.f. = 3, p < 0.0001; Self-references, χ^2 = 160.24, d.f. = 3, p < 0.0001. Visual inspection of the distribution of collective references over the years suggested an overall increase over 4 years, albeit a dip in the use of collective words in year 2 (Figure 1). In contrast, the distribution of self-references appeared to decrease over time, with the largest decrease between year 3 and 4 (Figure 2). In addition to a visual inspection, the differences were tested using the nonparametric Mann–Whitney U test for years 1 and 4. The results were significant for collective references between years 1 and 4, U = 425090.50, Z = –4.08, p < 0.00001, showing that more collective references were used in year 4 than year 1. Also, the differences between years 1 and 4 were significant for self-references, U = 32566.00, Z = 9.24, p < 0.000001, showing that less self-references were used in year 4 than in year 1.

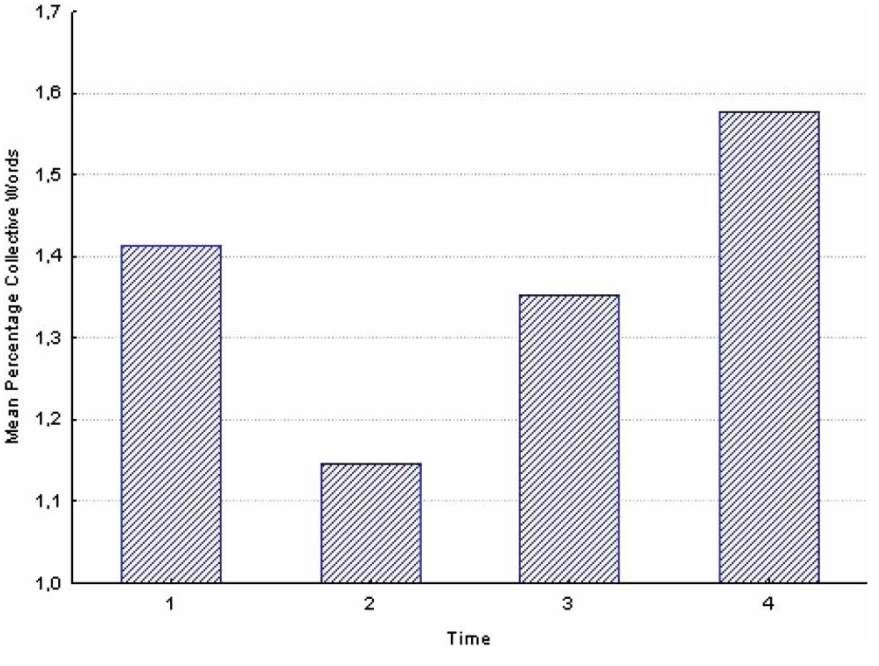

Figure 1. The development in use of collective words during the 4-year study period.

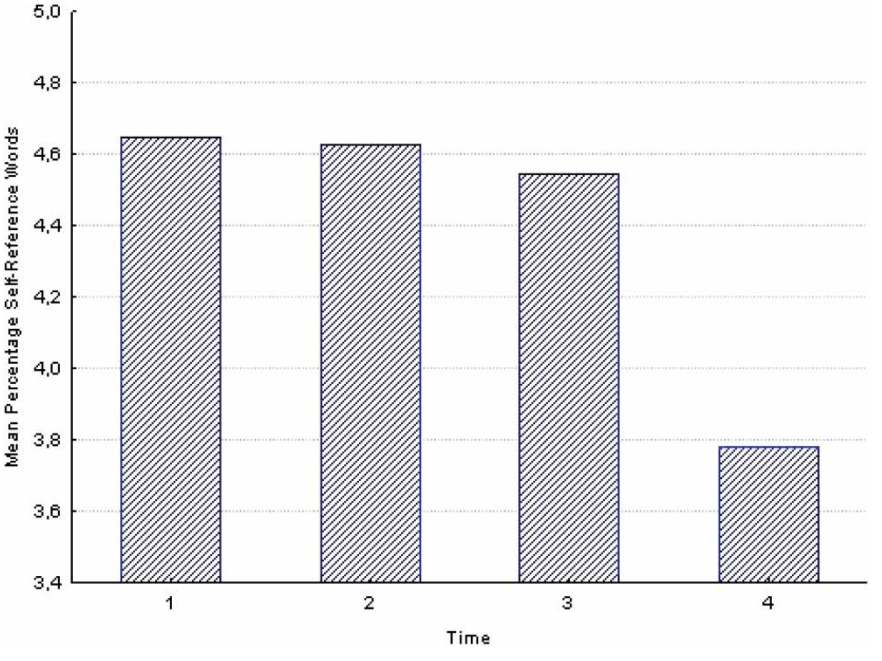

Figure 2. The development in use of self-reference words during the 4-year study period.

4. Discussion

The main finding in the present study was that the use of self-references decreased significantly and the use of collective references increased significantly in the ISG 'slutta.no' during the 4-year study period. The changes in the use of self-references and collective references were most obvious when comparing the beginning of the study period to the end of the period, and there were fluctuations in use during the period. While one should be cautious about making bold interpretations, we believe the overall pattern could be taken to support the idea of a development of the sense of community in the ISG. Considering the components of the sense of online community concept [24], we suggest that the development of the use of references from the individual (i.e. self-references) to the collective is likely to parallel a development of an online community identity, that is, a sense of belonging to a group. Also, although possibly more indirectly, the shift in the use of references could be taken as a proxy of an increasing degree of trust and support in the group. Our results can be seen in relation to other findings related to language and online groups. For instance, Cassell and Tversky [41] used quantitative content analysis techniques enriched with qualitative interviews to show how the communication in an online group took on properties reminiscent of a community. This included speaking in a collective voice and exhibiting homogeneity with regard to the topics discussed, the goals of the community, and the strategies with which to achieve these goals [41]. Also, a recent study indicates that collective emotional states might be created and modulated in internet-based groups, and that emotional expressiveness is linked to the longevity and sustainability of online communities [49].

Some authors have made a distinction between 'online' and 'offline' sense of community; however, the two concepts appear to be positively correlated [18]. Previous studies have shown that people may become more involved in a local community if the sense of community is high [19]. Moreover, the group members' sense of community develops

positively as they increasingly display community-related behaviors, i.e. behaviors that sustain a feeling of membership, a feeling of influence, the exchange of support as well shared emotional connections [19]. This may partly explain the continual increase in posts to the forum, as participants may have felt more connected to the forum and its participants. The link between online forum activity levels and experiences of sense of community is particularly interesting in light of the offline studies showing that the perceived control of community participants are related to activity levels in the community [50–54]. If higher levels of participation in the forum led to psychological empowerment, for instance through increased experience of control, this may also explain the previously suggested association between more active forum participation and successful smoking cessation [10,12].

Although we lack information about how active or engaged the individual participants were, previous studies have suggested that a minority of members are highly engaged in forums and responsible for most of the postings. While this may be the case also in 'slutta.no', there could be reason to assume that a somewhat higher proportion of the members contributed by posting, as the members had actively signed up as part of an effort to stop smoking. However, sense of community is not limited to those who participate actively by posting, and a member of the ISG that chooses to read rather than actively post may still experience a sense of belonging to the community.

Prior studies of individual writing-tasks [37] have suggested that changes in writing style can reflect important psychological changes and even that writing about certain, emotionally laden topics can lead to important positive changes in psychological functioning (i.e. the 'writing cure') [37–40,44]. However, group activity in contrast to solitary activity, could imply language matching with other participants [55]. Also, anonymous group settings, including those mediated by technology, are heavily influenced by the norms and contextually influenced goals of the group. For instance, the Social Identity Model of Deindividuation Effects (SIDE) [56] has proven useful in explaining how attitudes and behaviors are influenced in anonymous group settings (both online and offline). SIDE theory suggests that as a result of anonymity in online interaction and the loss of individual visibility, individuals partaking in an online group make a cognitive effort to understand the group as an entity. Thus, for anonymous group settings, SIDE proposes that group norms will be more salient as individual identities are unavailable, and that behavior and communication will adhere to group norms rather than individual motivations [57,58]. In this particular instance, norms should be aimed toward achieving and sustaining behavior change, for instance, through social processes such as self-disclosure and mutual support. The results of a related study [59] indicate that participants were probably using the forum to increase or maintain already high levels of self-efficacy. For example, that the 'high use group' probably dominated the activity of the forum [60] and had significantly higher levels of self-efficacy than the no-use or low-use group. Thus, the forum might have acted as an arena for peer modeling [61], providing participants with examples of successful smoking cessation. It can be argued that both normative and peer modeling procedures, in text-based, social communities, by their very nature are rooted in collectivistic use of language, rather than by conscious introspection. Examples of a collectivistic approach might be sharing information or personal stories of success or failure, which despite the personal contents (i.e. self-disclosure) are shared primarily for social impact and to produce feedback. This is a different setting than the individual writing task, which is often used in investigations of the 'writing cure' and related studies [38,40]. In such studies, the focus is on eliciting an individual's deepest thoughts and feelings without an explicit element of sharing.

As an increasing proportion of people around the world are gaining access to the internet, the importance of the internet for various aspects of health is clearly rising [1–3,62,63]. Various types of health providers as well as user groups are gradually becoming more visible online. The increasingly popular ISGs have the properties of being accessible and low-cost and, at least in some cases, effective in their task (i.e. for instance, in helping people to stop smoking). We suggest that ISGs also may offer members the possibility of belonging to a group where a sense of community is developed and maintained. Future programs promoting health online should consider making use of ISGs.

5. Limitations and directions for future research

A major challenge in studies of online communities is that these communities have multi level properties. In the current study, quantitative content analysis in the form of automated WCs was explored as a tool for measuring change in sense of community at an aggregate level. While significant results were found for some of the word categories, these changes were not validated against other established measures or changes in other variables.

Overall, the results are promising and warrant further research on the use of automated quantitative content analysis for these purposes. The method, including the aggregation and quantification of written speech, offers some advantages, such as the possibility to measure changes in language use over time, as we have done in the present study. However, we are aware that analyzing content through the coding of text units fails to reflect the complexity of the participants' contributions. Even when limiting the analysis to individual rather than social constructs, it can be argued that they are embedded in complex social contexts and that these cannot be reduced to measures of language behavior [64]. These challenges suggest combining exploratory and confirmatory research objectives and methods similar to Creswell's [65] pragmatist or mixed methods approach. Moreover, in the present study, we find that there has been a change in referencing, with an increase in the use of collective references and a decrease in the use of self-references. While we believe this finding most likely reflects a change in how the members of the ISG view and talk about the ISG (and smoking cessation), it remains a fact that the words we analyze can be used in different ways. For instance, the use of ‘we’ in a posting in the ISG could refer to a group member's family. However, used within the frame of the ISG and its defined target of smoking cessation, we deem it most likely that most of the use of the word ‘we’ refers to the ISG and its members. Our main finding, i.e. the increased use of collective references (and decreased use of self-references) also supports this interpretation, as it would seem quite unlikely that members over time increasingly often should refer to groups of people outside the ISG.

In order to observe the formation of a virtual community as naturalistic as possible, the moderator was very passive. An interesting question for future research is what impact online moderators might have when they are actively encouraging and facilitating behavior change, as has been done successfully in more traditional communities [66].

As participants were anonymous, we lack certain data, including information about individuals' degree of involvement and length of participation, and changes in smoking habits. Future studies should include more data about the participants. Other measures of sense of community, such as Chavis et al.'s Sense of Community Index [67], could also be added, in order to validate the findings of the present study.

6. Conclusions

Drawing on quantitative content analysis of the language of an ISG for smoking cessation, we analyzed text from a 4-year period totaling more than 5000 pages of text. The analysis showed that there was a reduction in the use of self-references over time, and a corresponding increase in collective references. Seen in light of previous findings that connect social support and use of collectivistic pronouns, we propose that participation in an online community can contribute to empowerment in relation to smoking cessation through a sense of community. The sense of community in an online setting may be revealed through factors such as a feeling of membership in a group, a feeling of influence, the exchange of support as well shared emotional connections. Moreover, this sense of belonging to a larger group that shares a commitment to a collective cause might possibly help initiate and sustain new, healthy behaviors. Future studies on online health promoting interventions should take these effects into account in the development of interventions and in the analyses of their impact. It is proposed that ISGs are included as an important part of future online interventions.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Acknowledgements

The study is supported in part by EXTRA funds from the Norwegian Foundation for Health and Rehabilitation, and funds from the Norwegian Directorate for Health. The authors wish to thank Roger J. Booth and James W. Pennebaker for their support with regard to use and scoring of the LIWC-application. The Norwegian version of the LIWC dictionary was made available by Paul Moxnes at The Norwegian School of Management (BI). Also, the authors would like to thank Inger Merete Skarpaas at the Norwegian Cancer Association for her contributions to developing the intervention, Olav Nilsen at the Norwegian Centre for Integrated Care and Telemedicine for help with data collection, and Leena Eklund at the University West, Sweden, for helpful input to an earlier version of this paper. The authors also thank the participants in the ISG that formed part of the study.

References

1. Andreassen HK, Bujnowska-Fedak MM, Chronaki CE, Dumitru RC, Pudule I, Santana S, Voss H, Wynn R. European citizens' use of E-health services: a study of seven countries. BMC Public Health 2007;7:53.
2. Santana S, Lausen B, Bujnowska-Fedak M, Chronaki CE, Prokosch HU, Wynn R. Informed citizen and empowered citizen in health: results from an European survey. BMC Family Practice 2011;12:20.
3. Van Uden-Kraan C, Drossaert CHC, Taal E, Smit WM, Bernelot Moens HJ, Siesling S, Seydel ER, van de Laar MAFJ. Health-related Internet use by patients with somatic diseases: frequency of use and characteristics of users. Informatics for Health & Social Care 2009;34:18–29.
4. Donelle L, Hoffman-Goetz L. Functional health literacy and cancer care conversations in online forums for retired persons. Informatics for Health & Social Care 2009;34:59–72.
5. Hoffman-Goetz L, Donelle L, Thomson MD. Clinical guidelines about diabetes and the accuracy of peer information in an unmoderated online health forum for retired persons. Informatics for Health and Social Care 2009;34:91–99.
6. Houston TK, Ford DE. A tailored Internet-delivered intervention for smoking cessation designed to encourage social support and treatment seeking: usability testing and user tracing. Informatics for Health & Social Care 2008;33:5–19.
7. Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM. The effectiveness of Web-based vs. non Web-based interventions: a meta-analysis of behavioral change outcomes. Journal of Medical Internet Research 2004;6:e40.

8. Civljak M, Sheikh A, Stead LF, Car J. Internet-based interventions for smoking cessation (Review). Cochrane Database of Systematic Reviews 2010, Issue 9. Art. No.: CD007078.
9. Graham AL, Cobb NK, Papandonatos GD, Moreno JL, Kangh H, Tinkelman DG, Bock BC, *et al*. A randomized trial of internet and telephone treatment for smoking cessation. Archives of Internal Medicine 2011;171:46–53.
10. Schneider SJ, Walter R, ÒDonnell R. Computerized communication as a medium for behavioral smoking cessation treatment: controlled evaluation. Computers in Human Behavior 1990;6:141–151.
11. Shahab L, McEwen A. Online support for smoking cessation: a systematic review of the literature. Addiction 2009;104:1792–1804.
12. Cobb NK, Graham AL, Abrams DB. Social network structure of a large online community for smoking cessation. American Journal of Public Health 2010;100:1282–1289.
13. Karren KJ, Hafen BQ, Lee Smith N, Frandsen KJ. Mind/body health: the effects of attitudes, emotions, and relationships. 3rd ed. San Francisco, CA: Pearson/Benjamin Cummings; 2006.
14. Chapple A, Ziebland S. How the internet is changing the experience of bereavement by suicide: a qualitative study in the UK. Health 2011;15:173–187.
15. Griffiths KM, Calear AL, Banfield M. Systematic review in internet support groups (ISGs) and depression (1): do ISGs reduce depressive symptoms? Journal of Medical Internet Research 2009;11:e40.
16. Bers MU, Beals LM, Chau C, Satoh K, Blume ED, DeMaso DR, Gonzales-Heydrich J. Use of a virtual community as a psychosocial support system in pediatric transplantation. Pediatric Transplantation 2010;14:261–267.
17. Kutek SM, Turnbull D, Fairweather-Schmidt AK. Rural men's subjective well being and the role of social support and sense of community: evidence for the potential benefit of enhancing informal networks. Australian Journal of Rural Health 2011;19:20–26.
18. Sum S, Mathews RM, Pourghasem M, Hughes I. Internet use as a predictor of sense of community in older people. CyberPsychology & Behavior 2009;12:235–239.
19. Chavis DM, Wandersman A. Sense of community in the urban environment: a catalyst for participation and community development. American Journal of Community Psychology 1990;18:55–81.
20. Laverack G. Health promotion practice: power & empowerment. London: SAGE; 2004.
21. Carpiano RM, Hystad PW. 'Sense of community belonging' in health surveys: what social capital is it measuring. Health Place 2011;17:606–617.
22. McMillan DW, Chavis DM. Sense of community: a definition and theory. American Journal of Community Psychology 1986;14:6–23.
23. Eysenbach G, Powell J, Englesakis M, Rizo C, Stern A. Health related virtual communities and electronic support groups: systematic review of the effects of online peer to peer interactions. British Medical Journal 2004;328:1166–1171.
24. Blanchard AL, Markus ML. The experienced 'sense' of a virtual community: characteristics and processes. Database for Advances in Information Systems 2004;35:64–79.
25. Wellmann B. Are personal communities local? A dumptarian reconsideration. Social Networks 1996;18:347–354.
26. Forster PM. Psychological sense of community in groups on the Internet. Behaviour Change 2004;21:141–146.
27. Greer BG. Psychological and social functions of an e-mail list for persons with cerebral palsy. CyberPsychology 2000;3:221–223.
28. Polder-Verkiel SE. Online responsibility: bad Samaritanism and the influence of Internet mediation. Science and Engineering Ethics 2012;18:117–141.
29. Finfgeld DL. Therapeutic groups online: the good, the bad, and the unknown. Issues in Mental Health Nursing 2000;21:241–255.
30. Chavis DM, Newbrough J. The meaning of "community" in community psychology. Journal of Community Psychology 1986;14:335–340.
31. Rappaport J. Terms of empowerment/exemplars of prevention: toward a theory for community psychology. American Journal of Community Psychology 1987;15:121–148.
32. Ferrell SJ, Coulombe TAD. Neighborhoods and neighbors: do they contribute to personal well-being? Journal of Community Psychology 2004;32:9–25.
33. Wellmann B. Computer networks as social networks. Science 2001;293:2031–2034.
34. Elvevåg B, Wynn R, Covington MA. Meaningful confusions and confusing meanings in communication in schizophrenia. Psychiatry Research 2011;186:461–464.
35. Wynn R, Bergvik S, Elvevåg B. Exaggerations in consultations between psychiatrists and patients suffering from psychotic disorders. Communication & Medicine 2009;6:95–105.

36. Snowdon DA, Kemper SJ, Mortimer JA, Greiner LH, Wekstein DR, Markesbery WR. Linguistic ability in early life and cognitive function and Alzheimer's disease in late life: findings from the Nun Study. Journal of the American Medical Association 1996;275:528–532.
37. Campbell RS, Pennebaker JW. The secret life of pronouns: flexibility in writing style and physical health. Psychological Science 2003;14:60–65.
38. Pennebaker JW, Francis ME. Cognitive, emotional and language processes in disclosure. Cognition and Emotion 1996;10:621–626.
39. Pennebaker JW, Graybeal A. Patterns of natural language use: disclosure, personality, and social integration. Current Directions 2001;10:90–93.
40. Petrie KJ, Fontanilla I, Thomas MG, Booth RJ, Pennebaker JW. Effect of written emotional expression on immune function in patients with human immunodeficiency virus infection: a randomized trial. Psychosomatic Medicine 2004: 66:272–275.
41. Cassell J, Tversky D. The language of online intercultural community formation. Journal of Computer-Mediated Communication 2005;10:2.
42. Sofer N. (2009). HTMLasText (Version 1.11). Nirsoft.net.
43. Pennebaker JW, Colder M, Sharp LK. Accelerating the coping process. Journal of Personality and Social Psychology 1990;5:528–537.
44. Pennebaker JW, Chung CK, Ireland M, Gonzales A, Booth RJ. Linguistic inquiry and word count: LIWCAustin, TX: LIWC.net, 2007.
45. Kahn JH, Tobin RM, Massey AE, Anderson JA. Measuring emotional expression with the Linguistic Inquiry and Word Count. American Journal of Psychology 2007;120:263–286.
46. Owen JE, Klapow JC, Roth DL, Tucker DC. Use of the Internet for information and support: disclosure among persons with breast and prostate cancer. Journal of Behavioral Medicine 2004;27:491–504.
47. Petrie KJ, Booth RJ, Pennebaker JW. The immunological effects of thought suppression. Journal of Personality and Social Psychology 1998;75:1264–1272.
48. StatSoft, Tulsa, OK, USA, 2004.
49. Chmiel A, Sienkiewicz J, Thelwall M, Paltoglou G, Buckley K, Kappas A, Holyst JA. Collective emotions online and their influence on community life. PloS One 2011;6:e22207.
50. Kieffer CH. Citizen empowerment: a developmental perspective. Prevention in Human Services 1984;3:9–36.
51. Le Bosse Y, Lavallée M, Lacerte D, Dube N, Nadeau J, Poercher E, Vandette L. Is community participation empirical evidence for psychological empowerment? A distinction between passive and active participation. Social Work & Social Sciences Review, 1999;8:59–82.
52. Schulz AJ, Israel BA, Zimmerman MA, Checkoway BN. Empowerment as a multi-level construct: perceived control at the individual, organizational and community levels. Health Education Research 1995;10:309–327.
53. Zimmerman MA, Israel BA, Schulz A, Checkoway B. Further explorations in empowerment theory – an empirical analysis of psychological empowerment. American Journal of Community Psychology 1992;20:707–727.
54. Zimmerman MA, Rappaport J. Citizen participation, perceived control, and psychological empowerment. American Journal of Community Psychology 1988;16:725–750.
55. Niederhoffer KG, Pennebaker JW. Linguistic style matching in social interaction. Journal of Language and Social Psychology 2002;21:337–360.
56. Reicher SD, Spears R, Postmes T. A social identity model of deindividuation phenomena. European Review of Social Psychology 1995;6:161–198.
57. Postmes T, Spears R, Lea M. The formation of group norms in computer-mediated communication. Human Communication Research 2000;26:341–371.
58. Postmes T, Spears R, Sakhel K, de Groot D. Social influence in computer-mediated communication: the effects of anonymity on group behavior. Personality and Social Psychology Bulletin 2001;27:1243–1254.
59. Wangberg SC, Nilsen O, Mittelmark MB. (submitted). Participation in an online discussion forum for smoking cessation and reduced smoking: the mediating role of self-efficacy on smoking reduction. Manuscript submitted for publication.
60. Burri M, Baujard V, Etter JF. A qualitative analysis of an internet discussion forum for recent ex-smokers. Nicotine & Tobacco Research 2006;8(Suppl 1):13–19.
61. Bandura A. Self-efficacy: the exercise of control. New York: W.H. Freeman; 1997.
62. Wangberg S, Andreassen H, Kummervold P, Wynn R, Sørensen T. Use of the internet for health purposes: trends in Norway 2000–2010. Scandinavian Journal of Caring Sciences 2009;23:691–696.
63. Andreassen HK, Wangberg SC, Wynn R, Sørensen T, Hjortdahl P. Health-related use of the Internet in the Norwegian population. Journal of the Norwegian Medical Association 2006;126:2950–2952. In Norwegian.

64. Burkitt I. Social and personal constructs. Theory & Psychology 1996;6:71–77.
65. Creswell JW. Research design: qualitative, quantitative, and mixed methods approaches. 2nd ed. Thousand Oaks, CA: Sage Publications; 2003.
66. Wallerstein N. What is the evidence on effectiveness of empowerment to improve health? Copenhagen: WHO Regional Office for Europe; 2006.
67. Long, DA., Perkins, DD. (2003). Confirmatory factor analysis of the Sense of Community Index and development of a Brief SCI. Journal of Community Psychology;31:279–296.