RETAINING PARTICIPANTS IN WEB-BASED HEALTH INTERVENTION: EFFECTS OF SOCIAL CAPITAL

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Abstract

User retention could significantly affect the results of web-based health interventions, e.g. weight loss. Past research reported that social ties could have positive influence on retention in weight loss program. However, in this study, it is proposed that social capital could be the reason underlying the effects of social ties on retention and health outcomes in web-based health interventions. It is hypothesized that social capital of participants in web-based health interventions affects their health outcomes directly, and indirectly via increasing user retention in the intervention. This research used the survey method, with which we conducted a 10-week-long physician-supervised weight loss program. In total, 48 participants were recruited, and everyone was required to join in an online health community specially designed for this program. The health outcomes were measured in terms of changes in weight, body fat, waist circumference, and body mass index. The empirical results support the hypotheses and show that social capital of participants can enhance health outcomes directly and indirectly through greater user retention in web-based health intervention.

Keywords: retention, social capital, social ties, web-based health intervention.
1 INTRODUCTION

Recent studies have shown that web-based interventions can improve health outcomes through users’ behavioral changes (Wantland, Portillo, & Holzemer et al., 2004; Winters, 2007; Kobb, Hoffman, & Lodge et al., 2003). However, its effectiveness is highly deteriorated by non-usage attrition (Eysenbach, 2005), dropout (Christensen, Griffiths, & Farrer, 2009). Reduced exposure to program contents results in participants receiving lower doses of the intervention. Thus, user retention have become a well-recognized challenge (Glasgow, Christiansen, & Kurz et al., 2011; Leslie, Marshall, & Owen et al., 2005; Strecher, McClure, & Alexander et al., 2008) to the development of effective web-based health interventions.

Public health research has long known about the association between social networks, social support and health (House & Kahn, 1985). Social resources from other users could offer solutions to weak retention in web-based health interventions (Poirier & Cobb, 2012). Poirier and Cobb pointed out that social tie, as personal connections in web-based health intervention, can have positive influence to user retention. However, it is only recently that the link between social capital and health has been established (Lomas 1998; Hawe & Shiell, 2000). The social capital theory pointed out that social relationships among people could be productive resources (Coleman, 1988). Following these theoretical findings, the effects of social capital may reflect users’ reliance on the actions of other users to determine their own appropriate behavior in a given situation (informational social influence), or their underlying desire to conform to the expectations of other patients (normative social influence; Deutsch & Gerard, 1955). This effect may also explain why individuals decide to share their health-related experience and knowledge with other users, and also translate that knowledge to action, thus affecting health outcomes.

Furthermore, People who come to an online community are not just seeking information or solving problem; they also treat online community as a place to meet other people, to seek mental support, friendship and a sense of belongingness (Andrews, 2002; Zhang & Hiltz, 2003). As asserted by social cognitive theory, people acquire knowledge through observing others within the context of social interactions, experiences, and outside media influences (Bandura, 1989). When the sharing knowledge is related to the personal health information or experience, which has higher privacy concern than normal information, we believe that, it is the social capital consists of trust between individuals, norms of reciprocity and density of civic associations-that facilitate cooperation for mutual benefit, which can help people to overcome the barriers of complex knowledge sharing process, then share valuable knowledge, especially when no extrinsic reward is provided. Although previous research results have been fruitful, they only speculated that, the effect of social tie as the access to social resources and to the opportunity of exchanging knowledge (Nahapiet, & Ghoshal, 1998). In this study, we verify the speculation that social capital could be the reason underlying the effects of social ties on retention and health outcomes in web-based health interventions.

2 LITERATURE REVIEW

2.1 User retention

The web-based health intervention can affect behavioral change across multiple health conditions (Strecher, McClure, & Alexander et al., 2008; Jacobs, Clays, & De Bacquier et al., 2011), thus improve health outcomes such as increased weight loss (Glasgow, Nelson, & Kearney et al., 2007), reduced smoking prevalence (Cobb, Graham, & Bock, 2005), increased physical activity (Heesch, Mâsse, & Dunn et al., 2003; Leslie, Marshall, & Owen et al., 2005), dietary change as an increase in fruit and vegetable consumption (Couper, Alexander, & Zhang et al., 2010), and a slower health decline. Previous studies have reported that the effectiveness of web-based interventions is highly affected by non-usage attrition (Eysenbach, 2005). Christensen, Griffiths and Korten pointed out that, the efficacy trials of web interventions show good-to-excellent levels of adherence (Christensen,
Griffiths, & Korten et al., 2004). Open-access websites have been associated with poor adherence and dropout, with substantial numbers of users not completing all webpages and exiting websites before the full completion of an offered program (Eysenbach, 2005; Glasgow, 2007.) For example, Farvolden found that only 1% of participants completed a 12-week open-access panic program (Farvolden, Denisoff, & Selby et al., 2005). Christensen and colleagues reported that less than 1% of users completed all modules on an open-access website for depression (Christensen, Griffiths, & Korten et al., 2004). Couper, Alexander, and Zhang (2010) found that greater engagement is associated with the retention of participants and a positive change in the key outcome of the intervention designed to promote consumption of fruit and vegetables. As suggested by Wicks, Massagli and Frost, patients who used more features of online health community site PatientsLikeMe: an online quantitative personal research platform for patients with life-changing illnesses to share their experience using patient-reported outcomes, perceived greater benefit on treatment decisions, symptom management, clinical management and outcomes (Wicks, Massagli, & Frost et al., 2010). Given our interest in examining the effect of online user retention on health outcome at weight loss program. This leads us to propose our first hypothesis:

- **H1.** Online user retention significantly increases health outcomes of participants in web-based weight loss program.

### 2.2 Social Capital

“Social capital” initially appeared in community studies, highlighting the central importance for the survival and functioning of city neighborhoods – of the networks of strong, crosscutting personal relationships developed over time that provide the basis for trust, cooperation and collective action in such communities (Jacobs, 1965). Yli-Renko, Autio, & Sapienza (2001) pointed out that, the social interaction and network ties dimensions of social capital are indeed associated with greater knowledge acquisition. Tsai and Ghoshal (1998) shown that social capital were significantly related to the extent of interunit resource exchange. Nahapiet and Ghoshal (1998) defined social capital as “the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit”.

Social capital refers to an advantage created by the way people connected (Burt, 2005). Putnam has termed “social capital” and defined as: “features of social organization such as networks, norms and trust, that facilitate coordination and co-operation for mutual benefit” (Putnam, 1995). Social capital can be defined in terms of three distinct dimensions: structural, relational, and cognitive (Nahapiet & Ghoshal, 1998). Structural dimension defined as the overall pattern of connections between actors, relational dimension as the kind of personal relationships people have developed with each other through a history of interactions, and cognitive dimension is those resources providing shared representation, interpretations, and systems of meaning among parties. Zarit, Femia and Watson (2004) has pointed out, that the care-partners of people with dementia rated group intervention at health communities positively. Facing the same health concern, patients and their care-partners find it helpful to talk with one another and with peers in the same circumstances about the disease and its effects in an emotionally supportive atmosphere. Research has shown that peer-led communities that do not use personal data have documented benefits on patient knowledge, discussion, and health care usage: users provide one another with support, and teach each other the science and medical information they need to understand their disease (Hoch & Ferguson et al., 2005). According to Hoch et al., Web 2.0 communities compile resources and create shared knowledge that exceeds the scope of an individual. More important, patients are able to apply the evidence-based knowledge of other patients’ clinical diagnostic and therapeutic strategies to their clinical practices to improve patient care (Stewart & Abidi, 2012). Wicks, Massagli and Frost (2010) pointed out that, 21% of fibromyalgia patients changed their physician as a result of using PatientsLikeMe (n = 33 of 150), 41% of HIV patients agreed they had reduced risky behaviors (n =72 of 177) and 22% of mood disorders patients agree they need less inpatient care as a result of using the PatientsLikeMe (n = 31 of 141). However, according to Nahapiet and Ghoshal, social capital is not a universally beneficial resource. As Coleman observed (1990), a given form of social capital that is useful for facilitating certain actions may be useless or harmful for others.
We believe that the social capital consists of trust between individuals, norms of reciprocity and density of civic associations—that facilitate cooperation for mutual benefit, which is one of the key success factors for changing participant behaviour and improving health outcomes at web-based health intervention. Therefore, it’s important to explain social capital has positive influence to the health outcome. Based on the arguments detailed earlier, we put forward our second hypothesis:

- **H2.** Social capital significantly increases health outcomes of participants in web-based health intervention.

As suggested by Chiu, Hsu, and Wang (2006), social interaction ties represent the strength of the relationships, and the amount of time spent, and the communication frequency among members of virtual communities, network ties provide users with the opportunity to combine and exchange knowledge. According to Chiu, Hsu, and Wang, the expectation of personal benefits and the expectation of benefits to virtual communities can stimulate knowledge sharing. Similarly, social tie is to provide access to resources and the opportunity to exchange knowledge and anticipation of value through such exchange (Nahapiet, & Ghoshal, 1998). However, social tie may not explain why individuals decide to visit more often and spend more time in online health communities to share with other community members after their social ties have been established. In addition, especially for health-related knowledge, which leads to many privacy concerns when sharing information in a virtual community (Frost & Massagli, 2008). Therefore, identifying social capital is the resources to increase knowledge-sharing behavior in web-based health interventions can help both academics and practitioners gain insights into how to stimulate knowledge sharing in virtual communities. This leads to our third hypothesis:

- **H3.** Social capital significantly increases retention of participants in web-based health intervention.

![Figure 1. Research model](image)

### 3 METHOD

#### 3.1 Research Design

This research used survey method. We conducted a 10-week-long weight loss program with online experience sharing that includes a physician-supervised session (no medication prescription, and only health education on topics such as weight loss nutritional information, guidelines for physical activity, self-monitoring of caloric intake, benefits of monitoring weight, meal planning, and reading food labels) and an online health community’s knowledge/experience sharing. The physician-supervised sessions covered physician-supervised counseling, daily self-monitoring, use of body composition monitors, weight and activity checks and weight control knowledge building. All participants were requested to attend the physician-supervised sessions every week and they were also requested to record their daily weight and participate in the online discussion board at online health community (CareMe.tw) to share their weight loss experiences with other users. We explored the association
between Internet-mediated social support and weight loss to identify effective means of enhancing support.

3.2 Procedures

We asked eligible participants to join the weekly physician-supervised sessions and also participate in the online health community to share their health-related experience and knowledge. The physician-supervised sessions were held every Saturday morning from July 28 to October 13 of 2012. Participants’ weight, body fat and body mass index (BMI) were measured on a weekly basis. Participants’ waist circumferences were measured at 5th week and 10th week. The weight loss program was separated into two stages. Among the 48 eligible participants, participants who had not missed more than two physician-supervised sessions during the first 5 weeks could advance to the second half of the 5 weeks of the program as the Retained group (n=27). We identified those who could not continue to the second stages of the program as the Dropout group (n=21). Users’ social capitals were measured by paper-based social capital questionnaire. Forty-eight participants submitted self-reported social capital questionnaires in the first week of the program. The questionnaires were administrated right after we introduced the online health community (CareMe.tw) to participants. We analyzed the answers of the social capital questionnaire and separated the 48 participants into 2 groups. We defined the higher half of the social capital scores as the Higher Social Capital Scores Group (n=24), and defined the lower half of the social capital scores as the Lower Social Capital Scores Group (n=24), but the participants are not aware of such categorization. We also measured changes in weight loss, body fat, waist circumference, and BMI.

3.3 Participants

We recruited participants from the pool of employees at a telecommunication company in Taiwan. The incentive for participants who presented at all 10 weeks group discussion sections was USB flash drive.

- Demographics and user retention at weight loss program

Subject demographics of this research are shown in the Table 1. Forty-eight men and women aged 27-63 years were recruited in this study. After 5 weeks of the program, 21 participants were unable to continue to the second portion of the program because they had missed more than two physician-supervised sessions in the first portion of the program (Dropout group). 27 participants were able to continue into and complete the second portion of the program (Retained group). In the first week of the program, we measured the demographics data of participants as follows: 48 people (26/54.2% women, 22/45.8% men) between 27 and 63 old (41.00 years; SD = 10.12) with BMI of (Mean = 27.30; SD = 3.68) participated in this study.

<table>
<thead>
<tr>
<th></th>
<th>All Participants (n=48)</th>
<th>Dropout Group (n=21)</th>
<th>Retained Group (n=27)</th>
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<tbody>
<tr>
<td><strong>Gender</strong></td>
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</tr>
<tr>
<td>Female</td>
<td>26  (54.2%)</td>
<td>13 (61.9%)</td>
<td>13 (48.1%)</td>
</tr>
<tr>
<td>Male</td>
<td>22 (45.8%)</td>
<td>8  (38.1%)</td>
<td>14 (51.9%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>41.00 (10.12)</td>
<td>38.05 (7.66)</td>
<td>43.30 (11.30)</td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td>73.07 (12.86)</td>
<td>68.20 (11.04)</td>
<td>76.85 (13.09)</td>
</tr>
<tr>
<td><strong>Body Fat (%)</strong></td>
<td>30.86 (5.34)</td>
<td>29.70 (5.32)</td>
<td>31.76 (5.27)</td>
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</table>
sessions attended in independent variable to health outcomes. User retention at the weight loss program was used. Using a non-point Likert language and join the same weight control program, therefore we assumed capital is defined as reciprocity. Social interaction ties between users, which has been developed by paper (TR): 5 items, norm of reciprocity (NR): 2 items, and identification (ID): 4 items. As for cognitive dimensions; we measured the structural and relational dimensions of social capital by paper-based social capital questionnaire, which has been developed by Chiu, Hsu, and Wang (2006). The relational dimension of social capital refers to the presence or absence of social interaction ties between users, [social interaction ties (SIT): 4 items]. The structural dimension of social capital means trust, norm of reciprocity, and identification [trust (TR): 5 items, norm of reciprocity (NR): 2 items, and identification (ID): 4 items]. As for the cognitive dimension, social capital is defined as shared vision and shared language, since all participants are at the same company and joint the same weight control program, therefore we assumed they share the same vision and language (questionnaire items are shown at Appendix A). We collected social capital data using a 7-point Likert-type scale. User retention in web-based health intervention

<table>
<thead>
<tr>
<th></th>
<th>Mean (Standard Deviation)</th>
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<tbody>
<tr>
<td>Waist (cm)</td>
<td>36.22 (4.12)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27.30 (3.68)</td>
</tr>
</tbody>
</table>

Table 1. Demographics data of participants

3.4 The online health community platform

CareMe.tw is an online health community platform in Taiwan. CareMe.tw has a unique feature, which can calculate users’ health-related risk factors (e.g. for stroke patients, their risk factors could be Hypertension, Diabetes, Smoking, Alcohol, Vegetarian and etc. (Hsieh, Lien, & Chen, 2010)), medicine prescription records, users’ self-reported data in multiple medical questionnaires and users’ profiles such as gender, age, living location and etc. to come out relatively “health distances” between user to other users. CareMe.tw then introduces users with the closest “health distances” to each other. Thus, those with the most similar health needs can form a cognitive and social peer network. CareMe.tw facilitates the interactions between users and exposes them to one another to induce high behavioral adoption rates and increase knowledge sharing and retention in its web-based health intervention.

3.5 Measures

Every week during the program, we measured participants’ health outcomes as weight, body fat percentage and body mass index (BMI) before the weekly physician-supervised group sessions began. The waist circumferences were measured on the 1st week, 5th week and 10th week of the program. In 1st week of the program, we administered a survey questionnaire; Social Capital was measured immediately after the introduction of the online health community platform CareMe.tw. Participants’ attendances to the weekly physician-supervised group sessions and participation at the online health community were also recorded as their retention to the program.

- Weight and height, body fat percentage, waist circumference, and BMI

The dependent variable in this study is health outcomes at weight loss program, we examined the measured dependent variables at participants’ (1) weight, (2) body Fat, (3) waist circumference, and (4) body mass index (BMI). We measured weight in light clothing, without shoes, on a digital scale to 0.01 kg (Omron HBF-356 Body Composition Monitor). We measured body fat using the same body composition monitor under standardized conditions. We measured waist circumference to 0.1 cm using a non-extensible tape. Finally, we calculated the BMI as weight (in kilograms) divided by height (in meters) squared.

- Social Capital

The independent variable in this study is social capital. Social capital consisted with structural, relational and cognitive dimensions; we measured the structural and relational dimensions of social capital by paper-based social capital questionnaire, which has been developed by Chiu, Hsu, and Wang (2006).
they were requested not to attend the second half of the program (stage 2: weeks 6 to 10), and those participants were classified as the Dropout group. Participants who preceded to the second half of the program were classified as the Retained group.

3.6 Statistical analysis

We made comparisons between the 2 weight loss groups measured at 5 and 10 weeks of the program using a multivariate statistical comparison (MANOVA) on a given variable and corresponding 95% confidence intervals. When the omnibus test (MANOVA) was significant, post hoc analyses were conducted. We performed statistical analysis using the software packages SPSS for Windows (Version 7.0). We performed statistical analysis with the statistical analysis system by using the chi-square ($\chi^2$) test to determine the participants’ social capital influence on retention.

3.7 Ethics

All participants signed an informed consent form before participating in this study.

4 EMPIRICAL RESULTS

4.1 Results of effects of user retention and health outcomes

In the first hypothesis H1, we proposed that online user retention could significantly increase health outcomes in web-based weight loss program. This relationship is positive and marginally significant at the first stage result ($F(4, 43) = 2.470, p = 0.059$, see Table 2), which suggests that retained group shown significantly greater health outcome to dropout group in first half of the program (after the first 5 weeks), supporting hypothesis H1. Post hoc analyses suggested that the difference in weight loss between retain group and dropout group was significant ($F(1, 46)= 5.515, p = 0.023$) and the difference in waist circumference reduction between retain group and dropout group was significant ($F(1, 46)= 5.101, p = 0.029$). The difference in body fat reduction between retain group and dropout group was not significant ($F(1, 46)= 2.703, p = n.s.$) and the difference in BMI reduction between retain group and dropout group was not significant ($F(1, 46)= 0.115, p = n.s.$).

<table>
<thead>
<tr>
<th>All Participants (n=48)</th>
<th>Dropout Group (n=21)</th>
<th>Retained Group (n=27)</th>
<th>Retained Group (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Changes in 5th week</td>
<td>Changes in 5th week</td>
<td>Changes in 10th week</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>-0.74 $^a$ (1.21)</td>
<td>-1.76 (1.67)</td>
<td>-2.93 (2.39)</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>-0.20 (1.56)</td>
<td>-0.88 (1.28)</td>
<td>-1.08 (1.77)</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>-0.19 (0.84)</td>
<td>-0.87 (1.18)</td>
<td>-1.43 (2.50)</td>
</tr>
<tr>
<td>BMI (kg/m$^2$)</td>
<td>-0.54 (1.36)</td>
<td>-0.64 (0.59)</td>
<td>-1.06 (0.81)</td>
</tr>
</tbody>
</table>

Table 2. Health outcome of retained and dropout groups at the 5th week and 10th week

$^a$ Data expressed as Mean (Standard Deviation).

4.2 Results of effects of social capital and health outcomes

48 participants submitted analyzable self-reported social capital questionnaires at the first week of the program. We separated 48 participants into two groups (high social capital group and low social capital group). In the second hypothesis H2, we argued that social capital could significantly increase health outcome. This relationship is positive and marginally significant ($F(4, 43) = 2.372, p = 0.067$, see Table 3) suggesting that high social capital group shown significantly greater average health outcome compare to low social capital group, supporting hypothesis H2. Post hoc analyses suggested
that the difference in weight loss between high social capital group and low social capital group was significant ($F(1, 46)= 6.882, p = 0.012$) and the difference in body fat reduction between high social capital group and low social capital group was significant ($F(1, 46)= 4.436, p = 0.041$). The difference in waist circumference reduction between high social capital group and low social capital group was not significant ($F(1, 46)= 3.544, n.s.$) and the difference in BMI reduction between high social capital group and low social capital group was not significant ($F(1, 46)= .909, n.s.$).

<table>
<thead>
<tr>
<th>All Participants (n=48)</th>
<th>High Social Capital Group (n=24)</th>
<th>Low Social Capital Group (n=24)</th>
<th>Significance of change in High-SC Group vs. change in Low-SC Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>Change</td>
<td>F-value</td>
<td>p-value b</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>-2.77 a (2.71)</td>
<td>-1.18 (1.21)</td>
<td>6.882 *</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>-1.24 (1.68)</td>
<td>-0.38 (1.10)</td>
<td>4.436 *</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>-1.21 (1.77)</td>
<td>-0.43 (1.01)</td>
<td>3.544</td>
</tr>
<tr>
<td>BMI (kg/m^2)</td>
<td>-0.98 (0.93)</td>
<td>-0.68 (1.25)</td>
<td>0.909</td>
</tr>
</tbody>
</table>

Table 3. Participants’ health outcomes in the high vs. low social capital groups

- $^a$ Data expressed as Mean (Standard Deviation).
- $^b$ * $p < .05$, ** $p < .01$, *** $p < .001$

4.3 Results of effects of social capital and user retention

Of the 48 participants, 27 (56.25%) were included in the retained group, and 21 (43.75%) were included in the dropout group. In the high social capital group, 17 (70.8%) were included in the retained group, and 7 (29.2%) were included in the dropout group. For the low social capital group, 10 (41.7%) were in the retained group, and 14 (58.3%) were included in the dropout group. In the third hypothesis H3, we argued that social capital could significantly increase user retention. This relationship is positive and significant. The results of Chi-Square Test of Independence: $\chi^2$ value is 4.1481 with 1 degree of freedom, which results in a $p$-value of .0417, suggesting that high social capital group shown significantly greater user retention compare to low social capital group, supporting hypothesis H3. Table 4 shows the users retention in the high vs. low social capital groups. Hypothesis 3 is significantly supported by our data.

<table>
<thead>
<tr>
<th>Retained Group</th>
<th>All Participants (n=48)</th>
<th>High Social Capital Group (n=24)</th>
<th>Low Social Capital Group (n=24)</th>
<th>$\chi^2$ value $^b$</th>
<th>p-value $^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 * (56.25%)</td>
<td>17 (70.8%)</td>
<td>10 (41.7%)</td>
<td>4.1481</td>
<td>.0417 *</td>
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</tbody>
</table>

Table 4. Users Retention in the high vs. low Social Capital groups

- $^a$ Data expressed as Mean (Standard Deviation).
- $^b$ Chi Square ($\chi^2$) test
- $^c$ * $p < .05$, ** $p < .01$, *** $p < .001$
5 DISCUSSION AND IMPLICATIONS

5.1 Conclusion

Our results show that greater user retention in web-based health intervention and greater social capital among participants before weight loss program began can significantly improve health outcomes. Also social capital possession can help explain the increase of user retention in an online health community. These results are similar to Chiu, Hsu and Wang’s (2006) findings that social capital (as social interaction ties, trust, norm of reciprocity, identification, shared vision, and shared language) influence knowledge sharing in virtual communities, and the outcome expectations can encourage knowledge sharing in virtual communities.

User retention are positively related to the health outcomes of web-based health interventions. The results of this study suggest that social capital can help explain why user retention are increased, thus achieving better health outcomes when users are enrolled in a web-based health intervention. In addition, this study on the social capital of online health communities raises several interesting research questions: in most of the existing online health communities, patients only engage with other patients after they join the community, which means less resources in social capital could be built up before the patients began to exchange experience or knowledge. However, greater social capital could increase the health results, which were expected by patients. Therefore, could a social capital build up orientation for a new user increase the effect at the online health community? Also, could social capital possession have positive influence to users even after the weight loss program is over? Could online health community help users to maintain their weight loss for a longer period of time?

5.2 Limitations and future research

There are a number of limitations inherent in the study design that should be noted. Firstly, the requirement that participation eligibility include both attending to the group discussion sessions and being an active user at online health community. So findings may not be suitable to all Internet users. Secondly, the group discussion sessions were held on the weekend, this might have influenced participants’ dropout rate due to that extra effort of commuting is required for participants. Thirdly, the incentives paid to participation, which were equivalent across intervention arms. Further, the effort took to retain participants, relying mainly on weekly group discussion sessions and email reminders, may limit generalizability to other online interventions. Also, the discussion forum feature at online health community is definitely not all-inclusive given the rapid improvements being made in this type of Web service. There might be some emerging features that have not been included in this research but could be included in future research. For example, it would be very interesting to investigate whether the social support could be implemented by mobile applications at smart phone devices or tablet computers. Users may benefit more when he or she shares his or her health-related information to the online health community by smart mobile devices and other users can see and response more rapidly.

5.3 Managerial implications

In conclusion, our results suggest that social capital of participants can enhance health outcomes directly and indirectly through user retention in a weight loss program. The results of our study shed lights on the possible effects of social capital on health outcome in web-based health interventions and help both scholars and practitioners gain insights regarding how to leverage social resources in virtual communities. Our finding can be used to design the next generation weight loss program which supports the new online health community feature and allow users access their offline social capital via the social networking technology. Our finding might also be implemented to other web-based health interventions for diseases such as diabetes, cardiovascular disease, stroke or other chronic disease.
References


Appendix A: Social Capital Questionnaire

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<th>Structural Dimension</th>
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<tr>
<td>SIT1</td>
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<th>Relational Dimension</th>
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