Persuading Peers in the Web: Social Influence and Tweeters vs. non-Tweeters

Piiastiina Tikka, Harri Oinas-Kukkonen

University of Oulu, Finland
piiastiina.tikka@oulu.fi

Abstract. The present paper describes an experiment into the effects of sharing vs. receiving roles in a behavior change intervention over a social platform, Twitter. The purpose of the experiment was to explore the possible difference in how participation styles (tweeting vs. non-tweeting) affected the participants' perceived health behavior. Participants (N=30) in two groups were either to encourage healthier eating by tweeting, or to read these messages in a Twitter feed. The findings from PLS-SEM analysis suggest that the different roles lead to different perceived health behavior outcomes. Social influence factors appeared to boost the tweeting group's efficacy appraisals, but that efficacy was not seen to influence the perceived health behavior. For the non-tweeting group, efficacy appraisal influenced perceived health behavior. These observations led to the conclusion that the tweeting role may affect one's perception of one's actual health behavior, and that for non-tweeters receiving peer support over social media supports health behavior.

Keywords: Social media; information systems; health behavior; behavior change; experiment; PLS-SEM.

1 Introduction

We have grown used to sharing parts of our lives online with other people. Some of them we know well, others less so; in any event the ether has filled with information, pictures, videos, opinions and all manner of content that could be regarded as personal immaterial property about ourselves and about others. In the context of the social Web, sharing is interaction, a series of "mutual or reciprocal actions or influence" (Collins English Dictionary). Interaction mean communication of thoughts, opinions, moods and other information, and as such it ranges from general interest to the very personal in the degree to which the content being shared relates to the person sharing it.

Interaction contains an element of influence. In social interaction people influence each other whether in real life or online. Bandura's Social Learning Theory [1] and Social Cognitive Theory [2] as well as Zajonc's work on social facilitation [3] are some of the central works that have also extended to research on social influence in the context of (persuasive) technology and information systems. In the area of technology the concepts of social influence have been considered in [4,5].

When Web users take part in a discourse by voicing opinions, endorsing views, or even just by passing on some content, there is necessarily an expectation of impact on other participants in that discourse. The content that is put forward will also reveal something of the individual sharing it, since other participants can draw conclusions about the speaker's values, political views, socio-economic status and various other characteristics. How true these characteristics are of the individual is another matter, for people are free to project many different personae in a still fairly anonymous online environment. Nevertheless, the question remains: what is the impact of the act of sharing self-generated or curated content with other online users?

The present paper describes an experiment that builds on a number of core theories of social influence and persuasion and studies the difference between active participation and passive recipient role in an online interaction situation over a social networking platform. In the present paper we are interested in seeing if sharing-based influence over a social Web platform produces different efficacy appraisals between two types of interaction styles. Based on the theories of social learning, social facilitation and cognitive dissonance we can expect there to be a difference in how the influence of interaction manifests itself in the experiment participants, depending on whether their task is to actively contribute and try and influence others or whether their task is instead simply to receive the messages. Based on the Protection Motivation Theory [6], response efficacy and self-efficacy measures are feasible indicators of potential for behavior change.

2 Background: Social influence in the Web

A system like Twitter has not been built for persuasion as such, and therefore the system features have not been design with the intention to persuade [4]. It does, however, have is the ability to leverage social influence through its own core features of message delivery, network forming, comparison, cooperation, competition and even recognition when other users re-tweet messages or "like" them. Nevertheless, how users employ all these features is up to them – just as it is equally up to them whether they use these features at all or whether they take part in anything in any way. Such is the freedom of the social Web. What, then, follows is that when people do take part, they have chosen to do so.

Using social media as a delivery channel for supporting health behavior change has been studied for example in a Twitter based experiment on smoking cessation [7], finding that such an approach was twice as effective as other methods in helping smokers to quit. Systems can employ self-referential persuasion in order for their users to stay with the system, and by creating value and content and by involving others the users remain active and more loyal to a system [8]. Social media and other systems that users are already committed to and familiar with would, thus, seem natural platforms for promoting behavior change.

Bandura's theories on social learning [1,9] are realized in a social media setting like Twitter when users see not only that other people contribute but also what they contribute. Users know that their followers can see any content they share, which can

affect the selection and style of sharing [3]. It is enough to be aware of the presence of others even if there is no certainty of their paying attention to an individual's activity for social facilitation to take place [10]. At the same time, knowing that others are sharing similar content can act as a further encouragement to share more.

Social influence features of a system are the mechanisms for how people can influence each other, but the other aspect to consider is the effect of the influencing act upon an individual performing that act. Based on Festinger's Cognitive Dissonance Theory [11], an experiment by Festinger and Carlsmith [12] showed how a conflict between cognition and behavior was adjusted internally when no obvious external justification for an anti-cognition behavior was available. In the experiment dissonance was reduced by changing a personal opinion so that it would be more in line with the requested behavior [12].

When receiving a recommendation to alter behavior, the recipient can (naturally) either accept the message or reject it. Protection Motivation Theory (PMT) explains the process of accepting or rejecting a behavior recommendation via a threat message in terms of protection motivation [13]. According to PMT, individuals engage in behaviors that aim at reducing a given risk when they have high protection motivation [14]. In essence, PMT posits that upon receiving a message that presents a threat, for example negative health consequences of a bad diet, individuals respond to the threat by considering the source, the severity and the cost of the threat and the behavior required to avoid it, reaching eventually a high or low protection motivation state [14]. Adopting behaviors that reduce the threat requires an adequate efficacy appraisal [13].

On the Web, people take on the roles of 'trailblazer' and 'tracer' in online interactions, and the social web both needs and thrives on trailblazers [15]. Such trailblazers make wading in the information flow of the Web easier for others and enable social navigation [15]. Customizing the media content sources in this way affects how for example persuasive information is processed [16]. The tracers (also referred to as lurkers) tend to form a majority of users [17], but the roles are not fixed: a tracer in one context may well be a participating contributor in another, and the two roles need each other in the ecosystem of the social Web [15]. It is, then, this continuous dynamic of interaction that creates a persuasive system in which one user can achieve a mastery experience by sharing the right things and another can assess information validity by selecting the right people to follow.

3 Method

A between-subjects (N=30) experiment was devised for the purpose of studying the difference in health message acceptance and subsequent perceived health behavior change in an online social platform context. The effects were observed of interaction style (active contribution vs. non-contribution styles), pre-test fruit and vegetable consumption, and social influence on efficacy factors and subsequently on health behavior. The experiment employed Twitter (twitter.com) as the social networking platform, owing to the systems' general availability.

3.1 Model and hypotheses

Figure 1 illustrates the research model developed for the present study. The model includes the constructs of social influence (SI), efficacy (EFF), pre-test fruit and vegetable intake (PreTI), preventative style response efficacy (REprev), and perceived health behavior change (PHBC). Overall, we hypothesized that factors contributing to higher efficacy appraisal will lead in turn to higher subsequent perceived health behavior change. In addition we wanted to determine the role of pre-test fruit and vegetable consumption in itself in the PHBC construct.

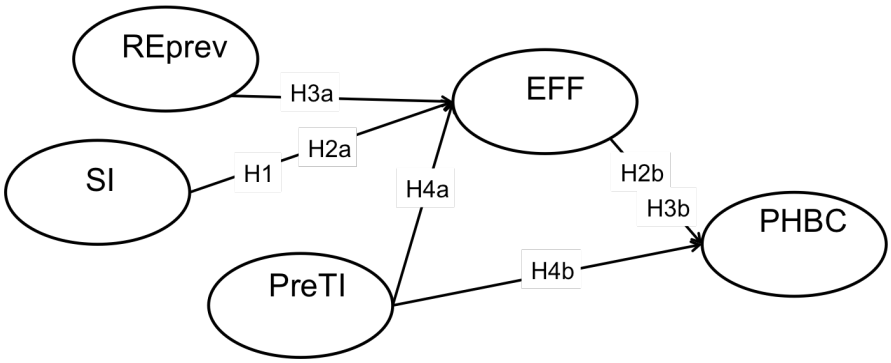

Fig. 1. Research model.

Social influence (SI). This construct is a composite of a selection of observation-based social influence factors as listed in the Persuasive Systems Design (PSD) model [4]. The full set of social influence features includes social learning, normative influence, social comparison, cooperation, competition, recognition, and social facilitation, as presented by Bandura [1,2] and Zajonc [3].

In the presented model we build upon a relationship between social influence and efficacy. Self-efficacy beliefs stem from the mastery experience [2] which is the interpreted result of previous performance: success in an activity or behavior feeds a positive self-efficacy belief for that activity. Self-efficacy can also form from observing others at an activity [2]. Seeing others complete tasks, perform activities or illustrate the common norms for behavior will motivate and encourage a system user to adopt the target behavior. Also, system users who receive praise or recognition for their actions from their peers receive confirmation and encouragement, which in turn can enhance experience of mastery. The construct of social influence (SI) comprises social comparison, social facilitation and recognition features.

It is on these grounds that we propose two hypotheses regarding the relationship between social influence and the efficacy constructs in our model:

H1: Social influence has a positive effect on efficacy.

Social influence's impact on PHBC is not included in the model as part of our parsing the constructs. Socially influencing features have been studied for example in [5].

Category variable: Active contributor (AC) and non-contributor (NC) interaction style. One group of participants were given the task of contributing information, knowledge and experiences over Twitter, thus forming the contributor group (Tweeters). Meanwhile, another group were instructed to simply observe the communication that takes place on Twitter, thereby forming the non-contributor group (Non-tweeters). Both groups were subjected to the exact same content, but participants in one group generated some of that content themselves. The two groups are a category variable in the present experiment and used as the basis for subgroup analysis.

Cognitive Dissonance Theory [11] posits that individuals strive towards consistency. If actions and cognition are not in line with each other, an individual will experience dissonance and will resort to a dissonance reduction process. In the case of endorsing healthy eating the test participants may not be experiencing a strong conflict in terms of their beliefs; they may well already be in agreement with the health message in question. However, by endorsing the message they will need some internal justification for their behavior. By justifying their behavior ("I am endorsing this message because I believe in it") the Tweeters should be more susceptible to being persuaded by the health message. On the same grounds we expected the response efficacy appraisal to benefit from the act of endorsing the message.

H2a: Active contribution style has a more positive effect on efficacy than a non-contribution style.

H2b: Active contribution style, through increased efficacy, has a stronger positive impact on perceived health behavior change than the non-contribution style.

Efficacy (EFF): Self-efficacy and Response efficacy. According to the Protection Motivation Theory (PMT), both efficacy appraisals need to be judged sufficiently high in order for an individual to be motivated to reduce a perceived (health) threat by adopting message recommendations [13]. When an individual has sufficient belief in his or her ability to carry out a behavior and likewise a sufficient belief in the efficacy of the message (that is, following the advice will reduce the threat of negative health consequences in the future), there is a higher likelihood of health message acceptance and the subsequent health behavior to reflect that acceptance. As these two efficacy types are both needed for a positive effect on behavior, our model has combined them into one construct.

H3a: Preventative response efficacy has a positive effect on the overall efficacy appraisal.

H3b: Efficacy has a positive effect on perceived health behavior change.

Pre-test fruit and vegetable intake (PreTI). A single-measure construct, PreTI offers an indication of the participants' fruit and vegetable consumption habits before the experiment. The participants' existing healthy eating habit may dictate the impact on perceived health behavior change in the sense that if participants are already eating plenty of fruit and vegetables before the experiment they are not likely to stop doing so after the experiment. However, receiving confirmation for the correct behavior that

one is already engaging in could well increase one's sense of ability and encourage carrying on or even further improving the target behavior. Therefore we hypothesize:

H4a: Pre-test fruit and vegetable intake has a positive influence on efficacy.

H4b: Pre-test fruit and vegetable intake has a positive influence on perceived health behavior change.

Perceived health behavior change (PHBC). The interest in the subsequent health behavior in the present study focuses on short-term (immediate) response to the health message, measuring the perceived health behavior change. This single variable construct is made up of open-ended responses by the participants on the perceived effect of the health message. Instead of using another food diary that measures one day very close to the experiment, the selected approach offered the participants a broader freedom to reflect on how they made their food choices after the experiment.

3.2 Measurement instruments

The present study employs a combination of previously developed and validated instruments as well as ones that have been adapted from their original form to better match the research and problem domains. Previously validated instruments are efficient, but do not necessarily produce the best match in another context [18]. All measurement instruments are available from the authors upon request.

Health behavior: Fruit and vegetable consumption (baseline and post test). The participants were asked to list everything they had eaten the day before and to try and estimate specifically the consumption of fruit and vegetables as portions. Estimating portion sizes was an element of the health message provided in the test situation. The open-ended form approach was adapted from Epton and Harris [19] to suit a group situation. On the whole, Cox et al. [20] have found that, after guidance, the portion-based estimations of fruit and vegetable consumption are realistic and reliable.

The post-test questionnaire concluded with an open-ended question "Have you noticed any difference in your food choices after taking part in the experiment? Please describe." A verbal, direct, question was selected for this item in order to probe the participants' cognition: how they observed their own behavior and thoughts after the experiment. The responses were then analyzed and broken down into single statements that were further categorized thus forming four ratings ranging from no effect to perceived effect.

Efficacy measures. Self-efficacy was measured using four items adapted by Epton and Harris [19] for the purpose of fruit and vegetable consumption from Fuchs, Leppin, Schwarzer, and Wegner [21]. Response efficacy was also measured using a set of items devised by Epton and Harris [19]. The same efficacy measures have also been used in a study of fruit and vegetable intake in an online self-affirmation context [22].

As both self-efficacy and response efficacy are required for potential behavior change, we combined these measures into a single efficacy construct in the present model and study. However, our explorative analysis revealed that the preventative response efficacy items differed from promoting ones and the self-efficacy items in

such a way that for the internal consistency of the efficacy construct it was more feasible to handle preventative efficacy items as a construct of their own.

Social influence measures. Social influence was measured using instruments adapted from earlier studies on socially influencing systems [5]. These were adapted to match the problem domain and system relevant to the present study.

3.3 Material

Health message. The health message in the experiment focused on the role of fruit and vegetables as part of a healthy, balanced diet. Specifically, the message promoted the National Nutrition Council recommendation of eating at least 500g of fruit and vegetables per day [23]. The material also provided information about a healthier diet being a factor in the avoidance of various illnesses and health risks. A focused health message in a form of a short presentation and leaflet was created on the basis of the 2014 guidance material [23].

Sample selection. The sample in the experiment was one of opportunity made up of volunteers recruited from all parts of the research. The recruitment was done via blanket e-mail and also by handing out flyers. Total of 37 people approached the researchers and volunteered for the experiment, finally 30 people participated in the test sessions.

Procedure. The experiment was conducted in six sessions. In the sessions participants were divided randomly (an A-B-A-B style division) into two groups. The procedure was explained, the participants filled pre-tweeting part of a questionnaire, received a health message presentation and materials, and after the tweeting period of the test, they filled in the post-tweeting part of the questionnaire. Approximately 24 hours later the participants were sent an e-mail link to a post-test food intake questionnaire that included the open-ended question about their perceived behavior change. Pre-made Twitter accounts were provided for participants who did not have one or did not wish to tweet on this topic to their real followers. Presence of followers was not relevant in the experiment. The participants were explained that they should consider everything from their own, personal, perspective.

Group A was instructed to be the tweeting group, group B was assigned to the more passive non-tweeting role. The tweeting groups mission was to promote the "half a kg a day" health message using any Twitter features and resources they wanted. The non-tweeting group was to receive the messages with the premise that they had a reason (personal/friend/family needing guidance) why they were interested in the topic. A # (hashtag) topic was provided for the tweeting and the following. Tweeting period was between 15 and 20 minutes. The variance in the tweeting time depended largely on the group dynamic and the pace of messaging.

In the present experiment the participants were not assessed directly on their perceived health expertise. Such perceived expertise could, potentially, play a role in the participants' responses, particularly in the Tweeter group. Some participants may have had high confidence in their health expertise to begin with, making them comfortable with offering advice to others (and vice versa). However, the participants were always instructed to act from their own perspective, using their own knowledge

or draw from the material provided in the test session. Random division into the experiment groups should also ensure a reasonable distribution of participant characteristics.

4 Data analysis and results

The research model was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The analysis tool was SmartPLS v.3.2.1. [24]. The nature of the presented research was theory developing, and therefore PLS-SEM was considered the most suitable method of analysis for explaining the variance between the constructs in the model. Typical recommendation for sample sizes with PLS-SEM analysis is 10 times the largest number of paths directed at a particular construct [25], which the sample size in the present study achieves.

4.1 Sample characteristics

There were 30 participants (14 females, 16 males) in total. Gender division between groups was near equal: 8 females and 8 males in group A, and 6 females and 8 males in group B. Age distribution was between 21 and 48 (31 years on average). The majority of participants were students from various fields of science at a university. Two thirds of the participants had used Twitter before, and of those the majority had used the service for a year or more.

4.2 Measurement model

The purpose of PLS-SEM is to predict theories [25]. PLS-SEM analysis demonstrates explained variance (R^2 values) in the constructs (latent variables), indicates the strength (β-values) of the connections (relationships) between the constructs in the model, and also tests the significance (p-values) of these relationships [26, 27]. Table 1 presents the descriptive statistics for the study (internal consistency and indicator reliability).

The overall aim was to achieve a good validity of the measures so that each item of a construct performed consistently (composite reliability and Cronbach's Alpha), and that indicator reliability (convergent validity) showed that the indicators measured the same phenomenon and shared high proportion of variance (AVE). In order to ensure such measurement model validity some indicators were omitted when they reduced the quality of the constructs. On the whole, indicator loadings and internal consistency above 0.708 were considered acceptable, though for explorative studies values above .6 are acceptable [25, 28]. In the present study composite reliability is between .852 and .888 for all items and Cronbach's alpha is above .6 for REprev and above .7 for other items. The AVE values were above the minimum suggested value of 0.50 [29]. Single item constructs do pose a potential risk of reduced validity with PLS with items that are not observable [27]. However, in the present case the single item constructs are analyzed composites from open-ended responses by the partici-

pants. Missing values (one item for one participants) were handled with mean value replacement.

Table 1. Internal consistency and indicator reliability assessment (CA= Cronbach's Alpha, CR= composite reliability). Convergent reliability is indicated using AVE and Fornell-Larcker analysis. Square roots of AVE and inter-construct correlations are shown as a bolded value.

	CA	CR	AVE	1	2	3	4	5
1. EFF	.769	.853	.594	**.785**				
2. PHBC				.568	**1.000**			
3. PreTI				.285	-.090	**1.000**		
4. SI	.855	.888	.503	.668	.514	-.046	**.655**	
5. REprev	.653	.852	.742	.450	-.099	.041	.323	**.817**

4.3 Structural model

The research model (Figure 1), was tested and the path coefficients and explained variances for the model were obtained using bootstrapping (Figure 2). The modeled constructs were reflective. Bootstrapping was done using 5000 samples and parallel processing with no sign changes.

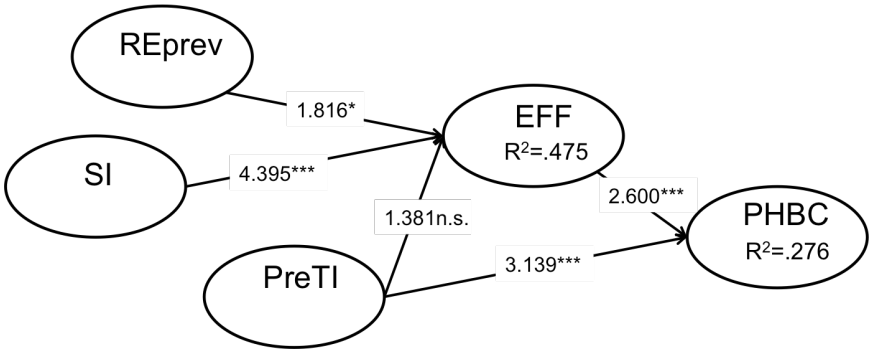

Fig. 2. PLS analysis results. ***p<.01, **p<.05, *p<.10.

In the complete model 48% of the variance in efficacy (EFF) was explained by the preventative response efficacy and social influence (SI) constructs. 28% of the variance in the perceived health behavior change (PHBC) was explained by efficacy and pre-test fruit and vegetable intake (PreTI).

4.4 Total effects and effect sizes, and predictive validity of the model

For determining practical relevance of the model, total effects and effect sizes (f^2) were assessed (table 2). With guideline values of .02, .15, and .315 to indicate small,

medium and large effect, respectively [30], we can assess a latent construct's contribution to another [25]. In the presented model all effects were valid with two small, two medium and one large f^2. Based on the effects and effect sizes we conclude that the model has some practical relevance.

	EFF	PHBC	PreTI	SI	REprev
EFF		.297 (med)			
PHBC					
PreTI	.081 (small)	.172 (med)			
SI	.585 (large)				
REprev	.088 (small)				

Table 2. Total effects and effect sizes (f^2).

We used the blindfolding procedure to assess predictive validity of the model. The Stone-Geisser cross-validated redundancy value (Q^2) is considered to suggest predictive validity of endogenous constructs when the value is >0. Both efficacy and perceived health behavior change demonstrate $Q^2>0$, thus indicating predictive relevance. For Efficacy, $Q^2=0.228$, and for PHBC $Q^2=0.182$.

4.5 Sub-group analysis

In order to examine the differences in the coefficients and the explained variances between the two groups (tweeters and non-tweeters, A and B respectively) by means of PLS analysis with bootstrapping for both groups, using 5000 samples. Tables 3 and 4 illustrate the significant paths and expected variances for the groups.

The observed difference is an interesting one, considering the two distinctly different roles the two groups had in the experiment. Group A was put in a more expert and pro-active role as regards health behavior and trying to promote it, and the results seem to suggest that existing eating habits (pre-test fruit and vegetable intake) is significant in terms of post-test perception of healthy eating. For this group efficacy and pre-test eating only contribute some 25% of the post-test perceived health behavior change. A significant path coefficient from social influence to efficacy for group A suggests that social influence does indeed boost efficacy. Some 85% of the variance in the efficacy construct for group A is explained by pre-test fruit and vegetable consumption, social influence and preventative response efficacy measure. The curious result, then, is that this sense of efficacy does not seem to carry over to the post-test perceived behavior change (PHBC). One reasonable conclusion is that the confidence boost that comes from being in the more "knowing" position, where the task is to help others and to share your own experience and perhaps even expertise with others, does indeed boost confidence and sense of ability more, and there is no perceived need to act on advice that you yourself have just offered to others – you already know this! A study into identity-related behavioral intentions [31] may offer some support for this conclusion. The study found that when an individual's identity-related behavioral intention became known socially, it tended to result in a premature sense of achieving

that aspired-to identity and consequently the individual would not enact the specific behavior.

In group B it is precisely in the path from efficacy to post-test perceived health behavior change where most significance can be observed. Social influence appears to contribute to efficacy ($p<.10$). As regards efficacy, 60% of the variance is explained by pre-test fruit and vegetable intake, social influence, and preventative response efficacy measure together. In this group, 39% of the variance in the PHBC construct is explained by efficacy and pre-test fruit and vegetable intake together – a notably higher percentage than with group A. Such observations suggest that the recipient role in the experiment has led to group B participants accepting the health advice as something they are to follow.

We hypothesized that SI would have a positive influence on EFF (H1), and that the influence would be greater for group A than for group B (H2a). In view of the path coefficients, both of these hypotheses are supported. We also hypothesized that EFF would have a positive effect on PHBC (H3b), and more so with group A than with group B (H2b). In this instance, overall the path coefficient from EFF to PHBC is significant ($p<.01$), but groupwise we can see that the result was the opposite of the hypothesis. The relationship between REprev and EFF (H3a) was found to be non-significant. PreTI was hypothesized to have a positive impact on both EFF and on PHBC, but this turned out not to be the case.

	B Subgroup A (N=16)	B Subgroup B (=14)	β Full (N=30)
EFF →PHBC	.688n.s.	2.461**	2.600***
PreTI→EFF	1.014n.s.	1.107n.s.	1.381n.s.
PreTI→PHBC	2.939***	1.165n.s.	3.139***
SI→EFF	6.065***	1.951*	4.395***
REprev→EFF	1.559n.s.	.912n.s.	1.816*

n.s. non-significant, *p<.1, **p<.05, ***p<.01

Table 3. Path coefficients (β) for the sub-group samples and the full sample. Subgroup A= Tweeters, subgroup B= Non-tweeters.

	R^2 Subgroup A (N=16)	R^2 Subgroup B (N=14)	R^2 Full (N=30)
EFF	.853 (85%)	.598 (60%)	.475 (48%)
PHBC	.247 (25%)	.392 (39%)	.276 (28%)

Table 4. Variances explained (R^2) for sub-group samples and the full sample. Supbgroup A= Tweeters, subgroup B= Non-tweeters.

5 Discussion

Peer support has been an established form in helping forming and maintaining behavior change for various health and lifestyle domains from weight loss to alcohol use cessation. Such peer support is already available online, and it is only natural to progress towards more synchronous forms of social interaction that is characteristic of social networking platforms.

In the present study we found that, as hypothesized, social influence affected efficacy (positively) and that this effect was stronger in the actively contributing group compared to the group who merely observed the discourse that was taking place on Twitter. We also confirmed that on the whole, efficacy had a positive impact on perceived health behavior change, but in this case our hypothesis that the effect would be stronger with the Tweeters turned out to be the reverse: the path was significant for the Non-tweeters.

The differences in the paths and the variance explained in the constructs led to two main conclusions. For the non-tweeting group the contributing constructs of efficacy and existing fruit and vegetable consumption style (pre-test intake) explained more of the perceived health behavior change than for the actively contributing group. For this latter group, however, social influence boosted their sense of efficacy more notably than for the other group. From this we are led to conclude that the Tweeters may have reached a premature assessment of ability and performance as regards the health behavior they were asked to promote. For the Non-tweeters efficacy did impact perceived health behavior change: they more readily accepted the health message and recognized that they made different food choices after the test.

The limitations of the present study are predominantly in the sample size (N=30). In addition, this sample was collected by recruiting from a university mailing; such a sample of opportunity naturally is weighted more heavily towards the higher-educated population. Furthermore, the sample were allowed to use a made-up Twitter account; some participants, however, were happy to use their own accounts. Regardless of these limitations, we maintain that the results from the present study give cause for designing and conducting further behavior change research in an actual social networking platform setting and real system users on the issues presented in this paper.

Having better insights into factors that affect acceptance of a behavior change message is of great importance when looking for maximum impact. On the one hand there is the great mass of social platform users, and on the other there is the potential of peer support in behavior change. Supporting that peer support in the social network environment requires understanding the mechanisms of social influence not only in general terms but also in terms of interaction styles and other behavioral traits that can be observed online. The present study focused on two interaction styles and by doing so has shared helpful knowledge about the differences between these styles. Another area of further research that touches on the present topic is the effect of synchronous communication in persuasive interactions. The role of unobtrusiveness in interactions

between a system and its user has been touched upon for example in [32], but how does the synchronicity of computer-mediated persuasion affect the perception of persuasiveness or the sustained use of a system?

Our research in the present paper offers theoretical contributions to the existing body of knowledge by demonstrating the difference in information processing and impact of social influence between participation styles. From the results we can see that generating and contributing content in a social context leads to a different outcome from receiving that content.

References

1. Bandura, A.: Social Learning Theory. Englewood Cliffs, NJ: Prentice Hall. (1976).
2. Bandura, A.: Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ: Prentice-Hall. (1986).
3. Zajonc, R.B.: Social Facilitation. Science 149, 269-274 (1965).
4. Oinas-Kukkonen, H. and Harjumaa,M.: Persuasive Systems Design: Key Issues, Process Model, and System Features. Communications of the Association for Information Systems 24, Article 28, (2009).
5. Stibe, A., Oinas-Kukkonen, H. and Lehto, T.: Exploring Social Influence on Customer Engagement: A Pilot Study on the Effects of Social Learning, Social Comparison, and Normative Influence. In: 46th Hawaii International Conference on System Sciences, pp. 2735-2744. IEEE, United States (2013).
6. Rogers, R.W.: Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In John T. Cacioppo and Richard E. Petty (Eds.), Social Psychophysiology: A sourcebook (pp. 153-176). New York: The Guildford Press. (1983).
7. Pechman, C., Delucchi, K., Lakon, C.M., and Prochaska, J.J.: Randomised controlled trial evaluation of Tweet2Quit: a social network quit-smoking intervention. (2016). Retrieved 17 April, 2016 from Tobacco Control, 2016: http://tobaccocontrol.bmj.com/content/early/2016/02/29/tobaccocontrol-2015-052768.full
8. Oduor, M. and Oinas-Kukkonen, H.: A System's Self-referential Persuasion: Understanding the Role of Persuasive User Experiences in Committing Social Web Users. 10th International Conference, PERSUASIVE 2015, Chicago, June 3-5 (2015).
9. Bandura, A.: Self-efficacy: Toward a Unifying Theory of Behavioral Change. Psychological Review 84(2), 191-215 (1977).
10. Markus, H.: The Effect of Mere Presence on Social Facilitation: An Unobtrusive Test. Journal of Experimental Social Psychology, 14, 389-397 (1978).
11. Festinger, L.A.: Theory of Cognitive Dissonance. Stanford University Press, Stanford. (1957).
12. Festinger, L.A. and Carlsmith, J.M.: Cognitive consequences of forced compliance. The Journal of Abnormal and Social Psychology 58(2), 203 (1959).
13. Rogers, R.W.: A protection motivation theory of fear appraisals and attitude change. Journal of Psychology 19, 93-114 (1975).
14. Floyd, D.L., Prentice-Dunn, S. and Rogers, R.W.: A meta-analysis of research on protection motivation theory. Journal of Applied Social Psychology 30, 407-429 (2000).

15. Oinas-Kukkonen, H. and Oinas-Kukkonen, H.: Humanizing the Web: Change and social innovation. Palgrave Macmillan, Basingstoke (2013).
16. Kang, H. and Sundar, S.S.: When Self Is the Source: Effects of Media Customization on Message Processing. Media Psychology 19(4), 561-588 (2016).
17. Muller, M., Shami, N.S., Millen, D.R. and Feinberg, J.: We are all Lurkers: Consuming Behaviors among Authors and Readers in an Enterprise File-Sharing Service. In: Proceedings the 16th ACM international conference on Supporting group work (GROUP'10), 7-10 November 2010, Sanibel Island, Florida, ACM, United States, pp. 201-210 (2010).
18. Boudreau, M.-C., Gefen, D. and Straub, D.: Validation in information systems research: a state-of-the-art assessment. MIS Quarterly 25 (1), 1-16 (2001).
19. Epton, T. and Harris, P.R.: Self-affirmation promotes health behaviour change. Health Psychology 74, 746-752 (2008).
20. Cox, D.N., Anderson, A.S., Reynolds, J., McKellar, S., Lean, M.E.J. and Mela, D.J.: Take Five, a nutrition education intervention to increase fruit and vegetable intakes: impact on consumer choice and nutrient intakes. British Journal of Nutrition 80(2), 123–131 (1998).
21. Fuchs, R., Leppin, A., Schwarzer, R. and Wegner, R.W.: Self-efficacy toward healthy eating behavior. In: Ralf Schwarzer (ed.), Measurement of perceived self-efficacy: Psychometric scales for cross-cultural research. Berlin, Germany: Freie Universität Berlin (1993).
22. Fielden, A., Sillance, L., Little, L. and Harris, P.R.: Online Self-Affirmation Increases Fruit and Vegetable Consumption in Groups at High Risk of Low Intake. Applied Psychology: Health and well-being (2016).
23. Ravitsemusneuvottelukunta (National Nutrition Council). Retrieved on April 15, 2016 from http://www.ravitsemusneuvottelukunta.fi/portal/fi/ravitsemussuositukset /suomalaiset+ravitsemussuositukset/ (2016).
24. Ringle, C.M., Wende, S. and Becker, J.-M.: "SmartPLS 3." Boenningstedt: SmartPLS GmbH, available from: http://www.smartpls.com (2015).
25. Hair, J.F., G. Hult, G.T.M., Ringle, C.M. and Sarstedt. M.: A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). SAGE Publications, Los Angeles. (2014).
26. Gefen, D. Ringdon, E.R. and Straub, D.: Editor's comment: And update and extension to SEM guidelines for administrative and social science research. MIS Quarterly 35(2), iii-xiv (2011).
27. Hair, J.F., G. Hult, G.T.M., Ringle, C.M. and Sarstedt. M.: PLS-SEM: Indeed a silver bullet. The Journal of Marketing Theory and Practice 19(2), 139-152 (2011).
28. Nunally, J.C. and Bernstein, I.H.: Psychometric Theory. New York: McGraw-Hill. (1994).
29. Fornell, C. and Larker, D.F.: Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, (18) 1, 39-50 (1981).
30. Cohen, J.: Statistical power analysis for the behavioral sciences. Mahwah, NJ: Lawrence Erlbaum (1988).
31. Gollwitzer, P.M., Sheeran, P., Michalski, V. and Seifert, A.E.: When Intentions Go Public – Does social reality widen the intention-behavior gap? Psychological Science 20(5) 612-618 (2009).
32. Tikka, P. and Oinas-Kukkonen, H.: RightOnTime: The Role of Timing and Unobtrusiveness in Behavior Change Support Systems. In: A. Meschtscherjakov et al. (eds): PERSUASIVE 2016, LNCS 9638, pp. 327 – 338 (2016).