



# HHS Public Access

Author manuscript

*Proc ACM Hum Comput Interact.* Author manuscript; available in PMC 2023 November 11.

Published in final edited form as:

*Proc ACM Hum Comput Interact.* 2022 November ; 6(CSCW2): . doi:10.1145/3555203.

## Meeting Young Adults' Social Support Needs across the Health Behavior Change Journey: Implications for Digital Mental Health Tools

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### Abstract

In pursuit of mental wellness, many find that behavioral change is necessary. This process can often be difficult but is facilitated by strong social support. This paper explores the role of social support across behavioral change journeys among young adults, a group at high risk for mental health challenges, but with the lowest rates of mental health treatment utilization. Given that digital mental health tools are effective for treating mental health conditions, they hold particular promise for bridging the treatment gap among young adults, many of whom, are not interested in – or cannot access – traditional mental healthcare. We recruited a sample of young adults with depression who were seeking information about their symptoms online to participate in an Asynchronous Remote Community (ARC) elicitation workshop. Participants detailed the changing nature of social interactions across their behavior change journeys. They noted that both directed and undirected support are necessary early in behavioral change and certain needs such as informational support are particularly pronounced, while healthy coping partnerships and accountability are more important later in the change process. We discuss the conceptual and design implications of our findings for the next generation of digital mental health tools.

### Keywords

digital health interventions; mental health; health journeys; transtheoretical model; young adults

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## 1 INTRODUCTION

Young adults, typically considered to be between the ages of 18 and 25 [34,81,111], are the age group with the highest prevalence of mental health problems, but the lowest engagement in traditional treatments for their symptoms [97]. While there is some recent work examining the barriers and facilitators to traditional mental health help-seeking [34,81,111], there remains a lack of understanding about the self-management practices and social support needs of non-treatment seeking young adults. To maximize the design, uptake, and acceptability of mental health services and tools of all types it is necessary to better understand non-treatment seeking young adults' mental wellness journeys.

Understanding health journeys has been of growing interest to CSCW researchers. Thus far, this work has focused primarily on understanding the needs and preferences of patients as they navigate physical health journeys [41,65,94,114]. The physical health journey literature provides a framework for understanding that each individual's navigation of their physical health is unique and, often, non-linear [41]. Despite the idiographic nature of health journeys, individuals' preferences, needs, and barriers can be addressed thoughtfully at the group level [41,65,114]. To this end, we draw on the physical health journey literature not to establish a comparison between physical and mental health journeys, but rather to adapt the concept of a journey to frame our exploration of the recovery and self-management processes of non-treatment seeking young adults' mental wellness.

Within CSCW and the broader HCI community there is an increased focus on the needs and preferences of patients pursuing self-directed mental wellness [48,54]. An integral part of mental wellness promotion is behavioral change. As with other domains of behavioral change (e.g., physical activity, dietary changes, cessation of smoking or drug use), behavioral change can be a difficult process, as it may involve overcoming ambivalence, breaking and/or starting new habits, and learning new skills. Behavioral change in depression also presents unique challenges; in addition to low mood, individuals with depression often experience diminished reward from their environment, loss of motivation, and a reduction in the number of activities they are engaged in, resulting in fewer opportunities to derive pleasure from one's environment, often worsening one's depression [30]. Behavioral change supporting mental wellness can therefore involve a diverse set of strategies, including initiating new actions (e.g., commencing therapy), practicing new ways of thinking (e.g., challenging negative thought patterns), and building new routines (e.g., getting more sleep, incorporating more exercise into one's day, reengaging in positive activities that were once rewarding). Often, it involves a combination of such changes, aligning with an individual's needs and preferences. Ultimately, making changes is generally needed to achieve long-term abatement of mental health symptoms [95].

Given that these types of behavioral changes can be difficult, social support is often a critical component of their success [52,109]. A friend can become a partner who engages in behavioral change alongside an individual with depression and, in so doing, provides accountability, social support, and solidarity. Recent work in CSCW recognizes the important roles that other people play in helping individuals manage mental health

concerns, including by building motivation, normalizing experiences, exchanging strategies for managing symptoms, and building collaborative routines for self-management [19,70].

According to the Transtheoretical Model (TTM) of health behavior change (also known as the “stages of change” model), individuals’ internal motivation and readiness to change health-related behavior are highly dynamic [84]. In the case of mental health, symptoms often manifest in adolescence or young adulthood (ages 18-25), yet it can take years or decades before individuals become ready to seek professional help [108].

A growing number of digital technologies for managing mental health symptoms have emerged that offer support and guidance for the behavioral change process, including through exchanging messages with peers [75], sharing personal mental health data [71], and receiving professional guidance. However, the research into and the design of these tools have typically involved populations who are highly motivated (e.g., those participating in trials who are, by definition, treatment seeking) or who have already taken steps to seek help for their mental health needs [7]. Therefore, it is less understood how tools can be designed to appeal to, and provide support for, individuals who may not be as motivated as they are first recognizing symptoms and beginning their mental wellness journey. The present study therefore focuses on a narrow population: non-treatment seeking young adults.

To better understand individuals’ needs and preferences for obtaining social support for managing mental health concerns, and how these may shift across stages of change, we examine this issue among young adults ages 18-25, an age group with extremely high levels of mental health issues like depression [97], but who face a number of barriers to seeking formal help [68]. We worked with a large non-profit mental health advocacy group to reach young adults who reported being uninterested in seeking traditional forms of mental health care despite significant depression symptoms. Three research questions (RQs) guided this work: First, what types of support do young adults find helpful as they navigate self-management of mental health symptoms and their mental health journey (RQ1)? Related to this, we sought to answer how young adults’ social support needs differ within their mental health journeys (RQ2). Finally, we explored challenges and barriers to obtaining needed social support for symptom self-management across mental health journeys (RQ3).

Our work involved a remote elicitation workshop using Asynchronous Remote Communities (ARC) methods, which allow for anonymous, text-based, and asynchronous participation, and which have previously been successfully applied to understand user needs in other sensitive and stigmatized health contexts [61,62,79] such as pregnant people, individuals living with HIV or AIDS, and individuals living with rare medical conditions. We conducted qualitative analysis to identify the key needs, constraints, and preferences of non-treatment seeking young adults with depression. Our findings suggest a high level of desire for support from others across behavioral change journeys, but also highlight that individuals at different points in the journeys have different views of the roles others should play in supporting them. Furthermore, they suggest that support, as currently delivered, can be both beneficial and harmful. We discuss the ways that digital mental health (DMH) tools can be designed to help individuals meet their support needs more effectively, including through offering

options for both directed and undirected forms of social support, and consideration of an individual's stage in the change process as a key tailoring variable for DMH tools.

## 2 RELATED WORK

This study adds to a growing body of literature examining mental health journeys and seeking to leverage technology to support individuals whose mental health needs are not being met by existing healthcare systems. In the next sections, we discuss the DMH tools that have been designed for young adults, and the ways that these tools have used social support to address the needs of users. We highlight how this study extends previous work.

### 2.1 Young Adults and Digital Mental Health Tools

Young adults are the age group with the highest prevalence of mental health conditions. In 2019, nearly 30% of young adults in the United States (US) experienced a mental illness, relative to 20% of adults aged 26 or older [97]. This high rate of mental health symptoms among young adults is exacerbated by the fact that they have the lowest rates of mental health treatment seeking. In contrast to the 46% of US-based adults age 26 and older who sought in-person care for their psychological or psychiatric symptoms in the past year, less than 39% of those aged 18-25 did so [98]. Structural barriers, such as financial hardships, are often pointed to as reasons for the low use of in-person mental health care among young adults; however, attitudinal barriers (e.g., low perceived need for treatment, preferences for self-management, etc.) are over four times more prevalent than structural or financial barriers [68]. This suggests that efforts to increase access to traditional care alone will be insufficient to address the treatment gap within the young adult age group.

New technologies offer tremendous promise to deliver effective interventions to individuals experiencing mental health symptoms in formats that are accessible and appealing [5,21,93,105]. For instance, digital technologies to support mental health can be used in targeted ways that require short periods of engagement, increasing convenience [8,67], they can be used in private, and they have the ability to provide on-demand care when it is needed [6,92]. Digital technologies have been useful for treating and supporting the self-management of myriad mental health concerns including depression, anxiety, bipolar disorder, schizophrenia, substance use disorders, and suicidal ideation [4,17,32,33,53,59,63,112]. Young adults are heavy users of digital tools, 96% of US-based young adults own a smartphone, and they are the age group most likely to access the internet only through their smartphone [77]. Therefore, smartphone-delivered mental health interventions are a well-suited delivery medium [40,53,101]. DMH tools include apps or services designed to ameliorate mental health symptoms [4,32,33,59]. Most often, they work by promoting or facilitating a skill that targets a key cognitive or behavioral mechanism (e.g., ruminative thinking or cognitive distortions). Importantly, DMH tools offer a new intervention system that increases the accessibility of mental health treatment in a form that is effective and novel, democratizing the mental healthcare system [35,93,105,110].

However, despite many clinical trials demonstrating their effectiveness in reducing symptoms [5,32,33,59], existing mobile DMH tools have high dropout rates, low adherence, and generally low usage [9,60,104]. One recent analysis found that, in real-world settings,

only 4% of individuals who have installed a DMH app open it daily [9]. While existing mobile DMH tools are effective in controlled conditions, their effectiveness in real-world settings remains limited. This research-to-practice gap highlights that, even among research studies – which typically include more highly motivated users than are found in real-world use – engagement can be low [104]. This underscores the importance of designing tools that address the needs of less motivated and less proactive potential users. Increasing rates of sustained engagement is one of the great design challenges for DMH tools. Recent work has suggested that social interactions can provide an important avenue to increase engagement with DMH tools [15]; however, many questions remain about the forms of social interaction that are most appealing and helpful, particularly for those who are initiating their behavioral change journey.

## 2.2 Stages of Change

The transtheoretical model (TTM), or the stages of change model, is frequently used to understand an individuals' readiness to engage in health behavior change, and is often used as a framework for intervention in smoking [22,88,89,113], alcohol, and other substance use disorders [50]. The stages of change model has also been used to understand an individuals' readiness for change in the context of depression and affective disorders [57], and is linked to psychotherapy outcomes, such that individuals who were in later stages of change prior to initiating psychotherapy had improved psychotherapy outcomes once they engaged in mental health treatment [50,73].

The stages of change model [84] stipulates that health behavior change happens over time and that an individual's stage of change is a reflection of their progress across six stages. The first stage, *precontemplation*, is generally conceptualized as the period of time before an individual is considering any health behavior change. In this stage, individuals may not be aware of negative consequences of any maladaptive or otherwise unhelpful behaviors or practices, or they may be aware of these negative consequences of their behaviors but are nonetheless not considering health behavior change. *Contemplation* is the second stage of change and can be characterized by an individual weighing the benefits and drawbacks of health behavior change. In the contemplation stage, an individual may be aware of the negative consequences of certain behaviors, but they may not have decided to take any action to shift their behaviors. In this stage, individuals may not yet know the specific change behaviors to take, but may understand the negative consequences involved in not changing. Therefore, the cost of changing behavior is often weighed or considered against the potential gains of engaging in health behavior changes. During the *preparation* stage, individuals have resolved to imminently engage in health behavior change. They are likely to have engaged in preparatory work such as information gathering, researching ways of engaging in health behavior changes, talking to loved ones about changes, or otherwise generating a plan to engage in new health behavior changes. The next stage, the *action* stage, includes individuals who are engaging in change behaviors. They have overcome the cost of new behaviors and begun to modify their routines even if these changes continue to have high costs associated with them. The fifth stage is the *maintenance* stage, in which the new health behavior changes become more routine and the high cost of initiating a behavior lessens, instead shifting to the prevention of lapses and relapses. Finally, the *termination*

stage is one where an individual no longer needs to expend energy or effort to stave off lapses or relapses, but has integrated the change behavior as a matter of routine [84]. Within this model, individuals can move in and out of each stage of change, depending on individual circumstances, the health behavior change in question, and the support available to the individual.

The stages of change model has previously been applied to better understand how best to meet the needs of users of a digital health service. In particular, a study by de Vries and colleagues [106] used the stages of change model as a framework to tailor motivational text messages developed by Amazon Mechanical Turk workers, with the aim of promoting exercise adherence. After coding crowdsourced motivational messages based on how well they represented a particular stage of change, the researchers then tested how motivating each message was if it was delivered to an individual based on their self-described stage of change. de Vries and colleagues found that there was benefit to tailoring messages to an individual's stage of change, especially when individuals are in the latter stages of change. Our present study expands on this work by beginning to explore the needs and preferences non-treatment seeking young adults have on their mental wellness journeys which can then be addressed by tailoring specific tools and services.

The stages of change model allows for understanding the processes, struggles, and motivational factors that an individual goes through when confronted with the prospect of health behavior change. However, additional models can further build on the TTM by specifying how behavioral change can be supported through an individual's interactions with technologies. In particular, two of these models include the Lived Informatics Model of Personal Informatics [31] and the Technology-Mediated Reflection Model [13]. Like the TTM, these models describe ways individuals move through various phases; however, unlike the TTM, which describes overall trajectories of a health behavior change journey, these models describe interactions with a particular type of technology: self-tracking.

The Lived Informatics Model of Personal Informatics (LIMPI) [31], describes the processes individuals go through as they consider the prospect of tracking personal behaviors, and the cyclical or non-linear processes they may encounter as part of the self-tracking experience. The LIMPI is an expansion of Li et al.'s [58] Stage-based Model of Personal Informatics, which is closely related to the TTM in that it outlines consecutive stages that individuals move between as they interact with personal tracking technologies for the purposes of behavior change [31]. The LIMPI expands on this model by describing a broader range of rationales for personal tracking beyond behavior change (e.g., curiosity and interest in quantifying personal behaviors, or simply to create a digital record of a behavior). The LIMPI, therefore is a useful model for understanding how and why many individuals begin, continue, and stop using personal tracking. The LIMPI describes the entry-point to personal tracking, the *deciding* phase, which the authors describe as akin to the *precontemplation* and *contemplation* stages in the TTM. This is followed by the *selecting* phase in which an individual decides what tracker to use. The next phase, *tracking and acting*, comprises three simultaneous activities including *collecting personal data*, *integration of tracking into daily life*, and *reflecting on personal data*. At any point in this phase, an individual can have a lapse and re-enter the *deciding* or *selecting* phase. In this way, the LIMPI mirrors the TTM



in that it describes non-linear phases of personal tracking activities, but its narrower focus on personal tracking differentiates it from the TTM.

Another, related, model of personal informatics is the Technology-Mediated Reflection Model (TMRM) [13]. The TMRM expands on the LIMPI [31] by expanding upon the ways that users in the *tracking and acting* phase of the LIMPI enter and maintain the process of personal informatics reflection. In this model, personal health tracking technologies can help with *facilitated reflection*, a transitory state in which a tracking technology's features and data summaries match a user's (a) *conceptual needs* (i.e., the extent to which a user's interpretation of data summaries matches their perceptions of their experiences), and (b) their *temporal needs* (i.e., how often a user wants to engage in reflection, and how frequent and long this reflection takes). As users' tracking needs change over time, this model highlights ways in which users can adjust technology settings, or other features to create strong alignment between conceptual and temporal attributes of the tracking experience to help facilitate health behavior change. The TMRM not only helps illustrate ways in which *technology-facilitated reflection* can be used to bring awareness and motivation to an individual while on their health behavior change journey, but also highlights ways in which misalignment between a tool and a user's needs can create a dissonant experience and jeopardize the critical state of *facilitated reflection*. The TMRM focuses on an area of a behavior change journey only once an individual has identified a desire for health behavior change, whereas the TTM describes the process of behavior change beginning before an individual is even interested in making a health behavior change (e.g., *precontemplation*) and spanning to a point at which behavior change has been well integrated and no longer requires effort to maintain (e.g., *maintenance*). While self-tracking data and *facilitated reflection* can be an important aspect of symptom self-management, prompting movement across stages of change, the present study is focused on the full trajectory of young adults' mental wellness journeys.

In this paper, we explore the utility of the stages of change model as a lens to understand the kinds of social supports young adults with depression find helpful for symptom self-management.

### 2.3 Social Support in Digital Mental Health Tools

Social support has successfully been incorporated into a number of DMH tools, with studies suggesting it can help to sustain engagement [19,54,74]. This reflects the fact that social support helps bolster a user's intrinsic motivation, helps normalize struggles, and provides access to compassionate others [19,54]. One study that included a systematic search of mental health apps on the Google Play store, in combination with app use data from a panel of mental health app users, found that DMH tools that incorporated peer support had longer use times and greater open rates [9]. In online mental health interventions and forums focused on helping users manage mental health symptoms, social support played a key role in promoting skills use and intervention effectiveness [3,18,24,26,28,29,54,74,102].

To categorize different types of social support in this work, we draw on the concept of "directedness," as introduced in the HCI literature [20], which distinguishes between communications aimed at specific individuals from those aimed at a broad or public

audience. The need to distinguish directed and undirected forms of support increased alongside the growth of online communication formats that give individuals routine opportunities to use ubiquitous technologies to reach audiences on a mass scale through personal technologies, and to act as senders, receivers, or both [69]. Social media sites, for example, allow for directing messages at a public audience (e.g., via a newsfeed) or at specific individuals (e.g., through one-to-one messaging). Past work in the arena of self-disclosure has found that individuals disclose differently through directed and undirected channels, with greater openness and wellbeing benefit typically being associated with directed disclosures within close dyads [11,20]. On the other hand, indirect online disclosure can also allow for candor when key elements are present, such as anonymity, a lack of pre-existing social ties, or similarity to the audience [49,85]. In addition, disclosing within many undirected forums creates a record of individual experiences that can be accessed by others.

In the context of mental health concerns, in particular, many individuals living with invisible stigmatized chronic illnesses such as mental health disorders are hesitant to disclose in directed ways, such as by seeking help from close others or specific peers [23,91]. Undirected engagement (e.g., consuming or producing knowledge from, and for, general audiences [26]) is therefore common, and includes behaviors such as online information seeking and “lurking” on peer-to-peer forums [100], as well as disclosing within these forums. Thus, there are highly varied ways that individuals may seek out input and help from others when dealing with mental health concerns, ranging from relatively direct (e.g., intentionally interacting with specific individuals [20,90]) to relatively undirected [10].

Undirected support is common among individuals engaging in health behavior changes. One study examining online health information seeking among adults across the lifespan found that, overall, approximately 40% of participants searched for health information at a minimum of once per week [27]. Reasons for seeking out the experiences of others online include: to identify alternative sources of information (relative to conventional sources of health information), to seek personal recommendations or advice, and to find similar others [27]. One study of Finnish 18-year-old men who had been “called up” for civil service, examined online information-seeking practices in the context of physical activity changes and found that 60% of their sample sought information about physical activity or exercise in the weeks leading up to the study. Information seeking behavior was more likely from participants in the latter (i.e., maintenance) stage of change relative to participants in the earlier (i.e., pre-contemplation) stage of change [38], suggesting important interactions between the kinds of social support that are important for health behavior change and an individual’s position in the change process.

The utility of undirected online social interactions also differs by medium, reflecting each medium’s perceived capacity to facilitate social support [25]. Especially when coping with stigmatized conditions, aspects of the platform and medium play an important role in whether an individual chooses to disclose issues or seek support [91]. One study that leveraged publicly available data from an alcohol use disorder support forum to examine the different ways people use technology platforms when engaging in behavioral change [25]. They found that posts on a public-facing online forum and posts on an online journal,



that could be set to be either public-facing or limited to certain contacts, were both far more likely to contain informational support than nurturant support or validation. In contrast posts directly to others' profiles (akin to a direct message) were more likely to contain nurturant support than informational support. Journals and Forums provide convenient methods for documenting personal experiences with health behavior change and thus may lend themselves well to non-conventional and idiosyncratic information that may be useful when individuals are engaging in behavioral change.

Directed forms of support can also be accessed online to support behavioral change. Directed forms of computer-mediated communication have previously been linked to increased feelings of closeness with others and reduced feelings of loneliness [20]. Directed support also incorporates low-effort interactions such as “likes” or brief non-specific reactions to other users' shared information or self-disclosures [2]. These low-effort interactions can be delivered in real time or asynchronously and are generally considered reinforcing for users engaged in health behavior change [107]. This type of support is often generalized in that it does not specifically reference the “liked” element of a message or post, but instead provides users with a sense of encouragement. One study [107] examined the role of “likes” and comments in retaining users in an online health community and support network for both patients experiencing health conditions as well as caregivers caring for an individual with a health condition. The authors found that while both comments and “likes” are important for engagement and retention, the value of “likes” changes depending on users' levels of engagement; encouraging text-based comments were associated with better retention than “likes” when there was ample engagement on a post, but when engagement was sparse, “likes” were more useful than text-based comments for retention. Across studies, even when brief encouragement was provided in the form of a short text response, these low-cost and low-effort interactions served to motivate users to continue engaging in health behavior change or in online communities [1,56,107]. These results highlight the critical importance of building different levels of social support into a digital platform, as both high- and low-effort directed engagement is important for the long-term success of health behavior change and continued engagement in an online community.

When using digital technologies, directed support can further be distinguished according to a number of media affordances that shape the experience of receiving support from others. Past work has highlighted the importance of affordances that include anonymity, visibility (i.e., the number of nonverbal cues, for example “leaner” media such as SMS vs. “richer” media such as video chat), and similarity of users when directly communicating with others [12,46,56,87], and these may moderate the type of social support solicited and how it is received. Together, these studies suggest that direct personal relationships are important for helping users connect and obtain social support for their health behavior change.

## 2.4 Summary

This study focuses on the ways young adults – the adult age group with the greatest mental health burden and lowest level of treatment seeking [97] – engage with social support across their behavioral change journeys as they move toward improved mental wellness. In particular, we explore, via the stages of change model, the changing social needs of young

adults with depression as they move through their behavioral change journeys. We also detail the role technology and different forms of communication play in supporting users at different stages of behavioral change.

### 3 METHODS

The purpose of this qualitative study was to better understand the needs and preferences of non-treatment seeking young adults with depression, who might be interested in better managing their mental health concerns in daily life. Individuals were recruited after they voluntarily completed a depression or anxiety screening questionnaire (the Patient Health Questionnaire [PHQ-9]; [51]) on a mental health patient advocacy group's website (Mental Health America [MHA]) and received a score corresponding to at least moderate depressive symptom severity.

#### 3.1 Asynchronous Remote Community (ARC)

We used an Asynchronous Remote Community (ARC) method for data collection. The ARC methodology consists of using an asynchronous elicitation workshop format in which participants respond to researcher- and participant- posted prompts and replies, much like an asynchronous digital conversation. Given that we were primarily interested in understanding the needs and preferences of young adults who were not interested in face-to-face interventions, face-to-face elicitation workshops would not have been an ideal setting as they may have presented barriers for participants who are just beginning their health behavior change journeys and may not yet feel comfortable sharing their personal experiences if they are identifiable to other participants. Moreover, individual interviews were not chosen as the primary modality of data collection because we wanted to ensure participants had the ability to respond to the ideas and experiences of similar others. As a result, we used an ARC methodology which has been used to understand the needs of specific userbases in previous work [e.g. 41,42,53,57], and which can increase engagement of underrepresented populations by decreasing barriers related to in-laboratory studies (e.g., transportation, child-care, time off work) [37]. Additionally, the group format was chosen to facilitate conversation between young adults with shared experiences. These types of remote elicitation workshops have been commonly used within HCI to facilitate conversation, elicit several perspectives simultaneously, and provide the environment for participants to build on each other's creative contributions [61].

**3.1.2 ARC procedures**—Using an anonymous, interactive, online research platform ([focusgroupit.com](https://focusgroupit.com)) that was built on secure architecture and had privacy settings enabled such that only the researchers were able to link participant usernames to participants' identities, individuals responded to a series of prompts about their experiences of depression and anxiety, mental health-related needs and goals, mental health self-management strategies, psychological strategies and messages they found useful or unhelpful, and the modes of digital interactions individuals are interested in having to support their mental health. A new prompt was released every three days (two days between prompts) and total participation lasted 18 days (six total prompts or "sessions"). For a screenshot of the platform with an exemplar prompt, see Figure 1. Each prompt was designed to take about

10-20 minutes for participants to respond to. Participants were asked to respond to each of the six researcher-posted sessions and comment at least once on another participant's reply for each of the six sessions. As with a traditional in-person focus group, researchers could ask follow-up and clarification questions as needed on the elicitation workshop platform. All session prompts remained open for participants to reply to and comment on through the close of the final prompt on day 18. Participants were compensated for responding at least once to each of the six researcher-posted prompts (\$8 per session) and providing at least one substantive response to another participant's post within each of the six researcher-posted prompt discussions (up to \$2 each session).

All participants' posts were monitored for compliance with our stated code of conduct and for posts indicating changes in participant's risk and safety. During the course of the study, a research team member checked posts daily and deleted any comments that revealed personally identifiable information and followed-up with participants as needed. Over the course of the study, researchers deleted a total of two posts that contained potential personally identifying information. One was a post that contained a participant's phone number, and another was a post that contained a participant's relative's first name and state. Out of an abundance of caution, these posts were redacted, and participants contacted prior to post redaction. The research team member also monitored posts for implicit or explicit threats to oneself or others, mentions of self-harm, as well as the presence of a suicide plan and/or intent to die. Research staff had a risk management protocol in place in the event monitoring revealed any posts signaling elevated risk. The risk management protocol consisted of a doctoral-level clinical psychologist conducting telephone outreach to rapidly acquire additional information about the nature, frequency, and intensity of suicide risk by administering the Columbia-Suicide Severity Rating Scale (C-SSRS) [78]. Following the administration of the C-SSRS, and depending on the risk level indicated, the doctoral-level clinical psychologist was tasked with delivering appropriate clinical interventions such as brief safety planning [96] and presentation of nationally available mental health resources. If participants were determined to be at imminent risk for self-harm or suicide, the doctoral-level clinical psychologist would conduct a warm handoff to crisis resources such as the National Suicide Prevention Lifeline or would reach out to emergency first-responders, if needed. Importantly, throughout the course of the study, there were no instances of participants posting responses or comments that signaled any sort of risk or threat to their safety, and thus the risk management protocol never needed to be enacted. All study procedures including recruitment, informed consent, prompt wording, data collection, monitoring and response procedures, and analyses were approved by the Northwestern University Institutional Review Board (IRB #: STU211168). Elicitation workshops took place between April and June of 2020, during the early days of the COVID-19 pandemic.

**3.1.2.1 Security:** All participant data collected through the [focusgroupit.com](https://focusgroupit.com) platform used end-to-end encryption. Once participants completed a screener questionnaire, were deemed eligible, and provided affirmative informed consent, participants were added to the private [focusgroupit.com](https://focusgroupit.com) group. Participants' identities were known only to the researchers, not to other group members. Participants were only able to be added to the group by the research staff. [focusgroupit.com](https://focusgroupit.com) has a forced anonymity feature that was used in this

study, ensuring that researchers could A) assign usernames to participants, B) no personally identifiable information could be viewed by other group members. The group pages were closed, meaning that only participants could post and view other participants' postings.

### 3.2 Participants

Mental Health America (MHA), the United States' oldest and largest patient advocacy organization, began offering mental health screening tools online in 2014, including the widely used depression screener the PHQ-9. Visitors to their site completing online screeners have increased year-over-year, totaling over one million users completing one of 10 online screeners annually. Among those visitors who completed screeners and reported their age, 1/3 are aged 18-25 and more than 2/3rds have clinically meaningful levels of depression (PHQ-9 $\geq$ 10). Visitors to MHA's screener site are generally representative of the ethnic and racial diversity of the United States with an overrepresentation of particularly vulnerable groups such as LGBTQ+ individuals. Crucially, the great majority of the young adults with a PHQ-9 $\geq$ 10 who complete the depression screening have not had and do not want formal mental health treatment, such as pharmacotherapy or psychotherapy [72]. Recruitment ads were hosted on screening portions of MHA's website as the goal of the project was to elicit design principles for digital tools that could be administered by mental health advocacy organizations such as MHA to support non-treatment seeking young adults with depression and reach young adults with depressive symptoms who were uninterested in seeking traditional forms of mental health care.

Participants were included if they voluntarily completed a digital depression screening tool (PHQ-9) and, at the time of screening, were experiencing elevated symptoms of depression (defined by a score of 10 or greater on the PHQ-9). Given that we were primarily interested in the needs and preferences of non-treatment seeking young adults, participants were precluded from participating if they endorsed any psychotherapy or antidepressant medication use or if they were actively seeking mental health treatment. Participants were also excluded if they required immediate psychiatric or medical intervention (e.g., suicidal ideation with a plan and intent to act, psychosis, bipolar disorder, or other serious mental illness for which participation would be contraindicated); if they were located outside of the United States; or were unable to read and write in English.

Participants were 29 self-identified non-treatment seeking young adults between the ages of 18 and 25 (Table 1). Mean age was 21.4 years (SD=2.5). Attempts were made to include diverse participants with demographics similar to those of other MHA site visitors between the ages of 18-25 [72]. Participants identified primarily as female (72%; 21/29), 10.3% (3/29) identified as male, and five participants elected not to report gender. Participants self-identified race as White (44.8%; 13/29); 17.2% (5/29) as Asian; 10.3% (3/29) as more than one race, 3.4%; (1/29) as Black or African American; 3.4% (1/29) as American Indian or Alaskan Native; and 20% (6/29) elected not to report race. A minority of our sample identified as Hispanic or Latinx (6.9%; 2/29).

### 3.3 Data Analysis

We employed a stepped thematic analysis [16] using transcripts from the ARC study. Participants generated a corpus of 49,226 words. Transcripts were open coded at the level of paragraphs or complete participant responses. Four coders, each trained in thematic analysis procedures [16], open coded overlapping data slices amounting to  $\frac{1}{2}$  of the full corpus for each coder such that each coder's slice of data overlapped with at least two other coders' slices of data. Coders then met to discuss their results and generate the initial codebook. The codebook was then iteratively revised over three rounds of coding to focus the codebook on codes that were most prevalent and central to answering the research questions, to exclude less relevant codes, to consolidate overlapping codes, and to clarify definitions to better encompass the data. In each subsequent round of coding, coders reviewed and applied codes to  $\frac{1}{4}$  of the dataset. Coders met and discussed discrepancies and resolved them through a consensus process. After three rounds of coding, coding consistency was reached and the final codebook developed. At that point, each coder was familiar with all the data and was randomly assigned  $\frac{1}{4}$  of the data to code using the final codebook. Following the coding of the full corpus, coders met to organize higher order thematic codes. Codes were applied to the data using a qualitative data analysis software, Dedoose [115].

Importantly, as part of this thematic analysis, the authors coded participants' *statements* as being representative of a particular stage of change based on literature that describes the core features of each stage. Participants, themselves, were not categorized as being exclusively in one stage or another. Thus, some participants may have made statements that were representative of multiple stages of change. Additionally, the authors applied codes representing each stage of change aside from the pre-contemplation and termination stages (contemplation, preparation, action, maintenance). Because inclusion criteria for this study required that participants experience at least some distress or impairment related to their depressive symptoms and be actively seeking self-management strategies for their depressive symptoms, they would not be in the pre-contemplation or termination stages.

## FINDINGS

In the sections that follow, we discuss themes that arose in these data around the ways that social support contributed to self-management of mental health symptoms in non-treatment seeking young adults (RQ1), the ways social support needs differed in different stages of young adults' mental wellness journeys (RQ2), and the barriers to obtaining social support to facilitate self-management (RQ3). Briefly, our findings revealed a strong desire for support from others when taking steps to manage mental health, although participants varied in whether they preferred support that was undirected (i.e., written for unspecified audiences) or directed (i.e., in which specific people communicate with one another). Thus, whereas past work has often emphasized whether mental health support is informational or emotional [39,80,91], our findings suggest the importance of also considering the source or audience of support (undirected vs. directed). We also describe how directed or undirected support are viewed as most beneficial at different points in one's mental wellness journey, noting several media characteristics that can make directed support more or less acceptable (e.g., visibility, anonymity, and similarity). These findings therefore extend prior work that

used the stage of change model as a tailoring variable to match messaging approaches to an individual's stage of change [106]. Finally, our findings reveal challenges to obtaining necessary social support, with participants emphasizing two key reasons: First, participants expressed challenges finding support that felt appropriately validating and nonjudgmental, and second, participants experienced ambivalence around using technological devices to seek support, given the role these devices also play in unproductive coping activities (e.g., "doomscrolling" [83]). In this way, our work extends previous discussions of barriers to obtaining social support [82] by highlighting the sometimes paradoxical nature of using technology, that can occasionally give rise to feelings of loneliness, to elicit social support.

#### 4.1 Types of Support: Directed and Undirected Support

This section addresses RQ1 by detailing the types of online support young adults found helpful as they engaged in symptom self-management. The directness of support played an important role in supporting participants' health behavior change. Participants highlighted the importance of obtaining social support by way of more undirected means, where they engaged with others' public content, or shared their own content broadly without knowledge of who would be accessing it (e.g., through social media use such as Twitter, Instagram, and TikTok). Undirected support provided social connection without centering on any party, but rather on a shared activity or topic. For example, P25 highlighted that certain social media accounts that deploy public health campaigns, rather than engaging directly with participants, normalizing mental health challenges and effective coping were very useful,

*"It's been really helpful to make my instagram home screen be filled with both aesthetic and happy things while also making sure to have a lot of realistic things such as posts by [the mental health advocacy group] and other people who are open about their live[s]."* (P25)

While Instagram and social media were sources of ambivalence for many young adults, some like P25 found ways to curate a feed that served to provide them with support. Participants highlighted that controlling the directness of the support and matching it to their needs across the health behavior change process was important for symptom self-management.

Other participants highlighted the important role directed support played. Direct modes of obtaining social support included face-to-face talking or spending time with friends, telephone calls, texting or online messaging, and email. Direct social connection with others provided participants with a powerful coping tool. Participants discussed ways they elicited direct social support from others using technology. For example, participants highlighted the ways they use technologies to maintain and develop their social connections,

*"I enjoy texting people when I need them. Although it has to be specific people I text. People telling me its ok to be sad makes me feel like I'm not making excuses to be sad or depressed. It makes my feelings feel validated. It also makes me feel as if I can get through this and it's not just something that's staying."* (P22)

Although users reported a variety of modes of eliciting direct support from others, texting was the most commonly used medium. P22 highlights the intentionality involved in eliciting



support from specific others. Participants have a clear sense for who will be the most supportive person(s) to text and often are able to selectively seek out those particular supportive people when they are needed.

Participants described the ways that different media affordances moderated how and when they chose to both give and receive directed support. Media characteristics such as anonymity, visibility (e.g., ranging from “leaner” media such as SMS, which convey few nonverbal cues, to “richer” media such as video chat), and the similarity of others online were important considerations that helped participants feel more comfortable with directed support. For example, when discussing the hesitancy to seek in-person therapy, several participants noted that one of the key barriers was the loss of anonymity,

*“I would not seek help from a professional over the phone or online/apps unless it was anonymous (such as something like this [a reference to the anonymous nature of the ARC elicitation workshop]). I am only able to open up if I feel detached from what I’m saying and that I can hide behind it in anonymity.” (P1)*

Anonymity, as described by P1, allows young adults to express their feelings and emotions without fear of stigmatization or suffering wounds to ones’ sense of identity. Relatedly, other participants discussed how control over their online visibility by using media with different levels of nonverbal cues (e.g., low: text-based conversations, high: audio- or video-based conversations) impacted their comfort expressing different ideas online. For example, participants reported that they would sometimes visibly display their emotion (e.g., crying), when discussing important ideas or difficult experiences. When using richer media, that display of strong emotion might de-center the ideas or experiences being expressed, leading to a preference for text-based communication. On the other hand, a video or audio-based conversation sometimes enabled participants to connect with others in a way that required less planning or cognitive effort, as described by P13,

*“I have started to move away from texting long-form conversations though--I find it much easier to, say, catch up with an old friend, via voice call.” (P13)*

Participants provide and receive directed social support using many technologies and media with different characteristics. The choices of which tool they use at what time is made with the consideration of the content and ideas being expressed and the cognitive and emotional load they are experiencing.

## 4.2 Need for Support

In this section we examine RQ2 by addressing the differential social support needs as a function of stage of change. In Table 2, we aggregate and summarize identified social needs as they related to particular stages of change.

**4.2.1 The Contemplation Stage**—In our sample, several types of social support were specific to the needs of individuals in the contemplation stage of change (Table 2). The contemplation stage is primarily characterized by self-reflection about the prospect of changing one’s behaviors. It often results in a state of ambivalence in which an individual has identified value in changing their behavior, but the cost of changing behavior may still

seem quite high [84]. Many participants stated their mixed feelings about behavioral change, noting that they “needed to do something,” but also that they lacked motivation to make changes, or were skeptical that their efforts would pay off.

In regard to social support, participants who were very early in their change process (i.e., the contemplation stage) described that they wanted reminders of the prevalence or shared nature of mental health challenges. Participants highlighted that the experience of feeling less alone as a result of their mental health symptoms was valuable and did not need to involve directed communication with others. Participants in this stage commonly searched for others’ experiences of mental illness and engaged in online information seeking as a method of obtaining validation of their experiences of depression. For instance, one participant in our workshop (P6) highlighted that reading about others’ experiences provided a sense of validation,

*“It always makes me feel better to do research and remind myself that I am not the only one feeling this way.” (P6)*

Participants in our workshop, like P6, reported taking online screeners for depression and searching for resources about their symptoms on an online mental health website (MHA) as a method of validating that their experiences of depression were real and that there were others currently experiencing similar difficulties. Participants were consistent in their reporting that information-seeking helped them feel less lonely.

**4.2.2 The preparation stage**—During the preparation stage, individuals have committed to engage in new health behaviors; however, they have not yet taken concrete actions to actually begin these new health behaviors. This was evident among a number of participants, such as P24, who wanted to address their mental health symptoms,

*“I have not done anything about [my mental health symptoms]. I have told my boyfriend of 7 years and him and I are trying to come up with a plan but I know I need to tell my family.” (P24)*

P24 highlights strong motivation to change their behavior to address their mental health, though the change is non-specific. While P24 has not yet started to engage in the new behavior that will help them manage their symptoms, they have recruited close others to help plan their next step. Participants in the preparation stage found planning assistance and decisional reinforcement to be important forms of social support (Table 2), and many noted that when provided at the right time, decisional reinforcement and planning assistance helped them move from the contemplation stage to the preparation stage.

Additionally, participants demonstrated that, during the preparation phase, there is high value gained from directly talking with similar others about their mental health concerns. In addition to gaining validation by communicating directly with others, participants noted that information gathering and idea sharing during the preparation phase around health behavior change served to normalize the new health behavior and facilitated the transfer of knowledge around successful self-management strategies.

Participants also found directed motivational support, or encouragement that increased an individual's sense of self-efficacy, to be valuable. Specifically, when internal motivation to pursue health behavior changes is low, external infusions of encouragement can be useful for increasing the likelihood that one will take the desired action and continue moving towards engaging in health behavior change.

**4.2.3 The action and maintenance stages**—In the action stage, an individual has engaged in – at a minimum – some health behavior change. They have overcome the high cost of beginning a new behavior. Beyond the action stage, individuals must maintain their action and stave off lapses. We combine the action and the maintenance stages because they are so closely linked and there is significant overlap in terms of young adults' needs across these stages. Validation, idea sharing, and motivational support continue to be necessary across the action stages and beyond (Table 2). In the action stage and beyond, individuals partner with close others to join in their healthy coping routines. Close others support participants' healthy coping by providing accountability and encouragement. For example, participants partner for healthy coping by reaching out to specific others regularly and reliably and having a clear established routine that can support one's healthy coping goals. P1 illustrated the role of others in setting up healthy coping partners,

*“I have also started to work out a little. Sometimes it is hard to find the motivation but my sister forces me to do it with her so having her there to make me helps make it a little easier to do. And when I do end up working out I feel like I have more motivation to take on the day.” (P1)*

P1 highlights that initiating behavioral change is difficult work, and social support in the form of healthy coping partners can reduce the barriers to behavioral change initiation. In the same way, beyond the action stage, it is necessary to involve other social partners who can provide reminders of ones' goals, normalize lapses or breaks when they occur, and reduce the barriers to re-starting a behavior following a gap or a lapse.

### 4.3 Challenges to Obtaining Support

Young adults face many challenges to managing their mental health symptoms, in this section we specifically address RQ3 by exploring the barriers young adults encounter when attempting to gain social support.

**4.3.1 Invalidation and stigma**—At any stage, a number of unhelpful social interactions present as barriers to health behavior change. As alluded to previously, invalidation or stigma can be a potent blocker to health behavior change. Participants brought up ways in which invalidation or voiced stigma from loved ones served as a roadblock to health behavior changes. Invalidation and stigma can be extremely discouraging and serve as major barriers to engaging in new health behavior changes because it can lead to maladaptive beliefs that a person *shouldn't* be experiencing the symptoms they are in-fact experiencing, increasing feelings of shame and social withdrawal or isolation.

Invalidation and stigma can also interrupt, delay, or reverse an individual's behavioral change momentum. Invalidating and stigmatizing experiences can leave young adults feeling drained and questioning the merits of behavioral change. For example, P15 noted,

*“Some things that I would love to do but don't are exercising, cleaning, hanging out with the family, and socializing. It's just tougher to find the drive to do these things. I feel that hanging out with my family can be very dreadful because I feel that I have to be okay for them, and I feel judged and misunderstood.”* (P15)

P15 describes deflated motivation and delaying of behavioral change that often accompanied invalidation or stigma. These experiences can lead young adults who might be contemplating, or even preparing for, behavioral change to experience decreased motivation to overcome the high cost of engaging in new health behaviors and can even spur a reevaluation of the cost-benefit calculation of engaging in health behavior changes.

**4.3.2 Ambivalence about technology**—Another challenge to obtaining support that facilitates behavioral change in the context of a DMH tool is the ambivalence about the role technology played in participants' lives. Young adults especially highlighted the many drawbacks of technology to support health behavior change, noting that certain inherent elements of technologies present a threat to the potential gains.

In our sample, young adults often spurned the effects of technology because it increased isolation or triggered social comparisons. While participants were clear that technology possessed the potential to be effective for mitigating isolation, many participants highlighted that it sometimes can actually amplify loneliness. Social media in particular created feelings of isolation and bred low self-esteem. Participants highlighted that social comparison triggered negative mood states, leading them to doubt technology's ability to help and support them in addressing mental health challenges. For example, P27 noted,

*“What doesn't help me is mindless scrolling through Facebook, Twitter, or Instagram. All I'm doing is wasting time comparing my whole life to another person's highlight reel. I either see a bunch of beautiful people doing wonderful things, or I see horrible news articles about the worst violence imaginable. Neither of these things help me when I'm down. But social media is an extremely tough habit to kick, especially when everything is closed and I can't even walk outside without restricting my breathing with a mask.”* (P27)

This common experience of social comparison leading to deepening isolation was repeated often and poses a major barrier to technological solutions to mental health self-management among young adults. Despite the challenges social media presents with regard to social comparisons, participants often continued using social media because they found social communication elements of the platforms to be extremely compelling.

#### 4.4 Summary

These findings illustrate that while young adults with depression experience unique behavioral change journeys, it is useful to examine the process of behavioral change in the service of mental wellness through a series of localized stages of change. Young

adults' social support needs were dynamic depending on their readiness to engage in health behavior changes. Our findings reveal a need for informational support and validation early in the change process (i.e., the *contemplation stage*). As participants began to overcome the barriers to initiating a new behavioral change, and entered into the *preparation stage*, planning support and decisional reinforcement became important needs along with motivational support and fortifications to one's sense of self-efficacy. Many young adults in the *preparation stage* also found validation in the form of stories or the experiences of similar others to be extremely useful. Once participants initiated some behavioral change and entered the *action stage* and beyond, there was a need to link up with healthy coping partners who could help provide accountability. Relatedly, after initiating behavioral changes, trusted others were helpful for bridging gaps in motivation, and reducing barriers to re-initiating health behavior change if lapses occurred. Our findings also highlight several significant barriers to behavioral change such as invalidation and stigma, which can serve to interrupt, delay, or reverse one's forward movement through a behavioral change journey. Participants also highlighted the challenges to technology mediated DMH tools such as perceived negative psychological effects of social media. Beyond these dynamic needs, our workshop revealed that young adults wanted support that spanned a full spectrum of directness and was accessed via media with different characteristics depending on the circumstances and needs of the individual. Taken together, our results suggest the need to consider an individuals' behavioral change journey and the needs across these journeys when designing tools that aim to support young adults pursuing mental wellness.

## 5 DISCUSSION

In our discussion, we turn our attention to the broader behavioral change journey. Understanding young adults' social needs and preferences across the behavioral change journey is an important first step to supporting their mental wellness and designing digital tools that adequately facilitate mental health symptom management. Understanding the needs and preferences of patients on physical health journeys has led to the development of features that are relevant to users at different stages of their journeys, including improving patients' abilities to find relevant information, seek emotional support, and communicate with their care teams and peers [43,44]. Similarly, an improved understanding of the behavioral change journey of young adults can lead to digital tools that help facilitate improved mental health and symptom management by providing features that adapt, get added or removed, and change based on users' specific needs. This discussion first explores the characteristics of behavioral change journeys; we then describe how this work suggests directions for the design of digital tools for young adults on behavioral change journeys.

### 5.1 Conceptual Contributions

In the section that follows, we outline the unique contributions our findings add to the literature on mental wellness and behavioral change journeys.

**5.1.1 Behavioral change journeys and stages of change**—To better understand the trajectories and aspects of the behavioral change journey, it is important to understand that these journeys are characterized by ups, downs, and movement toward and away from

mental wellness. Our participants highlighted that their ultimate goal when embarking on a behavioral change journey is the pursuit of mental wellness, but that the path is not clear and contains many social, psychological, and pragmatic barriers. Behavioral change journeys have two key characteristics: First, they are comprised of individual stages of change. Second, across behavioral change journeys, support needs are dynamic rather than static.

In RQ1 we explored the types of support that young adults found to be most useful. To effectively meet a user where they are in their behavioral change journey while still supporting their goal of mental wellness, it is critical to consider how a users' immediate goals at each stage of their behavioral change journey may differ. For example, in the contemplation stage, a user may be confronted with the immediate goal of weighing the benefits and costs of engaging in a new health behavior (e.g., P21 who wanted to confirm their symptom severity level through an online screener before deciding whether to act; see Table 2). In this stage, participants found undirected support to be most helpful, often seeking support from public sources of information such as blogs or general online sources (e.g., MHA) and relying less on one-to-one communication with others. In contrast, in the action stage, a user's immediate goal might be to overcome motivational barriers to beginning a specific health behavior (e.g., going for a daily walk). Here – as we saw with P1 who partnered with their sibling to help provide accountability for regular exercise – participants found that partnership, accountability, and encouragement from trusted others was useful for meeting this immediate goal. If DMH tools are designed with only the broad goal of moving toward mental wellness in mind, it will not help individuals see the concrete steps that need to be taken to move to the next stage. Worse, it can lead to users feeling forced or pushed to constantly do more or believe where they are in their journey is somehow a failure on their part. However, by meeting users' needs at each individual stage, DMH tools can serve to validate the process of behavioral change while providing users with the necessary supports to pursue their ultimate goal of mental wellness, on their own timeline.

At the heart of the behavioral change journey are the individual stages of change. As we explored in RQ2, these stages are where behavioral change actually occurs. Within each stage, individuals are confronted with a central organizing task. For example, in the preparation stage, individuals must consolidate information, motivation, and the resolve to act – developed in the earlier contemplation stage – and merge it with concrete behaviors. For example, P24 highlighted they recognized a need to act. They built up courage to disclose their symptoms to, and request support from, their boyfriend, but no specific plan had yet been developed. This process of contending with a central task requires that sufficient social supports be in place at each stage. Social support needs differ depending on the stage one is in, and – continuing the example – within the preparation stage, social support needs include validation, decisional reinforcement, planning assistance and motivational support. Once participants have accomplished the central task of a particular stage, they typically move into the transitional space spanning two consecutive stages and then arrive at the next stage in their journey. At each stage, an individual may or may not have access to the proper support infrastructure, as was illustrated by P18 who reported disclosing their symptoms to their mom and being dismissed (Table 2). As a



result, an individual may progress to the next stage, stay in the current stage until they have accomplished the central task of their current stage, or move to the previous stage if the right support is not in place to sustain an individual in accomplishing the central goal of a particular stage. Additionally, as we learned through our exploration of RQ3, young adults often face barriers or challenges in the form of invalidation, ambivalence, stigma, or a lack of access to supportive environments. These barriers can interfere with accomplishing the central task of a particular stage and, therefore, delay transition to a subsequent stage. Invalidation, stigma, or environments with inadequate support can also prompt a move to an earlier stage of change if the interference with the central task of each stage is sufficiently disruptive. For example, P15 reported that being in an invalidating environment sapped motivation to engage in action or concrete activities that facilitated self-management.

The individual stages of change characterize processes in the behavioral change journey and therefore serve as a useful framework for understanding movement towards and away from mental wellness. Our participants wanted to move towards mental wellness, however, each journey was individual. Therefore, behavioral change journeys need to achieve two goals simultaneously: 1) support an individual's unique needs at each stage of the behavioral change journey regardless of where they are or have come from on their journey; 2) support their long-term objective of moving toward mental wellness, even if smaller changes involve movement away from the higher-order goal. Achieving both of these goals requires meeting users where they are in their journey without judgement or prescribed timelines.

Generally, the social needs of individuals pursuing mental wellness have been considered static by developers of digital health tools, evidenced by the fact that features of most digital health tools include social sharing of progress or achievements, public posting (e.g., a forum or timeline), or connection with a social network [55,64]. These social features also typically remain constant in DMH tools, regardless of where a user is in their behavioral health journey. This can create a disconnect between the dynamic needs of an individual pursuing mental wellness and a digital support tool. The DMH tool assumes a users' social needs do not change as they pursue mental wellness. However, one recent study by Peng et al., [76] examined the dynamic nature of satisfaction with social comments on a mental health community site, finding that users' needs changed over time. Specifically, as posters spent more time in a community and their knowledge of that community changed, they became less satisfied with the informational support comments they received. This highlights that users' needs are often dynamic across time. The study also highlights that when support needs match support received, the satisfaction of posters is greater, suggesting that it is important to consider the changing needs of users and ways of matching needs to resources within online mental health tools. Our study extends this work by specifically examining the dynamic needs of young adults interested in self-management who are at different places in their mental health journeys. Our findings reveal that there are myriad, highly dynamic social needs across the behavioral change journey. Understanding how these needs change at various points in a mental health journey as well as the axes on which it is important to match needs to resources is a first step in designing DMH tools that can keep users engaged and satisfied. It is conceivable that if a digital tool successfully tailors offerings and social support, specifically, to a user over the course of their mental wellness journey, satisfaction

with the DMH tool and more robust engagement may result, helping to alleviate some of the previously identified challenges of sustained engagement with DMH tools [60].

**5.1.2 Journeys as unique collections of experiences**—In HCI, substantial work has been done in the realm of understanding health journeys, specifically, cancer journeys [e.g., 33,38,39,87,89]. In cancer journeys, patients have a number of responsibilities at different stages of their medical illness. Jacobs et al., [42] identifies several key points in an individual’s cancer journey: screening and diagnosis, information seeking, acute care and treatment, and no evidence of disease. At each of these key points, patients must navigate managing their own health as well as their own personal experiences (e.g., relationship changes). Throughout a cancer journey there are also barriers and challenges of all magnitudes that one must navigate. These barriers and challenges can impact cancer patients’ quality of life and even the adequacy of the care they receive [42]. Understanding the cancer journey has led to useful technologies [43] for cancer patients.

While cancer journeys, like all health journeys, are specific in their impact on individuals, families, and communities, we can nonetheless learn a great deal about the concept of a health journey from this past work. The health journey literature highlights those journeys as non-linear, which suggests the imperative to design for changing needs of individuals navigating recovery or symptom management [99]. Health journeys describe how an individual experiences their health condition over time, and can include fluctuating, escalating, and changing symptoms, as well as changes in an individual’s self-concept or identity in relation to a condition (e.g., identifying as an individual living with a particular medical condition) [42,99].

In mental wellness journeys, there is often an overarching goal of improving or maintaining one’s mental health. This may be a primary motivator for change and rejecting the status quo. However, unlike many other health journeys, mental wellness journeys – especially among young adults – often do not begin at the point of diagnosis, and may not involve engagement of professional providers at all. For many young adults on mental wellness journeys, self-management is the preferred path [34] and social support becomes a key scaffolding for supporting their mental wellness journey. Moreover, a mental wellness or behavioral change journey is rarely complete. Mental wellness is an ambiguous goal and can be elusive given that even after remission is achieved, symptoms are often recurrent and chronic, and residual symptoms can linger even if clinical thresholds for diagnosis of mental health disorders are not met [14,47]. Those on behavioral change and mental wellness journeys need to remain vigilant and engage the appropriate social supports to maintain the behaviors that served them well in the acute phase of their mental health difficulties.

As the TTM specifies, behavioral change may look different at different stages of one’s journey [84]. For example, the self-screening process could be an early step individuals take as they first come to recognize their symptoms and consider change (i.e., the contemplation stage). This may be followed by planning and taking action to seek treatment or adopt new practices. Finally, a maintenance period is also part of many health journeys, wherein those behaviors that have helped the individual adapt to and manage their condition must be sustained. Mental health symptoms are sometimes experienced by individuals as distressing

but not urgent. The typical latency from first symptom onset to first point of professional mental health treatment is often the better part of a decade [108]. Importantly, this means that behavioral change journeys unfold over a wide variety of timelines. In some cases, early change processes (i.e., contemplating making a change and weighing the benefits and costs of behavioral changes) may last years, and the actual preparation and action phases may happen on the order of weeks or months. On the other hand, early stages may last a very short amount of time, while maintaining behavioral changes and the transitions between preparing for a new behavior, initiating it, and maintaining it over the long-term may be prolonged.

In this study (Sec. 5.1.1), we provide an overarching framework for understanding the behavioral change journey among young adults with depression. Unpacking the behavioral change journey is a promising method of understanding the experiences and needs of individuals navigating mental health challenges and a necessary first step to building well-designed tools that enable individuals to effectively address their behavioral health needs and goals.

## 5.2 Design Implications: Facilitating Behavioral Change Journeys

Understanding behavioral change not as a single decision or action, but as a journey in which a user has varying needs depending on their individual experiences is necessary for developing DMH tools that can flexibly meet users where they are and to engage them across their recovery. Social support is one of the most critical components of mental wellbeing and must meet the dynamic needs and preferences of users as they engage in their own symptom self-management. Considering that, social support needs change, as do the preferred modalities of that support, it is crucial that the next generation of DMH tools be designed to facilitate behavioral change while minimizing barriers. In this section, we explore methods of incorporating optimal forms of social support that meet users' changing needs, as well as leveraging multiple media characteristics to appeal to the broad preferences of young adults. Finally, we discuss design principles that address users' ambivalence to DMH tools.

**5.2.1 Matching changing needs with a flexible form—**It is important to build DMH tools that target symptoms, but also accommodate individuals' changing social needs across their entire behavioral change journey. Most digital health tools incorporate social features uniformly, without regard to an individual's progress or time spent using the intervention. Typically, these social features involve incorporation of an online social network or online forum [64,103]. A user is often presented with myriad ways to interact with social features such as sharing achievements/goals, likes, direct messaging, or other forms of social interaction, which are meant to sustain and encourage engagement with the DMH tool. However, if presented at the wrong point in the change process, these features could paradoxically have the opposite effect and lead a new user to become overwhelmed, such as if directed interactions are presented before a user is ready. A new user may perceive the system to be too forceful in suggesting that a user share more information than they might be ready to disclose. For this user, however, being able to browse other peoples' testimonials or experiences across the use of the DMH tool might be extremely valuable.

For a user in the action or maintenance stages, connecting with other specific users of a DMH tool and/or “liking” others’ social shares might help support engagement and serve to motivate them to continue moving towards their own health behavior change goals.

As one potential illustration of a dynamic DMH tool that tailors social support based on an individual’s stage of change, we can envision a text-messaging service that delivers periodic text messages a few times per week to users containing brief psychoeducational information, reflection prompts, and light-weight self-tracking features. In addition to these basic message types, the system delivers additional tailored content to users who are early in the change process, consisting of periodic anonymized self-management strategies that other users of the texting program have found beneficial and agreed to share with fellow users of the program (amounting to a version of crowdsourced tips for, and testimonials of, symptom self-management). In this way, users in the contemplation and preparation stages can browse personal testimonials and self-management strategies that are delivered via text message without needing to interact directly with another person or user. As users move out of the early stages of change and into the more advanced stages (e.g., action and maintenance stages), the texting program can offer two-way communication between consenting users and suggest that these users share one or two concrete goals per week with one another and check in periodically to help the other remain accountable and achieve their previously set goals while also providing an element of peer support. In this way, users in the later stages of change would be acting much like a behavioral coach [66].

There are, of course, potential drawbacks to an approach that incorporates dynamic social support as part of a DMH tool. For example, it is possible that some users’ mental wellness journeys do not correspond to the stages of change model used in this study, or that certain subsets of users would prefer the reliability of knowing how to use a DMH tool that was static and did not have changing features. However, these are important empirical questions that additional research can answer. Our findings tend to support the concept of DMH tools that incorporate dynamic social components, as these can be important elements that not only support engagement with the DMH tool, but also users’ implementation of, and adherence to, new behavioral self-management strategies. In this way, building DMH tools with dynamic social features to meet users’ needs can increase DMH tool engagement and enhance the effectiveness of the digital interventions being delivered.

**5.2.2 Adjusting technological affordances to meet users’ social needs**—Our findings also suggest that different levels of support directness were aided by a range of technological affordances such as anonymity and visibility. This suggests that in addition to considering potential users’ individual behavioral change journeys, there is a need to ensure they have multiple kinds of social support formats open to them. Our findings mirror and extend past recent work. One recent study by Pretorius et al. [82] examined young peoples’ online help seeking behavior, and found that one affordance that can be useful in helping users achieve comfort with directed communications is the medium of communication (e.g., video, interactive FAQs, podcasts, or audio-only content, etc.), as the content medium can determine how a young person will engage in online help seeking.

Our work similarly suggests the importance of building tools with a wide range of affordances to match various users' comfort level. For example, it may be important to allow undirected information consumption and browsing of personal stories and testimonials such as microblogs while having the option to remain anonymous. Moreover, we learned that it is important to build in simple interactions that allow users to share their progress through their health behavior change journey. It may also be useful to build in features that enable users to schedule times to engage in health behavior change activities and invite fellow users to join them, as this might support motivation and accountability during the action and maintenance stages. Some users may also require direct messaging through video or voice to connect with fellow users. Ensuring a variety of both directed and undirected forms of social features that have a spectrum of affordances such as a range of visibility, anonymity, and interaction styles (from "likes" to longform comments and posts) can ensure DMH tools make social support available that can meet the needs of myriad users across their behavioral change journeys.

**5.2.3 Navigating ambivalence**—Despite the promise of DMH tools to support the behavioral change journeys of young adults with depression, important challenges may limit or complicate a user's ability to move towards improved mental wellness. Designing DMH tools for ambivalent users requires delivering highly targeted mental health content while minimizing opportunities for distractions or online behaviors perceived to be harmful (e.g., "doomscrolling" [83]). One approach may be to design DMH tools that minimize users' time spent engaging with their devices. With the advent of smartphone notifications, users do not even have to "unlock" or open their device to view message or app notifications. Delivering DMH content through smartphone notifications (e.g., text message previews) can minimize the need for users to spend time opening their phone and engaging with one or more apps that have potential for harmful psychological effects, instead simply requiring a glance at one's device. Relatedly, another useful approach to overcoming users' ambivalence about technology might be to design DMH content that actually encourages engagement in the "offline" world without digital distractions. For example, DMH tools can suggest users take periodic digital breaks by turning off their devices, disabling notifications, or turning off connection capabilities (e.g., "airplane mode") for prescribed periods of time while engaging in "offline" activities like going for a walk. DMH tools can also make use of "blended" interventions that require users to engage in the offline world while simultaneously using the DMH tool as a guide (e.g., guided meditations and mindfulness exercises). Finally, DMH tools can deliver modules about using smartphones and social media intentionally. DMH tools can help users clarify and keep central their goals for social media and smartphone use. Through these modules, users can clarify for themselves what they hope to gain from their use of social media or smartphones resulting in more intentional use.

### 5.3 Limitations

A number of limitations are noted. First, while the data collected reflect heterogeneous opinions, ideas, and experiences, we note that our sample of 29 young adults may not be representative of the larger young adult population with depression. Future studies must replicate these findings before generalizing to other populations, conditions, or health journeys. Furthermore, all participants were recruited from the same source: MHA. While

MHA is a large community organization that serves a diverse constituency, future formative user-centered design studies may wish to recruit from a variety of online sources. Another limitation of the current work is that participants' stage of change was not assessed at baseline. In addition, we coded behaviors and reflections that suggest particular stages as they emerge in each comment, and thus a single participant's data may contribute to understanding multiple stages of change, at different points. This coding approach reflects the fact that behavioral change is non-linear, and often involves moving back and forth through the stages [84]; however, a consequence is that we do not present an overall breakdown of how many users are in each stage of change.

We also acknowledge the need for the mental health community to pursue two parallel activities that address the state of mental health care delivery in the service of increasing access to care. First, we note that it is important to improve self-management tools for those who prefer to self-manage outside of traditional or existing care structures. Second, it is necessary to address and reduce barriers to accessing formal care. In this paper, we have focused on addressing the former, but we acknowledge that work in this domain is incomplete unless the latter challenges are also addressed.

#### 5.4 Conclusions

Our findings suggest that young adults on mental wellness journeys have dynamic and diverse social needs, partially as a function of their readiness for change. It is incumbent on designers of DMH tools to meet users where they are in their behavioral change journeys, which may include incorporating dynamic social elements to support behavioral change. Specifically, our results suggest that young adults may require DMH tools that offer control over the directness of support as well as different media affordances to facilitate user comfort with social interactions. The mental health community must also consider threats to DMH tool uptake and adoption such as ambivalence about technology and its ability to support mental wellness journeys.

#### ACKNOWLEDGEMENTS

We would like to thank Olga Barnas and Renwen Zhang for their contributions to this work by helping to code the data. This work was supported by funding from the National Institute of Mental Health (P50MH119029, K01MH125172, R34MH124960). In addition, we acknowledge a gift from the Microsoft AI for Accessibility program to the Center for Behavioral Intervention Technologies that, in part, supported this work.

#### REFERENCES

- [1]. Adams Phil, Baumer Eric PS, and Gay Geri. 2014. Staccato social support in mobile health applications. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14), Association for Computing Machinery, New York, NY, USA, 653–662. DOI:10.1145/2556288.2557297
- [2]. Ahmadi Mousa, Schneider Mary E., Kadam Rohit, and Wohn Donghee Yvette. 2016. Designing Paralinguistic Digital Affordances for Social Support. In Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion (CSCW '16 Companion), Association for Computing Machinery, New York, NY, USA, 221–224. DOI:10.1145/2818052.2869120
- [3]. Andalibi Nazanin, Ozturk Pinar, and Forte Andrea. 2017. Sensitive Self-disclosures, Responses, and Social Support on Instagram: The Case of #Depression. In Proceedings of the



2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17), Association for Computing Machinery, New York, NY, USA, 1485–1500. DOI:10.1145/2998181.2998243

- [4]. Andersson Gerhard and Cuijpers Pim. 2009. Internet-Based and Other Computerized Psychological Treatments for Adult Depression: A Meta-Analysis. *Cogn. Behav. Ther* 38, 4 (December 2009), 196–205. DOI:10.1080/16506070903318960 [PubMed: 20183695]
- [5]. Andrews G, Basu A, Cuijpers P, Craske MG, McEvoy P, English CL, and Newby JM. 2018. Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: An updated meta-analysis. *J. Anxiety Disord* 55, (April 2018), 70–78. DOI:10.1016/j.janxdis.2018.01.001 [PubMed: 29422409]
- [6]. Balaskas Andreas, Schueller Stephen M., Cox Anna L., and Doherty Gavin. 2021. Ecological momentary interventions for mental health: A scoping review. *PLoS One* 16, 3 (2021), e0248152. DOI:10.1371/journal.pone.0248152 [PubMed: 33705457]
- [7]. Baumel Amit, Edan Stav, and Kane John M.. 2019. Is there a trial bias impacting user engagement with unguided e-mental health interventions? A systematic comparison of published reports and real-world usage of the same programs. *Transl. Behav. Med* 9, 6 (November 2019), 1020–1033. DOI:10.1093/tbm/ibz147 [PubMed: 31689344]
- [8]. Baumel Amit, Fleming Theresa, and Schueller Stephen M. 2020. Digital Micro Interventions for Behavioral and Mental Health Gains: Core Components and Conceptualization of Digital Micro Intervention Care. *J. Med. Internet Res* 22, 10 (October 2020), e20631. DOI:10.2196/20631 [PubMed: 33118946]
- [9]. Baumel Amit, Muench Frederick, Edan Stav, and Kane John M. 2019. Objective user engagement with mental health apps: Systematic search and panel-based usage analysis. *J. Med. Internet Res* 21, 9 (September 2019), e14567. DOI:10.2196/14567 [PubMed: 31573916]
- [10]. Bazarova Natalya N.. 2012. Public Intimacy: Disclosure Interpretation and Social Judgments on Facebook. *J. Commun* 62, 5 (October 2012), 815–832. DOI:10.1111/j.1460-2466.2012.01664.x
- [11]. Bazarova Natalya N. and Choi Yoon Hyung. 2014. Self-Disclosure in Social Media: Extending the Functional Approach to Disclosure Motivations and Characteristics on Social Network Sites. *J. Commun* 64, 4 (2014), 635–657. DOI:10.1111/jcom.12106
- [12]. Bazarova Natalya N., Choi Yoon Hyung, Sosik Victoria Schwanda, Cosley Dan, and Whitlock Janis. 2015. Social Sharing of Emotions on Facebook: Channel Differences, Satisfaction, and Replies. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '15)*, Association for Computing Machinery, New York, NY, USA, 154–164. DOI:10.1145/2675133.2675297
- [13]. Bentvelzen Marit, Niess Jasmin, and Wo niak Paweł W.. 2021. The Technology-Mediated Reflection Model: Barriers and Assistance in Data-Driven Reflection. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, ACM, Yokohama Japan, 1–12. DOI:10.1145/3411764.3445505
- [14]. Karolien EM, Biesheuvel-Leliefeld, Kok Gemma D., Bockting Claudi L. H., Cuijpers Pim, Hollon Steven D., van Marwijk Harm W. J., and Smit Filip. 2015. Effectiveness of psychological interventions in preventing recurrence of depressive disorder: Meta-analysis and meta-regression. *J. Affect. Disord* 174, (March 2015), 400–410. DOI:10.1016/j.jad.2014.12.016 [PubMed: 25553400]
- [15]. Borghouts Judith, Eikay Elizabeth, Mark Gloria, De Leon Cinthia, Schueller Stephen M, Schneider Margaret, Stadnick Nicole, Zheng Kai, Mukamel Dana, and Sorkin Dara H. 2021. Barriers to and Facilitators of User Engagement With Digital Mental Health Interventions: Systematic Review. *J. Med. Internet Res* 23, 3 (March 2021), e24387. DOI:10.2196/24387 [PubMed: 33759801]
- [16]. Braun Virginia and Clarke Victoria. 2006. Using thematic analysis in psychology. *Qual. Res. Psychol* 3, 2 (2006), 77–101.
- [17]. Budney Alan J., Borodovsky Jacob T., Marsch Lisa A., and Lord Sarah E.. 2019. Chapter 5 - Technological Innovations in Addiction Treatment. In *The Assessment and Treatment of Addiction*, Danovitch Itai and Mooney Larissa J. (eds.). Elsevier, 75–90. DOI:10.1016/B978-0-323-54856-4.00005-5

- [18]. Burgess Eleanor R.. 2019. Collaborative Self-management of Depression. In Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing, ACM, Austin TX USA, 38–42. DOI:10.1145/3311957.3361851
- [19]. Burgess Eleanor R., Ringland Kathryn E., Nicholas Jennifer, Knapp Ashley A., Eschler Jordan, Mohr David C., and Reddy Madhu C.. 2019. “I think people are powerful”: The Sociality of Individuals Managing Depression. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW (November 2019), 41:1–41:29. DOI:10.1145/3359143
- [20]. Burke Moira, Marlow Cameron, and Lento Thomas. 2010. Social network activity and social well-being. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*, Association for Computing Machinery, New York, NY, USA, 1909–1912. DOI:10.1145/1753326.1753613
- [21]. Burr Christopher, Morley Jessica, Taddeo Mariarosaria, and Floridi Luciano. 2020. Digital Psychiatry: Risks and Opportunities for Public Health and Well-Being. *IEEE Trans. Technol. Soc* (2020), 1–1. DOI:10.1109/TTS.2020.2977059
- [22]. Cahill Kate, Lancaster Tim, and Green Natasha. 2010. Stage-based interventions for smoking cessation. *Cochrane Database Syst. Rev* 11 (November 2010), CD004492. DOI:10.1002/14651858.CD004492.pub4
- [23]. Chaudoir Stephenie R. and Fisher Jeffrey D.. 2010. The disclosure processes model: Understanding disclosure decision making and postdisclosure outcomes among people living with a concealable stigmatized identity. *Psychol. Bull* 136, 2 (2010), 236–256. DOI:10.1037/a0018193 [PubMed: 20192562]
- [24]. Chikersal Perna, Belgrave Danielle, Doherty Gavin, Enrique Angel, Palacios Jorge E., Richards Derek, and Thieme Anja. 2020. Understanding Client Support Strategies to Improve Clinical Outcomes in an Online Mental Health Intervention. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, ACM, Honolulu HI USA, 1–16. DOI:10.1145/3313831.3376341
- [25]. Chuang Katherine Y. and Yang Christopher C.. 2010. Helping you to help me: exploring supportive interaction in online health community. In *Proceedings of the 73rd ASIS&T Annual Meeting on Navigating Streams in an Information Ecosystem - Volume 47 (ASIS&T '10)*, American Society for Information Science, USA, 1–10.
- [26]. Chung Jae Eun. 2013. Social Interaction in Online Support Groups: Preference for Online Social Interaction over Offline Social Interaction. *Comput Hum Behav* 29, 4 (July 2013), 1408–1414. DOI:10.1016/j.chb.2013.01.019
- [27]. De Choudhury Munmun, Morris Meredith Ringel, and White Ryen W.. 2014. Seeking and sharing health information online: comparing search engines and social media. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*, Association for Computing Machinery, New York, NY, USA, 1365–1376. DOI:10.1145/2556288.2557214
- [28]. Dean Jeremy, Potts Henry W. W., and Barker Chris. 2016. Direction to an Internet Support Group Compared With Online Expressive Writing for People With Depression and Anxiety: A Randomized Trial. *JMIR Ment. Health* 3, 2 (2016), e12. DOI:10.2196/mental.5133 [PubMed: 27189142]
- [29]. DeAndrea DC and Anthony JC. 2013. Online peer support for mental health problems in the United States: 2004–2010. *Psychol. Med* 43, 11 (November 2013), 2277–2288. DOI:10.1017/S0033291713000172 [PubMed: 23410539]
- [30]. Dimidjian Sona, Barrera Manuel, Martell Christopher, Muñoz Ricardo F, and Lewinsohn Peter M. 2011. The origins and current status of behavioral activation treatments for depression. *Annu. Rev. Clin. Psychol* 7, (2011), 1–38. DOI:10.1146/annurev-clinpsy-032210-104535 [PubMed: 21275642]
- [31]. Epstein Daniel A., Ping An, Fogarty James, and Munson Sean A.. 2015. A lived informatics model of personal informatics. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing - UbiComp '15*, ACM Press, Osaka, Japan, 731–742. DOI:10.1145/2750858.2804250
- [32]. Firth Joseph, Torous John, Nicholas Jennifer, Carney Rebekah, Pratap Abhishek, Rosenbaum Simon, and Sarris Jerome. 2017. The efficacy of smartphone-based mental health interventions

- for depressive symptoms: A meta-analysis of randomized controlled trials. *World Psychiatry* 16, 3 (2017), 287–298. DOI:10.1002/wps.20472 [PubMed: 28941113]
- [33]. Firth Joseph, Torous John, Nicholas Jennifer, Carney Rebekah, Rosenbaum Simon, and Sarris Jerome. 2017. Can smartphone mental health interventions reduce symptoms of anxiety? A meta-analysis of randomized controlled trials. *J. Affect. Disord* 218, (August 2017), 15–22. DOI:10.1016/j.jad.2017.04.046 [PubMed: 28456072]
- [34]. Gulliver Amelia, Griffiths Kathleen M., and Christensen Helen. 2010. Perceived barriers and facilitators to mental health help-seeking in young people: a systematic review. *BMC Psychiatry* 10, (December 2010), 113. DOI:10.1186/1471-244X-10-113 [PubMed: 21192795]
- [35]. Harari Gabriella M., Lane Nicholas D., Wang Rui, Crosier Benjamin S., Campbell Andrew T., and Gosling Samuel D.. 2016. Using Smartphones to Collect Behavioral Data in Psychological Science: Opportunities, Practical Considerations, and Challenges. *Perspect. Psychol. Sci* 11, 6 (2016), 838–854. DOI:10.1177/1745691616650285 [PubMed: 27899727]
- [36]. Hayes Gillian R., Abowd Gregory D., Davis John S., Blount Marion L., Ebling Maria, and Mynatt Elizabeth D.. 2009. Opportunities for Pervasive Computing in Chronic Cancer Care. In *Proceedings of the 6th International Conference on Pervasive Computing (Pervasive '08)*, Springer-Verlag, Berlin, Heidelberg, 262–279. DOI:10.1007/978-3-540-79576-6\_16
- [37]. Hinshaw Stephen P., Hoagwood Kimberly, Jensen Peter S., Kratochvil Christopher, Bickman Leonard, Clarke Greg, Abikoff Howard B., Atkins Marc, and Vitiello Benedetto. 2004. AACAP 2001 research forum: challenges and recommendations regarding recruitment and retention of participants in research investigations. *J. Am. Acad. Child Adolesc. Psychiatry* 43, 8 (August 2004), 1037–1045. DOI:10.1097/01.chi.0000129222.89433.3d [PubMed: 15266200]
- [38]. Hirvonen Noora, Korpelainen Raija, Pyky Riitta, and Huotari Maija-Leena. 2015. Health information literacy and stage of change in relation to physical activity information seeking and avoidance: a population-based study among young men. In *Proceedings of the 78th ASIS&T Annual Meeting: Information Science with Impact: Research in and for the Community (ASIST '15)*, American Society for Information Science, USA, 1–11.
- [39]. Horgan Aine, McCarthy Geraldine, and Sweeney John. 2013. An Evaluation of an Online Peer Support Forum for University Students With Depressive Symptoms. *Arch. Psychiatr. Nurs* 27, 2 (April 2013), 84–89. DOI:10.1016/j.apnu.2012.12.005 [PubMed: 23540518]
- [40]. Huckvale Kit, Nicholas Jennifer, Torous John, and Larsen Mark E. 2020. Smartphone apps for the treatment of mental health conditions: status and considerations. *Curr. Opin. Psychol* 36, (December 2020), 65–70. DOI:10.1016/j.copsyc.2020.04.008 [PubMed: 32553848]
- [41]. Jacobs Maia, Clawson James, and Mynatt Elizabeth D.. 2014. Cancer navigation: opportunities and challenges for facilitating the breast cancer journey. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*, ACM, Baltimore Maryland USA, 1467–1478. DOI:10.1145/2531602.2531645
- [42]. Jacobs Maia, Clawson James, and Mynatt Elizabeth D.. 2016. A cancer journey framework: guiding the design of holistic health technology. In *Proceedings of the 10th EAI International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth '16)*, ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), Brussels, BEL, 114–121.
- [43]. Jacobs Maia, Johnson Jeremy, and Mynatt Elizabeth D.. 2018. MyPath: Investigating Breast Cancer Patients' Use of Personalized Health Information. In *Proceedings of the ACM on Human-Computer Interaction*, 1–21. DOI:10.1145/3274347
- [44]. Jacobs Maia L., Clawson James, and Mynatt Elizabeth D.. 2014. My journey compass: a preliminary investigation of a mobile tool for cancer patients. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*, Association for Computing Machinery, New York, NY, USA, 663–672. DOI:10.1145/2556288.2557194
- [45]. Jang Chyng-Yang and Stefanone Michael A.. 2011. Non-Directed Self-Disclosure in the Blogosphere. *Inf. Commun. Soc* 14, 7 (October 2011), 1039–1059. DOI:10.1080/1369118X.2011.559265
- [46]. Kang Ruogu, Dabbish Laura, and Sutton Katherine. 2016. Strangers on Your Phone: Why People Use Anonymous Communication Applications. In *Proceedings of the 19th ACM Conference*

- on Computer-Supported Cooperative Work & Social Computing (CSCW '16), Association for Computing Machinery, New York, NY, USA, 359–370. DOI:10.1145/2818048.2820081
- [47]. Kennedy N and Paykel ES. 2004. Residual symptoms at remission from depression: impact on long-term outcome. *J. Affect. Disord* 80, 2–3 (June 2004), 135–144. DOI:10.1016/S0165-0327(03)00054-5 [PubMed: 15207926]
- [48]. Kornfield R, Zhang R, Nicholas J, Schueller S, Cambo S, Mohr D, and Reddy M. Energy is a Finite Resource”: Designing technology to support individuals across fluctuating symptoms of depression. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, Association for Computing Machinery (ACM), Honolulu, HI. DOI:10.1145/3313831.3376309
- [49]. Kornfield Rachel and Toma Catalina L.. 2020. When do Online Audiences Amplify Benefits of Self-Disclosure? The Role of Shared Experience and Anticipated Interactivity. *J. Broadcast. Electron. Media* 64, 2 (May 2020), 277–297. DOI:10.1080/08838151.2020.1757366 [PubMed: 33584002]
- [50]. Krebs Paul, Norcross John C., Nicholson Joseph M., and Prochaska James O.. 2018. Stages of change and psychotherapy outcomes: A review and meta-analysis. *J. Clin. Psychol* 74, 11 (November 2018), 1964–1979. DOI:10.1002/jclp.22683 [PubMed: 30335193]
- [51]. Kroenke Kurt, Spitzer Robert L., and Williams Janet B. W.. 2001. The PHQ-9: Validity of a Brief Depression Severity Measure. *J. Gen. Intern. Med* 16, 9 (2001), 606–613. DOI:10.1046/j.1525-1497.2001.016009606.x [PubMed: 11556941]
- [52]. Lampe Cliff, Gray Rebecca, Fiore Andrew T., and Ellison Nicole. 2014. Help is on the way: patterns of responses to resource requests on facebook. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing (CSCW '14)*, Association for Computing Machinery, New York, NY, USA, 3–15. DOI:10.1145/2531602.2531720
- [53]. Lattie Emily G., Adkins Elizabeth C., Winquist Nathan, Stiles-Shields Colleen, Wafford Q. Eileen, and Graham Andrea K.. 2019. Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review. *J. Med. Internet Res* 21, 7 (22 2019), e12869. DOI:10.2196/12869 [PubMed: 31333198]
- [54]. Lattie Emily G., Kornfield Rachel, Ringland Kathryn E., Zhang Renwen, Winquist Nathan, and Reddy Madhu. 2020. Designing Mental Health Technologies that Support the Social Ecosystem of College Students. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*, Association for Computing Machinery, New York, NY, USA, 1–15. DOI:10.1145/3313831.3376362
- [55]. Laurie James and Blandford Ann. 2016. Making time for mindfulness. *Int. J. Med. Inf* 96, (December 2016), 38–50. DOI:10.1016/j.ijmedinf.2016.02.010
- [56]. Lee Yeoreum and Lim Youn-kyung. 2015. Understanding the Roles and Influences of Mediators from Multiple Social Channels for Health Behavior Change. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '15)*, Association for Computing Machinery, New York, NY, USA, 1070–1079. DOI:10.1145/2675133.2685032
- [57]. Lewis Cara C., Simons Anne D., Silva Susan G., Rohde Paul, Small David M., Murakami Jessica L., High Robin R., and March John S.. 2009. The role of readiness to change in response to treatment of adolescent depression. *J. Consult. Clin. Psychol* 77, 3 (June 2009), 422. DOI:10.1037/a0014154 [PubMed: 19485584]
- [58]. Li Ian, Dey Anind, and Forlizzi Jodi. 2010. A stage-based model of personal informatics systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*, Association for Computing Machinery, New York, NY, USA, 557–566. DOI:10.1145/1753326.1753409
- [59]. Linardon Jake, Cuijpers Pim, Carlbring Per, Messer Mariel, and Fuller-Tyszkiewicz Matthew. 2019. The efficacy of app-supported smartphone interventions for mental health problems: a meta-analysis of randomized controlled trials. *World Psychiatry* 18, 3 (2019), 325–336. DOI:10.1002/wps.20673 [PubMed: 31496095]
- [60]. Linardon Jake and Fuller-Tyszkiewicz Matthew. 2020. Attrition and adherence in smartphone-delivered interventions for mental health problems: A systematic and meta-analytic review.

- J. Consult. Clin. Psychol 88, 1 (January 2020), 1–13. DOI:10.1037/ccp0000459 [PubMed: 31697093]
- [61]. Haley MacLeod Ben Jelen, Prabhakar Annu, Oehlberg Lora, Siek Katie, and Connelly Kay. 2017. A guide to using asynchronous remote communities (ARC) for researching distributed populations. *EAI Endorsed Trans. Pervasive Health Technol* 3, 11 (July 2017). Retrieved from 10.4108/eai.18-7-2017.152898
- [62]. Maestre Juan F., MacLeod Haley, Connelly Ciabhan L., Dunbar Julia C., Beck Jordan, Siek Katie A., and Shih Patrick C.. 2018. Defining Through Expansion: Conducting Asynchronous Remote Communities (ARC) Research with Stigmatized Groups. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*, ACM Press, Montreal QC, Canada, 1–13. DOI:10.1145/3173574.3174131
- [63]. Melia Ruth, Francis Kady, Hickey Emma, Bogue John, Duggan Jim, O'Sullivan Mary, and Young Karen. 2020. Mobile Health Technology Interventions for Suicide Prevention: Systematic Review. *JMIR MHealth UHealth* 8, 1 (January 2020), e12516. DOI:10.2196/12516 [PubMed: 31939744]
- [64]. Mendiola Martin F., Kalnicki Miriam, and Lindenauer Sarah. 2015. Valuable Features in Mobile Health Apps for Patients and Consumers: Content Analysis of Apps and User Ratings. *JMIR MHealth UHealth* 3, 2 (May 2015), e4283. DOI:10.2196/mhealth.4283
- [65]. Miller Andrew D., Mishra Sonali R., Kendall Logan, Haldar Shefali, Pollack Ari H., and Pratt Wanda. 2016. Partners in Care: Design Considerations for Caregivers and Patients During a Hospital Stay. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, ACM, San Francisco California USA, 756–769. DOI:10.1145/2818048.2819983
- [66]. David C Mohr Pim Cuijpers, and Lehman Kenneth. 2011. Supportive accountability: A model for providing human support to enhance adherence to eHealth interventions. *J. Med. Internet Res* 13, 1 (March 2011), e30. DOI:10.2196/jmir.1602 [PubMed: 21393123]
- [67]. Mohr David C., Kathryn Noth Tomasino Emily G. Lattie, Palac Hannah L., Kwasny Mary J., Weingardt Kenneth, Karr Chris J., Kaiser Susan M., Rossom Rebecca C., Bardsley Leland R., Caccamo Lauren, Stiles-Shields Colleen, and Schueller Stephen M.. 2017. IntelliCare: An eclectic, skills-based app suite for the treatment of depression and anxiety. *J. Med. Internet Res* 19, 1 (2017), e10. DOI:10.2196/jmir.6645 [PubMed: 28057609]
- [68]. Mojtabai R, Olfson M, Sampson NA, Jin R, Druss B, Wang PS, Wells KB, Pincus HA, and Kessler RC. 2011. Barriers to mental health treatment: Results from the National Comorbidity Survey Replication. *Psychol. Med* 41, 8 (August 2011), 1751–1761. DOI:10.1017/S0033291710002291 [PubMed: 21134315]
- [69]. Morris Merrill and Ogan Christine. 1996. The Internet as Mass Medium. *J. Comput.-Mediat. Commun* 1, 4 (March 1996). DOI:10.1111/j.1083-6101.1996.tb00174.x
- [70]. Murnane Elizabeth L., Walker Tara G., Tench Beck, Volda Stephen, and Snyder Jaime. 2018. Personal Informatics in Interpersonal Contexts: Towards the Design of Technology that Supports the Social Ecologies of Long-Term Mental Health Management. *Proc. ACM Hum.-Comput. Interact* 2, CSCW (November 2018), 127:1–127:27. DOI:10.1145/3274396
- [71]. Ng Ada, Kornfield Rachel, Schueller Stephen, Zalta Allison, Brennan Michael, and Reddy Madhu. In Press. Provider Perspectives on Integrating Sensor-Captured Patient-Generated Data in Mental Health Care. In *Proceedings of the ACM on Human-Computer Interaction*.
- [72]. Nguyen Theresa, Hallebuyck Michele, Halpern Madeline, Reinert Maddy, and Fritze Danielle. 2017. Lessons Learned from Online Depression Screening. *Mental Health America*, Alexandria, VA. Retrieved from [https://mhanational.org/sites/default/files/Lessons%20Learned%20From%20Online%20Depression%20Screening\\_0.pdf](https://mhanational.org/sites/default/files/Lessons%20Learned%20From%20Online%20Depression%20Screening_0.pdf)
- [73]. Norcross John C., Krebs Paul M., and Prochaska James O.. 2011. Stages of change. *J. Clin. Psychol* 67, 2 (February 2011), 143–154. DOI:10.1002/jclp.20758 [PubMed: 21157930]
- [74]. Kathleen O'Leary Arpita Bhattacharya, Munson Sean A., Wobbrock Jacob O., and Pratt Wanda. 2017. Design Opportunities for Mental Health Peer Support Technologies. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*, Association for Computing Machinery, New York, NY, USA, 1470–1484. DOI:10.1145/2998181.2998349



- [75]. Kathleen O’Leary Stephen M. Schueller, Wobbrock Jacob O., and Pratt Wanda. 2018. “Suddenly, we got to become therapists for each other”: Designing Peer Support Chats for Mental Health. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems, Association for Computing Machinery, New York, NY, USA, 1–14. Retrieved February 15, 2021 from 10.1145/3173574.3173905
- [76]. Peng Zhenhui, Ma Xiaojuan, Yang Diyi, Tsang Ka Wing, and Guo Qingyu. 2021. Effects of Support-Seekers’ Community Knowledge on Their Expressed Satisfaction with the Received Comments in Mental Health Communities. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, ACM, Yokohama Japan, 1–12. DOI:10.1145/3411764.3445446
- [77]. Pew Research Center. Demographics of mobile device ownership and adoption in the United States. Internet, Science & Tech: Mobile Fact Sheet. Retrieved from <https://www.pewresearch.org/internet/fact-sheet/mobile/>
- [78]. K Posner, Brent D, Lucas C, Gould M, Stanley B, Brown G, Fisher P, Zelazny J, Burke A, and Oquendo M. 2008. Columbia-Suicide Severity Rating Scale (C-SSRS). N. Y. N. Y. State Psychiatr. Inst (2008).
- [79]. Prabhakar Annu Sible, Guerra-Reyes Lucia, Kleinschmidt Vanessa M., Jelen Ben, MacLeod Haley, Connelly Kay, and Siek Katie A.. 2017. Investigating the suitability of the asynchronous, remote, community-based method for pregnant and new mothers. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI ‘17, ACM Press, Denver, Colorado, USA, 4924–4934. DOI:10.1145/3025453.3025546
- [80]. Prescott Julie, Hanley Terry, and Ujhelyi Katalin. 2017. Peer Communication in Online Mental Health Forums for Young People: Directional and Nondirectional Support. JMIR Ment. Health 4, 3 (2017), e29. DOI:10.2196/mental.6921 [PubMed: 28768607]
- [81]. Pretorius Claudette, Chambers Derek, and Coyle David. 2019. Young People’s Online Help-Seeking and Mental Health Difficulties: Systematic Narrative Review. J. Med. Internet Res 21, 11 (2019), e13873. DOI:10.2196/13873 [PubMed: 31742562]
- [82]. Pretorius Claudette, McCashin Darragh, Kavanagh Naoise, and Coyle David. 2020. Searching for Mental Health: A Mixed-Methods Study of Young People’s Online Help-seeking. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, ACM, Honolulu HI USA, 1–13. DOI:10.1145/3313831.3376328
- [83]. Price Matthew, Legrand Alison C., Brier Zoe M. F., van Stolk-Cooke Katherine, Peck Kelly, Dodds Peter, Adams Zachary W., and Danforth Christopher M.. 2021. Doomscrolling during COVID-19: The negative association between daily social and traditional media consumption and mental health symptoms during the COVID-19 pandemic. DOI:10.31234/osf.io/s2nfg
- [84]. Prochaska James O. and Velicer Wayne F.. 1997. The Transtheoretical Model of Health Behavior Change. Am. J. Health Promot 12, 1 (September 1997), 38–48. DOI:10.4278/0890-1171-12.1.38 [PubMed: 10170434]
- [85]. Rains Stephen A. and Wright Kevin B.. 2016. Social Support and Computer-Mediated Communication: A State-of-the-Art Review and Agenda for Future Research. Ann. Int. Commun. Assoc 40, 1 (January 2016), 175–211. DOI:10.1080/23808985.2015.11735260
- [86]. Reisner Sari L., Randazzo Renee K., White Hughto Jaclyn M., Peitzmeier Sarah, DuBois L. Zachary, Pardee Dana J., Marrow Elliot, McLean Sarah, and Potter Jennifer. 2018. Sensitive Health Topics With Underserved Patient Populations: Methodological Considerations for Online Focus Group Discussions. Qual. Health Res 28, 10 (August 2018), 1658–1673. DOI:10.1177/1049732317705355 [PubMed: 29298574]
- [87]. Reno Corbin and Poole Erika S.. 2016. It Matters If My Friends Stop Smoking: Social Support for Behavior Change in Social Media. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 5548–5552. Retrieved January 13, 2021 from 10.1145/2858036.2858203
- [88]. Rios Leonardo Essado, Herval Alex Moreira, Ferreira Raquel Conceição, and Freire Maria do Carmo Matias. 2019. Prevalences of Stages of Change for Smoking Cessation in Adolescents and Associated Factors: Systematic Review and Meta-Analysis. J. Adolesc. Health Off. Publ. Soc. Adolesc. Med 64, 2 (February 2019), 149–157. DOI:10.1016/j.jadohealth.2018.09.005

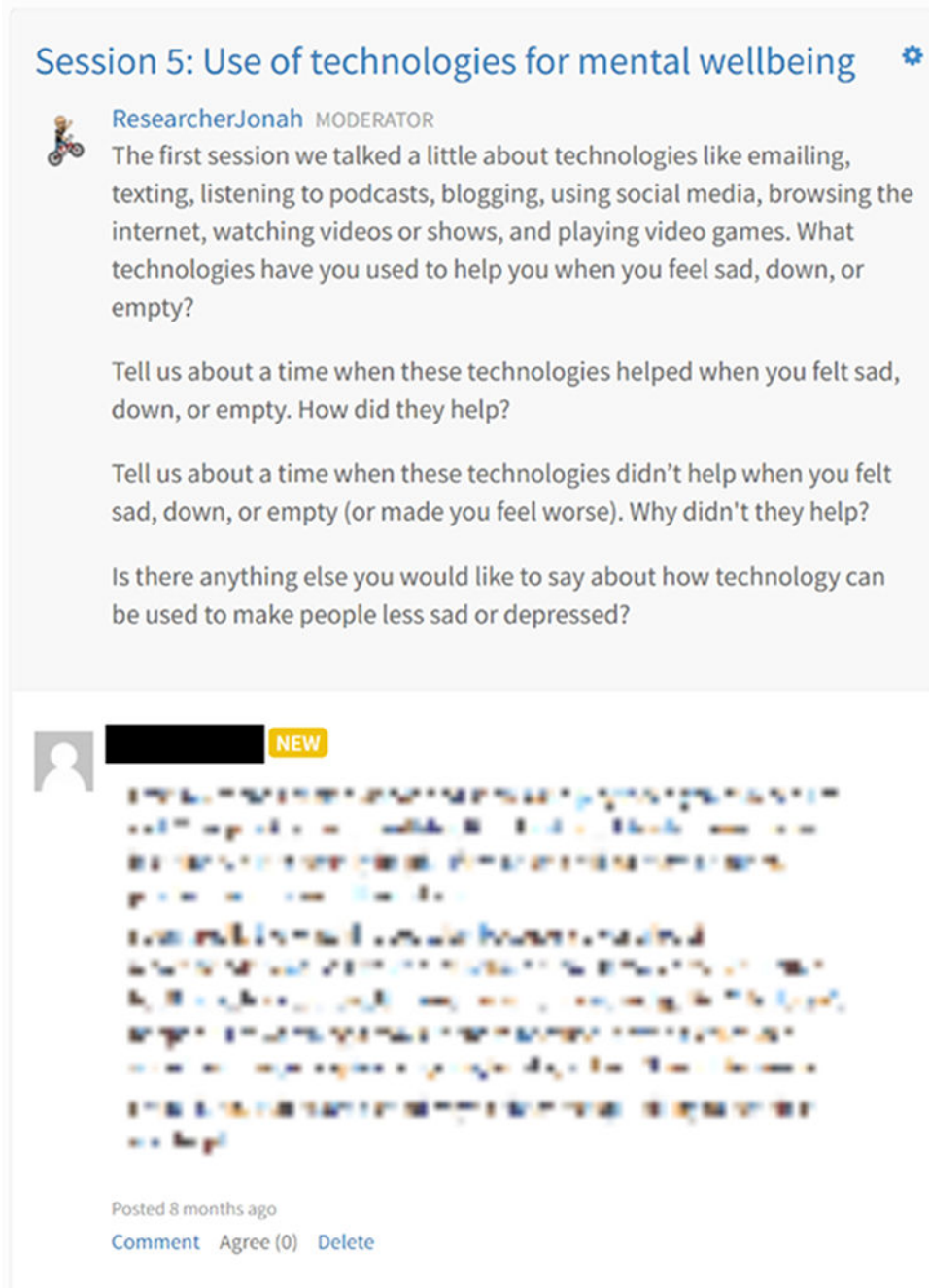


- [89]. Robinson Lisa M. and Vail Sara R.. 2012. An integrative review of adolescent smoking cessation using the Transtheoretical Model of Change. *J. Pediatr. Health Care Off. Publ. Natl. Assoc. Pediatr. Nurse Assoc. Pract* 26, 5 (October 2012), 336–345. DOI:10.1016/j.pedhc.2010.12.001
- [90]. Sakamoto Yasuhisa and Kuwana Eiji. 1993. Toward integrated support of synchronous and asynchronous communication in cooperative work: an empirical study of real group communication. In *Proceedings of the conference on Organizational computing systems (COCS '93)*, Association for Computing Machinery, New York, NY, USA, 90–97. DOI:10.1145/168555.168565
- [91]. Sannon Shruti, Murnane Elizabeth I., Bazarova Natalya N., and Gay Geri. 2019. “ I was really, really nervous posting it”: Communicating about Invisible Chronic Illnesses across Social Media Platforms. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, ACM, 353.
- [92]. Schueller Stephen M., Aguilera Adrian, and Mohr David C.. 2017. Ecological momentary interventions for depression and anxiety. *Depress. Anxiety* 34, 6 (2017), 540–545. DOI:10.1002/da.22649 [PubMed: 28494123]
- [93]. Schueller Stephen, Muñoz Ricardo F., and Mohr David C.. 2013. Realizing the potential of behavioral intervention technologies. *Curr. Dir. Psychol. Sci* 22, 6 (December 2013), 478–483. DOI:10.1177/0963721413495872
- [94]. Shah Parth V. and Ringland Kathryn E.. 2019. Health Information Technologies for Cancer Care: Characterizing Developments for Precision and Personalized Medicine. In *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing*, ACM, Austin TX USA, 362–366. DOI:10.1145/3311957.3359504
- [95]. Shelton Richard C.. 2009. Long-Term Management of Depression: Tips for Adjusting the Treatment Plan as the Patient’s Needs Change. *J. Clin. Psychiatry* 70, suppl 6 (November 2009), 0–0. DOI:10.4088/JCP.8133su1c.05
- [96]. Stanley Barbara and Brown Gregory K.. 2012. Safety Planning Intervention: A Brief Intervention to Mitigate Suicide Risk. *Cogn. Behav. Pract* 19, 2 (May 2012), 256–264. DOI:10.1016/j.cbpra.2011.01.001
- [97]. Substance Abuse and Mental Health Services Administration (SAMHSA). 2018. National Survey on Drug Use and Health 2018 (NSDUH-2018). U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. Retrieved from <https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHDetailedTabs2018R2/NSDUHDetTabsSect8pe2018.htm>
- [98]. Substance Abuse and Mental Health Services Administration (SAMHSA). 2019. National Survey on Drug Use and Health 2019 (NSDUH-2019). U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. Retrieved from <https://www.samhsa.gov/data/report/2019-nsduh-detailed-tables>
- [99]. Suh Jina, Williams Spencer, Fann Jesse R., Fogarty James, Bauer Amy M., and Hsieh Gary. 2020. Parallel Journeys of Patients with Cancer and Depression: Challenges and Opportunities for Technology-Enabled Collaborative Care. *Proc. ACM Hum.-Comput. Interact* 4, CSCW1 (May 2020), 038:1–038:36. DOI:10.1145/3392843
- [100]. Sun Na, Rau Patrick Pei-Luen, and Ma Liang. 2014. Understanding lurkers in online communities: A literature review. *Comput. Hum. Behav* 38, (September 2014), 110–117. DOI:10.1016/j.chb.2014.05.022
- [101]. Tal Amir and Torous John. 2017. The digital mental health revolution: Opportunities and risks. *Psychiatr. Rehabil. J* 40, 3 (September 2017), 263–265. DOI:10.1037/prj0000285 [PubMed: 28891658]
- [102]. Tomasino Kathryn N., Lattie Emily G., Ho Joyce, Palac Hannah L., Kaiser Susan M., and Mohr David C.. 2017. Harnessing peer support in an online intervention for older adults with depression. *Am. J. Geriatr. Psychiatry* 25, 10 (October 2017), 1109–1119. DOI:10.1016/j.jagp.2017.04.015 [PubMed: 28571785]
- [103]. Tong Huong Ly and Laranjo Liliana. 2018. The use of social features in mobile health interventions to promote physical activity: a systematic review. *Npj Digit. Med* 1, 1 (September 2018), 1–10. DOI:10.1038/s41746-018-0051-3 [PubMed: 31304287]

- [104]. Torous John, Lipschitz Jessica, Ng Michelle, and Firth Joseph. 2020. Dropout rates in clinical trials of smartphone apps for depressive symptoms: A systematic review and meta-analysis. *J. Affect. Disord* 263, (February 2020), 413–419. DOI:10.1016/j.jad.2019.11.167 [PubMed: 31969272]
- [105]. Torous John, Staples Patrick, and Onnela Jukka-Pekka. 2015. Realizing the Potential of Mobile Mental Health: New Methods for New Data in Psychiatry. *Curr. Psychiatry Rep* 17, 8 (August 2015), 61. DOI:10.1007/s11920-015-0602-0
- [106]. Roelof A.J. de Vries, Truong Khiet P., Kwint Sigrid, Constance H.C. Drossaert, and Evers Vanessa. 2016. Crowd-Designed Motivation: Motivational Messages for Exercise Adherence Based on Behavior Change Theory. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*, Association for Computing Machinery, New York, NY, USA, 297–308. DOI:10.1145/2858036.2858229
- [107]. Wan Ruyuan, Levonian Zachary, and Yarosh Svetlana. 2020. How much is a “like” worth? Engagement and Retention in an Online Health Community. In *Conference Companion Publication of the 2020 on Computer Supported Cooperative Work and Social Computing*. Association for Computing Machinery, New York, NY, USA, 413–417. Retrieved January 12, 2021 from 10.1145/3406865.3418320
- [108]. Wang Philip S., Berglund Patricia, Olfson Mark, Pincus Harold A., Wells Kenneth B., and Kessler Ronald C.. 2005. Failure and delay in initial treatment contact after first onset of mental disorders in the National Comorbidity Survey Replication. *Arch. Gen. Psychiatry* 62, 6 (June 2005), 603–613. DOI:10.1001/archpsyc.62.6.603 [PubMed: 15939838]
- [109]. Wang Yi-Chia, Kraut Robert, and Levine John M.. 2012. To stay or leave? the relationship of emotional and informational support to commitment in online health support groups. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work (CSCW '12)*, Association for Computing Machinery, New York, NY, USA, 833–842. DOI:10.1145/2145204.2145329
- [110]. Wilhelm Sabine, Weingarden Hilary, Ladis Ilana, Braddick Valerie, Shin Jin, and Jacobson Nicholas C.. 2019. Cognitive-Behavioral Therapy in the Digital Age: Presidential Address. *Behav. Ther* (August 2019), S0005789419300978. DOI:10.1016/j.beth.2019.08.001
- [111]. Wilson Coralie J., Rickwood Debra J., Bushnell John A., Caputi Peter, and Thomas Susan J.. 2011. The effects of need for autonomy and preference for seeking help from informal sources on emerging adults’ intentions to access mental health services for common mental disorders and suicidal thoughts. *Adv. Ment. Health* 10, 1 (October 2011), 29–38. DOI:10.5172/jamh.2011.10.1.29
- [112]. Witt Katrina, Spittal Matthew J., Carter Gregory, Pirkis Jane, Hetrick Sarah, Currier Dianne, Robinson Jo, and Milner Allison. 2017. Effectiveness of online and mobile telephone applications (‘apps’) for the self-management of suicidal ideation and self-harm: a systematic review and meta-analysis. *BMC Psychiatry* 17, 1 (August 2017), 297. DOI:10.1186/s12888-017-1458-0 [PubMed: 28810841]
- [113]. Woody Delinda, DeCristofaro Claire, and Carlton Betty G.. 2008. Smoking cessation readiness: are your patients ready to quit? *J. Am. Acad. Nurse Pract* 20, 8 (August 2008), 407–414. DOI:10.1111/j.1745-7599.2008.00344.x [PubMed: 18786015]
- [114]. Zhang Jing. 2017. Supporting Information Needs of Transitional Phases in Diabetes Management Through Online Health Communities. In *Companion of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, ACM, Portland Oregon USA, 107–111. DOI:10.1145/3022198.3024942
- [115]. 2018. Dedoose. SocioCultural Research Consultants, LLC, Los Angeles, CA. Retrieved from [www.dedoose.com](http://www.dedoose.com)

**CCS Concepts:**

- Human centered computing → Human-Computer Interaction • User studies



**Figure 1.** Screenshot of [focusgroupit.com](https://focusgroupit.com) platform with participant information and response redacted.

**Table 1.**

## Participant Demographics

Participant	Age	Race	Hispanic/Latinx	Gender	# of prompts responded to (out of 6)	# of comments on others' posts
1	18	White	No	Female	6	11
2	21	White	No	Female	6	10
3	20	Declined to answer	Declined to answer	Declined to answer	5	8
4	23	Asian	No	Female	6	5
5	25	White	No	Female	6	7
6	20	White	No	Female	6	14
7	20	White	No	Female	6	9
8	18	Asian	No	Female	6	6
9	23	White	No	Male	6	7
10	20	Declined to answer	Declined to answer	Declined to answer	0	0
11	21	More than one race	No	Male	6	1
12	18	Declined to answer	Declined to answer	Declined to answer	6	14
13	25	Asian	No	Female	6	7
14	25	White	No	Female	6	10
15	25	More than one race	No	Male	6	8
16	24	Black or African American	No	Female	6	13
17	22	Asian	No	Female	6	3
18	25	Asian	No	Female	6	6
19	20	Declined to answer	Declined to answer	Declined to answer	1	0
20	18	More than one race	No	Female	6	6
21	23	White	No	Female	6	19
22	19	White	No	Female	6	15
23	22	White	No	Female	6	12
24	18	White	No	Female	6	6
25	23	Declined to answer	Yes	Female	6	9
26	23	White	No	Female	6	14
27	19	White	No	Female	5	16
28	20	Declined to answer	Declined to answer	Declined to answer	6	6
29	22	American Indian or Alaskan Native	Yes	Female	0	0

**Table 2.**

## Conceptual Relationship between Stages of Change, Needs, and Form of Support

Stage of Change	Need	Relevant Forms of Support	Exemplar Quotes
<b>Contemplation</b>	Reduce loneliness	<i>Undirected</i>	<i>"I believed that I had been experiencing depressive symptoms for a long time and wanted some confirmation to help me decide what to do next." (P21)</i>
	Reduce ambivalence	-Online information seeking	<i>"I wanted to see how other people deal with depression on their own." (P22)</i>
	Increase motivation	-Reading personal experiences	<i>"[I have been] Trying to see how others cope with depression without going to a Shrink. I don't know what's been wrong with me the past 9 months or so." (P23)</i>
	Validation		
<b>Preparation</b>	Decisional reinforcement	<i>Undirected</i>	<i>"After the test, it said I was "moderately depressed" I figured this was great, because I thought it wasn't bad enough where I needed to see a doctor. It didn't really make me feel anymore sad, if anything i felt a little better. I didn't do anything with the information because I wasn't sure what exactly to do with it.</i>
	Increase in self-efficacy	-Reading personal experiences	
	Increase motivation	-Online information seeking	<i>I found this study on that website and decided to give it a try because I met all the standards for it. I don't plan on going to a doctor for this and I was hoping that maybe this group could help me a little bit since I'm not going to the doctor." (P18)</i>
	Validation	<i>Directed</i>	
		-Messaging and discussions with close others	<i>"I spoke with my mom after receiving the result, and her response was somewhere along the lines of "well, who isn't depressed right now?" I do understand her response - I don't know anyone who isn't down about the situation we are all in right now, but after that it was swept under the rug. I haven't done much more with the information beyond that, though I will probably be scheduling an appt with my doctor soon." (P5)</i>
		-Idea sharing	
		-Planning	
<b>Action and Maintenance</b>	Routine building	<i>Undirected</i>	<i>"When I started having bad anxiety and feeling depressed my mom suggested working out and I lived on campus at my college and could easily walk to the gym which made it so easy to workout. Since being home and not having that accessibility I find it much harder but if you can really think up the easiest way to work out and go from there to finding more encouraging things to help you do that workout routine, like having a friend or family member doing it with you as an extra encourager, make a playlist of songs to listen to while you do, or a special reward for yourself it can help a lot, especially if you go into it with the mindset of I am doing this to make me feel better not to lose weight or anything." (P4)</i>
	Accountability	-Online information seeking	
	Increase motivation	<i>Directed</i>	
	Validation	-Messaging and discussions with close others	<i>"I like to pray, go on a drive, listen to music, cook/bake, watch Disney movies, and watch videos of my niece and nephew. (I think one of the most satisfying relationships is that one created between an aunt and their nephew and/or niece). I also try to reach out to an understanding person because I do not like to bottle up my feelings anymore." (P9)</i>
		-Scheduling or partnering	
		-Idea sharing	