The mediating role of group dynamics in shaping received social support from active and passive use in online health communities

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ABSTRACT

Exchanging social support on online health communities (OHCs) can be beneficial to people's health, but the OHC characteristics that promote environments in which users feel socially supported are understudied. We develop a model that examines the mediating influence of OHC cohesiveness, altruism, and universality on the relationships between active and passive use and received OHC social support. Our findings indicate that social support can be derived from both active and passive use of the OHC. Although active use can directly stimulate received OHC social support, the relationship between passive use and social support is fully mediated by OHC group dynamics.

1. Introduction

Online health communities (OHCs) are "virtual social networks where individuals can share health experiences, post health questions, seek, and/or provide support" [14, p. 195]. Information systems (IS) research has established, typically through empirical studies of archival data from OHCs, that OHCs can provide informational and emotional social support to their members [e.g., 14, 37, 42, 43, 125]. Understandably, the focus of many early OHC studies was to determine how the exchange of social support on OHCs contributes to improved health outcomes such as the evolution of patients' health conditions [126], health knowledge and attitudes [14], changes in patient uncertainty regarding diagnosis or treatment [58], weight loss [124], or rural–urban health disparities [37]. These studies demonstrate that exchanging social support on OHCs can help improve patients' health outcomes, knowledge, and behaviors.

Given that researchers largely show that exchanging social support on OHCs can be beneficial to people's health, we assert that a natural next step in this research is to determine the characteristics that foster social support on OHCs. Fewer IS studies have emphasized factors that increase or decrease the provision or receipt of social support on OHCs [e.g., 42, 53, 58, 69]. Some factors that increase the likelihood that users will provide social support to others have been identified, such as possessing health knowledge to share, empathy, or reciprocity [42, 57, 128]. Factors such as social identity, health severity, and channel richness are shown to increase social support-seeking behaviors on OHCs

[58, 68]. Research also indicates that social capital, in the form of network betweenness centrality calculated from archival data, can determine the informational and emotional social support both provisioned and received [14]. Social relationships are also shown to be key to enabling the receipt of social support on OHCs [53]. Consequently, our study focuses on drivers of received OHC social support, which have not received much attention in the IS literature. Although it is helpful to understand which factors provoke people to seek out or provision social support to others on OHCs, it is also imperative to understand which OHC characteristics promote environments in which users feel socially supported. Our study focuses on the latter.

Increasingly, people rely on Internet-based health resources such as OHCs for social support, as evidenced by a study that found a majority of US adults searched for health or medical information online in each of several years in which surveys were given between 2008 and 2017 [29]. This is not solely a trend in the USA because a 2019 study found that more than 85% of primary care clinic patients in Hong Kong had used the Internet to find health information [117]. In fact, because of the benefits of online health information seeking such as improved quality of life, one of the stated goals of the US Department of Health and Human Services Healthy People 2020 initiative is to "increase the proportion of information seekers who report easily accessing health information online" [29, p. 618]. Such trends have fostered the increase in patient-centered OHCs that serve various health conditions (e.g., diabetes and cancers) [91, 100], which include dedicated OHCs such as

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"patientslikeme.com" and "dailystrength.org" as well as groups dedicated to specific health conditions on traditional social media such as Facebook and Reddit. These patient-centered OHCs provide platforms on which people can both give and receive social support to help each other cope with health conditions. Our study focuses on the characteristics of these communities that allow people to best receive social support from their OHC use.

Specifically, we examine how patients' perceptions of the group dynamics on OHCs mediate the relationships between how they use the OHC (i.e., *active* versus *passive* use) and the social support they receive from the OHC. Leveraging social media research, we divide OHC use into *active* (i.e., *information sharing*) and *passive* (i.e., *information consumption*) use[1] [e.g., 12, 52, 82] and examine how the way that people use OHCs can increase or decrease the social support they receive. We build on research that finds that group dynamics factors and social relationships can mediate the relationships between personal and situational characteristics and outcomes [e.g., 45, 53, 62, 116] and posit that the relationship between use and received OHC social support is mediated by the nature of the OHCs. To study the nature of the OHCs, we draw on group dynamics research from psychotherapy research that has explained the importance of the three group dynamics of cohesiveness, altruism, and universality in increasing the effectiveness of group therapy [79, 123]. Our study contributes to the IS literature by examining the role of group dynamics factors known to be beneficial in-person group therapy settings in creating socially supportive OHCs for people who use OHCs in different ways. By answering the following two research questions, we provide insights into the types of environments OHCs should nurture to best provide social support to all their users and are able to provide recommendations on the types of use that aid the development of such environments.

RQ1. Does both *active use* (i.e., sharing information) and *passive use* of OHCs (i.e., consuming information) lead to similar perceptions of social support received from OHCs?

RQ2. How do OHC group dynamics mediate the relationships between active and passive use and social support received from OHCs?

To answer these questions, we study people who have at least one chronic health condition, because they will be the most likely population to make extensive use of OHCs. Global healthcare is increasingly being challenged by aging populations suffering from multiple chronic health conditions [1, 24, 71, 75]. The US Centers for Disease Control and Prevention (CDC) reports that six in ten US adults have a chronic health condition and that these conditions are the leading cause of death and the primary driver of the $3.8 trillion dollars spent on healthcare annually [107]. Chronic diseases are key factors in explaining 87% of

deaths in Europe [24], the majority of deaths worldwide (70%) [107], and most direct healthcare costs (75%) [101, 110]. Chronic health conditions are expensive, long-term, and widespread, characteristics which increasingly tax the healthcare systems that must support sufferers. Targeting patients with chronic health conditions, we obtain data on their use of OHCs for information consumption and information sharing, as well as their perceptions of the group dynamics and received social support on the primary OHC they use.

We contribute to research and practice in several ways. *First*, social support research shows that receiving social support can benefit people adjusting to acute stress [36, 54]. IS researchers have also illustrated the health benefits of received OHC social support such as improved health attitudes and literacy [14], reductions in uncertainty regarding their diagnosis and treatment [58], and increased weight loss [124]. What is not well understood are the OHC characteristics that create an environment in which users feel that they receive social support. Our study contributes to this research discourse by demonstrating that group dynamics—specifically, cohesiveness and altruism—are key to creating such environments. If our results hold, entities managing OHCs should then consider developing features or holding events designed to promote cohesiveness and altruism.

Second, many studies have used archival data obtained from existing OHCs to study OHC social support [e.g., 14, 42, 124], which provides rich insights from the study of actual behaviors but not of the perceptions of OHC members. Our study complements such research by probing the perceptions that users have of the group dynamics of their OHC and examining how these perceptions and their OHC use shape the OHC social support they receive. Our findings go beyond the mechanics of the social support exchanges on OHCs to examine how people view the group dynamics of their OHC, and the effect those perceptions have on the benefits they derive from OHC use. It is crucial to better understand how OHC users feel about their group because such perceptions can influence their affective experiences and adherence to health behaviors [39]. Such knowledge may also provide insights into the survival of OHCs, because OHCs that are not able to satisfy their users' expectations are more likely to be abandoned [e.g., 15, 88]. Likewise, OHCs that do not provide users with the social support they seek may lose user support [56].

Finally, we go beyond the lurker-versus-poster dichotomy often emphasized in virtual community studies [e.g., 46, 96, 108, 127] to instead examine the frequency with which users consume and share information on OHCs. This allows us to show how the paths to received OHC social support differ with frequent information consumption versus frequent information sharing but does not require that people be classified purely as consumers or sharers. We show that as users' frequencies of information consumption increase, so do perceptions that their OHCs are accepting and caring (i.e., cohesiveness) groups in which they can feel needed and helpful (i.e., altruism). Both cohesiveness and altruism increase received OHC social support. However, as users' frequencies of information sharing increase, only perceptions of altruism increase. Although information sharing can directly lead to received OHC social support, the relationship between information consumption and received OHC social support is fully mediated by the group dynamics. Our findings thus illustrate the importance of building positive group dynamics to facilitate maximum received social support for all OHC users, whether they are more frequent information consumers or sharers. If true, it is crucial to build communities in which people feel that they belong (i.e., *cohesiveness*) and can help others (i.e., *altruism*) because these two characteristics increase OHC received social support. However, because the paths to OHC received social support differ with OHC use, it may be worthwhile to consider how to encourage more information consumption because this can build perceptions of group cohesiveness that increases OHC received social support.

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[1] To study passive versus active use, we use the constructs proposed by Krasnova et al. [52]: information consumption and information sharing. *Information consumption* reflects social media uses that are passive in nature, such as browsing content others have posted, reading comments left by others on posts, and viewing photos and videos others have posted. *Information sharing* reflects social media uses that are active in nature such as "liking" another person's post or posting something such as an opinion, photo, or information. We thus use the terms information consumption and passive use, and information sharing and active use, interchangeably. These terms are like but less restrictive than the terms lurker (passive) and poster (active) that have been commonly used in the broader research stream. A lurker is a user who consumes and does not share. We did not want to restrict our data collection to a binary categorization (e.g., shares or does not share). Therefore, we measured the frequency of information sharing and information consumption on the user's primary OHC. Using this measurement, respondents can report more nuanced use. Our constructs can capture lurkers (i.e., those respondents who report never sharing but frequently consuming information) but they also allow for variation along a spectrum from fully engaged (i.e., frequently shares and frequently consumes) to not engaged at all (i.e., never shares and never consumes).

2. Theoretical development

OHCs can be considered a type of online social network (OSN) that serves the health context [14]. Research has identified two major activities that an individual can do on an OSN: social information sharing and consumption [52]. *Social information sharing* is an active activity in which users create and post content to the OHC, whereas *social information consumption* is a passive activity in which users read content posted by others [52]. We examine the relationships between such active and passive use of the OHC and perceptions of social support received. In general, social support suggests that social resources are available to an individual, such as "information that one is cared for, loved, esteemed, and part of a mutually supportive network" [104, p. 16].

Furthermore, we propose that individuals' OHC use will shape the perceived group dynamics of the communities in which the individuals participate and that the group dynamics of the communities will in turn shape the perceptions of OHC received social support. *Group dynamics* can be defined as "the actions, processes, and changes that occur within groups and between groups" [31, p. 2]. A group's dynamics are determined by the activities of its members [79]; that is, sharing or consuming information on OHCs in our context. Researchers have identified three therapeutic factors arising from group interaction that can be measured to provide an overview of how the group is functioning (i.e., measures of group dynamics in a therapeutic context): cohesiveness, altruism, and universality. We propose that if users' activities result in the perception of positive OHC group dynamics, they will feel higher levels of received social support from their OHC. Our proposed model is shown in Fig. 1.

2.1. OHC social support and its components

We examine OHC received social support as our outcome of interest. *Received social support* can be defined as "a social network's provision of psychological and material resources *intended to benefit an individual's ability to cope with stress*" [18, p. 676, emphasis in reference]. In our context, *OHC received social support* thus refers to such resources that users have received from their OHC. Social support is typically operationalized by determining the receipt of psychological and material resources [18, 104]; for example, whether a person has received emotional or tangible support from his or her social network—in our context, the OHC.

Three types of social support resources are commonly defined in the literature: instrumental, informational, and emotional support. *Instrumental (tangible) support* "involves the provision of material aid, for example, financial assistance or help with daily tasks" [18, p. 676]. *Informational (directive) support* is defined as "the provision of relevant information intended to help the individual cope with current difficulties and typically takes the form of advice or guidance in dealing with one's problems" [18, p. 676–677]. *Emotional (nondirective) support* "involves the expression of empathy, caring, reassurance, and trust and provides opportunities for emotional expression and venting" [18, p. 677]. Uchino [104] states that social support is often conceptualized through the functions the social network provides to the individual and lists instrumental, informational, and emotional among these functions. To this list, he adds what he calls belonging support and defines as "shared social activities, sense of social belonging" [104, p. 17], which would be similar to the companionship activities examined in some IS social support studies [42].

To develop their *inventory of social supportive behaviors*, Barrera and Ainlay [5] began with six categories of social support that included material aid, behavioral assistance, intimate interaction, guidance, feedback, and positive social interaction. Their testing revealed four stable categories they called directive tangible (instrumental) support, directive (informational) support, emotional (nondirective) support, and social interaction [5, 94]. These categories map to the three primary categories described by both Cohen [18] and Uchino [104]. The last category corresponds to the belonging support of Uchino [104] in that the support is in the form of shared interests and activities for fun and diversion. We adopt this view of social support being comprised of tangible (instrumental), informational (directive), emotional (nondirective), and social interaction support. Our second-order factor in Fig. 1 thus determines the users' acquisition of instrumental (tangible), informational (directive), emotional (nondirective), and social interaction support from their OHCs.

The primary benefit of social support is suggested to be its role in buffering stress. Psychologists find that when an individual believes social support is available, stressful events appear more manageable and result in less stress [18]. The perception that social support is available has been found to buffer the effect of stress on psychological disorders (e.g., depression and anxiety) and physical ailments [19, 20, 47, 85, 105, 106]. Cohen [18, p. 678] notes that receiving social support "may alleviate the impact of stress by providing a solution to the problem, by reducing the perceived importance of the problem, or by providing a
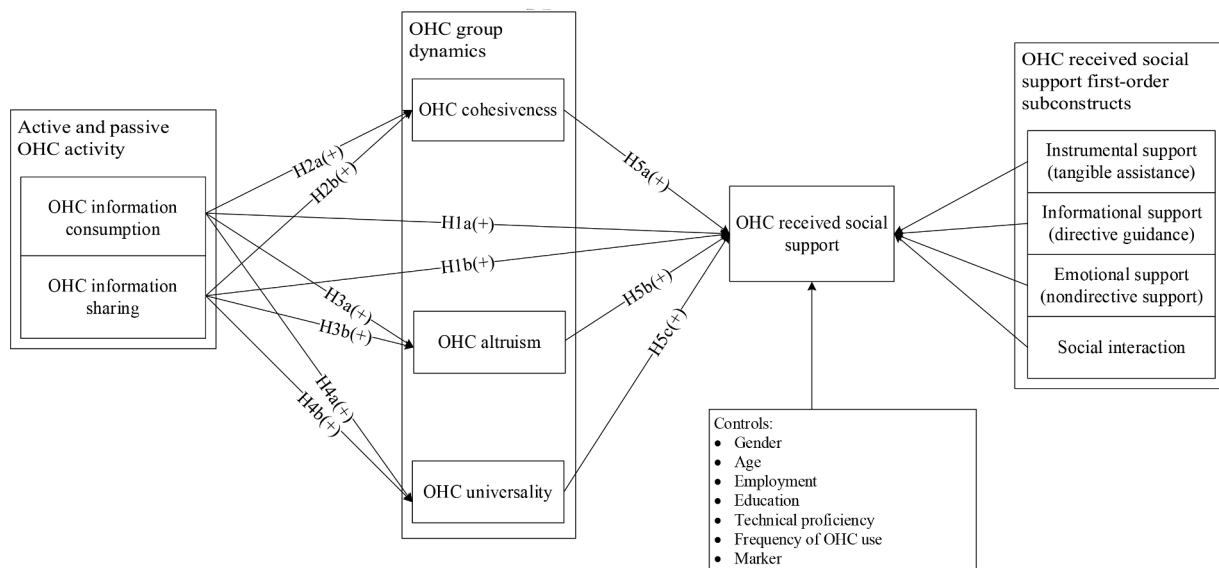

Fig. 1. Online health community social support model.

distraction from the problem." He further suggests that social support could facilitate healthy behaviors (e.g., exercise and sleep). Social support has also been directly linked to health benefits through such mechanisms as helping to regulate emotional states, enhancing immune function, and influencing good health behaviors [18, 106]. Receiving social support during periods of acute stress can also minimize cardiovascular reactivity that may be a factor in heart disease [36, 54]. Social support available through an OHC could thus result in many health benefits. Determining the factors that increase OHC received social support could help guide both OHC design and use to better facilitate such benefits that could complement an overtaxed health system.

Research has found that OHCs can provide social support [e.g., 14, 37, 42, 43, 125]. For example, Coulson [21] conducted a thematic analysis of an irritable bowel syndrome (IBS) OHC and found evidence of the three primary types of social support (tangible, informational, and emotional), but ultimately determined that the IBS OHC's primary use was for informational support related to the interpretation of symptoms, management of IBS, and communicating with health providers. Emotional, informational, and companionship, the latter which is similar to social interaction, have all been identified in OHCs [42, 43]. Evidence of social support was also found in studies of OHCs for disability, chronic disease, cancer, amyotrophic lateral sclerosis (ALS), eating disorders, and HIV/AIDS [9, 14, 25, 27, 48, 70, 84, 120]. Emotional, instrumental, and informational support were also identified in a content analysis of a message board for pregnant teens [89]. Leimeister et al. [53] determined that social relationships on OHCs lead to feelings of social support. Such findings confirm that people are exchanging social support through OHCs, and that people do feel like they receive social support on OHCs. Our interest in the current study is in determining the group characteristics that can be nurtured through active and passive use that may foster OHC received social support.

2.2. Active and passive use and social support

We leverage the concepts of passive and active use from the IS literature on OSNs [51, 52]. Specifically, we use information consumption as our measure of passive use and information sharing as our measure of active use. *Information consumption* "is passive in nature and takes place when users follow updates and interactions of others (e.g., [OSN] friends)," whereas *information sharing* "reflects an active creation of social content by users (about themselves and their environment), involving such activities as content broadcasting and interaction" [52, p. 588]. Together, these two activities are said to encompass what users do in virtual communities (i.e., OSNs) [12, 52, 82], of which OHCs are a specialized type [14, 26]. The information that is shared and consumed on traditional OSNs is social in nature and reflects the users' lives and interests. OHCs, although similar in nature to OSNs, are more focused because the information shared and consumed is typically related to a health condition and the users' knowledge of and experience with that health condition [e.g., 21, 27].

Research on virtual communities often classifies users as *lurkers* or *posters* [e.g., 46, 96, 108, 127], the former referring to people who consume information and the latter referring to people who share information. In our study, we do not make such a dichotomous distinction, but instead adopt the information consumption and sharing approach from IS [52]. Namely, we focus on how the intensity (i.e., frequency) with which these activities are conducted helps to build a better functioning OHC in terms of its group dynamics, and through the group dynamics, how these activities shape OHC received social support. Nonetheless, lurkers and posters are captured by our measurements because they are represented in the extremes; for example, a lurker would be a user who consumes information but does not share it. We can thus draw from findings about lurkers and posters to inform us about how OHC information consumption and sharing may be related to OHC received social support.

A study of lurkers versus posters on an OHC for HIV/AIDS revealed

that lurkers spent less time on the OHC than posters, even when they had belonged to the OHC for approximately the same length of time [69]. Moreover, lurkers reported lower levels of social support and useful information obtainment. In this study, lurkers were defined as anyone who had never posted a message to the HIV/AIDS OHC. These findings do not mean that the lurkers did not receive social support, but that they received less than the posters. The researchers suggest that an explanation for the lower levels of received information reported by the lurkers may be that posters are asking specific questions about their own situations, whereas lurkers are reading information in others' posts that may be less relevant to their own situations. They attribute the lower levels of social support received by lurkers to a lack of social relationships with other members of the OHC. Leimeister et al. [53] found that the link between use and social support goes through social relationships, which supports this argument and provides support for the idea that this link is mediated by group dynamics.

Fullwood et al. [34] found that selective contributions to an OHC resulted in increased OHC social support, which further indicates that information sharing may lead to higher perceptions of OHC social support. More granular findings were reported for lurkers versus posters in a study of Dutch OHCs for breast cancer, fibromyalgia, and arthritis [108]. In this study, lurkers and posters did not significantly differ on many of the empowerment outcomes tested, including: "being better informed," "improved acceptance of the disease," "feeling more confident about treatment," and "increased optimism and control" [108, p. 1]. However, posters reported higher levels of information exchange, recognition, and social well-being. Researchers have argued that lurkers may benefit from online communities, but that the benefits may be more substantial for posters [34, 67]. These findings suggest that passive and active uses can both generate feelings of social support from an OHC.

Social information consumption in traditional OSNs is associated with negative outcomes such as envy, which are argued to result from social comparisons with others who appear to have a better life [52]. People participate in OHCs because of a specific negative shared interest, such as a disease, and thus OHCs are less likely to be places where people go to disclose their "best selves." Consequently, information consumption on OHCs is not likely to be driven by an entertainment motive but rather is likely to be purposeful, such as helping others cope with a shared disease. For example, consuming information on an OHC may include reading posts left by others about how to better manage a disease, which is an example of received informational social support. Simply reading about others' journeys with an illness may provide a means of coping, hope, or inspiration [95, 98, 99] and thus may provide emotional support. For example, users may read posts about other's struggles that make them feel they are not as bad off as they could be [118] or about other people having a good health day, which can serve as inspiration to feel better one day [99]. Consuming such information can help build a sense of community around a shared interest and form a basis for social relationships. Members of a community often care for each other, which may increase their desire to help others, thereby increasing OHC social support exchanges.

On OHCs, users who share information may be asking for advice. For example, users may ask the community questions about how to better manage their own illness or may post about their experience with a disease in hopes of receiving empathy. Such requests are social support-seeking behaviors [58] in which the users are asking for informational or emotional support. In this case, users may receive social support because they are directly or indirectly asking for it by making a post. Alternatively, those sharing information may be providing social support to others. For example, they may be answering another person's questions about a disease, sharing a story to empathize with another user, or posting information about a disease for the community. Such uses may stimulate community, and although such users may not immediately receive social support in exchange for the support they provide, they build goodwill that may be returned in the future. We thus propose that both OHC information consumption and sharing will be positively

associated with higher levels of OHC received social support.

H1a. OHC information consumption is positively associated with higher levels of OHC received social support.
H1b. OHC information sharing is positively associated with higher levels of OHC received social support.

2.3. The mediating role of group dynamics

As group members interact by sharing and consuming information, they exchange various forms of communication such as personal experiences and stories, and this interaction creates both group dynamics and group outcomes [33]. Researchers have found that active participation through information sharing and the perception of personal benefit that can be obtained through information consumption can help increase emotional attachment to an online community, which in turn can increase activity level and the benefits obtained from the community [8]. Such research suggests that social interaction, through information sharing and consumption, is necessary to build a thriving community to which users feel they belong, which will then be a source of social support to its users. Likewise, we examine how information sharing and consumption influence OHC group dynamics, which in turn affect the receipt of social support from the community.

Studies have confirmed the basic premise that participation (e.g., reading or making posts) can increase a *sense of virtual community* or emotional attachment to the community [8, 103, 122]. For example, Tonteri et al. [103] found both reading and posting messages increase a sense of virtual community. This lends support to the argument that active and passive use can influence the way the dynamics of groups are perceived. Various participation behaviors such as the number of postings and the time spent on the site were tested as antecedents of virtual health community attachment by Wu and Bernardi [122], who found only the time spent on the site directly influences community attachment. However, they also found community attachment directly decreases emotional distress. Decreased emotional distress is an outcome of social support [2]; therefore, if community attachment decreases emotional distress, it may be associated with increased social support. Such relationships would lend support for group dynamics increasing received OHC social support. Leimeister et al. [53] considered the *intensity of Internet use* to include the duration, frequency, and type of use and found it increases virtual social relationships which in turn increases virtual social support. In summary, these findings suggest that active and passive use help build relationships and community on OHCs, which may be crucial to best achieving high perceptions of received social support for OHC users. These studies illuminate the central role of community and social relationships on positive outcomes from virtual community use, thereby lending support for our mediated model. We extend this research by examining the role of group dynamics in mediating the relationships between active and passive OHC use and OHC received social support.

We examine three characteristics of groups (i.e., group dynamics) that can ultimately influence OHC received social support: cohesiveness, altruism, and universality. We propose that, in general, positive group dynamics will lead to higher levels of OHC received social support. However, we posit that the pathways that lead to higher levels of OHC received social support will differ for active versus passive OHC use. Specifically, we propose that the association between information sharing and OHC received social support will be partially mediated by the group dynamics factors, whereas the association between information consumption and OHC received social support will be fully mediated by them.

First, we propose that OHC information sharing is partially mediated by cohesiveness, altruism, and universality. Research has shown that posters are more likely to report social support from their online communities [34, 69]. Researchers have argued that although lurkers may find OHC use beneficial, posters may achieve more substantial benefits because they can ask personally relevant questions or have social relationships with other members [34, 69, 81]. It may be that posters are asking direct questions relevant to their situation and receive OHC social support when those inquiries are answered. However, it may also be that users who share information on the OHC develop relationships and promote community, and through such functions perceive themselves to be socially supported. Although positive group dynamics may be helpful in ensuring users who share information feel socially supported, group dynamics may not be necessary to achieve this outcome.

Second, we propose that the relationship between information consumption and OHC received social support is fully mediated by the group dynamics. Research that found no difference between lurkers and posters in terms of intrapersonal empowerment, which is composed of control, competence, and self-efficacy, argued that such findings may only hold for established OHCs [77]. Such findings suggest that established OHCs may have characteristics that are favorable to both posters and lurkers such as more positive group dynamics. We posit that consuming information other OHC members have posted is one way to build understanding and community. Members may help improve community simply by being a good "listener," as one user stated in a study of lurkers: "I have always been an advocate of being a good 'listener' as opposed to be a good 'talker'" [81, p. 212]. Reading the posts written by other OHC members may result in information consumers feeling a sense of connection with the community, an understanding of other's plights, a sense that they could have something to contribute to the community, or simply an understanding that others are having similar experiences and facing similar problems. Moreover, passive users report lower levels of social support than active users [34, 67, 69], suggesting that the community may need to offer passive users more than active users to make them feel socially supported. Perceiving their OHCs to possess characteristics considered helpful in group therapy (i.e., cohesiveness, altruism, and universality) could result in information consumers feeling socially supported. We posit that information consumers achieve OHC received social support through positive group dynamics. In what follows, we first introduce our group dynamics constructs, and then we develop the hypotheses for the mediated model.

2.3.1. Group dynamics: OHC cohesiveness, altruism, and universality

Group dynamics can be defined as "the actions, processes, and changes that occur within groups and between groups" [31, p. 2]. A large and varied field of study, group dynamics is an umbrella term assigned to the study of groups and also used to describe the changing nature of groups [31]. One context in which the functioning of groups is crucial is in group therapy or counseling [79, 123], which is similar in nature to the purpose of an OHC. In the context of psychotherapy, several therapeutic factors have been identified as key to successful outcomes from group therapy [79, 123].

Of the identified factors, three have notable importance and have been linked to group climate: cohesiveness, altruism, and universality [79]. *Group cohesiveness* is the "emotional closeness among members; members' caring and empathy toward each other; and members' positive regard for what others feel, think, and do" [32, p. 9], and groups that possess this quality have been found to make more effort to influence other members, be more open to group member influence, be more willing to accept and listen to others, self-disclose more, and experience more security and less group tension [49, 55, 79]. *Altruism* occurs when group members "feel helpful and needed by others" [79, p. 236] and thus "fulfills the need of group members to feel that they have something to offer other people and that they are needed by others" [79, p. 237]. Yalom [123] describes how individuals beginning group therapy may feel demoralized and think that they have nothing to offer others. He thus argues that feeling needed or valued by others can be beneficial to such individuals and give them purpose. *Universality* here means that group members have "a sense of similarity of their deepest concerns and profound feelings of acceptance" [79, p. 236], which "gives group

members a feeling that they are not alone in their experiences and life issues" [79, p. 237]. In discussing universality, Yalom [123] states that people with difficulties that necessitate therapy often experience social isolation that makes it difficult for them to confide in others or learn about others' experiences. Being a part of a therapy group can help disconfirm a person's "feelings of uniqueness [which] may be a powerful source of relief" [123, p. 6].

All three of these factors have been identified as present in an online support group for cancer patients [112]. We thus use these three therapeutic factors as group characteristics that together provide an indication of the nature of an OHC. Research suggests that these therapeutic factors directly influence group therapy outcomes [49, 50, 79, 123]. We focus on how the perceived presence of these three group characteristics on OHCs mediate the relationships between active and passive use and OHC received social support.

2.3.2. Type of OHC use and OHC group dynamics

It is reasonable to propose that both consuming information posted by others and sharing information with others will help build more cohesive groups. For example, reading about the struggles other group members are facing may make an individual feel closer to the members of the group without the need to contribute to the conversation. Similarly, posting helpful information (e.g., a healthy recipe to a diabetes community) may make an individual feel like a contributing member of the group, and sharing such information could help develop a cohesive bond between group members. We propose that the more users both consume and share information, the more vital the community that results. In fact, some studies support this premise by finding that active or passive use or use intensity can strengthen people's attachment to a virtual community or increase feelings of community [8, 103, 122].

Cohesiveness refers to "the strength of the bonds linking individuals to and in the group" [31, p. 9]. It is one of the most effective factors leading to positive outcomes from group therapy [123]. Braithwaite et al. [9, p. 128] argue that for individuals with disabilities "an advantage of online support groups is the large numbers of participants who, in turn, provide and promote a sense of universality and community for people." This suggests that the presence of others can benefit those suffering from physical ailments or disabilities by relieving feelings of social isolation and uniqueness. A sense of community describes people's affective attachment or feelings of belonging to a group [8] and thus is similar to cohesiveness. It has been suggested that interacting with existing content may make lurkers feel like they belong to the group [65]. Soroka and Rafaeli [92] state that through the performance of passive activities, people watch a community and learn about its norms, which makes them feel like they belong to the group. Research has found that reading messages in an online community increases users' sense of virtual community or attachment to the community [103]. These findings suggest that by consuming content people get to know the other group members, which can make them feel like part of the community. Consequently, we argue that information consumption should increase OHC cohesiveness.

Although passive use has been found to promote a sense of community, researchers generally conclude that the relationship between active use and sense of virtual community is stronger [72, 103]. For example, Nonnecke et al. [72] found that both lurkers and posters can feel a sense of membership in the community. However, they found that posters are more likely to feel a sense of community than lurkers and that posters are more likely to report "being a community member" as a reason they joined the virtual community. Similarly, studies have found that although posters may "feel a greater sense of membership," lurkers can still feel like members and feel a sense of belonging to online communities [67, 81, p. 207]. These findings suggest that passive use can result in cohesiveness but that it may be easier for active users to feel connected to their community, partially because that type of connection may have been what they were seeking by joining the community.

Active participation in online communities has been prominently

studied because researchers believe that such participation is necessary to build vital, long-lasting online communities [65]. Tonteri et al. [103, p. 2217–2218] explain that "participation through sharing information entails a social dilemma: individual users benefit the most if they do not contribute themselves but only use the information that others provide." However, without shared content, an online community will not be useful and thus is unlikely to survive. Moreover, people may ask questions of the community that lead to direct benefits through answered questions. It has been suggested that it is through discussing their lived experiences with diseases that participants on OHCs build a sense of closeness with the community [122]. An experiment that restricted participants from sharing on Facebook found that participants who could not share or did not receive feedback on their status updates reported lower levels of belonging [102]. If so, then sharing information is integral to increasing belonging to a group. Moreover, research has found that posting messages on an online community is strongly associated with a sense of virtual community [103]. Active members have also reported feeling more attached to their online community [8]. Consequently, we argue that information sharing should also increase cohesiveness on OHCs.

Research thus suggests that both reading about others' experiences as well as sharing one's own could help build a sense of community and togetherness. We posit that whereas information sharing may more readily lead to cohesion, information consumption is also a necessary ingredient for OHC cohesion. Listening, comforting, and helping are all aspects of caring for others [38] that in an online environment require both information consumption and sharing. We thus propose:

H2a–b. OHC information consumption and OHC information sharing are positively associated with OHC cohesiveness.

Altruism involves actively helping others in an OHC, but it also encompasses simply thinking of others before oneself. By thinking of others, members of the OHC may feel needed or useful, and feeling that they have a contribution to make to the community may help counteract self-absorption and provide purpose [123]. This sense of purpose and usefulness to the OHC can itself be beneficial even if an individual has not directly conversed with other members. It is straightforward to propose that those individuals sharing information on the OHC may be driving the altruism of the group [34]. A qualitative study of an HIV/AIDS OHC found that members reported participating in the OHC as a way to help others [70]. Nonnecke et al. [72] found that posters were more likely than lurkers to report "offering expertise" as a reason for joining an online community. Similarly, OHC members who felt their goals were met without contributing were found to be less likely to feel that they helped others [34]. However, in the same study, those making selective contributions to the OHC were more likely to feel that they helped others, which indicates that it may not be simply the volume of information sharing but the type of sharing that influences OHC altruism. Consuming information may also help drive the altruism of the group because it feeds OHC members' senses of purpose. One study of an OHC found that participation was positively associated with the help given to others, where participation included both information sharing and consumption [22]. Therefore, information sharing and consumption may both drive OHC altruism. We propose that both information sharing and consumption can positively affect the sense of altruism on an OHC by providing members with a sense of purpose and allowing for communication that can offer direct aid:

H3a–b. OHC information consumption and OHC information sharing are positively associated with OHC altruism.

Universality embodies the idea of not feeling alone or unique in one's anguish [123]. One benefit of self-help groups has been suggested to be that participants can feel like they are in the "same boat" as others [9]. Namely, OHCs can help members realize they are not alone in their

suffering. In fact, one study of an OHC found that "for almost all respondents there appeared to be great comfort derived from the knowledge they were not alone" [11, p. 266]. Reading messages left by others revealed to members of the OHC that their anxieties and experiences were not unusual. Members that had not posted themselves but simply read what others had posted described that by reading posts left by others they felt less alone and had greater peace of mind [11]. This indicates that information consumption is likely to drive OHC universality. However, in the same study, those that posted to the OHC reported being understood and finding others sympathetic to their fears and anxieties, which also encourages universality. In his discussion of universality in psychotherapy, Yalom [123, p. 7] states that individuals with interpersonal difficulties may not have the opportunity in everyday life to confide in and be validated or accepted by others. Information sharing on an OHC can provide individuals, especially those with stigmatized or disabling conditions, with such opportunities. We thus propose that both information consumption and sharing will have a positive influence on OHC universality:

H4a–b. OHC information consumption and OHC information sharing are positively associated with OHC universality.

3. OHC group dynamics and OHC social support

Good group dynamics are crucial to ensuring high-functioning online communities as indicated by a study of lurkers that found that poor group dynamics discouraged participation [81]. Lurkers in this study reported that they did not contribute to the online community because of poor group dynamics, stating that the receipt of rude posts or being made to feel like they were an outsider were cause for them to lurk [81]. Online community interaction can motivate participation because users may derive enjoyment and knowledge from watching what others discuss and how they find solutions to problems [111], which suggests that a highly functioning group may be attractive even to lurkers. Wasko and Faraj [111, p. 169] conclude that "people participate in these communities because they want to participate in a 'community' and engage in the exchange of ideas and solutions." Barak et al. [3, p. 1873] state that "participation in a dynamic group entails a process of creating intimate interpersonal connections," which "increases social cohesiveness, thus legitimizing the expression of a variety of feelings." Moreover, virtual relationships have been found to increase the perceptions of social support received on cancer OHCs [53]. These findings suggest that social cohesiveness allows for an improved level of comfort with the group that encourages people to express their feelings and vent their emotions, which could lead to feelings of social support because people feel they are being listened to and able to openly discuss their issues. A socially cohesive group that fosters feelings of belongingness can help retain users and provide those users with social support [3].

Researchers have suggested that group cohesiveness contributes to social support outcomes [3]. It is possible that no one in a person's immediate physical social network is suffering from the same affliction; thus, an OHC may be able to provide the support that may not be obtainable otherwise [121]. Studies have confirmed that cohesiveness can occur on OHCs and that people have reported that they felt closer to members of their online support group than their family [119, 121]. As cohesiveness on OHCs increases, OHC received social support is likely to increase. Supporting this premise is research that has shown that when individuals feel a lack of community they are less likely to receive social support on an OHC [34]. Another study found a correlation between both information and support functions, both components of our definition of social support, and community ties [113], which also suggests feelings of community may increase social support. Similarly, social capital in the form of network betweenness centrality has been found to be a key predictor of social support provisioning and receipt on OHCs [14]. Previous research thus leads us to propose that the more cohesive the OHCs are perceived to be, the higher levels of social support they

will provide.

Altruism is helpful for people who suffer from chronic conditions because "it forces them to change their focus from preoccupation with their own sickness to thinking of others" [112, p. 59]. It has been found to be the most influential reason why people post answers to others' inquiries on an OHC [73]. In fact, it has been suggested that people on an OHC are motivated by goodwill and will give advice and help without the expectation of reward even in the absence of personal relationships between members [73]. Altruism was also identified as a key motivation for participation in online knowledge-sharing communities, where one respondent stated "This is simply what one does. How can the world improve unless we improve it?" [111, p. 165]. Research has found that both giving and receiving help can lead to better mental health [86], which suggests that altruistic behaviors on OHCs could have a positive influence on patients coping with health conditions. Schwartz et al. [86] found that giving help was more beneficial to mental health than receiving it, but only up to a point where others' demands became overwhelming. Giving social support has even been found to reduce mortality [10]. Moreover, "even perceptions that are likely to be associated with giving, such as a sense of meaning, purpose, belonging, mattering, have been shown to increase happiness and decrease depression [e.g., 6, 97]" [10, p. 320]. These findings suggest that OHCs that can provide users with an altruistic environment in which they can find a sense of purpose and help others may be beneficial. We thus propose that OHC altruism will have a positive influence on OHC received social support.

In a study of an online support group for cancer patients that investigated the presence of the therapeutic factors outlined in Yalom [123], universality was one of the most prevalent factors perceived to be present [112]. Weinberg et al. [112] argued that universality was beneficial to cancer patients because it helped them realize that others have similar problems and reduced feelings of isolation. The same argument was made by Shaw et al. [87], who found that breast cancer patients reported feeling comfort from being understood by people who had shared similar experiences. They argued that "although sharing breast cancer experiences may seem like a depressing form of social interaction, it can be comforting for some women because it makes their own symptoms seem less harrowing" [87, p. 147]. It has been suggested that because the participation in OHCs is not geographically limited, members can draw from the experiences of a large number of people from various backgrounds, which promotes universality [9, 115]. In a study of a disability OHC, Finn [27, p. 224] identified a category of messages he named "universality" and which included messages "expressing the idea that people have the same experiences or report similar experiences, circumstances, or feelings; stating that the person is 'not all alone' and that others have experienced similar situations, feelings, and emotions." Universality of experience was also identified in a computer-based support group for sexual abuse survivors [28]. Wright and Bell [121] describe how OHCs may provide a safe environment for those with socially stigmatized disease (e.g., HIV/AIDS) to obtain support. Buchanan and Coulson [11, p. 266] reported that "for almost all respondents there appeared to be great comfort derived from the knowledge that they were not alone," which is what universality provides. Being in an environment where chronic disease sufferers are surrounded by people with similar afflictions provides universality and we propose that such an environment increases OHC received social support:

H5a–c. OHC cohesiveness, altruism, and universality are positively associated with OHC received social support.

4. Methodology

In what follows, we describe the development of our scales and the pre-analysis performed to assess their validity and reliability. We then detail the statistical tests performed to test our hypotheses.

4.1. Scale development and pilot testing

Our survey was constructed using preexisting scales adapted to our context. Specifically, the information sharing and consumption scales were leveraged from Krasnova et al. [52], the group dynamic scales (group dynamics inventory) from Phan et al. [79], and the social support scales (inventory of socially supportive behaviors) from Barrera and Ainlay [5]. We contextualized the information sharing and consumption and the social support scales by slightly modifying the prompt to instruct the respondent to consider his or her "online health community" when answering the questions. The group dynamics inventory was contextualized by replacing the word "group" with "online health community" in each item. Once these adaptations were made, the survey was presented to two experts in survey design who were asked to evaluate the items for readability, resulting in minor wording changes to improve clarity. These steps adhered to recommended practice for scale adaptation [17, 63]. The use of an expert panel and randomizing the items when administering the survey are suggested to help reduce common method bias, and both practices were implemented in this study [80].

We ran a pilot to test the scales by collecting 150 usable responses from Amazon's Mechanical Turk (MTurk), which is a crowdsourcing platform that has gained acceptance for data collection in IS and behavioral research [59, 93]. We followed recommended practice for using MTurk, including paying a small fee for responses, restricting participation to respondents in the USA, and ensuring anonymity. Assuring the respondents of anonymity also helps reduce the likelihood that their responses are biased toward what they think the researchers expect and reduces the tendency of answering in a socially desirable way. The survey was administered using the Qualtrics™ online survey platform. The pilot resulted in an acceptable factor structure, and no additional changes to the survey items were required. The construct definitions, the items, and the sources from which these were obtained are provided in Online Appendix A.

4.2. Data collection

For both the pilot and the full data collection, we used three criteria that respondents needed to meet to participate: (1) have at least one chronic disease, (2) use at least one OHC, and (3) be at least 18 years old, per institutional review board (IRB) requirements. We used filter questions to ask if the respondents met these qualifications. If they answered "no" to the filter questions, they were not allowed to continue taking the survey. There were 1409 attempts to take the survey, and of these attempts, 135 people did not pass the first filter that asked if they both had a chronic disease and used an OHC. The age requirement caused another six individuals' participation in the survey to be terminated. If they passed the filter questions, they were asked to specify what chronic conditions they had and what OHCs they used. The answers to these inquiries are provided in Tables 1 and 2, but due to space limitations, only a sample of the reported OHCs are provided in Table 2. Table 2 also reports the overall technical proficiency and the frequency of OHC use for the final sample.

The use of attention traps has been recommended as a technique to improve data quality [74]. We thus included attention trap items in our survey to ensure the cognitive engagement of the respondents. The attention trap items are provided in Online Appendix A. Respondents were asked to answer a question that had a definitive answer (e.g., Please answer "Slightly True for Me" to this question.) and were not allowed to continue taking the survey if they failed one of the attention traps. The inclusion of attention traps resulted in 92 partial responses to the survey that were discarded from the final sample. Our final sample included 505 responses. The demographics of the final sample are provided in Table 3.

Table 1

Chronic disease profile of sample (*n*= 505).

Chronic disease		"Other" conditions	
Alzheimer's disease and related dementia	2	Acid reflux	Gout
Arthritis (osteoarthritis and rheumatoid)	28	ADD	Hidradenitis suppuativa
Asthma	74	Addison's disease	Hyperemesis gravidarum
Atrial fibrillation	2	Advanced pulmonary fibrosis	Idiopathic intercranial hypertension
Autism spectrum disorders	7	Alopecia	Limb-girdle muscular dystrophy
Cancer	14	Ankylosing spondylitis	Lofgren's syndrome and sarcoidosis
Celiac disease	22	Anxiety	Lyme disease
Chronic fatigue syndrome	18	Arnold–Chiari malformation	Meniere's disease
Chronic obstructive pulmonary disease (COPD)	2	Ataxia	Medium chain Acyl-CoA Dehydrogenase deficiency
Diabetes	66	Autoimmune disorder	Narcolepsy, Addison's, & Parkinsonism
End-stage renal disease (ESRD)	4	Bipolar disorder	OCD
Epilepsy	14	Bronchiectasis	PCOS
Fibromyalgia syndrome	31	Chronic knee joint pain	Peripheral neuropathy
Heart failure	11	Chronic migraines	Pituitary tumor
Hepatitis (chromic viral B & C)	5	Chronic pain	Polycystic ovarian syndrome
HIV/AIDS	11	Chronic uterine fibroids	Polymyositis
Hyperlipidemia (high cholesterol)	3	Complex regional pain syndrome	Psoriasis
Hypertension (high blood pressure)	38	Costochondritis	PTSD
Hyperthyroidism, PKU (Phenylketonuria)	22	Crohn's disease	Rheumatoid disease
Inflammatory bowel diseases	11	Depression	Scoliosis
Multiple sclerosis	13	Diseases of the spine	Severe allergies
Osteoporosis	0	Dysautonomia	SI joint dysfunction
Parkinson's disease	0	Dystonia/ dysphonia	Sjogren's syndrome
Stroke	1	Eczema	Systemic mastocytosis
Systemic lupus erythematous	4	Ehlers–Danlos syndrome	Tourette syndrome
Other	102	Endometriosis Ulcerative colitis	Trigeminal neuralgia Vitiligo

5. Analysis and results

The model was analyzed using partial least squares (PLS) regression as implemented in SmartPLS version 3.3.3 [83]. It is appropriate to use PLS for exploratory causal modeling or theory development, and it allows for the testing of complex models [7, 16, 30, 40, 60, 76]. PLS is commonly employed in studies exploring behavioral phenomena in IS [7].

5.1. Model specification and pre-analysis

Our model has two exogenous reflective independent variables: OHC information consumption and OHC information sharing. The reflective mediating variables in our model are OHC cohesiveness, OHC altruism, and OHC universality. The dependent variable in our model is modeled as a second-order formative factor (i.e., multidimensional construct) [78]. In PLS, second-order formative factors are developed using a repeated indicator technique outlined in [60]. This technique requires a measurement model to be developed in which first-order subconstructs containing the respective items for each component of the second-order factor are created. Our dependent variable is composed of four

Table 2

Technical exposure of sample (*n*= 505).

Technical proficiency		Frequency of OHC use		Examples of online health communities used	
Novice	17	Several times a day	45	epilepsy.com	http://www.epilepsy.com/connect
Intermediate	163	Once a day	66	Reddit	https://www.reddit.com/r/CrohnsDisease/
Advanced	246	Several times a week	173	Daily Strength	https://www.dailystrength.org
Expert	79	Once a week	87	This Is MS	thisisms.com/forum
		Several times a month	82	Living With Fibromyalgia	http://www.livingwithfibro.org/
		Once a month	33	Crohn's and colitis community	ccfacommunity.org
		Less than once a month	19	Our neuropathy friends	https://www.facebook.com/pages/Our-Neuropathy-Friends/1470166936552772

Table 3

Sample demographic information (*n*= 505).

Age distribution		Gender		Employment		Education	
18–21 yrs.	17	Male	170	Employed full time	341	Grade school (K–8 grade)	1
22–24 yrs.	49	Female	335	Employed part time	95	High school or equivalent (e.g., GED)	34
25–27 yrs.	84			Not employed	69	Some college credit, no degree	118
28–30 yrs.	54					Trade/technical/vocational training	14
31–35 yrs.	107					Associate degree	62
36–40 yrs.	66					Bachelor's degree	196
41–50 yrs.	66					Master's degree	63
51–60 yrs.	43					Professional degree	8
61 + yrs.	19					Doctorate degree	9

first-order reflective subconstructs: instrumental, informational, emotional, and social interaction support. A second-order construct is also created that contains the items for all the first-order subconstructs, and the first-order subconstructs are modeled as formative indicators of the second-order construct. Therefore, the second-order construct is perfectly predicted by the first-order subconstructs (i.e., the R^2 is equal to 1.0), an effect referred to as being "swamped out" [60]. To overcome this issue, the measurement model is used to obtain the latent variable scores for each of the constructs in the model. A structural model is then created in which the latent variable scores from the measurement model are used as the indicators. The measurement model provides path coefficients and *p*-values for each of the first-order subconstructs, which are shown in Fig. 2.

We stringently adhere to the guidelines for employing PLS in behavioral research [16, 35, 40, 60]. As a first step, we conducted extensive pre-analysis and data validation outlined in Online Appendix B. Specifically, we examined convergent and discriminant validity

statistics to establish the factorial validity of our scales. To establish discriminant and convergent validity, we examined the outer model loadings and cross-loadings for all our items, and then compared the square roots of the average variance extracted (AVE) values to the latent variable correlations for each latent construct. Our analysis supported the convergent and discriminant validity of our measures. As a second step, we conducted several tests to examine our model for common method bias issues, in addition to the steps taken in the research design. The results of this testing are also provided in Online Appendix B and lead us to suggest common method bias is unlikely to be an issue in our model. As a third step, we confirmed that multicollinearity was not an issue by examining the variance inflation factors. Finally, we established the reliability of our scales by examining the Cronbach's alpha, composite reliability, and AVE statistics for each latent variable. Our testing suggests that our model meets the rigorous validation standards necessary for PLS-based analysis [7, 13, 23, 40, 60, 76, 78].
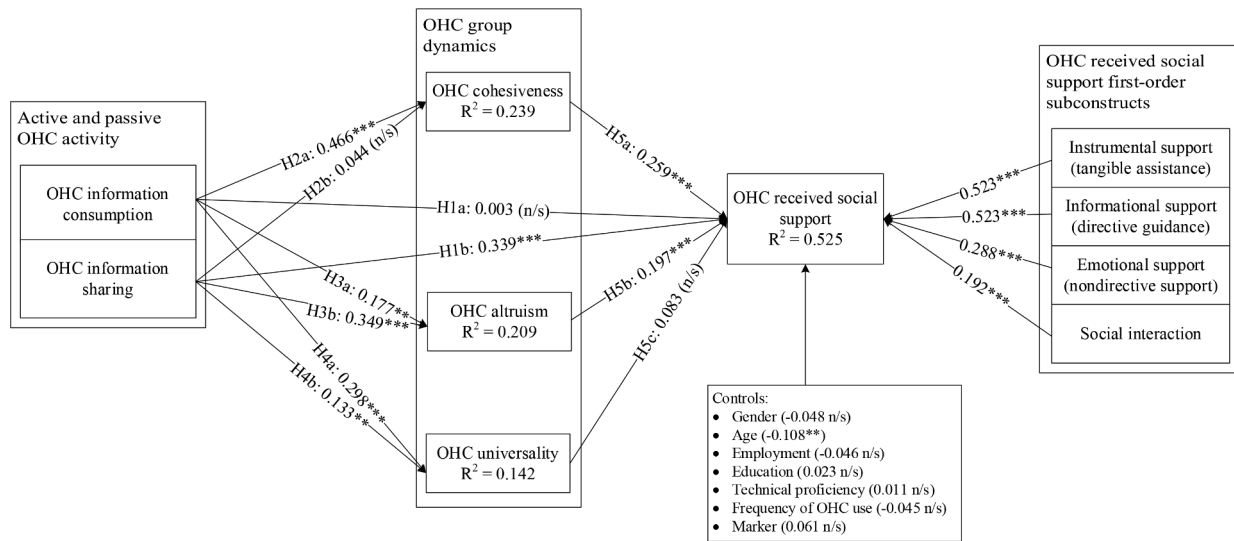
6. Results

Fig. 2 depicts the results for our structural model obtained from SmartPLS v. 3.3.3, and Table 4 provides the details.[2]

6.1. Mediation testing through bootstrapping the indirect effects

The results of our structural model as shown in Fig. 2 show that there is not a significant relationship between OHC information consumption and OHC received social support. We proposed that this relationship would be fully mediated by the OHC group dynamics. There is a significant and positive relationship between OHC information sharing and OHC received social support. We proposed that this relationship would be partially mediated. We tested for full and partial mediation using the bootstrapping method [41, 64, 109]. This method has advantages over the traditional Baron and Kenny [4] and Sobel [90] methods, including not assuming a normal distribution, greater statistical power, and allowing for direct measurement of the mediating effects. The results from the bootstrapping method are provided in Table 5. For completeness, we also provide the results for the Baron and Kenny mediation procedure [60, 61] in Online Appendix C, which show that the relationship between OHC information consumption and OHC social support is indeed positive and significant when the mediating variables are not included in the model.

To conduct the bootstrap mediation testing, the same paths that are traditionally investigated in the Baron and Kenny procedure are analyzed (see Fig. C.1. in Online Appendix C). To obtain the confidence intervals for the indirect effects (*ab* in Table 5), the bootstrap procedure in SmartPLS is run for many resamples with replacement, preferably 5000, which was done for our analysis. The bootstrap is run on the full model (see Fig. 2). The path coefficients for each of the 5000 resamples are obtained from the SmartPLS output. For each indirect effect (i.e., for each *ab*), we multiply the path coefficient for the relationship between an independent variable and a mediating variable (i.e., *a*) with the path coefficient for the mediating variable and the dependent variable (i.e., *b*). We perform this calculation for each independent–mediating variable pair, as shown in Table 5. To obtain the lower and upper bound of

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[2] For researchers using PLS, Peng and Lai [76] advocate conducting post-hoc analyses to assess the effect sizes in and predictive relevance of the model. To examine the effect sizes, because they cannot be estimated from the PLS coefficients, we use the conservative approach of examining the Pearson's r values provided in Online Appendix B. Most of our supported relationships had medium to large effect sizes, where medium > 0.30 and large is > 0.50. We ran the blindfolding procedure in SmartPLS to examine the predictive relevance of our model. Peng and Lai [76, p. 473] state that "If Q2 > 0, then the model is viewed as having predictive relevance." The Q2 values were greater than zero in each case, which indicates predictive relevance.

***= p < 0.001; ** = p < 0.010, * = p < 0.050, n/s = not significant**

Fig. 2. Online health community social support model.

Table 4
Results of tested hypotheses and control variables for full dataset ($n = 505$).

Tested hypothesis/path	β	t-statistic	f^2
Hypotheses			
H1a. OHC information consumption → OHC social support	0.003	0.075 (n/s)	<0.001
H1b. OHC information sharing → OHC social support	0.339	8.332***	0.148
H2a. OHC information consumption → OHC cohesiveness	0.466	11.286***	0.225
H2b. OHC information sharing → OHC cohesiveness	0.044	0.980 (n/s)	0.002
H3a. OHC information consumption → OHC altruism	0.177	3.527***	0.031
H3b. OHC information sharing → OHC altruism	0.349	7.574***	0.121
H4a. OHC information consumption → OHC universality	0.298	6.307***	0.081
H4b. OHC information sharing → OHC universality	0.133	2.935**	0.016
H5a. OHC cohesiveness → OHC received social support	0.259	5.021***	0.047
H5b. OHC altruism → OHC received social support	0.197	3.708***	0.031
H5c. OHC universality → OHC received social support	0.083	1.746 (n/s)	0.007
Controls			
Gender → OHC received social support	−0.048	1.466 (n/s)	0.004
Age → OHC received social support	−0.108	3.104**	0.021
Employment → OHC received social support	−0.046	1.270 (n/s)	0.004
Education → OHC received social support	0.023	0.638 (n/s)	0.001
Technology proficiency → OHC received social support	0.011	0.331 (n/s)	<0.001
Frequency of OHC Use → OHC received social support	−0.045	1.366 (n/s)	0.004
Marker → OHC received social support	0.061	1.663 (n/s)	0.007

*$p <= 0.05$, **$p <= 0.01$, ***$p <= 0.001$, and n/s = not significant.

the confidence interval, we employ the formulas $k(0.5 - ci/200)$ and $1 + k(0.5 + ci/200)$, respectively. We assumed a 95% confidence interval. The values for each *ab* and each *c* are sorted in ascending order, and we observe if zero appears between the lower (125, in our case) and upper (4876, in our case) bounds. If zero appears between the bounds for an

ab, then no mediating effect is present. If zero does not appear between the bounds for an *ab*, then the path *c′* is fully mediated if zero does appear between the bounds for *c′* and is partially mediated if it does not. As can be seen in Table 5, the path between OHC information consumption and OHC received social support is fully mediated by OHC cohesiveness and OHC altruism. However, the path between OHC information sharing and OHC received social support is neither fully nor partially mediated by the OHC group dynamics.

7. Discussion

We developed and tested a model to examine how information sharing (passive use) and information consumption (active use) is associated with OHC received social support. We further proposed that these relationships are mediated by the OHC group dynamics of cohesiveness, altruism, and universality.

7.1. Summary of results

We found that both OHC information consumption and sharing positively predict OHC received social support. However, the relationship between information consumption and OHC received social support is fully mediated by the perceptions that the OHCs are cohesive and altruistic. The relationship between information sharing and OHC social support is not mediated by the OHC group dynamics. One interpretation of these results is that passive use of OHCs, in which users read what others have posted, helps them feel a sense of community with the other members and gives them a sense of purpose. Specifically, reading what others have posted may help users feel closer to the other members, feel like they fit in, and help develop a sense of belongingness to the group (i. e., cohesion). Similarly, reading the travails and advice that others have posted to the OHC may help users derive a sense of purpose and feel like they could contribute to the community. Our findings suggest that it is through the group characteristics of cohesiveness and altruism that information consumers feel socially supported on OHCs.

OHC information sharing has a direct, positive influence on OHC received social support. Moreover, this relationship was not mediated by the OHC group dynamics. This could be explained by considering that users who share information on an OHC may be looking for an answer to a specific inquiry that is relevant to their current situation [69]. Users' whose inquiries are answered may feel socially supported without the

Table 5
Bootstrapped confidence interval tests for full and partial mediation model.

Proposed relationship	Proposed full mediator	Mediation test (ab) (indirect effects)			Full/partial mediation test (c′)			Type of mediation relationship
		5% lower bound	95% upper bound	Include zero?	2.5% lower bound	97.5% upper bound	Include zero?	
IC →VC → SS	VC	0.070	0.174	No	−0.088	0.096	Yes	Full
IC →VA → SS	VA	0.011	0.068	No	−0.088	0.096	Yes	Full
IC →VU → SS	VU	−0.003	0.054	Yes	−0.088	0.096	Yes	None
IS →VC → SS	VC	−0.012	0.036	Yes	0.261	0.417	No	None
IS →VA → SS	VA	−0.009	0.027	Yes	0.261	0.417	No	None
IS →VU → SS	VU	−0.001	0.029	Yes	0.261	0.417	No	None

IC = OHC information consumption; IS = OHC information sharing; VC = OHC cohesiveness; VA = OHC altruism; VU = OHC universality; SS = OHC social support.

need to consider the overall OHC group dynamics. Simply posting a question or statement to an OHC may not directly lead to a sense of belongingness or community, which our results indicate; that is, there was no association between information sharing and cohesiveness. However, information sharing can directly foster altruism because the user may be answering someone else's question. Information sharing also provides the chance for the user to express themselves, be vulnerable, and feel heard or understood (i.e., universality). Our results indicate that OHC information sharing is indeed directly and positively associated with both altruism and universality. Notably, users who share information leave a data trail that information consumers can later read. Although positive group dynamics may not be necessary for the information sharer to feel socially supported, the public conversation can help shape positive group dynamics that are critical for information consumers to feel social support on the OHC.

Our findings reveal that information consumption is positively associated with cohesiveness. This suggests that reading what others have posted is necessary to develop a sense of belongingness and connection to the OHC. Information consumption is also positively associated with both altruism and universality. This means that consuming information on OHCs can help create a sense of purpose for users and let them feel that they have a contribution to make (i.e., altruism). OHCs also provide information consumers with content that can help them realize that they are not alone in their suffering (i.e., universality). These findings suggest that reading the posts on an OHC can help develop positive group dynamics that lead to higher levels of OHC received social support.

Our results also show that cohesiveness and altruism contribute to OHC received social support, but universality does not. One interpretation of these findings is that universality is simply a benefit of active and passive OHC use akin to OHC received social support. Although perceptions of universality could bring comfort, it is possible that such comfort alone is a benefit and universality does not lead to instrumental, informational, emotional, or social interaction support. In other words, just knowing that one is not unique in his or her experience does not necessarily drive feelings of support from others. However, feeling like one is a part of a community, belongs to a group of similar others, and has a contribution to make to that group (i.e., cohesiveness and altruism) could bolster and contribute to OHC received social support, and our findings provide evidence of this occurring on OHCs.

Our results illustrate that OHC information consumers can develop a sense of not being alone in their suffering (i.e., universality), a sense of purpose (i.e., altruism), and a sense of belongingness or community (i.e., cohesiveness). Those who share information report a sense of altruism, or being able to help others, and universality, which can be interpreted as being able to express themselves among like others that may make them feel that they are being heard. Both cohesiveness and altruism drive OHC received social support. In other words, the more users feel that their OHCs provide a sense of belonginess and community, the more likely they are to feel socially supported. Similarly, the more users feel that the OHC provides a sense of purpose and allows them to be helpful to others, the more likely they are to feel socially supported. Moreover,

cohesiveness and altruism fully mediate the relationship between information consumption and OHC received social support. This means that it is through perceiving the OHC to be cohesive and altruistic that information consumers feel socially supported. Although information sharers are contributing to positive group dynamics, they do not need them to feel socially supported on the OHC. Cohesiveness and altruism both contribute to OHC received social support, but universality does not.

7.2. Contributions to research and theory

Our study makes several contributions to research and theory. OHCs hold the promise of helping remove some of the burden from overtaxed healthcare systems by providing basic social support. Studies show that not only can OHCs provide social support [e.g., 14, 37, 42, 43, 125] but that receiving social support can be beneficial to mental and physical health behaviors and attitudes [e.g., 14, 36, 54, 58, 124]. What is less clear is which user and community characteristics make OHCs more socially supportive. Few studies focus on the drivers of OHC received social support [14, 53], but instead focus on factors influencing social support seeking or provisioning [42, 57, 58, 68, 128]. For the long-term survival of OHCs [56], it is crucial they address users' expectations [e.g., 15, 88], which in the case of OHCs is a supportive environment to help them cope with their disease. Our study provides insight into how both use and group dynamics shape OHC received social support.

We complement studies that have emphasized the role of virtual social connections or relationships on the receipt of OHC social support [14, 53], by developing a model that highlights the importance of how people choose to use OHCs and the perceptions they have about the nature of the environment to which they are turning for support. Namely, we contribute to the OHC research discourse by (1) examining how people report using and feeling about their OHCs by using survey data rather than archival data; (2) extending beyond the dichotomous categorization of users as either lurkers or posters to instead examine how the frequency of types of use (i.e., active and passive) contribute to functional OHCs and received social support; (3) leveraging research in psychotherapy [79, 123] to examine how group characteristics known to promote functional therapy groups contribute to creating more functional OHCs.

Studies of social support on OHCs often rely on archival data obtained from OHCs [e.g., 14, 42, 124], which provides insight into actual behaviors, such as a user answering another user's inquiry. Such studies improve understanding of the help mechanisms and the characteristics of the underlying social network on OHCs. Our study complements such studies because our approach helps provide an understanding of how people's perceptions of their OHC influence their received social support, and such perceptions are not measurable from archival data. Perceptual data is important because how people feel about the groups in which they participate can influence their affective experiences in health-related contexts and their adherence to healthy behaviors [39]. Thus, it is likely that users who positively perceive their OHCs are more likely to be helped by them. Our results show that this is the case: users

who feel that their OHC is a caring place to which they can contribute report higher levels of OHC received social support. We thus illustrate the benefits of promoting cohesiveness and altruism on OHCs.

Virtual community studies often examine a dichotomous categorization of users [e.g., 46, 96, 108, 127] rather than focusing on the types of use. Rather than dividing users along one dimension—e.g., lurkers and posters—we adopt the approach used in OSN research [52] to examine active and passive use separately. We also draw on IS research that finds the relationships between the use type in online communities and the outcomes of that use may be mediated by social experiences [52, 53, 122]. Taking this approach, we discover the nuances that differentiate how benefits are derived from the two types of use. Specifically, we determine that information sharing leads to OHC received social support directly, but positive group dynamics fully mediate the relationship between information consumption and OHC received social support. We also find that, whereas information consumption leads to perceptions of OHC cohesiveness, altruism, and universality, only the latter two are driven by information sharing. This may indicate that simply asking a question on an OHC does not help build community; instead, getting to know the community by reading their postings leads to better group dynamics overall. Better group dynamics result in increased benefits, thus understanding how use drives group dynamics is crucial. Researchers have argued that different motives exist for lurking, and thus simply investigating whether someone shares on an online community is not granular enough [81, 96]. Similarly, we posit that not all use is equal and that researchers should continue to examine use in more fine-grained ways, especially in different contexts. OHCs are focused on health and are contextually different from other types of online communities. Even basic types of use in such contextually different environments can lead to different outcomes.

Finally, ours is among the first studies to examine group dynamics on OHCs using a fine-grained approach drawn from the psychotherapy literature [79, 123]. We expand upon IS research that found social relationships were key to realizing social support on OHCs [53]. Specifically, rather than examining the formation of interpersonal relationships on OHCs, we examined how group characteristics shape OHC received social support. That is, we examined how users perceive the group as a whole by singling out specific group characteristics whose presence in group therapy are known to be beneficial [123]. By doing so, we provide insight into how OHCs can be beneficial for different types of users. We were able to determine that active and passive use both contribute positively to altruism and universality, but only passive use contributes to cohesiveness. Moreover, cohesiveness and altruism fully mediate the relationship between information consumption and OHC received social support. This suggests that positive group dynamics are crucial for passive use to result in OHC received social support. Group dynamics is a large field of study, and the current research singled out three factors that are thought to be especially critical for group therapy [31, 79, 123]. Our results show that building positive group dynamics could be key to maximizing the OHC received social support for all users no matter how they choose to use the OHC. These findings suggest that activities and features that promote positive group dynamics should be further studied and emphasized in the management and design of OHCs.

7.3. Implications for society and practice

Our findings also have several potential implications for society and practice. Our model reveals that OHC information consumption is fully mediated by OHC group dynamics; specifically, cohesiveness and altruism. Research on lurkers has found that new users often consume information while they are learning about the online community and share later once they have developed some comfort with it [27, 72, 81, 96]. Our findings illustrate that information consumption leads to OHC received social support through feelings of belongingness and altruism. Altogether this indicates that positive group dynamics may be especially crucial to retaining new members of an OHC.

If our results hold, then positive group dynamics on OHCs need to be nurtured to maximize their helpfulness for all users. One way to do so is to use human or automated moderators to encourage helpful content and remove content that may inhibit positive group dynamics from developing on the OHC. Such moderators should be allowed to remove content that may make the OHC appear unfriendly [44, 81]. Policing members' posts and removing members who detract from a sense of community may be necessary as well. Moderating OHCs can help enhance and preserve a sense of community and encourage a sense of purpose, which are necessary to best assist those who consume information. Moreover, features could be developed that encourage information consumption, community, and altruistic behaviors. For example, OHCs could sponsor activities that encourage real-time interaction that may help group members build community. As another example, OHCs could provide ways to tag a post so users can signal that they are in distress or need help, a feature which may stimulate altruism. OHC designers may want to consider both activities and features that could be developed to provide ways to bring users together, encourage them to read others' posts, and aid those in need.

Our findings also show that information sharing is directly related to OHC social support, which means that by, for example, asking questions, venting, and providing information, active users can benefit from the OHC. However, information sharing also helps build the positive group dynamics that are crucial for information consumption to result in OHC received social support. This means that people need to share information to build community and that by doing so the community may be more welcoming to more individuals. Although it may not be necessary to share information to benefit from OHCs, active use is necessary to nurture OHCs. Research has emphasized the role of active participation and suggested that it needs to be encouraged for online communities to provide maximum benefits [66, 114]. Our findings reinforce this view. However, our findings illustrate the processes through which both active and passive use can result in OHC received social support.

Additionally, OHC information consumption was positively associated with OHC cohesiveness, but OHC information sharing was not. This suggests that it may be necessary to read the postings of other members to develop a cohesive community. Although posting is critical for a thriving OHC, information sharers should also be encouraged to read what others have posted. This means that steps should be taken to encourage community and advance members' understanding and knowledge of each other. OHC cohesiveness is positively associated with OHC received social support, meaning that building a stronger community is beneficial to users. It has been noted that posters may use OHCs to ask pointed questions relevant to their own situations; that is, use OHCs as question and answer forums [69]. There may be advantages in finding ways to evolve such users into more integrated community members.

In summary, our findings show that it is necessary to both talk and listen to nurture a thriving, supportive community. OHCs serve highly specific groups of people and should be designed in ways that allow users the flexibility to use OHCs in whatever ways best support those users at a given point in time. One implication of this is that OHCs may need different design elements than traditional OSNs or online communities that target other populations. It may be worthwhile for OHC designers to think about activities or features that encourage longer interactions that will build community rather than for more utilitarian purposes such as getting a question answered. For example, threads could be started by the OHC moderators to encourage discussion around a particular topic at a defined time. Or more emojis could be added to encourage users to read other's posts and leave quick feedback. Facebook added a "care" emoji as a way to express sympathy, and thus OHC designers could develop more contextually relevant emojis similar to the "care" emoji that would allow for interaction that is not time-consuming. This could help build community by encouraging people to be active (i.e., share an emoji) but also could encourage noticeable information consumption that may in turn promote good community

citizenship.

7.4. Limitations and future research

Our study illustrates the importance of building positive group dynamics for all OHC users to maximize the benefits from their use. OHCs can provide critical social support to users that may help supplement the care that they receive from healthcare providers and their physical circle of family and friends. Our study examined three of the more prominent factors discussed in psychotherapy research, but group dynamics is a large discipline. Thus, future research should expand on our model and findings to explore other factors that promote better functioning communities, or to see what factors may be most influential for OHCs for specific types of chronic diseases (e.g., stigmatized). Our study did not focus on a particular chronic disease or a particular type of OHC. Future studies may also want to delve into explorations of differences between OHCs for different chronic conditions. Although our study examined use in a broader way than many past studies that focused only on the poster versus lurker dichotomy, more detailed studies of use or studies of OHC features that promote specific types of use should also be the focus of future research.

We conducted a cross-sectional survey, which limited the contribution of our study because we were only able to capture people's perceptions at one point in time. Future studies could consider different methodological approaches that could obtain time-series data. For example, longitudinal studies could capture use as people's struggles with their diseases changed course over time. Experimental studies could be developed that test particular features that would encourage some of the group dynamics we identified to be foundational. Finally, data mining or text mining techniques could be employed to identify patterns in communication or the characteristics of discussions that occur on different types of OHCs with different technological characteristics. We encourage future research to continue such expansions of our findings because OHCs are certain to become more critical as increasingly taxed healthcare systems look for new ways to better support people with chronic health conditions.

8. Conclusion

Our study investigated the mediating role of cohesiveness, altruism, and universality on the relationships between the type of OHC use (active and passive) and perceptions of OHC received social support. Our findings revealed that the relationship between information consumption and OHC received social support is fully mediated by cohesiveness and altruism. That is, it is through perceiving the OHC to be a cohesive community to which users feel a sense of belongingness and that provides them with a sense of purpose and ways in which they can contribute that information consumption results in OHC received social support. Information sharing is directly associated with OHC received social support, which suggests that people who go to the community to ask for help or guidance or who offer help or guidance to others can achieve social support from the OHC regardless of community functioning. However, information sharing is a driver of both altruism and universality, which confirms the need for users to participate to develop a thriving community. In addition, information consumption is a driver of cohesiveness, altruism, and universality, which highlights the importance of listening to others (i.e., reading their posts) in developing a high-functioning community. Cohesiveness and altruism are both positively associated with OHC received social support, further supporting the importance of positive group dynamics in the obtainment of social support from OHCs. Our findings provide evidence that the design and caretaking of OHCs should focus on ways to promote positive group dynamics to best support all types of users.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.im.2022.103606.

References

[1] J. Amann, C. Zanini, S. Rubinelli, What online user innovation communities can teach us about capturing the experiences of patients living with chronic health conditions. A scoping review, PloS ONE 11 (2016) 6. Article: e0156175.

[2] G. Arling, Strain, social support, and distress in old age, J. Gerontol. 42 (1) (1987) 107–113.

[3] A. Barak, M. Boniel-Nissim, J. Suler, Fostering empowerment in online support groups, Comput. Human Behav. 24 (5) (2008) 1867–1883.

[4] R.M. Baron, D.A. Kenny, The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations, J. Pers. Soc. Psychol. 51 (6) (1986) 1173–1182.

[5] M. Barrera, S.L. Ainlay, The structure of social support: a conceptual and empirical analysis, J. Community Psychol. 11 (2) (1983) 133–143.

[6] Batson, C.D. and Powell, A.A. Altruism and prosocial behavior. In S.T. Fiske, D.T. Gilbert, and G. Lindzey (eds.), Handbook of Social Psychology, 2, 2003, pp. 463–484.

[7] J. Benitez, J. Henseler, A. Castillo, F. Schuberth, How to perform and report an impactful analysis using partial least squares: guidelines for confirmatory and explanatory IS research, Inf. Manag. 57 (2) (2020), 103168.

[8] A.L. Blanchard, M.L. Markus, The experienced sense of a virtual community: characteristics and processes, ACM SIGMIS Database 35 (1) (2004) 64–79.

[9] D.O. Braithwaite, V.R. Waldron, J. Finn, Communication of social support in computer-mediated groups for people with disabilities, Health Commun. 11 (2) (1999) 123–151.

[10] S.L. Brown, R.M. Nesse, A.D. Vinokur, D.M. Smith, Providing social support may be more beneficial than receiving it: results from a prospective study of mortality, Psychol. Sci. 14 (4) (2003) 320–327.

[11] H. Buchanan, N.S. Coulson, Accessing dental anxiety online support groups: an exploratory qualitative study of motives and experiences, Patient Educ. Couns. 66 (3) (2007) 263–269.

[12] Burke, M.; Marlow, C.; and Lento, T. Social network activity and social well-being. Presented At Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Atlanta, GA, 2010, pp. 1909–1912.

[13] R.T. Cenfetelli, G Bassellier, Interpretation of formative measurement in information systems research, MIS Q. 33 (4) (2009) 689–707.

[14] L. Chen, A. Baird, D Straub, Fostering participant health knowledge and attitudes: an econometric study of a chronic disease-focused online health community, J. Manag. Inf. Syst. 36 (1) (2019) 194–229.

[15] Cheung, C.M. and Lee, M.K. Understanding user intention to continue sharing knowledge in virtual communities. Presented At 5th European Conference On Information Systems, St. Gallen, Switzerland, 2007, pp. 635–646.

[16] W.W. Chin, B.L. Marcolin, P.R. Newsted, A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study, Inf. Syst. Res. 14 (2) (2003) 189–217.

[17] G.A. Churchill, A paradigm for developing better measures of marketing constructs, J. Mark. Res. 16 (1) (1979) 64–73.

[18] S. Cohen, Social relationships and health, Am. Psychol. 59 (8) (2004) 676–684.

[19] S. Cohen, R. Mermelstein, T. Kamarck, H.M. Hoberman, Measuring the functional components of social support, in: I.G. Sarason, B.R. Sarason (Eds.), Social Support: Theory, Research and Applications, Martinus Nijhoff, The Hague, Holland, 1985, pp. 73–94.

[20] S. Cohen, T.A. Wills, Stress, social support, and the buffering hypothesis, Psychol. Bull 98 (2) (1985) 310–357.

[21] N.S. Coulson, Receiving social support online: an analysis of a computer-mediated support group for individuals living with irritable bowel syndrome, CyberPsychol. Behav. 8 (6) (2005) 580–584.

[22] J.N. Cummings, L. Sproull, S.B. Kiesler, Beyond hearing: where the real-world and online support meet, Group Dyn. 6 (1) (2002) 78–88.

[23] A. Diamantopoulos, J.A. Siguaw, Formative versus reflective indicators in organizational measure development: a comparison and empirical illustration, Br. J. Manag. 17 (4) (2006) 263–282.

[24] D. Divajeva, T. Marsh, S. Logstrup, M. Kestens, P. Vemer, V. Kriaucioniene, S. Peresson, S. O'Kelly, A. Rito, L. Webber, Economics of chronic diseases protocol: cost-effectiveness modelling and the future burden of non-communicable disease in Europe, BMC Public Health 14 (1) (2014) 456.

[25] K.C. Eichhorn, Soliciting and providing social support over the Internet: an investigation of online eating disorder support groups, J. Comput.-Mediated Commun. 14 (1) (2008) 67–78.

[26] G. Eysenbach, J. Powell, M. Englesakis, C. Rizo, A. Stern, Health related virtual communities and electronic support groups: systematic review of the effects of online peer to peer interactions, BMJ 328 (7449) (2004) 1166–1171.

[27] J. Finn, An exploration of helping processes in an online self-help group focusing on issues of disability, Health Soc. Work 24 (3) (1999) 220–231.

[28] J. Finn, M Lavitt, Computer-based self-help groups for sexual abuse survivors, Soc. Work Groups 17 (1–2) (1994) 21–46.

[29] L.J. Finney Rutten, K.D. Blake, A.J. Greenberg-Worisek, S.V. Allen, R.P. Moser, B.W. Hesse, Online health information seeking among US adults: measuring

progress toward a healthy people 2020 objective, Public Health Rep. 134 (6) (2019) 617–625.

[30] C. Fornell, D.F Larcker, Evaluating structural equation models with unobservable variables and measurement error, J. Mark. Res. 18 (1) (1981) 39–50.

[31] D.R. Forsyth, Group Dynamics, 5th edition, Cengage Learning, Belmont, CA, 2018.

[32] Frank-Saracini, J.; Wilbur, M.; Torres Rivera, E.; and Roberts-Wilbur, J.GCT: Structure and chaos of group supervision. Presented At Annual Convention of the North Atlantic Association for Counselor Education and Supervision, Wells, ME, 1998.

[33] L.R. Frey, Sunwolf, The symbolic-interpretive perspective on group dynamics, Small Group Res. 35 (3) (2004) 277–306.

[34] C. Fullwood, D. Chadwick, M. Keep, A. Attrill-Smith, T. Asbury, G. Kirwan, Lurking towards empowerment: explaining propensity to engage with online health support groups and its association with positive outcomes, Comput. Human Behav. 90 (1) (2019) 131–140.

[35] D. Gefen, D.W. Straub, A practical guide to factorial validity using PLS-Graph: tutorial and annotated example, Commun. Assoc. Inf. Systems 16 (5) (2005) 91–109.

[36] W. Gerin, C. Pieper, R. Levy, T.G. Pickering, Social support in social interaction: a moderator of cardiovascular reactivity, Psychosom. Med. 54 (3) (1992) 324–336.

[37] J.M. Goh, G. Gao, R. Agarwal, The creation of social value: can an online health community reduce rural–urban health disparities? MIS Q. 40 (1) (2016) 247–263.

[38] C. Goodenow, S.T. Reisine, K.E. Grady, Quality of social support and associated social and psychological functioning in women with rheumatoid arthritis, Health Psychol. 9 (3) (1990) 266–284.

[39] S. Graupensperger, J.S. Gottschall, A.J. Benson, M. Eys, B. Hastings, M.B. Evans, Perceptions of groupness during fitness classes positively predict recalled perceptions of exertion, enjoyment, and affective valence: an intensive longitudinal investigation, Sport, Exerc. Perform. Psychol. 8 (3) (2019) 290–304.

[40] J.F. Hair, W.C. Black, B.J. Babin, R.E. Anderson, R.L. Tatham, Multivariate Data Analysis, Pearson Prentice Hall, Upper Saddle River, NJ, 2006.

[41] A.F. Hayes, Beyond Baron and Kenny: statistical mediation analysis in the new millennium, Commun. Monogr. 76 (4) (2009) 408–420.

[42] K.-.Y. Huang, I. Chengalur-Smith, A. Pinsonneault, Sharing is caring: social support provision and companionship activities in healthcare virtual support communities, MIS Q. 43 (2) (2019) 395–424.

[43] K.-.Y. Huang, I. Chengalur-Smith, W. Ran, Not just for support: companionship activities in healthcare virtual support communities, Commun. Assoc. Inf. Syst. 34 (2014) 561–594. Article: 29.

[44] J. Huh, B.C. Kwon, S.-.H. Kim, S. Lee, J. Choo, J. Kim, M.-.J. Choi, J.S. Yi, Personas in online health communities, J. Biomed. Inform. 63 (2016) 212–225.

[45] K. Irwin, J.A. Tsang, R. Carlisle, M.J. Shen, Group-level effects of forgiveness: group cohesiveness and collective action in social dilemmas, Eur. J. Soc. Psychol. 44 (4) (2014) 280–286.

[46] L. Jiang, K. Mirkovski, J.D. Wall, C. Wagner, P.B. Lowry, Proposing the core contributor withdrawal theory (CCWT) to understand core contributor withdrawal from online peer-production communities, Int. Res. 28 (4) (2018) 988–1028.

[47] I. Kawachi, L.F Berkman, Social ties and mental health, J. Urban Health 78 (3) (2001) 458–467.

[48] M.M. Kazmer, M.L.A. Lustria, J. Cortese, G. Burnett, J.H. Kim, J. Ma, J. Frost, Distributed knowledge in an online patient support community: authority and discovery, J. Assoc. Inf. Sci. Technol. 65 (7) (2014) 1319–1334.

[49] D.M. Kivlighan, R.L. Lilly, Developmental changes in group climate as they relate to therapeutic gain, Group Dyn. 1 (3) (1997) 208–221.

[50] D.M. Kivlighan, J.M. Tarrant, Does group climate mediate the group leadership–group member outcome relationship?: a test of Yalom's hypotheses about leadership priorities, Group Dyn. 5 (3) (2001) 220–234.

[51] Koroleva, K.; Krasnova, H.; and Günther, O. It's all about networking! empirical investigation of social capital formation on social network sites. Presented At 32nd International Conference On Information Systems, Shanghai, China, 2011.

[52] H. Krasnova, T. Widjaja, P. Buxmann, H. Wenninger, I. Benbasat, Why following friends can hurt you: an exploratory investigation of the effects of envy on social networking sites among college-age users, Inf. Syst. Res. 26 (3) (2015) 585–605.

[53] J.M. Leimeister, K. Schweizer, S. Leimeister, H. Krcmar, Do virtual communities matter for the social support of patients? Antecedents and effects of virtual relationships in online communities, Inf. Technol. People 21 (4) (2008) 350–374.

[54] S.J. Lepore, K. Allen, G.W. Evans, Social support lowers cardiovascular reactivity to an acute stressor, Psychosom. Med. 55 (6) (1993) 518–524.

[55] K.P. Lese, R.R. MacNair-Semands, The therapeutic factors inventory: development of a scale, Group (New York) 24 (4) (2000) 303–317.

[56] Liao, R.; Kishore, R.; and Lee, M.J. Users' continued usage of online healthcare virtual communities: an empirical investigation in the context of HIV support communities. Presented At 25th Americas Conference On Information Systems, Cancun, Mexico, 2019, pp. 1–10.

[57] T.-.C. Lin, J.S.-C. Hsu, H.-.L. Cheng, C.-.M. Chiu, Exploring the relationship between receiving and offering online social support: a dual social support model, Inf. Manag. 52 (3) (2015) 371–383.

[58] N. Liu, Y. Tong, H.C. Chan, Dual effects of social support seeking in patient-centric online healthcare communities: a longitudinal study, Inf. Manag. 57 (8) (2020), 103270.

[59] P.B. Lowry, J. D'Arcy, B. Hammer, G.D. Moody, Cargo Cult" science in traditional organization and information systems survey research: a case for using nontraditional methods of data collection, including mechanical Turk and online panels, J. Strateg. Inf. Syst. 25 (3) (2016) 232–240.

[60] P.B. Lowry, J. Gaskin, Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: when to choose it and how to use it, IEEE Trans. Prof. Commun. 57 (2) (2014) 123–146.

[61] P.B. Lowry, N.C. Romano, J.L. Jenkins, R.W. Guthrie, The CMC interactivity model: how interactivity enhances communication quality and process satisfaction in lean-media groups, J. Manag. Inf. Syst. 26 (1) (2009) 155–196.

[62] E. Lvina, G. Johns, C. Vandenberghe, Team political skill composition as a determinant of team cohesiveness and performance, J. Manag. 44 (3) (2018) 1001–1028.

[63] S.B. MacKenzie, P.M. Podsakoff, N.P. Podsakoff, Construct measurement and validation procedures in MIS and behavioral research: integrating new and existing techniques, MIS Q., 35 (2) (2011) 293–334.

[64] D.P. MacKinnon, Introduction to Statistical Mediation Analysis, Erlbaum, New York, NY, 2008.

[65] S. Malinen, Understanding user participation in online communities: a systematic literature review of empirical studies, Comput. Human Behav. 46 (1) (2015) 228–238.

[66] K.Y. McKenna, Influences on the nature and functioning of online groups, in: A. Barak (Ed.), Psychological Aspects of Cyberspace: Theory, Research, Applications, Cambridge University Press, Cambridge, UK, 2008, pp. 228–242.

[67] S.K. Merry, A. Simon, Living and lurking on LiveJournal: the benefits of active and non-active membership, Aslib Proc. 64 (3) (2012) 241–261.

[68] T. Mirzaei, P. Esmaeilzadeh, Engagement in online health communities: channel expansion and social exchanges, Inf. Manag. 58 (1) (2021), 103404.

[69] P.K. Mo, N.S. Coulson, Empowering processes in online support groups among people living with HIV/AIDS: a comparative analysis of 'lurkers' and 'posters', Comput. Human Behav. 26 (5) (2010) 1183–1193.

[70] P.K. Mo, N.S Coulson, Are online support groups always beneficial? A qualitative exploration of the empowering and disempowering processes of participation within HIV/AIDS-related online support groups, Int. J. Nurs. Stud. 51 (7) (2014) 983–993.

[71] S. Newman, L. Steed, K. Mulligan, Self-management interventions for chronic illness, Lancet 364 (9444) (2004) 1523–1537.

[72] B. Nonnecke, D. Andrews, J. Preece, Non-public and public online community participation: needs, attitudes and behavior, Electron. Commer. Res. 6 (1) (2006) 7–20.

[73] S. Oh, The characteristics and motivations of health answerers for sharing information, knowledge, and experiences in online environments, J. Am. Soc. Inf. Sci. Technol. 63 (3) (2012) 543–557.

[74] D.M. Oppenheimer, T. Meyvis, N. Davidenko, Instructional manipulation checks: detecting satisficing to increase statistical power, J. Exp. Soc. Psychol. 45 (4) (2009) 867–872.

[75] A.K. Parekh, R. Kronick, M. Tavenner, Optimizing health for persons with multiple chronic conditions, JAMA - J. Am. Med. Assoc. 312 (12) (2014) 1199–1200.

[76] D.X. Peng, F. Lai, Using partial least squares in operations management research: a practical guideline and summary of past research, J. Oper. Manag. 30 (6) (2012) 467–480.

[77] A. Petrovčič, G. Petrič, Differences in intrapersonal and interactional empowerment between lurkers and posters in health-related online support communities, Comput. Human Behav. 34 (2014) 39–48.

[78] S. Petter, D. Straub, A. Rai, Specifying formative constructs in information systems research, MIS Q. 31 (4) (2007) 623–656.

[79] L.T. Phan, E.T. Rivera, M.A. Volker, M.T. Garrett, Measuring group dynamics: an exploratory trial, Can. J. Couns. 38 (4) (2004) 234–245.

[80] P.M. Podsakoff, S.B. MacKenzie, J.-.Y. Lee, N.P. Podsakoff, Common method biases in behavioral research: a critical review of the literature and recommended remedies, J. Appl. Psychol. 88 (5) (2003) 879–901.

[81] J. Preece, B.;. Nonnecke, D Andrews, The top five reasons for lurking: improving community experiences for everyone, Comput. Human Behav. 20 (2) (2004) 201–223.

[82] A. Ramirez, J.B. Walther, J.K. Burgoon, M. Sunnafrank, Information-seeking strategies, uncertainty, and computer-mediated communication: toward a conceptual model, Hum. Commun. Res. 28 (2) (2002) 213–228.

[83] Ringle, C.M.; Wende, S.; and Becker, J.-.M. SmartPLS 3. Hamburg, Germany: http://www.smartpls.com, 2021.

[84] S. Rodgers, Q. Chen, Internet community group participation: psychosocial benefits for women with breast cancer, J. Comput.-Mediated Commun. 10 (4) (2005) 1–31.

[85] A. Rosengren, K. Orth-Gomer, H. Wedel, L. Wilhelmsen, Stressful life events, social support, and mortality in men born in 1933, BMJ 307 (6912) (1993) 1102–1105.

[86] C. Schwartz, J.B. Meisenhelder, Y. Ma, G. Reed, Altruistic social interest behaviors are associated with better mental health, Psychosom. Med. 65 (5) (2003) 778–785.

[87] B.R. Shaw, F. McTavish, R. Hawkins, D.H. Gustafson, S. Pingree, Experiences of women with breast cancer: exchanging social support over the CHESS computer network, J. Health Commun. 5 (2) (2000) 135–159.

[88] X.-.L. Shen, Y.-.J. Li, Y. Sun, Wearable health information systems intermittent discontinuance: a revised expectation-disconfirmation model, Ind. Manag. Data Syst. 118 (3) (2018) 506–523.

[89] L.E. Sherman, P.M. Greenfield, Forging friendship, soliciting support: a mixed-method examination of message boards for pregnant teens and teen mothers, Comput. Human Behav. 29 (1) (2013) 75–85.

[90] M.E. Sobel, Asymptotic confidence intervals for indirect effects in structural equation models, Sociol. Methodol. 13 (1) (1982) 290–312.

[91] Solberg, L.B. The benefits of online health communities. (2014), Date last accessed: March 22, 2021, retrieved from https://journalofethics.ama-assn.org/article/benefits-online-health-communities/2014-04.

[92] Soroka, V. and Rafaeli, S. Invisible participants: how cultural capital relates to lurking behavior. Presented At Proceedings of the 15th International Conference On World Wide Web, Edinburgh, Scotland, 2006, pp. 163–172.

[93] Z.R. Steelman, B.I. Hammer, M. Limayem, Data collection in the digital age: innovative alternatives to student samples, MIS Q. 38 (2) (2014) 355–378.

[94] J.P. Stokes, D.G. Wilson, The inventory of socially supportive behaviors: dimensionality, prediction, and gender differences, Am. J. Community Psychol. 12 (1) (1984) 53–69.

[95] J. Suls, L. Wheeler, Social comparison theory, in: P.A.M. Van Lange, A. W. Kruglanski, E.T. Higgins (Eds.), Handbook of Theories of Social Psychology, 1, Sage, Thousand Oaks, CA, 2012, pp. 460–482.

[96] N. Sun, P.P.-L. Rau, L. Ma, Understanding lurkers in online communities: a literature review, Comput. Human Behav. 38 (1) (2014) 110–117.

[97] J. Taylor, R.J Turner, A longitudinal study of the role and significance of mattering to others for depressive symptoms, J. Health Soc. Behav 42 (3) (2001) 310–325.

[98] S.E. Taylor, B.P. Buunk, L.G. Aspinwall, Social comparison, stress, and coping, Pers. Soc. Psychol. Bull. 16 (1) (1990) 74–89.

[99] S.E. Taylor, M. Lobel, Social comparison activity under threat: downward evaluation and upward contacts, Psychol. Rev. 96 (4) (1989) 569–575.

[100] The Independent. More patients flock to growing online health communities. In The Independent, 2011.

[101] J.H. Thrall, Prevalence and costs of chronic disease in a health care system structured for treatment of acute illness, Radiology 235 (1) (2005) 9–12.

[102] S.J. Tobin, E.J. Vanman, M. Verreynne, A.K. Saeri, Threats to belonging on Facebook: lurking and ostracism, Soc. Influ. 10 (1) (2015) 31–42.

[103] L. Tonteri, M. Kosonen, H.-.K. Ellonen, A. Tarkiainen, Antecedents of an experienced sense of virtual community, Comput. Human Behav. 27 (6) (2011) 2215–2223.

[104] B.N. Uchino, Social Support and Physical Health: Understanding the Health Consequences of Relationships, Yale University Press, New Haven, CT, 2004.

[105] B.N. Uchino, Social support and health: a review of physiological processes potentially underlying links to disease outcomes, J. Behav. Med. 29 (4) (2006) 377–387.

[106] B.N. Uchino, J.T. Cacioppo, J.K. Kiecolt-Glaser, The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health, Psychol. Bull. 119 (3) (1996) 488–531.

[107] UN. Chronic illnesses: UN stands up to stop 41 million avoidable deaths per year. (2021), Date last accessed: March 22, 2021, retrieved from https://news.un.org/en/story/2018/09/1021132.

[108] C. van Uden-Kraan, C. Drossaert, E. Taal, E.;. Seydel, M van de Laar, Self-reported differences in empowerment between lurkers and posters in online patient support groups, J. Med. Internet Res. 10 (2) (2008). Article: e18.

[109] A. Vance, P.B. Lowry, D.L. Eggett, Increasing accountability through the user interface design artifacts: a new approach to addressing the problem of access-policy violations, MIS Q. 39 (2) (2015) 345–366.

[110] B.W. Ward, J. Schiller, R.A. Goodman, Multiple chronic conditions among US adults: a 2012 update, Prev. Chronic Dis. 11 (2014).

[111] M.M. Wasko, S. Faraj, It is what one does": why people participate and help others in electronic communities of practice, J. Strateg. Inf. Syst. 9 (2–3) (2000) 155–173.

[112] N. Weinberg, J.S. Uken, J. Schmale, M. Adamek, Therapeutic factors: their presence in a computer-mediated support group, Soc. Work Groups 18 (4) (1995) 57–69.

[113] R. Weis, K. Stamm, C. Smith, M. Nilan, F. Clark, J. Weis, K. Kennedy, Communities of care and caring: the case of MSWatch. com®, J. Health Psychol. 8 (1) (2003) 135–148.

[114] J.L. Welbourne, A.L. Blanchard, M.B. Wadsworth, Motivations in virtual health communities and their relationship to community, connectedness and stress, Comput. Human Behav. 29 (1) (2013) 129–139.

[115] M. White, S.M. Dorman, Receiving social support online: implications for health education, Health Educ. Res. 16 (6) (2001) 693–707.

[116] C.P. Wilderom, Y. Hur, U.J. Wiersma, P.T.V. den Berg, J. Lee, From manager's emotional intelligence to objective store performance: through store cohesiveness and sales-directed employee behavior, J. Organ. Behav. 36 (6) (2015) 825–844.

[117] D.K.-K. Wong, M.-.K. Cheung, Online health information seeking and ehealth literacy among patients attending a primary care clinic in Hong Kong: a cross-sectional survey, J. Med. Internet Res. 21 (2019) 3. Article: e10831.

[118] J.V. Wood, S.E. Taylor, R.R. Lichtman, Social comparison in adjustment to breast cancer, J. Pers. Soc. Psychol. 49 (5) (1985) 1169–1183.

[119] K. Wright, The communication of social support within an on-line community for older adults: a qualitative analysis of the SeniorNet community, Qual. Res. Rep. Commun. 1 (1) (2000) 33–43.

[120] K. Wright, Social support within an on-line cancer community: an assessment of emotional support, perceptions of advantages and disadvantages, and motives for using the community from a communication perspective, J. Appl. Commun. Res. 30 (3) (2002) 195–209.

[121] K.B. Wright, S. Bell, Health-related support groups on the Internet: linking empirical findings to social support and computer-mediated communication theory, J. Health Psychol. 8 (1) (2003) 39–54.

[122] Wu, P.F. and Bernardi, R. Community attachment and emotional well-being: an empirical study of an online community for people with diabetes. Inf. Technol. People, Forthcoming, DOI 10.1108/ITP-06-2019-0293 (2020), 1–27.

[123] I.D. Yalom, The Theory and Practice of Group Psychotherapy, 4th edition, Basic Books, New York, NY, 1995.

[124] L. Yan, Good intentions, bad outcomes: the effects of mismatches between social support and health outcomes in an online weight loss community, Prod. Oper. Manag. 27 (1) (2018) 9–27.

[125] L. Yan, Y. Tan, Feeling blue? Go online: an empirical study of social support among patients, Inf. Syst. Res. 25 (4) (2014) 690–709.

[126] Z. Yan, T. Wang, Y. Chen, H. Zhang, Knowledge sharing in online health communities: a social exchange theory perspective, Inf. Manag. 53 (5) (2016) 643–653.

[127] X. Yang, G. Li, S.S. Huang, Perceived online community support, member relations, and commitment: differences between posters and lurkers, Inf. Manag. 54 (2) (2017) 154–165.

[128] X. Zhang, S. Liu, Z. Deng, X. Chen, Knowledge sharing motivations in online health communities: a comparative study of health professionals and normal users, Comput. Human Behav. 75 (2017) 797–810.

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