Exploring Design Opportunities for Supporting Mental Wellbeing Among East Asian University Students in Canada

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ABSTRACT

Amidst increasing reports of mental health problems in Canadian university students, those of Asian descent have particularly struggled to seek out services due to cultural barriers. Counselling practices have long noted that culture influences how mental health is perceived and treated, yet the design of mental health technologies is limited with respect to how users' backgrounds influence usability and adoption. To identify inclusive design opportunities, we interviewed 20 East Asian university students in Canada. We found that they struggle to engage with technologies for mental health due to cultural stigma which have led them to prefer apps that support self-help though still valuing social help. We present inclusive design opportunities for mental health technologies that sensitively consider these challenges, including supporting learning opportunities with peers through storytelling and skill-sharing to promote literacy, empowerment, and advocacy for their own health. We conclude by discussing how universities can promote mental wellbeing more inclusively.

CCS CONCEPTS

• **Social and professional topics** → *Cultural characteristics.*

KEYWORDS

mental health, mental wellbeing, culture, social media, mobile applications

1 INTRODUCTION

Mental health is a fundamental component of one's overall health [71], and there is a growing sense of crisis among youths and emerging adults. According to a 2019 survey of Canadian postsecondary students, 68.9% of respondents reported having experienced overwhelming anxiety within the past year [7], and the numbers have

been increasing [6]. In particular, students of Asian descent have been found to seek less mental health services than other students due to cultural barriers [30, 36, 99]. This reflects the broader data in North America that people of East Asian ancestry disproportionately underuse public mental health services due to stigma and lower levels of acculturation [1, 20, 60].

Generally, to address issues regarding inequality of access and uptake of services as well as the growing awareness that the study of mental health is culturally laden towards Western perspectives and can privilege majority groups [27, 33], the field of counselling has looked into various solutions including treatment guidelines with culturally-sensitive models of care [27, 35, 66]. This reflects at a foundational level the discipline of cultural psychology which states that cultural beliefs and values influence how people perceive and understand their health [33]. For East Asian immigrants, in particular, studies suggest that mental health treatments with cultural tailoring can enhance treatment outcomes [34, 43], such as recommending family-oriented counselling to reflect collectivist attitudes towards shared health decision making [22] or using culturally and linguistically adapted cognitive behavioral therapy (CBT) interventions [86].

Mental health technologies have also been identified as promising platforms for supporting mental health for underserved communities [19, 67], emerging adults, and university students [53, 75, 102]. These include mobile and web-based apps, online forums, and social media platforms. Factors such as lower cost, promises of anonymity, and less time requirements than traditional care strategies have been shown to increase accessibility and lower barriers to care [92]. Among university students and young adults in North America, much of the work has focused on designing for online social and peer support [53, 75] and self-management [50, 56], but only a few have considered culture in their designs in a meaningful way [75, 102]. There is also a poor understanding of how mental health technologies are used and perceived by North American university students who do not align with the dominant Western understanding of mental health, as a lack of such studies suggest. This is surprising and worrisome as East Asian students make up the largest visible minority group in North American post-secondary institutions and their numbers are only expected to increase [17].

Our research expands on previous work on designing for university students' mental health by examining mental health technologies through the design lens of university students' East Asian-Canadian bicultural identity. Specifically, we investigate how they engage with technology for mental wellbeing and how their cultural upbringing affects that engagement. To help guide our study, we aimed to answer the following research questions: (1) How do the cultural backgrounds of East Asian university students in

Canada influence how they use and perceive mental health technologies? (2) How can technology support their cultural values and challenges with respect to mental health to improve accessibility and inclusivity?

To answer these questions with richness and depth, we interviewed 20 university students of East Asian descent in Canada. Rather than one specific ethnicity, we elected to take a broader group of East Asians whose societies belong to a cultural sphere influenced by Confucianism (China, Hong Kong, Taiwan, Korea, and Japan) [66, 81]. Cultural studies on mental health tend to adopt the homogeneity assumption, that is, prioritizing "between-group differences and within-group similarities" usually along ethnic or geographic boundaries [108]. To be mindful of this assumption, we also highlight findings on the intersectionality of their individual differences and similarities as well as variability along ethnic lines. This diversity can be challenging to design for, but we believe that their commonalities as university students negotiating biculturalism as the biggest visible minority group in Canada make this population worthwhile to consider in this study, especially in light of the discrimination they currently face due to the COVID-19 pandemic [109].

Our analysis revealed that our participants' upbringing in East Asian cultural norms and their unfamiliarity with Western values of mental health have led to limited awareness about their mental health needs when they enter university. The contributions of this work are: (1) a detailed understanding of how they leverage social support from peers online but prefer the comfort and self-reliance of using mobile applications due to cultural stigma; and (2) a description of different design elements that support their learning process about their mental health with particular attention to accommodating varying entry points that reflect different levels of mental health experience and comfort. Broadly, this study augments existing literature on understanding mental health technology use among university students by creating a greater awareness of the importance of explicitly investigating users' cultures that have the potential to influence how they use mental health technologies.

2 BACKGROUND AND RELATED WORK

In this study, we use the word culture to mean the individual members of a community and the information they share with others within the community that is capable of affecting behavior [40]. In this section, we first take a look into the intersectionality of mental health in Asian university students in North America to provide background information, then delve into prior work in designing for mental health to situate our work.

2.1 Mental Health

2.1.1 Culture and multicultural identities. Cultural psychology is a field that studies the effect of one's culture(s) in psychological processes [40]. It espouses the concept that the construction of the self is highly influenced by cultural experiences. For example, studies have shown that in some East Asian collectivist societies, people define themselves by their relational roles, while Western societies like Canada stress the importance of individual agency [40]. However, for those who identify with multiple cultures (e.g. immigrants), researchers found that they tend to shift between their

culturally specific mental frames in response to different cultural cues, in a process known as frame switching [41, 61]. Several studies showed that Chinese Americans behave more Western when given Western cultural cues and more East Asian with East Asian cultural cues [41, 61].

2.1.2 Mental health and Asians in North America. Among Asians in North America, family and community narratives surrounding mental health contribute to high levels of stigma and shame, significantly affecting help-seeking behaviors [8, 21]. In one study, Asian American youths reported that limited awareness and recognition of mental health issues in the family was one reason they were hesitant to seek care or discuss their concerns with others [57]. There are also cultural challenges to help-seeking with studies showing more prevalence of social anxiety among bicultural East Asians in Canada than European-Canadians or East Asians in Asia [42]. One example of social anxiety is called the *Taijin Kyofusho Scale*, an interpersonal fear of offending others, and is considered a culturally bound syndrome to East Asians [101]. Furthermore, Asians and Asian immigrants tend to express emotional distress in physical or somatic terms with common complaints of gastric pain and dizziness [4, 5]. Accordingly, they often view self-help strategies that touch on physical activity, relaxation, and getting out more frequently as being more helpful than medical or professional interventions [87, 98].

Several studies in psychology have explored ways to be more inclusive, for example, providing guidelines for clinicians on how to effectively communicate with Asian clients [35, 107] and fostering ways in which current help-seeking approaches (e.g. mental health literacy programs [48]) can be more responsive to different cultures [66]. Several interventions rooted in Eastern philosophies have been suggested for Asian American clients such as mindfulness and acceptance-based therapies (e.g. acceptance and commitment therapy (ACT) and dialectical behavior therapy (DBT)) [35].

Young adults are also particularly vulnerable to mental health challenges [90]. The effect this has on university students can have far-reaching repercussions, impacting their goals for education, career prospects, and social and personal development [76]. In one recent study, Asian students reported more symptoms and were more likely to be diagnosed with depression than other groups [49]. In another, Asians and Asian American students were found to experience the most personal stigma than any other racial group [30]. Canadian universities are aware of this mental health crisis, with one survey showing 73% of post-secondary institutions actively promoting their services to their students [46]. Campus support services include providing information and access to counselling [46, 51]. However, many students, especially international and ethnic minority students, report them to be ineffective [32], and studies with this population have recommended more culturally sensitive responses [57, 58].

2.2 Designing for Mental Health

Technology has been explored in HCI as an effective solution for mental health among emerging adults and university students. Research in counselling and psychology has provided evidence that high levels of social support can mitigate the impact of mental

distress [39, 63, 72] and that online support can promote empowerment and a sense of community [11, 23]. As such, several HCI studies have explored designs that can enhance peer support and other social connections among students [53, 75], reflecting similar findings in peer support studies for the general public [54, 70]. For instance, Park [75] developed the Social Support Mosaic to frame how engaging with a wide range of social groups is needed for university students' mental health, describing each group as having complementary roles that can address gaps in care including barriers commonly experienced among East Asian students due to cultural stigma. Park and others, including O'Leary et al. and Lattie et al. [53, 70, 75], suggest matching users based on their in-the-moment needs to ensure that online social support is more accessible and reliable for everyone. However, in many of these studies, users' cultural backgrounds were not investigated in a meaningful way or were touched on merely as future work.

In contrast, other HCI studies on online social support more directly explored cultural understandings of mental health among Asian users in Asia. Pendse et al. [77] found that South and Southeast Asians communicate and conceptualize mental distress differently than European users and advocated for designs that can be more effective for Asians such as peer matching with users of the same cultural background. Several studies focused on Chinese users of online community sites [59, 110] and found that their cultural beliefs shape how they understand and discuss their depression in ways that differ from prior work of online social support in the West. They observed that Chinese users gravitate towards online communities in place of professional advice as their primary method of care. By discussing mental health topics anonymously with others, they find empowerment and destigmatization [110]. This body of research describes the common traits with designing for online social support in Asia, namely the prevalence of stigma and the poor access to care. However, there is a lack of research on designing to support the needs of ethnic Asians in other countries who may face additional challenges to mental health care.

Beyond social support, mental health research in HCI has looked into cultural considerations that can inform the design of mental health technologies. Vacca [102, 103] conducted participatory design workshops using an ecological model to address emotional health among bicultural Latina teenagers in the US, uncovering opportunities that touch on familism and discrimination. Similarly, Tachtler et al. [93] explored socio-ecological factors to understand how unaccompanied migrant youth use mental health apps and found that culture plays a central role in their engagement.

More broadly, there is a wealth of mental health research in HCI for the general public. One of the more common HCI design approaches uses the lens of personal informatics [82], tracking symptoms of bipolar disorders [12, 65] and depression [13], and often going beyond the individual to the interpersonal [82]. Another common design approach is the delivery of computerized therapeutic interventions such as CBT and ACT [29, 79]. Gamification [25], virtual reality [85], using relational agents to engage with the user through dialogue [15, 83], and designs to facilitate communication with providers have also been proposed [84]. More holistically, work on mindfulness, rooted in Buddhist philosophy, has been embraced among mental health professionals as well as increasingly studied in HCI [95]. In addition, a CHI workshop [89]

highlighted the need for developing learning skills among people who suffer from mental distress. They explained it was not enough to treat and manage mental distress without an understanding of how to build self-efficacy to learn to cope with the distress. Though some work has touched on skill learning [88, 96], we note that design opportunities in this area are under-explored.

In the realm of mobile apps, an increasing number of mental health apps in the last several years [104] has led to considerable work investigating their functionalities and user experience. In one comprehensive study, Stawarz et al. [91] found that users designated different types of technologies depending on their purpose. Smartphone apps were the most commonly used tool for mental health, providing guided exercises, scaffolding self-tracking activities, and helping users relax. However, the results echoed other studies' findings where users were generally distrustful of technology, finding them poor substitutes for traditional in-person therapy and lacking sophistication and personalization.

Also of concern are the lack of evidence-based treatments underlying many of the apps which has the potential to negatively impact users' health [19]. Bakker et al. [10] compiled a list of 16 recommendations based on a review of HCI and mental health literature, and further compared them against apps available in the market. They formulated a guideline that can improve the effectiveness of app-based interventions by 1) having mental health features based on CBT, 2) addressing comorbidities like anxiety and depression, 3) accommodating non-clinical settings, 4) enabling personalization, 5) supporting self-tracking of symptoms, 6) recommending actionable activities, and 7) providing relevant information. Of these, the use of nonclinical terminology may help people with stigma by avoiding the use of triggering clinical diagnostic labeling [24, 80]. Further user experience considerations such as notifications, gamification or intrinsic motivation, and an intuitive interface have the potential to lower barriers for adoption. In this study, we use this list of recommendations, in part, to come up with a brief list of apps to be used in a Speed Dating based method [26] to rapidly explore apps with our interview participants.

3 METHOD

3.1 Participants

We interviewed 20 participants (15 female, 5 male), all students of East Asian descent living in Canada. Our goal for the study was not to aim for statistical representation. Instead, we used purposive sampling and selected participants to reflect diversity and varied levels of acculturation in terms of age (range: 19-37, avg: 23.7, median: 23, SD: 23) and ethnicity (11 Chinese, 7 Korean, 2 Japanese). However, our interview participants skewed heavily towards Chinese and Korean ethnicities, as they are more prevalent among the Canadian student population [69]. We only considered students of certain generational status (7 gen-1, 8 gen-1.5, 5 gen-2), as research has shown that Asian Americans from these generations have similar underutilization patterns of mental health resources, and it is only at the third generation that Asian Americans begin to increase their use of services [1]. Our inclusion criteria were: must be 18+, a student at a Canadian university (or recently graduated), fluent in English, self-reported to have challenges with mental health, and interested in using technology to manage and understand it. We

also considered what technology they have used, including online forums, social media, mobile apps, games, and others. As seen in Table 1, there were 14 undergraduate and 6 graduate students, of which 8 were international and 12 were domestic. Nine have had experience with professional counselling or therapy. For the types of technology they have used for mental health, 16 have used mobile applications that specifically target mental health, 15 have used social media, and 3 have used online community sites. In terms of their socio-economic status, they reported they were either partially or fully supported financially by their parents, suggesting that their families are at least of middle class. Most live and study in major Canadian metropolis areas, while P6 and P9 attend school in less urban settings. Participants received a compensation of $25 CAD at the end of the interview.

3.2 Procedure

After piloting with three students of East Asian descent, we recruited by posting on social networking sites, online message forums, and a paid participants studies list hosted by a major Canadian university. We conducted semi-structured interviews, each lasting on average 75 minutes (range: 59-96 min). All 20 interviews were conducted remotely using a popular video conferencing software to comply with pandemic physical distancing measures. One member of the team conducted all the interviews. We audio-recorded the interviews and transcribed them for analysis.

3.3 Data Collection

Our interview protocol consisted of two parts. We started the interview by asking participants about their upbringing and how mental health was viewed and navigated in their heritage culture. We then asked what they are doing currently in terms of specific strategies to cope with their mental wellbeing concerns, including their routines to manage them and any perceived barriers. According to Wang et al. [107], East Asians may be uncomfortable expressing their mental health due to stigma and as a result, we consulted with a social worker who works with Asian immigrants as well as used the Multicultural Orientation Framework for tips on bringing in cultural sensitivity to the interviews [27]. We ended this part of the interview by probing on what technologies they have used to understand and manage their mental wellbeing and their self-care practices.

To focus further on mental health technologies, we next presented several examples of mental health mobile applications that are commercially available, in a method similar to Speed Dating [26]. The goal for this exercise was to prompt participants for their impressions and to identify design opportunities and challenges. The types of applications we presented were systematically selected using the suggested recommendations by Bakker et al. [10] and further refined by counselling guidelines for Asian clients that touch on features such as mindfulness and acceptance-based therapies [35, 73]. We also cross referenced evaluations from a professional organization [3] to consider whether apps supported a variety of other self-care techniques and features so participants can reflect on them as well. We chose seven apps: What's Up [94]], MoodKit [97], Breathe2Relax [31], Headspace [44], Sanvello [45], Happify

[37], and BetterHelp [14]. For a breakdown of the apps' features, please refer to the supplemental materials.

We concluded the interview by asking them to connect how their mental health could be navigated using these apps in light of the cultural topics they discussed earlier in the interview. Our goal was to gather deeper insights into opportunities for design with these cultural considerations. For further review, the interview protocol and slide deck of the seven apps shown to participants are available in the supplementary materials.

3.4 Data Analysis

We analyzed the interview data using the thematic analysis framework proposed by Braun and Clarke [16], first with primarily an inductive approach and finishing it deductively. We began our initial analysis after interviewing the first 12 participants. The research team independently coded the transcripts using open-coding and discussed possible themes emerging from those codes, including the role of family in contributing to their limited mental health communication skills and the role of storytelling to help learn those skills. In the interviews that followed, we probed in depth into these emergent themes while also being open to new ones. In all, one researcher coded four transcripts, another six, and the lead researcher coded all twenty. For further review, an initial snapshot of our analysis that includes codes and themes can be found in the supplementary materials.

During analysis, we iteratively and collaboratively discussed the findings to identify themes on how our participants use technology for their mental wellbeing. The meanings we made from the data reflect our constructivist epistemological stance. That is, our discussions within our research team and our research cluster as well as the interviews with the participants all contributed to a process of shared subjective understanding of how our participants perceive and use technology for mental health. Therefore, the results from our study show only a glimpse of how East Asian students in Canada behave, and we cannot claim an objective truth of their behaviors.

An important part of the analysis focused on the reflexivity of the researchers wherein we continuously discussed our interpretation of the data. We deemed this to be especially important to discuss as the research team includes individuals from different cultural backgrounds. The lead researcher is of Korean heritage and is a graduate student in Western Canada where there is a large East Asian population. Another author is of South Asian descent attending the same university. The third author is of Western European cultural background. All three have a special interest in the intersection of mental health and culture among university students, and one is currently conducting a research project involving CBT. Our findings were discussed and iterated on with inputs from the research team and from the team's research cluster who hail from Canada, Europe and Asia. We continuously checked assumptions and coherency by discussing how a finding could be considered a cultural factor unique to East Asians or to university students in general. Though we felt the need to check for assumptions, we also valued the differences in viewpoints our backgrounds afforded us. This helped us to form a complex and in-depth understanding of the data in a way that allowed us to approach crystallization [100].

Table 1: Participant demographics

ID (Age, Gender)	Ethnicity	Generation	Years in Canada	Student status	Field of study	Attended counselling	Types of tools used
P1 (26, M)	Chinese	1	3	International, grad	Social Science	Yes	Apps (Breath), social media (Facebook, Twitter)
P2 (19, F)	Chinese	1.5	18	Domestic, undergrad	Neuroscience, Psychology	Yes	Apps (Noisli, Mindshift, past: Self Help for Anxiety Management), Social media (Instagram), journaling
P3 (23, F)	Chinese	2	23	Domestic, undergrad	Biology	Yes	Apps (MyLife, past: Headspace), online group chat counselling, journaling
P4 (21, M)	Chinese	2	21	Domestic, undergrad	Business	No	Social media (Facebook, YouTube)
P5 (25, F)	Chinese	1	8	International, undergrad	Business	Yes	Apps (past: university counselling app), social media (Facebook)
P6 (23, F)	Chinese	2	23	Domestic, grad	Psychology	No	Apps (Shine), social media (Twitter), websites (https://ggia.berkeley.edu/), blogging, journaling
P7 (21, F)	Chinese	1	1	International, undergrad	Interdisciplinary Studies	Yes	Apps (Relax), journaling, personal blogs
P8 (24, F)	Chinese	1.5	15	Domestic, undergrad	Nursing	No	Apps (Sanvello), social media (Instagram)
P9 (22, M)	Korean	1	3	International, undergrad	Engineering	No	Social media (Facebook), online forums (Quora, Reddit)
P10 (35, M)	Chinese	1.5	1*	International, grad	Computer Science	Yes	Apps (past: Headspace), journaling
P11 (24, F)	Korean	1.5	15	Domestic, undergrad	International Relations	Yes	Apps (Headspace), social media (Instagram, Facebook)
P12 (24, F)	Korean	1	6	International, grad	Psychology	No	Apps (Daylio, past: Calm and explored many others), social media (Instagram, Facebook), journaling
P13 (22, F)	Korean	2	22	Domestic, undergrad	English Literature	Yes	Apps (Momento), social media (Instagram), mood tracking, journaling
P14 (37, F)	Chinese	1.5	25	Domestic, grad	Social Science	No	Apps (SimpleHabit), Journaling (MS Word)
P15 (25, F)	Korean	1.5	20	Domestic, grad	NA	Yes	Apps (past: Headspace), social media (YouTube, Tumblr, Instagram), podcasts, journaling
P16 (18, F)	Japanese	2	11*	Domestic, undergrad	Environmental Science	No	Apps (Headspace, past: Wysa), social media (Facebook), journaling
P17 (25, M)	Chinese	1.5	13	Domestic, undergrad	Business	No	Apps (past: Headspace), online forums (PTT, Reddit), journaling
P18 (21, F)	Japanese	1	4	International, grad	Computer Science	No	Social media (Facebook), online forums (Reddit)
P19 (20, F)	Korean	1	2	International, undergrad	Nursing	No	Apps (Headspace for Sleep), social media (Facebook, Instagram), journaling
P20 (19, F)	Korean	1.5	12	Domestic, undergrad	Computer Science	No	Social media (Facebook, Instagram), journaling

*Spent some years in other countries prior to moving to Canada

In our analysis, we also considered the ways individual and cultural experiences have shaped our participants' views. In cultural psychology, there is always a tension in the lens of analysis between what behavior is due to individual variability or to cultural influence [40, 108]. Here, we follow what Heine [40] contends, that "cultural membership does not determine individual responses." We therefore aim to uncover in what ways our participants' common cultural backgrounds, their intersectional identities in Canada, and other individual experiences present varied and recurring patterns of how they use and perceive mental health technologies.

4 FINDINGS

We first present our findings with a general overview of how participants navigate their mental health in order to contextualize the material in the themes that follow. Then we present the themes we found that explore and describe the nuances surrounding their pursuit of mental health.

4.1 General Overview

All our participants were university students or recently graduated at the time of the interviews, and thus, not surprisingly, the prevalent mental health concerns they raised were stressors that stemmed from their academic studies. For most, it was the added

pressure of doing well in courses that forced them to recognize the negative impacts stress can produce and the importance of working towards their mental health. Some described more personal experiences unrelated to school, such as a loved one being diagnosed with cancer (P13) or dealing with anxiety and depression (P15). Interestingly, participants regarded the COVID-19 pandemic as mostly neutral and reported it has not influenced their mental health very negatively, though they were beginning to be concerned with anti-Asian racism, especially for domestic students who have close ties to family and friends in their communities. More generally, most participants noted they were prone to periods of negativity with poor self esteem, low self-confidence, and dwelling too much on negative thoughts.

To address their concerns, participants emphasized the connection across their physical, mental, and spiritual health, particularly with regards to eating well (P3, P6), being physically active (P1, P4, P7), sleep (P9, P10, P13, P19), and being spiritual (P10, P11, P12, P13). Most remarked on the importance and benefits of depending on friends rather than family, with only two participants relying on parents for support (P13, P14). Of the nine participants who have seen a counsellor or therapist, three (P3, P7, P15) stressed the benefits of regularly seeing them. Most of their self-care strategies involved using specific techniques (i.e. journaling, meditation, and mood tracking) on different platforms (i.e. notebooks, social media,

online forums, and mobile applications). In essence, their ecosystem of tools that they use align with findings from Stawarz et al. [91], which found that users tend to use different tools for different purposes. These strategies, however, tend to be hampered by the cultural dynamics of their upbringing which we discuss next.

4.2 Cultural and Communication Barriers

Throughout the interviews, participants touched on how their upbringing impacted how they view and interact with mental health currently. We present how their cultural contexts can affect how they approach mental health.

Mental health is rarely talked about at home. Growing up, discussing and sharing narratives of mental health with the family were rare or non-existent. It was mainly the ethnic Chinese and Korean participants who reported how talking about their distress was considered "shameful" (P1, P11, P12, P15, P17) and "weak" (P4, P5, P17) by their family, similar to what has been reported already [62]. Some international students (P1, P5, P7) even reported that their family's mistrust of Western medicine would at times exacerbate conversations when the students admit they were struggling. P5 said: "My family believes heavily in traditional Chinese medicine... [My mother] always says that Western medicine and these drugs that people take for depression, for example, are so dangerous and that people should instead self-regulate their emotions. And this is definitely an ignorant view, less empathetic, and they're basing it on very limited information. That's why I stopped going to them. They're very traditional and not that understanding." P4, a domestic student, even ventured a theory on why his parents do not talk about mental health: "So I think that mental health wasn't really talked about because it was more important to survive in a new country... I don't think they're thinking about being fulfilled or if their job is fulfilling or trying to have that work-life balance. These aren't problems for them, it's more like a luxury. But for us, we benefit from their hard work. We have a roof over our heads, we have enough food, and we have our basic needs met. So our problems are going to be different, you know, like people say, first world problems. And I think people like my parents are trying to understand; but to them, it's still somewhat of a foreign topic."

But that is not to say that all participants grew up with that same taboo. P13 and P14, in particular, reported good relationships with their mothers. P2, P11, P16, and P18 noted that although they feel like they can freely approach their parents about whatever is distressing them, they rarely have conversations about it in depth: "It's not really something that's talked about a lot... I didn't feel like they would reject the conversation or just shut it down or anything, but they wouldn't actively care about it like our physical health" (P18). Both P16 and P18 further explained that in Japanese culture, "the people are so much more reserved" about their emotions such that it becomes difficult to discuss them in a "polite" (P16) or "less confrontational way" (P18). We surmise that this may be one reason that we were not able to recruit more students of Japanese descent than we would have liked.

Language barriers hinder sharing with others. Although all international students speak their heritage language fluently, some (P1, P7, and P10) noted that frame switching was a big factor in why they have not discussed their mental wellbeing with their parents: "I feel like I haven't even developed the vocabulary and being able

to talk about these things because they've never really existed for me in Chinese when speaking with my parents.... I never speak English to my parents. So there is that barrier" (P10). For all of the domestic students, they explained that their heritage language skills were not sufficient in expressing complex topics like mental health with parents who have limited English skills. This has far-reaching repercussions. Having grown up without the experience of talking about their feelings, some participants (P2, P16, P20) currently find themselves without the ability to adequately verbalize them: "I'm not very confident in putting what I'm feeling into words... I think it has to do with the fact that I didn't really have much practice talking about myself and my problems growing up" (P20). As an international student, P19 also discussed the difficulty of being proactive and outspoken for her wellbeing when she cannot talk about it effectively: "[In Canada], it's all about 'you need to advocate for yourself' and 'you need to be responsible for yourself.' Because no one's going to know what you're going through if you don't explain it. I think that was the biggest clash when I first got here... That was my biggest struggle, still is actually. I'm still learning to be a self-advocate."

Fear of burdening others prevents discussions on mental health. Above all, the barrier that most colors their interactions with their friends, family, therapists, and in online sites is the fear of burdening others when sharing their mental distress. P5 said it best when relating her experience with her parents in China: "I only tell [them] good things that are happening. I think that's tradition. There's a Chinese saying, only tell your parents good things and never the bad things. You keep bad things to yourself and not burden anyone with your troubles." In fact, all our international students pointed out that being in another country made it especially difficult to share negative experiences with their parents: "I just don't want to worry them. Especially now because I'm not in China and it's a long-distance thing between us. And I just don't want them to be too worried about me." (P1). In effect, this created a divide between themselves and their families overseas where they felt they could not disclose anything meaningful: "I have a tendency to talk to my parents about things when things are going well... But lately, I haven't been doing well so I feel like there's not much to talk about when I do call" (P19). The domestic students also had similar wishes to not burden others, though it did not come across as strongly as the international students when it came to their families.

Indeed, work in cultural and clinical psychology shows that East Asians experience a culture-bound fear of displeasing or embarrassing others, all hallmarks of their societies that prioritize interpersonal relationships rather than the self [68, 101]. This has led all our participants to negotiate how much to share and to fear judgement that they are unnecessarily burdening those around them. As a result, most (except P14) found anonymity online as a very attractive outlet to consume and share mental health experiences. However, this comes with its own challenges.

4.3 Social Support Online in the Pursuit of Mental Wellbeing

Interestingly, we found that participants' self-care practices centered around learning and being supported culturally online, often influenced by their intersectional identities such as whether they

are international or domestic students. We also discovered that their learning practices followed certain patterns, and thus to better understand how these patterns affect their self-care, we categorized participants into two groups based on how they talked about mental health. Put simply, the inexperienced participants exhibited less confidence and depth of reflection when talking about their mental health, and were unsure about their needs and how to pursue self-care (P2, P4, P9, P11, P12, P16, P17, P18, P19, P20). On the other side of the spectrum, the more experienced participants demonstrated confidence and depth of reflection when talking about their mental health and were knowledgeable in different self-care strategies (P1, P3, P5, P6, P7, P10, P13, P14, P15). We deemed P8 unclear, as she did not go into enough detail about her personal journey though she knew enough objectively as a nursing student. In the following sections, we delve into the different ways our two cohorts leverage social support and learning as well as their perceptions on mobile applications.

4.3.1 Stories and online sources of support and learning. The act of learning came from multiple sources. Published research papers (P1, P17), school curricula (P6, P7, P8), and training as a crisis hotline volunteer (P3) were all mentioned as sources of learning. However, almost all participants overwhelmingly consulted social media and online forums to read about mental health. They were drawn to popular sites such as Twitter, Instagram, Reddit, and Facebook because of their ease of access and promises of anonymity. This supports general findings from HCI mental health literature that peer and other social support can be effective in protecting students from the negative impacts of mental health distress [53, 75]. Our findings show nuances that further illuminate how East Asian students in Canada leverage social support in light of their cultural and communication barriers.

Reading stories is an effective way to learn. Interestingly, P11, P12, P17, and P18 expressly used the term "stories" to describe other people's posts on mental health experiences. P12 mentioned that reading her friends' stories has helped her to learn how to talk about mental health: "I do read a lot of… personal stories of my friends that talk about [their] struggles… and they're strong advocates for mental health… I learn about how they talk about it and be an advocate for myself… I'm learning from them on how to be comfortable sharing things." Further, P17 uses both Reddit and PTT, a Taiwan-based forum to routinely read up on different perspectives and experiences: "They talk about their various problems and how it came about and how they resolved them. So that has been helpful because I get to understand and… be cognizant of the issues that can happen" (P17). But it was P11 who mentioned why she shares stories: "I don't talk about myself on social media. I share poems and stories that could help cheer my friends up or myself as a story. But, I wouldn't outright talk about the details of my mental concerns... I'm not ready to be too forward about it... I think for Asians, it can help normalize talking about it without it being too scary and too direct." However, they found it challenging to find relevant stories throughout all of the sites they use, creating for a fragmented and unreliable way to source the stories that can be helpful.

This corroborates findings from Zhang et al. [110] who also found storytelling to be meaningful among Chinese online support groups as a way to normalize and destigmatize mental health discussions. However, our participants further desired to leverage

stories to learn actual skills to communicate their mental health and be empowered to be more open. For the four participants, all inexperienced in mental health, the allure of reading stories from those who are more experienced was that they provided "real world examples" (P12), valuable context with a "beginning, middle, end" (P17), "almost like a how-to guideline" (P18), and "a good first step" (P11) of sharing distress in a healthy way.

Parents' stories are desired, but often missing. P3, P4, P8, and P13 discussed how they would value knowing about their parents' stories who tend not to be forthcoming about their lives. This was more prevalent among the Chinese domestic students whose parents had experienced the difficult transition of immigrating in the aftermath of the Cultural Revolution: "Ideally, I would like to understand them and their problems… They literally lived a whole different life in China… and I actually don't know how they really lived. I don't know if I can understand them without knowing what they went through" (P4). P13 was in a similar situation until her mother started sharing her own life stories, including experiences with living in patriarchal Korean society, helping her to connect with both her parent and her cultural roots: "By listening to her talk about her life stories and her struggles, I got the chance to know her… and that helped me to open up... and that even though I'm Korean, there are aspects of Korean culture that I don't know." As the above quotes highlight, facilitating communication among domestic students with their parents can play a valuable role in reaching out to not only students but also their vulnerable family members.

4.3.2 Stages of learning and mental health literacy. This section delves into the differences in learning between the two cohorts, how the experienced participants learned to be more educated and how the inexperienced are currently struggling to cope.

Inexperienced participants start to learn without a basic understanding of mental health. The motivation to start learning on one's own stemmed from their limited experience talking about mental health: "Because of [my parents'] upbringing, they didn't talk about mental health whatsoever themselves. So then, when it came to me, I don't think we ever talked about my mental health or mental health in general. I basically had to learn that from school, from books, and learning to build my emotional intelligence that way" (P3)." For P12, the problem was not just the limited experience but also having to unlearn certain behaviors from her parents before she could start learning for herself: "The reason why I tried to hide my feelings from my parents is because they try to hide their feelings from me too… So that had an influence on me growing up. Even now, I'm still trying to unlearn what they've taught me." Experienced participant P14 described the importance of mental health education for those with no experience, recalling from her own experiences of how confusing it had been for her: "I think education is the biggest thing that should be addressed. Having a newcomer in the discussion of mental health who [is] very culturally bound, I think they would be overwhelmed… It's difficult to reach out when you just don't know."

Universities have an important role in students' mental health, but their services are often inadequate. Because most participants experienced poor overall understanding of mental health in their younger years, most reported that it was not until they entered

university in Canada that they became aware of the importance of being mentally healthy. This felt more acute among international students whose awareness of what constitutes mental health was limited because they were less familiar with Western mental health concepts. P7 noted: "I think [my university] promotes their mental health services… really well. So because of such exposure… I started to realize I probably should frame the stress and distress I was feeling as mental health problems." This implies that universities' role in outreach is important, and indeed, the different experiences among the newer international students in our study further support the need for more targeted outreach. Both P1 and P7 attend large universities and have had positive experiences with their extensive outreach programs. P9 and P19, on the other hand, reported having less awareness overall of their institutions' mental health outreach campaigns, perhaps because they attend smaller schools, which may have contributed to a more difficult transition in Canada: "I'm not aware of anything that my school is doing right now" (P19).

In contrast, for some domestic students (P4, P11), university meant the freedom to enquire after in-person services they had heard about but hadn't much put into practice. However, they encountered difficulty accessing university services and setting up appointments. P11 said: "Once was enough. Not going back again. Didn't help. I remember walking in feeling really, really sad about myself and then walking out feeling the exact same way. There was no encouraging note or anything that told me that I would be understood and taken care of." The two participants further noted that their experiences had negatively impacted their willingness to seek out help again. In fact, among those who used school health services, it was only P7 who was satisfied with her experiences with campus counselling. This suggests that universities serve an important role introducing mental health to students but actual access and uptake of services can create barriers that can exacerbate an already difficult relationship with mental health.

Experienced participants are proactive and explore a variety of strategies. For the experienced participants, their current aim is to build a toolkit of knowledge and strategies in anticipation of future distress and to help out others. For example, P6 who recently recovered from graduate school burnout routinely goes through academic Twitter to find resources where she can learn and explore self-care methods. She explained how she builds and uses her toolkit: "I recently started to blog a lot about self-care … The blog lets me document my journey as a Chinese-Canadian and at the same time, I think it motivates me to explore more so I have something to write about. I like to think it's also a teaching piece to others who are starting out and want to know more but don't know how to." Her wish is to empower others to be more proactive about mental health, knowing full well how difficult it is to begin. In fact, domestic students P2, P3, and P6 highlighted their privilege of growing up in Canada and studying a mental health related field that eased some of their barriers: "I think a lot of my Asian friends here don't really talk about it with their parents either, same as me. But we at least grew up with, you know, like the Canadian zeitgeist is more about being open to mental health, you know, find a therapist. I have Asian friends who are international students and they just have a particularly hard time. I at least have that privilege. And you know, privilege of studying psychology and my volunteering,

all that has made it easier to understand what mental health is" (P3). For P3 and P6, being proactive also meant thinking about their future children, wanting to "break the cycle of silence and shame" (P3) surrounding mental health in the family. They further ruminated on what it would have been like having the privilege of "growing up [in families] where conversations on mental health were normalized" (P6) like their perceptions of other Canadians and felt that the Asian diaspora in Canada have a long way to go to get there.

Continuous learning is necessary. For experienced participants (P3, P5, P14), making sense of mental health needs a continuous process of understanding one's emotional health, how to identify and overcome one's cultural and communication barriers, and the more objective knowledge of the field of mental health. As P5 noted, they all contribute to the idea of mental health literacy: "For me, it's a continuous process… I'm constantly updating what I feel about myself and what I need to learn and things I need to overcome… My being self-aware isn't like a snapshot in time… It's hard because it seems I'll never get there, get healthy, and I wish it was easier."

These stages of learning, from inexperienced to experienced, show the difficulty in overcoming cultural and communication barriers and the lengths our participants go to to educate themselves and others who are less experienced. Resources online and from university services have shown to be valuable but participants felt more needed to be done to feel welcomed and supported.

4.3.3 Cultural Support. Asian representation is important to some to provide shared understanding. An important aspect that can help with learning is the feeling of belonging and representation. Participants explained why they sought comfort and knowledge from others like them online or at the very least, someone who could understand them. This was noticeable among domestic students who felt under-represented in media. For example, P4 related why he frequents social media where Asians can vent: "Growing up as Asian [in Canada], you have these shared experiences that you can really bond over. There's comfort in knowing that people are going through the same things as you." This was also the reason given by P17 who prefers going on PTT over Reddit. Furthermore, both P5 and P11 explicitly noted how they found it easier to communicate with the lead researcher because they shared the same cultural background: "Like talking to you, I don't have to explain myself how serious talking with parents can be because you get it. Whereas if it's someone not as familiar with Asian culture, then would they know the real implications?" (P5). P13 discussed the negative implications when there is no cultural sensitivity: "One of my friends is struggling to find a good counsellor and one of the [non-Asian] counsellors that she saw said, after she heard everything about my friend's Korean family, 'You need to cut them out. They're super unhealthy.' And she was like, 'No it's just a cultural thing!' So I feel like there could be some cultural consideration with apps as well." But P4 cautioned that focusing too much attention on his culture can have unwanted consequences: "I think Asians like us have a tough time here… We're always trying to assimilate, to fit in, especially people who moved here to build a new life. So I think an app should be mindful of not 'othering' us too much... Because for us, belonging is really important… family and community are a very huge thing." The other domestic students echoed

this sentiment, that there is a fine line between celebrating and alienating their heritage, especially in light of the news reports of violence against elderly Asians in their communities. In addition, both P4 and P17 noted that a shared understanding can also come from people with similar experiences but do not identify as Asian because they value all the different perspectives that their peers can give them.

For some international students, like recent arrivals P9 and P19, a sense of representation was desired because they felt unsure about how to fit into the customs of a new country and who to go to for support. P19 said: "When I first came here, there was a lot of cultural shock. I went through and actually I'm still going through the stress of feeling like I don't belong… I know I'm Asian but in order for me to fit in here, I need to do things the way they do things. Like how to do that was a big dilemma for me… I now find it helpful to look for friends who would be more from similar backgrounds as me." P9 also had difficulty fitting in at a less urban area compared to most of our participants, where a sense of East Asian community is less established than in the bigger cities. He said: "It was very difficult for me to blend in… And that contributed to my loneliness because I felt like I couldn't really connect with people. And I ended up staying in my room most of the time… And since [my town] is a small town, it tends to be lonely because there's not that many international students or Asians here. So in my first year, since I really didn't know anybody and didn't know where to go and who to go to, I felt really isolated." Here, cultural representation can be a solution to help the more recently arrived international students assimilate to a new country and help them avoid unhealthy ways to cope, such as self-isolation and questioning their cultural identity. These examples also show how much more vulnerable international students can be when they are new to the country and suggest that they undergo more serious barriers with mental health. Indeed, research on international students do highlight that there is a need to address their concerns with more culturally sensitive services [55, 64].

Cultural sensitivity is not needed by all. In direct contrast, P1, P7, and P15 remarked that they had no need for cultural considerations when reading and learning about mental health online. International students P1 and P7 talked about how they go through frame switching when navigating their mental health, and thus they have no need for cultural support: "I feel more comfortable using websites and applications in English… for my mental health. So… I don't think cultural consideration would matter much to me because honestly, when I'm in a foreign culture, I tend to integrate myself into this culture (P7)." P1 further elaborated on his dislike of traditional Chinese cultural values and beliefs regarding mental health, deeming them to be "lacking evidence" and "encouraging unhealthy ways to cope." For domestic student P15, a history of upsetting experiences with those of her own culture including her family led her not to value their input: "Because I am so far away from what … people from my heritage culture are experiencing, it doesn't bring me comfort … That's why when I want more information and comfort, it's not going backwards to my heritage culture, it's going in the opposite direction." Interestingly, this perception comparing the "unhealthy" way their heritage cultures deal with mental health as opposed to the "healthy" Canadian or Western

perspectives where mental health discussions are more normalized was plain to see among all our participants in varying degrees.

These preferences for cultural representation and learning styles that leverage different social groups corroborate findings from the work on Social Support Mosaic [53, 75]. For our East Asian participants in Canada, however, their social support network are also tempered by cultural and communication barriers, leading them not to seek out care when they need it. Online stories and storytelling offer an approachable and less confrontational yet context rich way for our participants to learn from others. Adding cultural sensitivity and representation to online and offline interactions can also offer a more meaningful solution to increase comfort and access to resources, but it is not a blanket solution for all.

4.4 Role of Applications for Mental Wellbeing

Overall, as Table 1 indicates, the majority of participants have used mobile applications for mental health, though some have lapsed. While others have never used them at all. We present in this section our participants' impressions of the apps they have experience using and those that we presented, including nuances of how they are used and motivations and barriers for use.

4.4.1 Motivations for use. Apps are perceived to promote independence. Although our participants learned from and valued social interactions online, they identified that the main motivation for using apps is to support independence and self-reliance. To assist with these practices for supporting self-reliance, all 20 participants reflected that applications may have a role in their self-care journey. Ten participants (P1, P2, P3, P4, P5, P7, P12, P15, P19, P20) discussed three main reasons for wanting to tackle their mental health on their own. For example, P12 and P20 both confessed they were not ready to see a professional but still wanted to take the next step towards taking care of themselves: "I'm open towards eventually consulting someone but I'm not there yet. So when you asked about the apps, I think that's the level that I am willing to go to right now. That is the max level where I feel comfortable doing something for my mental health" (P12).

Another reason touched on was trust and who participants can rely on. P2 learned that she could not rely on her family for help and was determined to only rely on herself: "Since I'm not talking about this in depth with my family… I force myself to get through some of the stuff on my own… My long term goal is to develop a way that doesn't have to involve other people… maybe with help from like apps or websites." This motivation aligns with feelings from those who had prior negative experiences with their own family (P5, P15, P20) or those of their own culture (P15): "I've had bad experiences with mental health with my family so I started to think about who I can really trust and rely on. It definitely can't be my parents… there's just me" (P5). Further, P5 revealed that even "reading about other people's posts can't really be trusted" while P2 wished "to eventually graduate from [them]." For these two at the extreme end, apps have the potential to help them reach their goal for complete self-reliance, which interestingly, means even excluding the passive consumption of others' experiences online. For all other participants (except P14), however, the boundary between what they consider social support and what can help them reach self-reliance is less clear cut, with some (P1, P3, P4, P19 P20) remarking that it is only the interaction with other people that they wish to avoid. This

Table 2: Example questions found in the app *What's Up?*

Ask yourself ...	Am I only noticing the bad stuff? Am I filtering out the positives? Am I wearing those gloomy specs? What would be more realistic?
	Am I assuming I know what others are thinking? What's the evidence? Those are my own thoughts, not theirs. Is there another, more balanced way of looking at it?
	Am I doing that compare and despair thing? What would be a more balanced and helpful way of looking at it?

suggests that our participants' degrees of desiring self-support and social-support can vary along different continuums.

Finally, it was the fear of burdening others with their negativity that was the main appeal for using apps that do not rely on any direct social help, which came up again and again during the interviews. P3 said it best: "Sharing and venting on social media or seeing a counsellor… it's great but after a bit, you tend to feel like you're spreading negativity and burdening people with your problems when you should take responsibility for it yourself… That's why I've been trying to do things on my own like meditation and mindfulness… like Headspace." This was an especially interesting finding from P3 who previously said she found counselling to be extremely rewarding but is now beginning to dabble with different apps. She continued on to say: "I am pursuing therapy. I think in the future, when I think I can start relying on myself, you know, learn all that I need to know, I think that's where apps can have a [more prominent] role. But right now, I'm not at that place."

These reasons support findings that East Asian immigrants tend to find self-help strategies for mental health attractive [66], and this extends to using self-help features in technology as well. Their desires for wellness approaches that enable self-reliance also have interesting contrasts from their current practices learning from others' experiences and desire for cultural belonging and inclusivity. However, the tone from these participants suggests they tend to favor them over other modes of care (i.e. social or professional). In light of evidence that social and peer support can effectively protect students' mental health [39, 63], the question then becomes, how to strike a balance between what our participants desire and are comfortable with versus what studies have shown they should need.

Apps assist in exploring strategies for self-care. Looking back on their journey, the experienced participants felt that it was important to explore and try out different apps and techniques as part of their continuous learning process: "Learning about what self-care strategies work for you, I think that's really important" (P6). But for the inexperienced (P11, P12, P18, P19), the need for exploration felt acute because they had less of a foundation of knowledge to depend on. P18 remarked: "I feel like I need to explore apps… I think it's so important especially when you're first learning about it and you don't know what you're supposed to know."

4.4.2 Preferences and Desires.
Most participants desire interactivity, but find it lacking. During our exercise where we presented several apps, most participants reacted positively with gamification, saying how that can help with motivation to keep using and make learning dynamic and fun: "This app [Happify] makes it a lot more approachable… I think making

things more exciting and fun could make it easier to stick" (P13). For participants P9 and P20 who have never used apps for mental health, games have the potential to ease their barriers to entry: "Games have clear rules. You need to follow them to succeed. So I like that it gives you that guidance without you having to think too deeply about how scary it is to start using an app" (P20).

By far, the most popular type of app our participants used focused on meditation and mindfulness. However some found issues with their lack of interactivity. P16 described why she is not actively using Headspace at present: "I wish there were more interactive things to do on the app… I'm always in my head and I don't think being in my head so much is helpful for me. So, if there was an outlet to those meditations…" P10 remarked that apps for mental health do not seem to be interactive at all: "There's really no interaction involved, is there? Like, I can just as easily read the information in a book."

Questions are important to help guide reflection and learning. During our presentation of apps, one feature stood out to many of our participants: The What's Up? app [94] features questions that can help pinpoint what users are thinking (see Table 2 for example questions). The inexperienced participants' initial reactions were overwhelmingly positive, saying that questions can give them guidance on how to talk about their feelings when they have limited experience to do so: "I like the idea of having it ask questions and having a conversation. I think dwelling on my problems this way with some guidance can help direct me towards finding a way to talk about myself more easily" (P20). Experienced participants also saw the value of being asked questions for their learning: "I think that would open up a number of things that I haven't been aware of before because I really do think that answering questions means you're forced to be reflective" (P10).

These quotes highlight the interesting barriers to supporting participants' desires for self-reliance in mental health apps. Although technology supported self-care strategies such as meditation and mindfulness are preferred by our participants, in reality, they lack the necessary interactivity to sustain their motivation and interest to keep using. In essence, as P10 succinctly put it: "They are just boring." As potential solutions, questions and gamification can engage the user and, at the same time, help new users overcome barriers with more guidance and clearer-cut expectations. We next delve further into the barriers of use.

4.4.3 Barriers to adoption and entry.
Although all participants stated that applications could have a place in their self-care journey, they listed several critical barriers that can hamper their adoption and, more interestingly, entry.

Inexperienced participants need some knowledge to begin using apps. Because the inexperienced participants start to learn without a basic understanding of mental health, there is a sense that they need to at least partially educate themselves first before they can use apps. This need for education has two dimensions, having an understanding of mental health at a general level and having an understanding about what they are going through at a personal level. Those who are currently using apps discussed the difficulty of starting, with P2 saying: "A lot of the apps I've used and seen are very demanding in what they wanted. They are very clear-cut. You should write down everything you are feeling right now.

Rate your happiness or how upset you are from a scale of 1-5. But oftentimes I don't know any of these things, you know? Like I don't have experience talking about these things. I didn't have parents who asked me about these things." P12 even enrolled in an online seminar because she felt she needed to understand the general mechanics of self-care: "It was a good foundation to have before I started exploring and learning on my own. Otherwise I wouldn't know where to start. Even with apps… I needed a little bit of education beforehand to get at their full potential."

Among the inexperienced participants, only those who are currently using apps commented about the need for learning, particularly P2, P11, and P12. The other inexperienced participants who have not started to use apps did not articulate whether they needed to learn, just that they wanted to be told what to do. This suggests a barrier to entry. P9 stated why he does not use apps for mental health, even though there was a period of time where he found it difficult to transition as a new international student from S. Korea: "I want to use an app but I don't know how to start… With the sleep app, I had a goal and it was really clear what that goal should be: how do I sleep better? And the advice the app gave was really clear too. With a mental health app, I think it's more difficult. I don't think I would understand what exactly I need to do… What would help is if [apps] could just be blunt and tell me exactly how to think and what to do." P20 similarly said: "I would like these apps to almost tell me what to do." These quotes echo earlier findings on reasons why they found games that have clear-cut rules for engagement so attractive: clearer expectations and guidelines can keep the guesswork out of a topic they know so little about.

Apps do not satisfy the goal of learning to be a self advocate. Another barrier especially among the inexperienced is that the apps they have tried do not seem to help them verbalize their feelings and talk about their mental health. Several mentioned how they read posts online to learn about how to talk about mental health and felt that learning about being an advocate for their health was an important aspect of their education. P19 said earlier: "I'm still learning to be a self-advocate." But in order to be a self-advocate, they first need to learn skills and be empowered to effectively communicate their needs. P12 noted: "Tracking mood and stuff is important but there are other aspects of mental health that I don't know what to do. Like learning how to be a self-advocate. I'm learning that on my own but what I really want is help doing that because it's hard… to just talk about my issues. To be open about it and share what I'm feeling. Like what do I say? How do I say it?" P19 further described her frustrations as a new international student from S. Korea, who found it difficult being vocal about her needs when it had not been expected of her in her home country, "I can't ask for help if I can't speak up about what I need help on."

Apps do not "grow" with the user. P12 talked at length about her desire for apps to grow with her, adapting to her needs as she learns more about herself and about mental health in general: "When I started keeping a journal and using Daylio… that's what I needed back then. It's a good starting point but I want to start doing more. I think one way that I can start is to be asked more pointed and deeper questions in the app… prompt me to think about my emotions and thinking patterns more deeply. Right now, it's starting to feel superficial." She admitted she is not ready to see a counsellor and thus wanted an app that she can rely on long term.

Participants further discussed their desires on what they need from these apps to reflect their different stages of learning. For the less experienced, they wanted a clear and unambiguous way to use them, as P9 and P20 mentioned above. On the other hand, experienced learner P7 talked about what she could do to personalize apps to reflect how much she has learned about herself: "It would be great if it really involved… real professionals but the next best thing would be to take part in the design of your own care because I feel like… I know myself and my needs well enough to do that."

5 DISCUSSION

This study examines the perceptions and use of technologies for mental health among university students of East Asian heritage in Canada. We first identified how their cultural and communication barriers have led to their current practices in learning from others online, with stories and storytelling offering approachable ways to learn about mental health and share personal experiences. However, their desires for self-reliance have led them to value and sometimes prefer mobile apps that provide self-help strategies even though they present barriers to adoption and entry, especially for those who are inexperienced in mental health.

These findings are consistent with psychology and HCI literature of Asians and university students. However, our understanding is enriched with the nuances of our participants' cultural and communication barriers as Asian students living in Canada. The experiences our participants have gone through to understand mental health despite their upbringing where silence on the matter is largely normalized, has brought in new variables to consider when designing for mental health. Therefore, HCI researchers and designers clearly need to consider ways that can support these students and others like them to access the help that they need. In the following section, we present design implications for mental health technologies by discussing how they can best consider our participants' cultural and communication barriers.

5.1 Role of Learning in the Design for Mental Wellbeing

5.1.1 Support the different entry points of users. HCI researchers for digital mental health should expand their design lens to be mindful of different entry points of users, with particular attention to those whose backgrounds lead to very limited understanding of mental health. To do this, digital support for mental wellbeing should not only focus on supporting specific practices but also teach a more well-rounded understanding of the significance of those practices and the terminology around it.

This presents an opportunity for suggesting solutions that can guide users in their practice of self-care strategies at various levels of experience. Questions were identified by most participants as a useful technique for framing what needs to be reflected on, how to reflect on it, and how to interpret what it means in terms of their self-care. Judicious use of questions to make sure all levels of users are on track with the practice of a self-care technique can help ensure greater understanding. Questions can also be used to help identify who needs more help (e.g. inexperienced participants) and who needs more freedom to explore. Several apps including Waking Up [106] use a graduated process where users can start

at an introductory level but can increase to more advanced levels. While this can be effective, we wonder what more interactivity and fine grain assistance might look like for determining level of user need and subsequent adjustment of practice. One way would be to implement a bidirectional learning process using questions where the technology also learns about the user. This can help with giving users the feedback of how they are learning and whether they are on the right track, which may involve semantic analysis and machine learning to make such assessments and the involvement of professional mental health experts. This flexibility also has the added benefit of growing with the user as they advance in their learning. Future work should look into conducting a longitudinal study to explore needs around designing for the progression of experience level on mental health.

5.1.2 Support skill learning to be a self-advocate for one's mental health. Several participants discussed wanting the skills to not only learn specific care strategies but also the skills to confidently open up and effectively communicate what they are feeling. Therefore, we believe there is a design opportunity in online peer support platforms to address the mechanics of mental health communication to empower self-advocacy. Researchers should also consider how social learning can be designed in a more structured and safer way than finding examples online. In unstructured contexts, there is the risk of encountering triggering content or cyber-bullying that can exacerbate feelings of negativity [70]. Design suggestions to help users learn communication and self-advocacy skills include ideas that can leverage the social learning they already engage in. One is the collaborative creation of templates or scripts where users with more experience can contribute words and phrases to help those who are inexperienced with communicating feelings effectively. Another concrete example is scenario-based collaborative learning through role-playing which can leverage the therapeutic power of stories.

5.1.3 Support storytelling for social learning. Our study shows that there are some who read the stories to learn, thus we suggest design opportunities to support this social learning. In HCI literature, it is common to suggest designs for online community sites that match users by similar needs, beliefs, and emotions [70, 74, 77]. To support learning as well as community support, matching across people's experience levels may be more suitable for those like our participants. More specifically, because mental health is a continuous undertaking, it would be valuable for the inexperienced users to know the contexts by reading stories on where others have been, where they are now, and where they hope to go for a meaningful and healthy life. As an example, we suggest a design metaphor for helping users curate mentorships online. However, this example still does not resolve issues with stigma and the unwillingness to talk with others due to fears of burdening others. Potential negatives with this approach also include sharing and supporting unhealthy habits and unsafe behaviors [18, 28] which can set back progress.

5.1.4 Support family storytelling with consideration for language barriers and stigma. Some participants discussed the values of using stories to foster communication with their parents. This presents an opportunity for design where family communication via storytelling can be effective. However, language barriers can be a difficult

hurdle to overcome. There have been many HCI projects that look into sharing family stories (e.g. [2, 9, 47]), however, they assume that family members share the same language or that there is little stigma with sharing. We suggest using methods of transmitting stories that do not depend on written or oral language. One promising method is digital storytelling (DST) [52], a research method commonly used in qualitative elicitation studies. DST has been used to engage clinicians and patients [105] as well as informally to encourage teenagers to share their mental health narratives [38]. An exploration of this method using participatory design sessions can engage family members in some form of shared understanding of lived experiences and help promote family wellbeing. Future work should explore ways to support family sharing with considerations to language barriers and stigma and how they can inform design. However, more formative work is needed to understand how it can be effective across borders to help transnational families of international students who have more significant cultural differences.

5.2 Role of Universities in Supporting Mental Health of All Students

5.2.1 Support the intersection of students' cultural identities. Although we have explored the trajectory of how our participants have started to learn about their mental health through the lens of their experience level, we have also discovered that there are different intersections of identities that impact their understanding of mental health and consequently their use of mental health technologies. One such example is the difference between the experiences and needs of our international and domestic students. Growing up in Canada, our domestic students have navigated multiple cultures, one reflecting their heritage cultures at home with immigrant parents all the while experiencing the more accepting mental health narratives outside of their communities. They also have deeper roots in the country and have different ideas about what it means to have cultural representation growing up as visible minorities. This biculturalism is a concept that the international students are just now coming to understand as they navigate how to communicate the Western concepts of mental health they are beginning to learn to their parents at home who tend to be mistrustful of it. We have also found that our international students experience comparatively more serious barriers with mental health and various technologies because they are less familiar with Western mental health concepts and have difficulties adjusting to new expectations to fit in and not knowing where to go for help. P9 and P19 especially struggled to assimilate as new students, but P9 found additional challenges being in a less urban part of the country with limited Asian representation. This suggests that international students are particularly vulnerable and need more consideration for outreach programs and designs that can target ways to help them acculturate. We present our ideas below.

5.2.2 Support students' mental health with technology-assisted interventions and outreach. Our findings show that universities are where most of our participants first become aware of mental health. This places universities in an important position where they bear considerable responsibility to provide services for supporting students in their mental health care learning. Canadian universities'

mental health services are aware of the need to consider different perspectives, including culture, but still very much cater to individual agency and focus [46, 51]. The number of international students in Canada is increasing dramatically every year [69], and if universities welcome diversity in their student body, more needs to be done to make their initiatives more effective, especially as we are seeing comparatively more serious barriers with our own participant samples. We suggest that universities should leverage the approachability and accessibility of interactive technologies, in the form of mobile applications and webapps, to complement existing in-person initiatives to expand literacy and normalize discussions on mental health. One example could be testing out different strategies to reach out to people who are not yet aware that they may need help understanding or even recognizing their mental health concerns. Another example is welcoming more diverse perspectives from different cultural groups, perhaps from the students themselves, to address stigma due to cultural factors and to promote cultural sensitivity on campus.

5.2.3 Additional ideas for future work. Universities are unique environments where many students from different cultures and perspectives interact with each other on a routine basis. In prior HCI studies with university students, researchers have leveraged this environment to consider student mental health in the midst of the broader ecosystem they belong in [53, 75]. Future work with students of Asian descent or other groups who are similarly underserved should attempt to understand in what ways different social relationships and the services universities provide can help students demystify mental health, especially for those new to Western approaches to care such as international students. An interesting finding that can be further examined within a university's ecosystem is how campus services can help make sense of students' contradictory desires of what they perceive they need in terms of self-help and social help strategies. Some participants have also confessed they are not yet ready to consult with a professional. We believe it may be valuable to conduct a co-design study gathering different perspectives on how technology can be designed to help encourage students to strike a balance between self, social, and professional care strategies. Individuals who play a role within the ecosystem of university students could be invited to participate, including counsellors, student wellness administrators, student peer support volunteers, and the students themselves.

6 LIMITATIONS

We do not make comparisons between different cultural groups, which some may perceive as a limitation. The lack of comparison may leave the impression that the struggles East Asian students in Canada are experiencing are unique and do not apply towards other ethnicities. But we argue that our focus is on extending inclusive designs for an under-served group and not on identifying differences between cultural groups. Another potential limitation is having only two participants of Japanese heritage. We acknowledge that interviewing more individuals from this group could have contributed a more well-rounded understanding of our findings; thus, a need for a larger study may be warranted. We also do not claim our findings are generalizable to other groups, though it may be reasonable to assume so, especially as similar cultural stigmas

are prevalent in other cultures [77]. Future work should examine how mental health technologies can address barriers that can more broadly represent students from different non-Western cultures. Furthermore, we recognize that our sample of students are biased towards those who are interested in using digital mental health tools. Thus, it may be unclear if our findings are representative of the larger population of Canadian students of East Asian heritage, especially those who are too stigmatized to discuss mental health struggles with others. Future work should examine different methods that can sensitively address stigma to further the work for designing inclusive digital mental health tools. And finally, we touch on privilege and the way it has limited our study. Although we have discussed the intersectionality of our participants' backgrounds, we did not consider their socioeconomic status (SES). Research has shown that socioeconomic factors influence mental health among young adults, placing those at lower SES at higher risk of mental health problems [78]. Therefore, we acknowledge that examining it more explicitly in our recruiting process would likely bring in additional nuance and insight to our findings.

7 CONCLUSION

Culture affects how mental health is perceived, treated, and discussed. Therefore, it is important to understand how culture can affect the use of digital mental health tools. Our research examined needs, practices, and opportunities in how East Asian university students in Canada use digital tools to maintain their wellbeing. We found that participants' cultural background, where mental health was not discussed, has led them to seek learning opportunities and cultural support from peers online. However, their desires to be self-reliant, to take responsibility for their own health without burdening others, have also led them to prefer self-help strategies in mobile applications despite barriers to entry and adoption. We further presented their wishes for more discussions with parents in the form of stories and for university services to be more sensitive and helpful with their mental health. We contribute implications for the design of mobile and online applications that can support their mental health seeking behaviors by: (1) accommodating learning from different entry points; (2) supporting skill learning for becoming a self-advocate for their own care; and (3) suggesting ways to share stories with others and with family members with consideration for language barriers and stigma. These implications are especially important currently with the added repercussions form COVID-19 discrimination [109]. Our work shows the importance of expanding the design lens of mental health technologies to be more culturally inclusive of vulnerable populations.

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