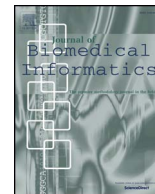




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Understanding pivotal experiences in behavior change for the design of technologies for personal wellbeing

Arpita Bhattacharya^{a,*}, Samantha Kolovson^a, Yi-Chen Sung^b, Mike Eacker^a, Michael Chen^a, Sean A. Munson^a, Julie A. Kientz^a

^a Human Centered Design and Engineering, DUB Group, University of Washington, Seattle, USA

^b Ren-Yu-Wu Inc., Taiwan

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ABSTRACT

Most health technologies are designed to support people who have already decided to work toward better health. Thus, there remains an opportunity to design technologies to help motivate people who have not yet decided to make a change. Understanding the experiences of people who have already started to make a health behavior change and how they made a pivotal decision can be useful in understanding how to design such tools. In this paper, we describe results from data collected in 2 phases. Phase 1 consisted of 127 surveys and 13 interviews with adults who have already accomplished behavior change(s). Phase 2 consisted of 117 surveys and 12 interviews with adults who have either already accomplished their behavior change(s) or are currently working toward them. We identified four factors that lead to pivotal experiences: (1) prolonged discontent and desire to change, (2) significant changes that increase fear or hope of future, (3) increased understanding of one's behavior and personal data, and (4) social accountability. We also describe a design space for designing technology-based interventions for encouraging people to decide to make a change to improve their health. Based on feedback from participants, we discuss opportunities for further exploration of the design space for people who are not yet motivated to change and for ethical considerations for this type of intervention.

1. Introduction

Making the decision to change one's behavior toward good health can be life-altering. For those who have engaged in unhealthy behaviors for years or even decades, this decision can be difficult and emotional, yet necessary for an improved quality of life. Support through this process can help these people achieve success in changing their behaviors [5]. Recognizing the difficulties inherent to achieving and maintaining a change in behavior, many technologists have designed tools to support people in successfully changing a variety of behaviors, including eating better [24], exercising more [13], quitting smoking [3], and improving sleep behaviors [6]. Most of these tools have been designed to provide support after people have decided to make a change. Thus, there remains an opportunity to design new tools to help people make that initial decision and then support them through that process toward eventual success.

To design for those who have not yet made the decision to change, designers and HCI researchers need to understand the factors that lead to a person's decision and what factors were pivotal for an individual to

carry through with the change for their personal wellbeing. Psychological theories for behavior change [20,17,26,40,49] describe intrinsic and extrinsic motivations for why and how people make changes for their personal wellbeing. Long-term behavior change, however, is not a linear process and most people move between relapses and some even give up [50]. Following a review of related work, Chilton conceptualizes the potential for specific moment of "epiphany" in the behavior change and characteristic antecedents and consequences experiences that define the moment. We build on Chilton's conceptualization to gather empirical evidence on whether there are specific moments that cause people to decide to change their behavior and/or follow through with it? We refer to this moment as a *pivotal moment* and the experiences in that moment as *pivotal experiences*. Research to understand the role of pivotal experiences in the process of behavior change can help guide development of technologies that prompt pivotal moments or support people during pivotal experiences. With the increase in number of behavior change technologies, we also sought to understand what is the role of technology in the moment (if any) and can technology be antecedent factor to pivotal moments?

* Corresponding author.

E-mail addresses: arpitab@uw.edu (A. Bhattacharya), kolovson@uw.edu (S. Kolovson), yichensung@gmail.com, yichen@goodtogo.tw (Y.-C. Sung), meacker@uw.edu (M. Eacker), mpchen@uw.edu (M. Chen), smunson@uw.edu (S.A. Munson), jkientz@uw.edu (J.A. Kientz).

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To understand the role of pivotal experiences in behavior change, we studied experiences of people who have already decided to make changes for their personal wellbeing. In this study, we conducted surveys with people who have decided to make a change for their personal wellbeing and follow up interviews with adults who have either accomplished changes in their behavior or were currently working toward them. We conducted this study in two phases: Phase 1 consisted of 127 survey responses and 13 interviews and Phase 2 consisted of 117 survey responses and 12 follow up interviews with adults who have decided to make a change for a better lifestyle. We analyzed these surveys and interviews to understand what led people to decide to make a change and to determine whether their process included a moment that they considered pivotal for that decision. Examining the role of technology in these moments, we found that technology led to a pivotal moment only for 3 participants, but people often used it to access support in the moment or right after a pivotal experience.

Based on these results and prior research, we derived a design space for *catalyzing pivotal moments for people who are not yet motivated to change*, from which developed three storyboard narratives depicting ideal scenarios of how technology might induce pivotal experiences for individuals who are not motivated to change a specific behavior. We used these design sketches to elicit feedback from the 12 interview participants in Phase 2. We discuss opportunities for the persuasive technology design and research communities to continue to explore how the design space can be used to explore technologies that can motivate people who are not yet motivated to change and extend the discussion on ethical considerations for this type of technology designed to manipulate a person’s understanding of personal wellbeing and their agency in deciding to change.

In this study, our primary contributions are:

1. an empirical analysis of pivotal experiences in behavior change for personal wellbeing; and
2. development of a design space for developing technologies to catalyze pivotal experiences for those not yet motivated to change.

2. Related work

Our research was guided by existing theories of behavior change, which informed our inquiry into pivotal moments, and research on persuasive design, which led us to explore the role of technology in the design of interventions for individuals who are not yet motivated to change.

In this research, we focus on experiences that were recognized and considered pivotal by people making behavior changes. These experiences were primarily conscious decisions, though behaviors may also be influenced through subconscious processes such as subliminal changes (e.g., [9]), nudges [44] or habits and their triggers [2].

2.1. Defining a pivotal moment

A pivotal moment in behavior change can be understood through the metaphor of having an “epiphany.” Chilton [10] describes three characteristics that define an epiphany moment in behavior change – (1) Sudden, unplanned clarity, (2) Ability to choose a path, (3) Confidence and resolve to move forward. In our work, we chose to refer to these as pivotal moment because having an “epiphany” may only be characterized as spiritual in nature for some. Building on Chilton’s conceptualization, we define a *pivotal moment* in behavior change as the time when a person decides to adopt new behavior(s) for their personal wellbeing and/or becomes ready to make progress toward positive change. Although we used this to conceptually guide our work, we purposefully did not pre-define what we meant by pivotal moments to study participants. We asked them open-ended questions, as we wanted to inductively analyze participants’ perceptions of what constituted a pivotal moment for them.

2.2. Theories of behavior change

Covering the vast literature on behavior change theories and techniques is beyond the scope for this paper. Our research questions focus on understanding pivotal moments and designing for people who are not yet motivated to change. To that end, we summarize how the above three characteristics of pivotal moments [10] can be explained through the lens of relevant psychological theories of motivation and health promotion. We also review stage-based models for an overview of the longitudinal process of behavior change.

2.2.1. Stages of behavior change

Where a person is in their behavior change process can be characterized by two stage-based models: the Transtheoretical Model of Behavior Change (TTM) [40] and the Precaution Adoption Process Model (PAPM) [49]. The Transtheoretical Model defines stages of *pre-contemplation*, *contemplation*, *preparation*, *action*, and *maintenance*, while the Precaution Adoption Process Model includes the stages *unaware of issue*, *unengaged by issue*, *deciding about acting*, *decided to act*, *acting*, and *maintenance*. The process of change, however, is not linear: different individuals may spend different amount of times in different stages, skip stages, or and move through multiple stages simultaneously [50]. Therefore, we chose not to use the framing of using specific time intervals to define stages—such as within 30 days or 6 months—as used to define stages in Transtheoretical model.

The stages in these models are also helpful to conceptualize what it means to not yet be motivated to change. Not being motivated to change could mean that a person is in the pre-contemplation state, either unaware that their behavior is unhealthy or that it is possible to change, that they are unengaged by the issue, they are undecided if they want to change, or they relapsed during acting and are not motivated to try again (e.g., they have “given up”). Building off the stage-based models, we distill four categories of people who have decided to change: people who have (1) decided but are not currently acting toward change, (2) decided and are taking at least one action toward change, (3) decided to and believe that they accomplished change, and (4) decided to, relapsed, and are not currently working toward change or have not succeeded. In this research, we wanted to explore whether pivotal experiences catalyze the progression of a person through these stages and, if so, what trajectories they take. To understand when pivotal moments occur and the types of transitions they lead to in the behavior change process (e.g., *unaware to aware*, or *unaware to making decision* or *decision to act*), we ask the following research question:

Research Question 1 (RQ1): When are pivotal experiences manifested in the process of behavior change for personal wellbeing?

2.2.2. Factors that catalyze behavior change

Health promotion theories describe factors that may catalyze factors that can be pivotal for the change. The Health Belief Model [26] describes a person’s likelihood to change their health behavior and adopt health services as a consequence of perceived susceptibility, severity, benefits, and barriers. It also specifies potentially pivotal cues to action that can modify these perceptions, which can be either internal (e.g., pain) or external (e.g., information from others or events). While making benefits, risks, and severity explicit can increase a person’s resolve to change, specific moments that help in understanding and removal of barriers can increase one’s ability to change and provide clarity on steps to take.

According to Cognitive Dissonance Theory [20], when people’s actions are inconsistent with their perceived image of themselves, they feel discomfort and try to take actions to minimize this discomfort using various strategies. We speculate that a pivotal experience of increased resolve may occur when this feeling of discomfort reaches a threshold that motivates the person to start changing their behavior. However, people may also resolve this discomfort by modifying their perception

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