Personal Informatics as a Site of Digital Mental Health
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Introduction
As more aspects of ourselves are off loaded to the cloud, more of our vital data is available for analysis and reflection. Personal Informatics (PI) has long been interested in how health can be impacted by the collection, analysis, and reflection on personal data. This also includes a growing interest in mental health.

Mental health concerns such as depression and anxiety impact a wide swath of the population, with approximately 20% of those living in the Western Pacific Region of the globe being diagnosed with depression and/or anxiety [12]. As research in Digital Mental Health (DMH) grows more broadly, PI is a natural place to explore how the various stages can impact (and are impacted by) those caring for their mental health. The case of DMH is an interesting research area for at least four reasons: 1) care of mental health is a growing concern for the population as a whole, 2) those with mental health symptoms often experience a variety of stages overtime [6], thus needing flexible PI, 3) the stigma attached to mental health is still pervasive [3], and 4) mental health is not limited to an individual—with families, friends, and communities often involved with various aspects of mental health care [1,10].

In this short position paper, I will review briefly some research already being conducted in the DMH space and then point to some directions this work may go in the future, in particular with PI.

Background
Previous research has explored the different ways in which DMH and PI converge to create tension in the lived experiences of those trying to maintain or improve their mental health. Mental illness can have certain stigma attached to it and those with mental illness have the added burden of managing their data in order have it be useful, but not accidentally disclose their mental health status. For example, managing online information can be challenging for those with cognitive impairments, with some of that work falling to family to help manage [11]. Past research has found, even for places such as social networks, understanding when to trust the software and manage the data can be trying [2].

Despite the challenges, PI can also offer ways to help augment current mental health care. Families are already managing PI from the family level to help maintain health, which can be extended to mental health [10]. At the individual level, those with mental illness are also using tracking and reflection to help understand their symptoms [8]. With the potential for just-in-time interventions using sensing data and machine learning, the potential to capture mental illness and suicide is becoming a reality [4]. However, there are many messy ethical questions that need to be addressed while grappling with these new potential DMH aids [4,8,9].

Future Work
Given the messiness that naturally comes from the lived experiences of DMH and PI, I am interested in exploring further the potential of the intersection of these two domains. Mental

health is an interesting case for PI because those with mental health concerns often find themselves going through stages (*e.g.,* contemplation, preparation, action, and growth), with the potential to have a crisis, followed by relief in symptoms over time, only to experience a crisis later [6]. As those who go through various stages in PI (*e.g.,* deciding, selecting, preparation, collection, integration, reflection, action, lapsing, and resuming tracking) [5,7], these may map to mental health recovery stages in interesting ways. Understanding how those with depression or anxiety, for example, might use their own data to help them become aware of an impending mental health crisis, may avert the worst for them (*i.e.,* they can contact their doctor or take pre-arranged steps to mitigate current circumstances). This becomes an interesting example of how PI can be an aid to DMH, instead of inundating those with mental illness on a daily basis with data, but giving it in the right moments to help them.

The intersection of DMH and PI also highlights how PI is extending beyond the unit of the individual. Family and friends are one group in the community who may benefit from some of the insights gained through PI. Another large group of people, given the nature of DMH, are medical personnel trained to help those with mental health care. Doctors are already being given access to individual self-tracking, but future research still needs to work on how to make these data usable and understandable (in a short amount of time) for the medical caregivers. And again, because of the potential for stigma and other privacy issues, understanding how PI is maintained by the individual and intentionally, selectively shared with others in their community is going to be of the utmost importance.

Given the nature of mental health, a better understanding from clinical psychology of how to handle the vulnerability and potential for harm to individuals using DMH and PI to maintain and improve their mental health. Interdisciplinary research with clinicians and medical researchers, as well as working closely with those who have mental health care concerns, will be essential in moving forward with this research area. There is still much to be learned, but the potential positive impact in people's lives is exciting.

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