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**The effect of social network site use on the psychological wellbeing of cancer patients**

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**Abstract**

Social Network Sites (SNSs) are growing in popularity and social significance. Although researchers have attempted to explain the effect of SNS use on users’ psychological well-being, previous studies have produced inconsistent results. In addition, most previous studies relied on healthy students as participants; other cohorts of SNSs users, in particular people living with serious health conditions, have been neglected.

In this study, we carried out semi-structured interviews with users of the Ovarian Cancer Australia (OCA) Facebook to assess how and in what ways SNS use impacts their psychological wellbeing. A theoretical model was proposed to develop a better understanding of the relationships between SNS use and the psychological wellbeing of cancer patients. Analysis of data collected through a subsequent quantitative survey confirmed the theoretical model and empirically revealed the extent to which SNS use impacts the psychological wellbeing of cancer patients. Findings showed use of OCA Facebook enhances social support, improves the experience of social connectedness, develops social presence and learning and ultimately improves psychological well-being of cancer patients.

**Key words**: Social Network Sites, Facebook, cancer patients, psychological well-being, social support, social connectedness, social presence, learning, theoretical model.

**INTRODUCTION**

Social Network Sites (SNSs) are networked communication platforms in which users can create profiles and content, establish connections, develop interactions with their connections, share content and consume content provided by their networks (Berger, Klier, Klier, & Probst, 2014; Ellison & Boyd, 2013). These user-oriented sites have attracted billions of people and are continually expanding (Min & Kim, 2015). The explosive growth of SNSs has made SNS use and its consequences increasingly popular topics for research (Ahn, 2011; Wilson, Gosling & Graham, 2012; Huang, Hsieh, & Wu, 2014). In particular, the effect of SNS use on users’ psychological well-being has not gone unnoticed by the academic community (Guo, Li, & Ito, 2014).

Psychological well-being is defined in the literature in terms of autonomy, personal growth, self-acceptance, life purpose, environmental mastery and positive relatedness (Ryff, 1989). Autonomy means being able to resist social pressures; personal growth refers to feelings of continued development; self-acceptance means holding positive attitudes toward oneself; life purpose is a sense of direction in life; environmental mastery is about feeling competent in creating context suitable to personal needs and values; positive relatedness is the extent to which one forms satisfying relationship with others. Psychological well-being can also be conceptualised as feeling happy, capable, well supported and satisfied with life (Huppert, 2009; Moyer, Goldenberg, Schneider, Sohl, & Knapp, 2014; Winefield, Gill, Taylor, & Pilkington, 2012).

SNSs have become an important part of many people’s lives (Ellison & Boyd, 2013), and many users spend hours using SNSs each week or even day (Junglas, Goel, Abraham, & Ives, 2013); naturally, such extensive use of a social tool has implications for psychological well-being (Reinecke & Trepte, 2014). Some studies have established correlations between the use of SNS and psychological well-being (Guo et al., 2014; Kalpidou, Costin, & Morris, 2011; Nabi, Prestin, & So, 2013); however the results have been inconsistent. Most previous studies have shown a positive relationship between the use of SNSs and individuals’ psychological well-being (Guo et al., 2014; Nabi et al., 2013; Oh, Ozkaya, & LaRose, 2014), but few studies were unable to support the existence of a positive relationship between SNS use and psychological well-being (Kalpidou et al., 2011). Inconsistent results could be due to differences in research design (Samson & Terziovski, 1999), including insufficient theoretical justification for the relationship between SNS use and psychological well-being, or focus on different mediating variables that might predict psychological well-being derived from the use of SNSs (Oh et al., 2014). For example, Kalpidou et al. (2011) used the number of SNS friends as a direct predictor of users' psychological well-being and failed to detect a positive relationship. However, Nabi et al. (2013) showed the number of Facebook friends was related to the individual’s perception of social support, which in turn was associated with greater psychological well-being (Nabi et al. 2013). Accordingly, recent studies have called for the establishment of a clear understanding of the impact of SNS use on users’ psychological well-being (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013; Reinecke & Trepte, 2014), and the development of a comprehensive theoretical model (Guo et al., 2013). Therefore, we aimed to develop a theoretical model that depicts the relationship between SNS use and the psychological well-being of cancer patients.

Most previous studies of the effect of SNSs use on psychological well-being used young and healthy students as their population sample. We selected cancer patients as the study population to investigate SNS use and psychological wellbeing because people living with serious health conditions could (theoretically) benefit greatly from SNS use. For example, SNSs use can bring together patients to exchange health-related information and emotionally support others with similar health concerns (Farmer, Holt, Cook, & Hearing, 2009; Bender, Jimenez-Marroquin, & Jadad, 2011; Westbrook, 2015). Secondly, no research to date had specifically shown the relationship between SNSs use and improvement of cancer patients’ psychological well-being (Hong, Pena-Purcell, & Ory, 2012; Erfani & Abedin, 2014). A diagnosis of cancer is a life-changing event and takes a great toll on a person’s psychological well-being (Moyer et al., 2014). Developing knowledge and providing evidence of novel tools and technologies that can improve cancer patients’ psychological well-being would be a major advance (Hong et al., 2012; McLaughlin et al., 2012).

In the next section we provide background to the research, followed by the research question. Then, we describe the research design and the theoretical foundation from which we developed our hypotheses. We then describe the online survey of SNS users that was used to empirically test the research model. Finally, we present and discuss the key findings, followed by avenues for future research, and our conclusions.

**RESEARCH BACKGROUND**

Researchers have demonstrated that SNSs such as Facebook can enhance information sharing (Pan et al., 2015; Zagaar & Paul, 2012; Zhitomirsky‐Geffet & Bratspiess, 2014; Leong, Pan, Ractham & Kaewkitipong, 2015), communication and information gathering (Thelwall & Wilkinson, 2010; Ellison & Boyd, 2013; Huang, Chu, & Chen, 2015), and the development of emotional support (Oh & Syn, 2015). Internet users are increasingly merging their online activities through SNSs (Yu, Tian, Vogel, & Kwok, 2010). SNS users can perform numerous activities – such as blogging, emailing, instant messaging and photo sharing – on a single site such as Facebook (Erfani, Abedin & Daneshgar, 2013; Abedin & Jafarzadeh, 2015).

Facebook, the most popular SNS, launched in February 2004, and had more than 900 million active users in 2015 (eBizMBA, 2015). The rapid growth in the number of SNS users makes it important to examine their impact and their potential to improve psychological well-being (Guo et al., 2013). However, as mentioned earlier, most published studies have relied on students for investigating the relationship between SNS use and psychological well-being (Liu & Yu, 2013; Guo et al., 2013); non-student users of SNSs have not been adequately investigated to date (Nabi et al., 2013).

Cancer patients use SNS such as Facebook for informational and emotional exchange (Farmer et al., 2009). Facebook enables cancer patients to share cancer-related information by posting content on their own message board, called a wall, or commenting on posted contents on others’ walls. Cancer patients spread wall posts such as links to new findings; cancer-related events and new drug trials via information distribution functionality such as “share”, needing only a single click (Bender et al., 2011). They also disseminate cancer related information through tagging engagement (Erfani et al., 2013a). Tagging engagement refers to “the act of tagging oneself and one's friends in photos or posts, as well as being tagged by friends in photos or posts” (Wisniewski, Xu, Lipford, & Bello-Ogunu, 2015 p.2). Facebook enables cancer patients to provide emotional support for each other by positing positive messages and liking each other’s’ content. Cancer patients use various messaging services, including public and private messaging. They use pubic messaging services for communication and making sense of data, and private messaging services for discussing sensitive issues that they might not be able to explore in a face-to-face environment (Erfani et al., 2013a).

SNSs such as Facebook are accessible through various communication platforms, including smartphones, tablets and laptops (Xu, Ryan, Prybutok, & Wen, 2012). The pervasive nature of Facebook, its unique features to support extensive interactions, and its accessibility through web-enabled devices makes it an ideal tool for people with mobility problems or people who are unable to interact normally due to their illnesses (Erfani, Abedin, & Daneshgar, 2013).

Despite the logically clear benefits of SNSs for health, research in SNSs and psychological well-being lacks a clear theoretical basis and empirically derived evidence for integrating these tools and data into existing health programs and systems. While the effect of other dynamic health-related web-based applications (Web 2.0) such as, blogs and forums, on the psychological well-being of cancer patients has been examined (Gustafson et al., 1994; Klemm, Hurst, Dearholt & Trone., 1998), little is known about the impact of SNS use on the psychological well-being of cancer patients (Erfani & Abedin, 2014; Hong et al., 2012) and research on the theoretical underpinnings of online cancer support is sparse (Hong et al., 2012). In this study, we addressed the fundamental question: In what ways and to what extent does SNS use impact the psychological well-being of cancer patients?

**RESEARCH DESIGN**

We used a mixed-methods approach to answer our research question. We conducted semi-structured interviews with users of the Ovarian Cancer Australia Facebook (hereafter OCA Facebook) to assess the ways in which SNS use impacts their psychological well-being. Drawing on an extensive literature review, concepts of social support, belongingness theory, sociocultural theory and social presence theory and the results of our interviews, we explained the relationship between the use of SNS and psychological well-being of cancer patients and developed a theoretical model. Then we empirically validated the factors through a quantitative survey and empirically revealed the extent to which SNS use impacts the psychological well-being of cancer patients. The theoretical basis and empirically-derived results together constitute a new and better understanding of the impact of SNS use on users’ psychological well-being.

**Case study and sample**

We adopted case study research methodology because it is appropriate for developing in-depth knowledge (Yin, 2013). We chose OCA Facebook as our research platform because it is used by large numbers of cancer patients for informational and emotional purposes (Erfani et al., 2013b). In February 2014 OCA Facebook had 9,499 members, with an average of 16 posts, 40 comments, and 15 shares every week, suggesting it is an active online environment (Hajli, 2014a).

OCA Facebook is maintained and moderated by Ovarian Cancer Australia, an independent national organization that supports ovarian cancer patients. OCA Facebook provides cancer patients with support, offers authoritative cancer-related information, promotes cancer awareness events, and suggests positive behaviours to stay healthy while living with cancer. OCA Facebook also enables people affected by ovarian cancer to connect and exchange details about their illness conditions, treatments and symptoms, and support one another. Commercial and unrelated content and negative comments and posts are not permitted.

**Interview process and participants**

We obtained ethical approval from Macquarie University’s ethics committee in November, 2013, then contacted the OCA Facebook administrator for permission to post an invitation to users of the OCA Facebook to participate in an interview. Interviewees had to be over the age of 18 and have used OCA Facebook for more than two months. Interviewees were self-selected. Twenty-five women who were affected by ovarian cancer (mean age=39 years, median=41 years, SD=5.6) and were users of OCA Facebook were interviewed. Semi-structured interviews were chosen to give the interviewer freedom to modify the format and order of questions as appropriate (Creswell, 2013). The interviews were conducted via telephone, Skype or Face-to-Face depending on participant preference, in February and March 2014. Interviewees were asked 13 open-ended questions (Supplementary File I) to gather feedback on participants’ experiences with using OCA Facebook, their assessments of their mental health states after using OCA Facebook, and their perceptions of the usefulness and helpfulness of OCA Facebook. Interviewees also estimated the amount of time they spent on OCA Facebook (frequency, duration), and described their history of OCA Facebook use and the specific activities they undertook while using OCA Facebook. Interviews took around 45 minutes and were audiotaped with permission from the interviewees. The interviews were transcribed for qualitative data analysis.

**Data analysis and summary of findings from interviews**

Thematic analysis, the process of collecting candidate themes and creating relationships between themes, was used to identify, analyse and report themes, (Kuch, 1982; Vaismoradi, Turune, & Bondas, 2013). Responses were coded in six phases: familiarisation with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final reports. We uploaded each transcript to NVivo and read it several times before coding began. We reviewed each transcript to become familiar with the data and to identify responses to each interview question. This was followed by a synthesis phase in which we identified the categories linked to the research objectives; particular attention was paid to the ways that interviewees used OCA Facebook and how this related to their psychological well-being. Concepts (explanatory ideas) were identified from the data and given a label or code that described them. The text was divided into meaning units that were then condensed. The condensed meaning units were abstracted and labelled with code. The various codes were compared and sorted into nodes in NVivo. Thematic analysis of interviewees’ responses to the open-ended questions discovered three themes: (1) Active and passive use of OCA Facebook (active use refers to activities such as chatting, liking, creating content and sending messages, while passive use includes observing the content and monitoring posts), (2) factors that mediate the relationship between OCA Facebook use and the psychological well-being of cancer patients (using OCA Facebook supported interviewees to experience a sense of belonging and a sense of being with others, and enabled them to obtain advice and support, allowed them to develop effective communication as well as gain knowledge and learn) (3) experiencing psychological well-being (interviewees reported they could experience happiness, satisfaction, positive affect and being well supported, and also could develop satisfactory friendships with members of OCA Facebook and were willing to continue growth in their health condition). The summary of descriptive results is presented in Figure 1. Further findings from the interviews were used to develop the theoretical model, and are discussed in the following section.

Please Insert FIG #1 Here

FIG1. Thematic map of OCA Facebook use and psychological well-being

**MODEL AND HYPOTHESES**

This section outlines a theoretical model with eight hypotheses developed from the literature and combines them with findings from our interviews to outline the relationship between SNS use and the psychological well-being of cancer patients.

**Social Support**

A recurring central theme within the literature and our interviews is the role of SNSs in developing social support. Social support theory helps to explain how interactions through computer-mediated communication can offer health related benefits (Morrison, 2015). Shumaker and Brownell (1984) defined social support as “an exchange of resources between two individuals perceived by the provider or recipient to be intended to enhance the well-being of the recipient” (p.13). Cutrona and Suhr (1992) listed five different types of social support: esteem support, emotional support, tangible support, network support and informational support. Esteem support refers to expressions of positive communication behaviours for support seekers’ skill. Emotional support refers to expressions of caring, sympathy, listening, understanding, empathy, and encouragement. Network support refers to expressions of companionship and connection. Tangible or instrumental support is the provision of needed goods and services. Informational support refers to guidance, advice, facts, stories of personal experience, opinions and referrals to other sources of data and information that aims to eliminate or solve support seekers’ problems or help in evaluating situations (Chang, 2009).

Informational support and emotional support are two main types of social support offered in online health communities. (Cobb, 1976; Hajli, 2014b; Zhang & Yang, 2015). Studies have shown social support to be a product of social connections (Chuang & Yang, 2014; Lin, Hsu, Cheng, & Chiu, 2015; Zhang & Yang, 2015) and a predictor of health outcomes, such as greater well-being (Bui, Yen, & Honavar, 2015; Wright, 2012). Rubenstein (2014) showed information and emotional support was exchanged among members of an online breast cancer group. In a study of the influence of social support on quality of life measures (including emotional and social well-being) in 3,139 women who were diagnosed with and survived breast cancer from 2006 to 2011, greater social support was found to be related to higher emotional and social well-being after diagnosis (Kroenke et al., 2013). A longitudinal content analysis of more than 33,200 postings from an online breast cancer bulletin board showed a positive relationship between participation in Internet-based groups and the psychosocial well-being of cancer patients (Rodgers & Chen, 2005).

Evidence of informational and emotional support was present in our interview findings. Cancer patients reported that they experienced more informational and emotional social support through using OCA Facebook than before they began using it. They began to feel well supported, positive and able to resist social pressures. For example, one of the interviewees said:When doctors have told you that you might not make it to Christmas it doesn't give you much hope, but when you use [OCA Facebook] and read their hopeful quotes you say doctors are not God and they don't know what is going to happen so, yes, look, there is much caring and understanding there and it does make you feel positive. (Interviewee #6)

Another interviewee noted: I was talking to someone and commenting on her comments then she told me that there is a trial that I might be able to be involved to, there is so much information that you need. (Interviewee #4)

Given the above findings, we propose that:

H1: A positive relationship exists between using Facebook and social support.

H2: Social support has a positive effect on the psychological well-being of cancer patients.

**Social Connectedness**

Social connectedness is described as emotional connectedness and a sense of belonging between an individual and other people (Pearson, Carmon, Tobola, & Fowler, 2010) that is formed through social connections and positive relationships (Abubakar, Van de Vijver, Mazrui, Murugami & Arasa, 2014). It is closely related to belongingness theory, as first posited by Baumeister and Leary (1995), which states individuals develop meaningful relationships to experience a sense of belonging and consequently experience greater psychological well-being. Studies have shown a positive correlation between the integration of SNS and social connectedness (Utz, 2015) that promotes well-being (Agosto, Abbas, & Naughton, 2012). Morris et al. (2014) showed participating in online support groups enabled cancer survivors to experience a sense of belonging. Another study that examined the psychosocial benefits of Internet community group participation for women with breast cancer showed breast cancer survivors could experience a sense of belonging in online discussion groups and ultimately experience greater well-being (Rodgers & Chen, 2005).

Findings from our interviews support the above assertions. Our interviewees noted that OCA Facebook use enabled them to experience social connectedness and ultimately develop satisfying relationships with other people in OCA Facebook and feel happy and positive. For example, one of our interviewees noted: I feel I belong to the community that is specific for people like me, I could meet new people and get some friendship from it and I could make sense of information provided by my doctors and feel good and happy. (Interviewee #21).

This evidence led us to propose the following hypotheses:

H3: A positive relation exists between using Facebook and social connectedness.

H4: Social connectedness has a positive effect on psychological well-being of cancer patients.

**Learning**

Sociocultural Theory (SCT) states learning as a social process that occurs through conducting interactions or observing interactions (Lantolf, 1994). According to SCT successful learning involves moving from object and other regulation to self-regulation. Object regulation is the stage that learners start to learn by the object they observe in a social environment. Other regulation stage is when learners learn by obtaining assistant and receiving feedback from peers or mentors in a social environment. Self-regulation stage is when learner becomes competent enough to preform independently (Lantolf, 1994). Learning outcomes span three domains: cognitive, affective and skill-based (Schmidt & Ford, 2003). Cognitive learning includes gaining knowledge and comprehension. The affective domain refers to emotional learning and the ability to deal with situations such as individuals’ satisfaction, self-esteem and appreciation of the learning experience. The skill-based domain of learning outcomes refers to the expansion of critical thinking to solve problems (Schmidt & Ford, 2003). Du, Hao, Kwok and Wagner (2010) state, “Effective learning is a process of guided individual self-practice with both explicitly and implicitly reinforced peer-influence” (p.2133).

Researchers reported that the learning that occurred in computer-mediated support groups for women with breast cancer was associated with improved health outcomes (Shaw, Hawkins, McTavish, Pingree, & Gustafson, 2006). Studies of interactive cancer communication systems showed breast cancer patients using the Comprehensive Health Enhancement Support System learned how to take charge of their treatment, and ultimately experienced better psychological well- being (Gustafson et al., 1994).

In line with the above findings, our interviewees reported that the use of OCA Facebook enabled them to learn new things about what works and what doesn’t, as well as acquire knowledge of similar situations in the past and present, gain the ability to deal with cancer-related problems and consequently feel more positive and be encouraged to continue development. For example, one of the interviewees noted: Using OCA Facebook enabled me to learn about my illness and cancer risks, and I learned different ways to cope with my cancer and I like to learn more. (Interviewee #20)

Based on this evidence, we developed the following hypotheses:

H5: A positive relationship exists between using Facebook and learning.

H6: learning has a positive effect on the psychological well-being of cancer patients.

**Social Presence**

Social presence is defined as the degree of salience of the other person in the interaction (Short, Williams, & Christie, 1976), a sense of human contact and experience of others’ presence in a social environment (Lee, Kozar, & Larsen, 2009; Ning Shen & Khalifa, 2008; Biocca, Harms, & Burgoon, 2003). Social Presence Theory (SPT) postulates that communication is effective if the medium has the social presence appropriate for the level of interpersonal involvement required for a task (Short et al., 1976). According to SPT, the degree of social presence varies in different media depending on its capability for rapid feedback, conveying non-verbal cues, and reducing communication ambiguity.

Liu, Cheung, and Lee (2015) showed a positive link between experiencing social presence and enhancing users’ satisfaction. Studies on Internet-based communication systems showed that participating in online cancer-related discussion groups enabled cancer patients to experience social presence that was related to emotional well-being promotion (Walther, Pingree, & Hawkins, 2005). Similarly, findings from our interviews showed that the use of OCA Facebook enabled our interviewees to feel the presence of others through receiving private or public messages, liking comments, tagging photos, sharing content and poking. Our interviewees also acknowledged the technical features of Facebook that enabled them to conduct aural and visual interaction with others, helped them to experience sociability, human warmth and understandable communication. The latter made them feel more satisfied and helped them to meet their social needs. For example, one of the respondents pointed out that: Communication on OCA Facebook is completely understandable since you can use different tools for delivering your message, such as posting photos, conducting video chats, all of them that would decrease ambiguity which allows you to understand what you need and experience more pleasing feelings. (Interviewee #14)

The above discussion led to the following hypotheses:

H7: A positive relationship exists between using Facebook and social presence.

H8: Social presence has a positive effect on psychological well-being of cancer patients.

Figure 2 presents the theoretical model of this research. This model is a summary of the theoretical perspectives on the proposed relationship between the use of Facebook by cancer patients and its impact on their psychological well-being. As this theoretical model shows, the use of OCA Facebook is expected to contribute positively to cancer patients’ social support, learning, social connectedness and social presence, which will consequently impact their psychological well-being.

Please Insert FIG #2 Here

 FIG 2.Theoretical model of OCA Facebook Use and Psychological Well-being of cancer patients

**Testing the Model and Hypotheses**

An online questionnaire was used to collect the data and test the theoretical model. This section outlines the measurement instruments, data collection, data analysis, demographics and descriptive statistics, validity and reliability analysis, and testing of the theoretical model.

**Measurement Instruments**

To collect data, we designed the questionnaire in four steps. First we reviewed the field studies with the overall intention of capturing cancer patients’ perceptions of the impact of using SNS use on their psychological well-being. A group containing the possible items was developed for the evaluation of OCA Facebook use, social support, social connectedness, social presence, learning and psychological well-being. The instruments identified are listed in Table 1. Indicators for each construct were listed, then indicators were merged when two or more indicators had exact or similar names and/or definitions, or their corresponding definition reflected the same concept. Next, content validity of measures was evaluated. Content validity refers to the extent to which empirical measurements reflects a specific domain of content. According to Bollen (2014), content validity is a qualitative type of validity in which the analyst judges whether the measure fully represents the domain. To ensure the content validity of all the measurements, 10 experts in information systems, health and psychological well-being were consulted for comments and suggestions on the constructs and the questionnaire. As a result, the constructs were revised and refined, including six items for Facebook use, five items for social connectedness, five items for social support, five items for social presence, four items for learning, and seven items for psychological wellbeing. Finally, the reliability and validity of the constructs were tested using exploratory factor analysis. As a result, one psychological well-being item and two OCA Facebook use items and one social support, social connectedness and social presence item were eliminated because of their insignificant loading coefficients. The revised constructs showed consistency, reliability and validity. Consequently, the final questionnaire contained five items dealing with OCA Facebook use, four items for social connectedness, four items for social support, four items for social presence, four items for learning, and six items for psychological wellbeing (Supplementary file II).

TABLE 1. Previous relevant instruments and constructs.

|  |  |
| --- | --- |
| **Construct/Study** | **Brief overview of measurement target and mode** |
| **Facebook use** |  |
| Ellison et al., 2007 | Measuring Facebook intensity |
| Xu et al., 2012 | Measuring social network site usage |
| Burke, Marlow, & Lento, 2010 | Measuring type of social network site usage |
| Social connectedness |  |
| Grieve et al., 2013 | Measuring social connectedness in online communities |
| Lee et al., 2000 | Measuring social connectedness for psychological outcomes |
| Van Bel, Smolders, Ijsselsteijn, & de Kort, 2009 | Measuring social connectedness in different communication systems  |
| Learning |  |
| Yu et al., 2010 | Measuring learning in online social networking sites |
| Jenkins, 2011 | Measuring the effect of learning on well-being |
| Social support |  |
| Lin et al., 2015 | Measuring social support in an online environment |
| Eastin & LaRose, 2005 | Measuring social support in online communities |
| Oh et al., 2014 | Measuring social support in social network sites |
| Social presence |  |
| Gefen & Straub.,2003 | Measuring social presence in online communities |
| Richardson & Swan, 2003 | Measuring social presence in an online environment |
| Xu et al., 2012 | Measuring social presence in social network sites  |
| Psychological well-being |  |
| Ryff, 1989 | Measuring psychological well-being in terms of self-acceptance, positive relatedness, autonomy, environmental mastery, purpose of life, personal growth |
| Winefield et al., 2012 | Measuring psychological well-being in terms of happiness and satisfaction with life |

**Data collection**

Data was collected through a questionnaire posted on OCA Facebook between May and July 2014. A summary of the research proposal and a link to the survey was posted on the OCA website, as well as OCA Facebook, to invite people affected by ovarian cancer to participate in the survey. In order to be eligible to participate in the survey, respondents had to be over the age of 18, and have been a user of OCA Facebook for more than two months. This ensured that members had a good level of experience and familiarity with OCA Facebook. Informed consent was obtained from all respondents, who were informed that they could terminate participation at any time during the research. No personal or identifiable information was collected. A total of 163 responses were received, of which nine were ineligible or inadequate: two did not meet the criteria of age and minimum time of OCA use, two gave incomplete responses, and five “unengaged” respondents (who had no variance in their responses) were excluded. The remaining 154 responses were used to test the model. Non-response bias was measured by comparing the responses of early and late responders. We split the sample into two halves based on the time when each response was received (Sivo, Saunders, Chang, & Jiang 2006). We then compared the early response group with the late response group in terms of respondents’ demographics (age and OCA Facebook use experience) and their responses about principal constructs of the study. The average ages for the early and late responders were 38.2 and 38.1, respectively, not significantly different (t = 0.21). The average OCA Facebook use experience (in months) for the early and late responders was 14.5 and 13.8 respectively, again not significantly different (t = 1.13). We therefore concluded that nonresponse bias was not a significant threat.

**Demographics and Descriptive Statistics**

Responses came from all six Australian states, as well as New Zealand and the UK. A third of the respondents (33%) were women aged 36 to 45 years. Over a third of respondents (35%) had used OCA Facebook for more than 12 months but less than 17 months. Respondent mean age was 38 years, with a mean of 14 months of use of OCA Facebook. The respondents’ demographic backgrounds are summarised in Supplementary file III.

**Data analysis**

Data analysis was conducted in two steps. This two-step approach establishes the reliability and validity of the measures before the structural relationship of the model is assessed. In the first step, the reliability and validity of the constructs were assessed to ensure the appropriateness of the measurement model. In the second step, the hypotheses were examined (Hu, Lin, & Pan, 2013).

*Validity and reliability analysis*

Construct reliability is the degree to which a research instrument gives consistent results. A value of Cronbach’s alpha greater than 0.7 suggests good reliability (Gefen & Straub, 2000; Sun, Wang, Yin, & Zhang, 2015). Cronbach’s α values are shown in Table 2; all were higher than 0.80, exceeding the cut-off point for confirmatory research (Markus, 2012).

TABLE 2. Construct reliability.

|  |  |  |
| --- | --- | --- |
|   | **Construct** | **Cronbach’s α** |
| 1 | OCA Facebook use | 0.82 |
| 2 | Social presence | 0.81 |
| 3 | Learning | 0.81 |
| 4 | Social connectedness | 0.87 |
| 5 | Social support | 0.83 |
| 6 | Psychological well-being | 0.90 |

Next, the validity of the measurement models was tested. Validity refers to the accuracy of an instrument in measuring what it is trying to measure (Byrne, 2013). A confirmatory factor analysis was conducted to check the construct validity (Arbuckle, 2013). The fit indices used in this study to estimate measurement models were the Comparative Fit Index (CFI), Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI). These fit indices were chosen because of their ability to adjust for model complexity and degrees of freedom. According to Hu and Bentler (1999), 0.90 is an acceptable minimum for GFI. CFI values of 0.95 are considered an excellent fit, while 0.80 is acceptable, and recommend a value of less than 3 for the CMIN/DF index (Kline, 2006; Hu et al., 2013). A minimum cut-off of 0.80 is recommended for the AGFI index (McDonald & Ho, 2002). As Table 3 shows, the results of the factor analysis for construct loading and goodness-of-fit statistics relating to each measurement model assure a satisfactory fit.

TABLE 3. Validity measures.

|  |  |
| --- | --- |
| **Constructs and items**  | **Factor Loading**  |
| **OCA Facebook Use** |  |
| On average every day I use the Ovarian Cancer Australia Facebook | .723 |
| For each log session, I use Ovarian Cancer Australia Facebook for a long time | .778 |
| On Ovarian Cancer Australia Facebook, I often post something | .736 |
| On Ovarian Cancer Australia Facebook, I often view something | .697 |
| On Ovarian Cancer Australia Facebook, I often reply to others | .671 |
| Goodness-of-fit of the model: CIMIN: 2, AGFI: .99, CFI: .98, GFI: .99 |
| **Social support** |  |
| Members of the Ovarian Cancer Australia Facebook tell me what they did in a situation similar to mine | .848 |
| Members of the Ovarian Cancer Australia Facebook offer me suggestions and advice about how to cope with cancer related problems | .822 |
| Members of the Ovarian Cancer Australia Facebook care about my cancer related concerns and worries | .818 |
| Members of the Ovarian Cancer Australia Facebook care about my feelings and my health conditions | .633 |
| Goodness-of-fit of the model: CIMIN: 2.1, AGFI: .91, CFI: .97, GFI: .97 |  |
| **Social Connectedness** |  |
| I feel close to people on the Ovarian Cancer Australia Facebook | .620 |
| I am not understood by members of the Ovarian Cancer Australia Facebook | .903 |
| I see people as friendly and approachable on the Ovarian Cancer Australia Facebook | .753 |
| I am comfortable around other members on the Ovarian Cancer Australia Facebook | .906 |
| Goodness-of-fit of the model: CIMIN: 2, AGFI: .93, CFI: .96, GFI: .97 |  |
| **Learning** |
| Using the Ovarian Cancer Australia Facebook makes me feel competent in adopting healthy behaviours | .650 |
| Using the Ovarian Cancer Australia Facebook makes me feel that I am able to do things as well as other people | .832 |
| Using the Ovarian Cancer Australia Facebook helps me to have a positive attitude toward myself | .690 |
| Using the Ovarian Cancer Australia Facebook makes me feel satisfied with myself | .687 |
| Goodness-of-fit of the model: CIMIN: 2.3, AGFI: .92, CFI: .96, GFI: .97 |  |
| **Social Presence** |
| There is a sense of sociability in the Ovarian Cancer Australia Facebook | .764 |
| I hardly notice the other individuals on the Ovarian Cancer Australia Facebook | .701 |
| I understand others' communication on the Ovarian Cancer Australia Facebook | .616 |
| My interaction with other members on the Ovarian Cancer Australia Facebook is clear and understandable | .782 |
| Goodness-of-fit of the model: CIMIN: 2, AGFI: .96, CFI: .97 , GFI: .97 |  |
| **Psychological well-being** |  |
| I like to make improvement in my health | .833 |
| I don’t feel remote from others | .768 |
| I am capable of improving my health | .738 |
| I can control cancer related irritations | .899 |
| I am good at dealing with cancer related problems | .716 |
| I lack companionship | .783 |
| Goodness-of-fit of the model: CIMIN: 2, AGFI: .91, CFI: .98 , GFI: .96 |  |

According to Cook and Campbell (1979), an instrument has convergent validity if the correlations between measures of the same construct using different methods are high. A test of each item’s coefficient was used to assess convergent validity. If each item’s coefficient is greater than twice its standard error, then measures indicate high convergent validity (Bagozzi & Heatherton, 1994; Hoskisson, Hitt, Johnson, & Moesel, 1993). The standard error of each retained item is presented in Table 4. All t-values are significant, indicating high convergence validity.

Discriminant validity was tested to assess to what degree measures of different constructs were discrete (Arazy & Kopak, 2011; Hoskisson et al., 1993). According to Crocker and Algina (1986), discriminant validity is present if the correlations between measures of different factors using the same method of measurement are lower than the reliability coefficients. Cronbach’sα and the bivariate correlations between the six constructs in our research model are presented in Table 5. All correlation coefficients are lower than the reliability coefficients, suggesting that all constructs in our research model are discrete.

TABLE4. Convergent validity of constructs

|  |  |  |
| --- | --- | --- |
|  **Constructs** | **Loading Factor**  | **Standard error** **Erorror**  |
| **OCA Facebook Use** |  |  |
| On average every day I use the Ovarian Cancer Australia Facebook | .723 |  |
| For each log session, I use Ovarian Cancer Australia Facebook for a long time | .778 | .137 |
| On Ovarian Cancer Australia Facebook, I often post something | .736 | .139 |
| On Ovarian Cancer Australia Facebook, I often view something | .697 | .126 |
| On Ovarian Cancer Australia Facebook, I often reply to others | .671 | .136 |
| **Social Support** |  |  |
| Members of the Ovarian Cancer Australia Facebook tell me what they did in a situation similar to mine | .848 |  |
| Members of the Ovarian Cancer Australia Facebook offer me suggestions and advice about how to cope with cancer related problems | .822 | .164 |
| Members of the Ovarian Cancer Australia Facebook care about my cancer related concerns and worries | .818 | .169 |
| Members of the Ovarian Cancer Australia Facebook care about my feelings and my health conditions | .633 | .157 |
| **Social Connectedness** |  |  |
| I feel close to people on the Ovarian Cancer Australia Facebook | .620 |  |
| I am not understood by members of the Ovarian Cancer Australia Facebook | .903 | .142 |
| I see people as friendly and approachable on the Ovarian Cancer Australia Facebook | .753 | .124 |
| I am comfortable around other members on the Ovarian Cancer Australia Facebook | .906 | .136 |
| **Learning** |  |  |
| Using the Ovarian Cancer Australia Facebook makes me feel competent in adopting healthy behaviours | .650 |  |
| Using the Ovarian Cancer Australia Facebook makes me feel that I am able to do things as well as other people | .832 | .179 |
| Using the Ovarian Cancer Australia Facebook helps me to have a positive attitude toward myself | .690 | .168 |
| Using the Ovarian Cancer Australia Facebook makes me feel satisfied with myself | .687 | .157 |
| **Social Presence** |  |  |
| There is a sense of sociability in the Ovarian Cancer Australia Facebook | .764 |  |
| I hardly notice the other individuals on the Ovarian Cancer Australia Facebook | .701 | .120 |
| I understand others' communication on the Ovarian Cancer Australia Facebook | .616 | .120 |
| My interaction with other members on the Ovarian Cancer Australia Facebook is clear and understandable | .782 | .123 |
| **Psychological well-being** |  |  |
| I like to make improvement in my health | .833 |  |
| I don’t feel remote from others | .768 | .088 |
| I am capable of improving my health | .738 | .072 |
| I can control cancer related irritations | .899 | .083 |
| I am good at dealing with cancer related problems | .716 | .081 |
| I lack companionship | .783 | .016 |

TABLE 5. Cronbach’s α, and bivariate correlations for the variables in the model.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **1** | **2** | **3** | **4** | **5** | **6** | **Cronbach’s α** |
| Social presence | 1.00 |  |  |  |  |  | 0.81 |
| Psychological well-being | .739\*\* | 1.00 |  |  |  |  | 0.90 |
| Learning | .778\*\* | .770\*\* | 1.00 |  |  |  | 0.81 |
| Social connectedness | .716\*\* | .736\*\* | .744\*\* | 1.00 |  |  | 0.87 |
| Social support | .785\*\* | .713\*\* | .706\*\* | .772\*\* | 1.00 |  | 0.83 |
| OCA Facebook use | .756\*\* | .766\*\* | .756\*\* | .714\*\* | .669\*\* | 1.00 | 0.82 |

Note: \*\* Significant at the 0.05 level; \*\*\* Significant at the 0.01 level.

**Testing the Theoretical Model**

Results of fitness indices show an adequate model fit. The achieved CFI for the model was 0.95, which indicates an excellent fit. Also, a GFI of 0.92, AGFI of 0.82, and CMIN/DF of 2 were achieved, which again indicated satisfactory results (Steiger & Lind, 1980). Structural equation analysis (Figure 3 and Table 6) showed that OCA Facebook use positively impacts on the four mediating factors (social support, social connectedness, learning and social presence), and consequently has a positive impact on cancer patients’ psychological well-being. A series of Sobel tests was carried out to assess the significance of indirect effects between the variables in the model. For the indirect effect of OCA Facebook use on psychological well-being was mediated by social support( p<.001). Social connectedness also significantly mediated the effect of OCA Facebook use on psychological wellbeing (p < .001). In addition, the effects of OCA Facebook use were significantly mediated by social presence (p <.05), as well as by learning (p <.001). Thus, Sobel tests confirmed the four mediating factors significantly mediated the effect of OCA Facebook use on psychological well-being (Baron & Kenny, 1986).

TABLE 6. Structural equation analysis: regression coefficients

|  |  |  |  |
| --- | --- | --- | --- |
| Description of path  |  | Path coefficient | Significance |
| OCA Facebook use | ---> | Social connectedness | .856 | 0.000 |
| OCA Facebook use | ---> | Social support | .869 | 0.000 |
| OCA Facebook use | ---> | Social presence | .534 | 0.000 |
| OCA Facebook use | ---> | Learning  | .812 | 0.000 |
| Learning | ---> | Psychological well-being | .170 | 0.000 |
| Social presence | ---> | Psychological well-being | .142 | 0.000 |
| Social support | ---> | Psychological well-being | .413 | 0.004 |
| Social connectedness | ---> | Psychological well-being | .262 | 0.009 |
| CIMIN: 3, GFI: 0.92, AGFI: 0.82, CFI: 0.95 |  |

Table 6 and Figure 3 show the results support all the research hypotheses. To recap, OCA Facebook use has a positive influence on social support (hypothesis 1), and the same positive and significant relationship exists between social support and psychological well-being, confirming hypothesis 2. The statistically significant relationship between OCA Facebook use and social connectedness supports hypothesis 3, and that between social connectedness and psychological well-being supports hypothesis 4. Similarly, significant positive relationships were identified between OCA Facebook use and learning (hypothesis 5) and between learning and psychological well-being (hypothesis 6). Finally, a positive and significant relationship between OCA Facebook use and social presence confirms hypothesis 7, and the significant relationship between social presence and psychological well-being supports hypothesis 8.

Please Insert FIG #3 Here

FIG 3.Structural model for the relationship between OCA Facebook use and the psychological well-being of cancer-patients

**DISCUSSION**

This study used a mixed-methods research design to examine the effect of SNS use on the psychological well-being of cancer patients. The results of interviews and a quantitative survey showed an overall positive relationship between the use of OCA Facebook and the psychological well-being of cancer patients. Findings from this study are in line with previous studies that showed the use of other dynamic health-related web-based applications (Web2.0) including blogs and forums, were associated with improved psychological well-being of breast cancer patients (Erfani & Abedin, 2014; Gustafson et al., 2005; Hong et al., 2012; Høybye et al., 2010; Klemm et al.1998). The results are also consistent with those of studies that showed SNSs use was positively associated with the psychological well-being of students (Nabi et al., 2013; Grieve et al., 2013; Guo et al., 2014). Our study extends the literature by showing that the relationship between the use of SNS and psychological wellbeing for cancer patients.

This study identified factors that mediate the relationship between the use of SNS and psychological well-being of cancer patients. The findings of this study supported all the hypothesised relationships in the research model. The results showed that OCA Facebook use increased social support, which in turn positively influenced the psychological well-being of cancer patients. This study confirmed the importance of SNS use for developing social support. This finding aligns with previous studies that suggested a positive relationship between participation in Internet-based support groups and obtaining social support (Kroenke et al., 2013; Rubenstein, 2014) and ultimately improved psychological well-being of cancer patients (Høybye et al., 2010).

Findings showed a positive relationship between OCA Facebook use and social connectedness, as well as a positive and significant relationship between social connectedness and the psychological well-being of cancer patients. These results confirm the third and fourth hypothesis, which proposed that OCA Facebook use positively, impacts social connectedness and consequently the psychological well-being of cancer patients. Sobel’s test confirmed the role of social connectedness in mediating the impact of the use of OCA Facebook on the psychological well-being of cancer patients. The findings demonstrate that social connectedness can be perceived as an outcome of OCA Facebook use and a predictor of psychological well-being. The results from this study confirm belongingness theory (Baumeister & Leary, 1995) and an improvement in psychological well-being through meaningful social relationship. Findings are in line with earlier studies that showed breast cancer patients’ participation in web-based health-related forums enabled them to experience a sense of belonging and greater well-being (Rodgers & Chen, 2005).

The analysis also supported the fifth and sixth hypotheses. Findings showed a positive and significant relationship between OCA Facebook use and learning as well as between learning and the psychological well-being of cancer patients. These findings are consistent with SCT’s position that individuals’ social connections play an important role in their learning (Lantolf, 1994). Findings are also inline with previous studies that showed cancer patients’ learning through participating in online support groups is a predictor of psychological well-being (Gustafson et al., 1994).

Finally, positive associations between OCA Facebook use and social presence and between social presence and psychological well-being of cancer patients were confirmed (confirmed hypotheses 7 and 8). A mediating test showed the role of social presence in mediating the impact of OCA Facebook use on the psychological well-being of cancer patients. This confirms the reciprocal relationship between experiencing social presence and psychological well-being. These findings are in line with previous studies that showed a positive association between experiencing social presence and wellbeing of cancer patients through participation in online health-related groups (Walther et al., 2005).

In summary, our qualitative study provided insights into the lived experience of cancer patients’ use of SNS and showed why it is important for cancer patients to use SNSs in relation to the factors influencing psychological well-being. With unprecedented convenience, availability and anonymity, SNS could bring together cancer patients people suffering from the same type of cancer. Cancer patients’ active use (e.g. chatting, liking and creating content), as well as passive use (observing content) of OCA Facebook enabled cancer patients to have a sense of closeness with other member of OCA Facebook, enabled them to receive recommendations, advice, caring and empathy, learn new things from other members to cope with cancer related concern, make sense of information and ultimately experience positive mood and affect, feel well supported, form satisfying relationships, resist cancer-related pressures and hopeful to continue improving their health conditions. Findings from the survey showed that social support, social connectedness, social presence and learning mediate the positive impact of SNS use on the psychological wellbeing of cancer patients.

Our analysis showed a good fit of the proposed theoretical model for the use of OCA Facebook and the psychological well-being of cancer patients. This corroborates similar studies (Guo et al., 2014; Nabi et al, 2013) in which SNS use such as Facebook use was positively related to the psychological well-being of students. As Burke et al. (2010) pointed out, it is important to obtain consistent research results for different users of SNS to make strong statements about positive outcomes of SNS use.

**CONTRIBUTIONS**

This study contributes to the literature in terms of both theory and practice. First, most previous studies used quantitative approaches to examine the relationship between SNS use and psychological well-being. Previous studies collected data from SNSs used by healthy students and attempted to explore how SNS use is related to the psychological well-being of users. In our study semi-structured interviews were conducted to gain a better understanding of how SNS use impacts the psychological well-being of cancer patients. In the second phase, an online survey was conducted to evaluate and empirically test the theoretical model. We triangulated the results and provided empirical support for that the use of SNS enhances social support, improves the experience of social connectedness, develops social presence and learning and ultimately improves psychological well-being. This study adds to the literature on SNS use and psychological well-being and provides a useful platform for future research.

Second, in this study we developed and tested a multi-theory approach to hypothesis development and to frame interpretation of relationships between the use of SNS such as Facebook and the psychological well-being of users, specifically cancer patients. A lack of theoretical underpinnings in previous studies in this area had been recognised (Guo et al., 2014; Hong et al. 2011), and our study was intended to fill this gap. Our study showed the capacity of SNS use to improve the psychological well-being of cancer patients. This evidence will assist organisations to generate strategies and make recommendations for using Facebook for improving the psychological well-being of their users.

Third, our qualitative study provided insights into the lived experience of cancer patients’ use of Facebook. This contributes to a better understanding of the ways that SNS use is associated with the psychological wellbeing of cancer patients. By clarifying this relationship, this study demonstrates that SNS use does indeed have possibilities for promoting psychological wellbeing of cancer patients. We showed the advantages that SNS use can have in the context of healthcare, at least with respect to cancer patients. The findings should encourage parties and institutes involved in the care of cancer patients, and cancer patients themselves, to use SNS to improve psychological well-being.

**RECOMMENDATION FOR FUTURE STUDIES**

*Conducting longitudinal investigations of users ‘psychological well-being on SNSs*

The population addressed in this study was examined cross-sectionally. More studies are still needed to apply a longitudinal study in order to improve the observation and understanding of SNS use on the psychological well-being of cancer patients. Future studies are encouraged to use a longitudinal approach, comparing cancer patients’ psychological well-being before and after using SNSs like Facebook.

*Conducting studies in developing countries and countries with different economic, cultural, educational and political conditions*

This study involved an Australian health-related Facebook page, but some of the respondents were residents of other countries. However, no participants were residents of developing countries. With the rapid adoption of SNSs around the world, and in particular in developing countries, research into the role of SNS use in developing-country users’ psychological well-being is needed. SNS use and its consequences should be investigated with particular attention to the users’ culture, education and policy backgrounds and circumstances, and results compared in different cultural contexts.

*Broadening the samples from cancer-patients to other cohorts of SNS users*

This study examined the impact of SNS use on the psychological well-being of cancer-patients. During the study, we received requests to participate from many ineligible caregivers, family members and friends; this shows that the caregivers, and family of cancer-patients are also using health related SNS for health and cancer related purposes. Future researchers are therefore encouraged to consider cancer patients’ caregivers and friends as a study population and generate evidence about the impact of SNS use on their psychological well-being.

**CONCLUSION**

The extreme popularity of SNS use highlights the importance of understanding the health-related implications of its use. This article has argued that by using a mixed method research, our understanding of the impact of SNS use on the psychological-wellbeing of cancer patients is enhanced. The first step was to establish an understanding of the ways that SNS use affects the psychological well-being of cancer patients. This was done by conducting semi-structured interviews with users of OCA Facebook. A theoretical model was proposed to develop a better understanding of the relationship between SNS use and psychological well-being of cancer patients. The second step was to articulate an approach to understanding the extent that SNS use impacts the psychological wellbeing of cancer patients. Analysis of data collected through a quantitative survey showed the extent to which SNS use impacts the psychological well-being of cancer patients and empirically confirmed the theoretical model. The theoretical model sheds light on how and to what extent SNS impacts the psychological-wellbeing of cancer patients.

This study highlights that social support; social connectedness, social presence and learning mediate the positive impact of SNS use on the psychological wellbeing of cancer patients – the ultimate beneficiaries of this study. These finding helps to unleash the potential of SNS to address informational, emotional and social needs of cancer patients and consequently their psychological well-being. Facebook-based communication practices throughout the cancer care continuum show promise. The incorporation of SNS in health care is one of the implications of this study; accordingly Health care providers can combine SNS as an online health resource into their treatment and care of cancer patients.

Future research should include the health industry and academics to document the outcomes of patients using SNSs – and in particular, cancer-patients to improve psychological well-being and generate more evidence about the impact of SNS use on cancer-patients. More studies are still needed to apply a longitudinal study in order to improve the observation and understanding of SNSs use on the psychological well-being of cancer patients.

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