Positive Feedback and Self-reflection: Features to Support Self-efficacy among Underrepresented Job Seekers

Tawanna R. Dillahunt
School of Information
University of Michigan
Ann Arbor, Michigan, USA
tdillahu@umich.edu

Joey Chiao-Yin Hsiao
School of Information
University of Michigan
Ann Arbor, Michigan, USA
jcyhsiao@umich.edu

ABSTRACT
Technologies play a key role in finding employment in today's job market. However, the majority of those who are unemployed, e.g., individuals who have limited education or who are racial and ethnic minorities, are not well supported by existing digital employment tools. Therefore, we conducted an 8-month randomized field experiment to evaluate two tools—Review-Me and Interview4—designed to address these job seekers' key employment needs. We used the Theory of Planned Behavior to examine the tools' effects on three factors influencing job seekers' job search intention: job search self-efficacy, subjective norms, and job search attitudes. Our interview data suggested that the tools positively affected all factors, but our survey results were mixed. Interview results suggest that these trends were caused by positive feedback and self-reflection. We contribute ways to integrate these two features into future tools for, and techniques to increase study retention among, underrepresented job seekers.

Author Keywords
Employment; Theory of Planned Behavior; Underrepresented Job seekers

CCS Concepts
•Human-centered computing → Field studies; Empirical studies in HCI; •Social and professional topics → Employment issues;

INTRODUCTION
Technology has transformed the world of work, impacted employment sectors, and thus led to market changes. Although many parts of the world have seen economic growth, stable employment opportunities are decreasing [21]. Racial and ethnic minorities, people who have disabilities and those with less than a college degree in the United States represent the majority of those who are unemployed [26, 27, 28, 29]. To get a better sense of how job seekers are managing their search in the context of this work environment, we investigated job seekers who represent the majority of those who are unemployed in the United States. For the sake of this article, we use the term "underrepresented" to describe these job seekers and we built on HCI literature to explore how digital employment tools could support them.

HCI work has conceptualized a number of tools that could support the needs of underrepresented and disadvantaged job seekers [9, 20]. Our work addresses the opportunity to implement and *assess* how effective such interventions are in supporting job searches among these populations. Such investigations are needed to develop better tools. Therefore, we built on past HCI employment literature and research from behavioral psychology to apply Ajzen's Theory of Planned Behavior (TPB) [2] as a theoretical model to examine the design factors that influence job seekers' intentions to search for jobs — job search self-efficacy, subjective norms, and job search attitudes. The TPB is a theoretical perspective commonly used to assess the effectiveness of job search interventions on employment. We used it to guide our evaluation of two digital employment tools — Review-Me, a resume feedback tool, and Interview4, an interview feedback tool — with the potential to increase self-efficacy, subjective norms, and job search attitudes. We assessed the digital employment tool features that positively affected these three cognitive TPB factors among job seekers.

Through a longitudinal deployment of these tools across 23 underrepresented job seekers from resource-constrained areas, we make the following empirical research contributions: First, our most salient survey results, although not statistically significant, included positive trends in job seekers' self-efficacy and subjective norms. We also identified slightly negative trends in their attitudes and intentions. Features that integrated aspects of positive feedback and self-reflection resulted in positive trends in self-efficacy, whereas the effects of long-term unemployment over time seemed to lead to negative trends. Our Interview4 results suggest that self-reflection led to changes in participants' job search strategy, which in turn, mitigated negative attitude changes. We conclude by reflecting on our methodological challenges and contributing ways to improve research conducted with underrepresented and disadvantaged populations. Our results address calls for employment research among broader populations, particularly as it relates to longitudinal deployments of digital tools, a very difficult task given the multitude of challenges underrepresented and disad-

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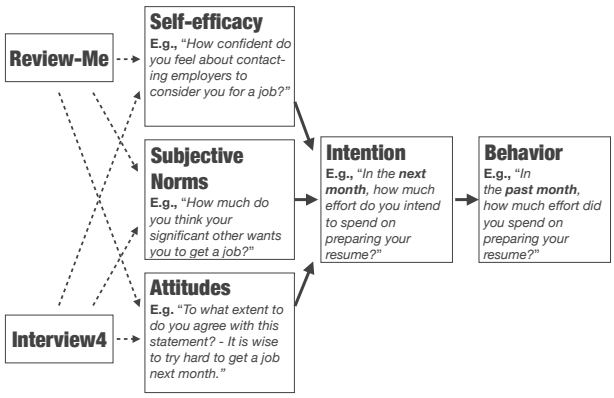

Figure 1. The TPB model adapted to our study context. In the current study, we tested how two employment tools, Review-Me and Interview4, influenced the TPB's three cognitive factors, which have positive effects on job search intention and behavior.

vantaged populations face [9, 18]. We also address the call to help balance the field's predominately quantitative research with qualitative studies to strengthen understanding of the job seeker experience in unemployment research [30].

BACKGROUND

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) states that perceived behavioral control, subjective norms, and attitudes determine intention, the central determinant of behavior [2]. It provides a theoretical perspective to model effects of a wide range of social and psychological factors (e.g., [37, 36, 39]) and of interventions on employment [38]. Fig. 1 illustrates how we adapted TPB to frame the present study.

Ajzen defines perceived behavioral control as "*the perceived ease or difficulty of performing the behavior*" [2, p.188]. The concept of perceived behavioral control is very similar to Bandura's self-efficacy concept [3], which is an individual's internal belief about their ability to execute a task, or in this context an individual's perceived ability to perform a successful job search. In fact, past employment research refers to perceived behavioral control as job search self-efficacy [1, 38], which we use going forward. Subjective norms relate to the perceived amount of social pressure (i.e. from close family, friends, the community), or the degree to which a person perceives social pressure to perform or not perform. This includes a person's motivation to meet these expectations. Lastly, attitudes refer to an individual's *evaluation* of how their job search behavior will lead to corresponding employment outcomes [36], i.e., evaluation of their job search efforts [48].

These three factors — job search self-efficacy, subjective norms, and job search attitudes — contribute to the job search intentions that inform actions. Job search intention describes an individual's willingness to try to perform a behavior, or how much effort a person is willing to put into a job search. The greater the perceived ability and intention to engage in the behavior, the higher the likelihood that it will be performed. These factors have all been shown to positively predict job attainment. We chose the TPB because (1) previous research supports its use to predict job search behavior [8, 38], (2) it provides specific and quantifiable information that leads to action [24], and (3) it models factors that encourage and discourage job search behaviors [24]. For conciseness, we remove "job search" from the following terms: self-efficacy, attitudes, intention, and behavior.

Career Development and Digital Employment Tools

A 50-year review of the emergence of computer-assisted career guidance found that many early systems were evaluated among students and operationalized on career development and decision-making theory [17]. Studies published between 1950 and 1996 solely focused on career identity, and 49% of those that compared a career counseling intervention to a control group had college students as samples [46]. Quasi-longitudinal study evidence shows that students who created career goals through these systems were more likely to remain in school, proceed to postsecondary education, and maintain a major that reflected their interests. Organizations developed the systems that followed, and instead of basing the systems on theories, they focused on strategies required to effectively search occupational and educational databases [17]. These systems consisted of conceptualization, evaluation, and design and implementation of digital employment tools [11].

However, an HCI literature review of how technology could support the most vulnerable job seekers (e.g., those who face challenges of homelessness [19, 20] and limited resources [13, 19, 20, 45] and those who have social communication challenges [18]) categorized the challenges that such job seekers face as social, societal, and personal [12]. These researchers acknowledged that few interventions exist to overcome such barriers and identified viable concepts that would benefit low-resource job seekers. In a speed-dating study of ten digital employment concepts, they found that low-resource job seekers preferred tools that addressed their most immediate needs versus their long-term unemployment needs [11]. Job seekers in this study most preferred Review-Me, a tool that allows job seekers to receive resume feedback from crowd-source volunteers; SkillsIdentifier, a tool to help job seekers articulate their current skills; and DreamGigs, a tool that shows job seekers the career-related skills they need to reach their "dream job." Hendry et al. evaluated whether six work-related systems could be modified to address the needs of homeless young adults [20]. They found that the applications did not meet the needs of homeless young adults in several ways, one of which was related to leading to self-efficacy and confidence among youth.

The tools mentioned in [11, 20] were conceptual in nature, and were not implemented — only a small number of digital interventions from our field have been. Pilot results from an implementation of one of these tools — DreamGigs — suggest that the tool was empowering to low-resource job seekers [12]. A 1-month pilot deployment of Review-Me, a tool that sources volunteers to provide resume feedback to job seekers, revealed significant limitations for job seekers with few digital literacy skills and with criminal records, and encountered unforeseen issues with document storage and digital access [9]. Hayes et al. designed, implemented, and evaluated VidCoach, an iOS software prototype that demonstrated video modeling and prompting techniques in seven interview

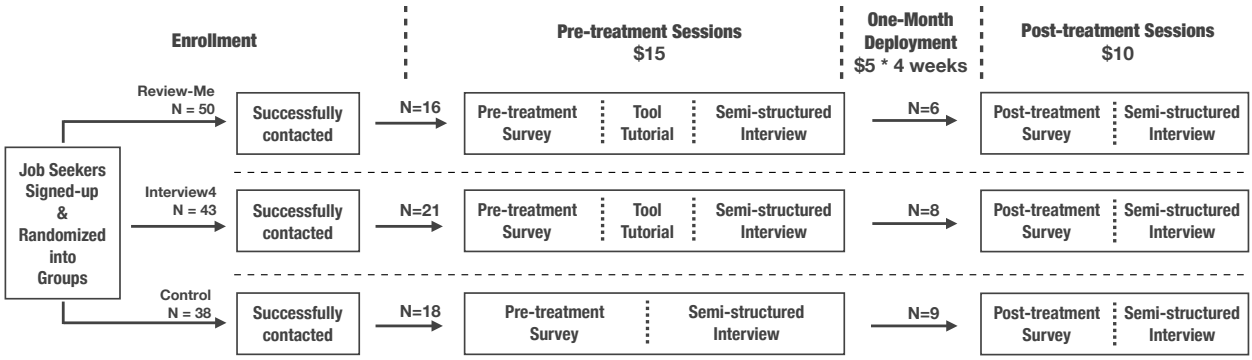

Figure 2. The stages of our randomized field experiment. This diagram presents the number of participants that we randomly assigned to the three groups and the numbers of participants in each phase of the study, and the compensation for each phase. Participants could receive up to $20, or $5 per week for their weekly diaries during the one-month deployment.

videos [18]. The authors conducted a 1-month randomized experiment among fifteen students with an Autism Spectrum Disorder (ASD) diagnosis and found that students in the Vid-Coach group made a statistically significant improvement in their evaluation performance as rated by employers. Video modeling as an intervention increased students' abilities to succinctly and logically present their ideas, helped to decrease fidgeting, and improved interview hygiene.

The challenges that students with an ASD diagnosis face, however, are distinct in comparison to the challenges of homeless youth, or even older adults without an ASD diagnosis. In addition, given that the majority of digital employment interventions reviewed for the last 50 years have focused on career identity and college students, none of those tools is likely to benefit job seekers who face any of these challenges. Also none of the career development or HCI literature assesses how digital interventions impact job seekers' job search intentions. This is key to understanding technological opportunities to support underrepresented and less advantaged job seekers' employment.

METHOD

To capture how the tools affected job seekers' three TPB factors over time, we conducted a 1-month randomized field experiment from November 2018 to July 2019. This experiment consisted of three parts: a pre-treatment session, a 1-month tool deployment, and a post-treatment session. Both pre-treatment and post-treatment sessions included interviews and surveys. We compensated participants up to $45 for their time. Fig. 2 shows the stages of the field experiment and compensation details.

After job seekers signed up for the study, we randomly assigned participants to each group (either one of the tool groups or the control group) and contacted them to schedule their pre-treatment session. The pre-treatment session included a survey, tool tutorial, and a semi-structured interview. We asked each tool-assigned participant to use their assigned tool to facilitate their job search for the next month. We also asked all participants to report their job search activities in their diaries within the 1-month time frame. We obtained approval from our institutional review board and received participant consent. Next, we describe the details of our evaluation, recruitment, study, and data analysis.

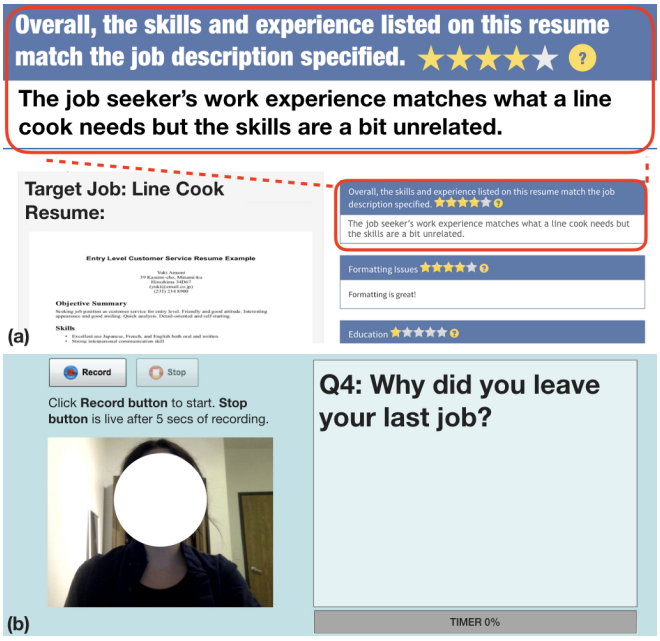

Figure 3. (a) Review-Me and (b) Interview4 screenshots. Note that these were edited to convey key features: Review-Me's volunteer *feedback* and resume *ratings* and Interview4's prompting and *recording* answers. Participants could also *review* and *share* their practice videos. Permission received from Hire-Intelligence LLC to use Figure 3b.

Tools Evaluated

We evaluated two tools (Fig. 3): Review-Me (https://review-me.us; https://github.com/UMICTResearch/resume-me) and Interview4 (https://www.interview4.com/; Shut down after July 19th 2019). Both of these tools were conceptualized in [11], and categorized as feedback tools to address job seekers' most immediate and pressing needs. Review-Me [9] is an application that we implemented to allow job seekers to update their resume and receive feedback from Amazon Mechanical Turk workers and student volunteers who agreed to serve as backup reviewers if needed. Interview4, owned by Hire-Intelligence LLC, was a free online video tool. The tool enabled job seekers to practice and record interviews, and share their videos for feedback.

Participant Recruitment and Group Assignment

For study eligibility, participants needed to (1) have been actively seeking employment for the last 6 months; (2) have

either a digital or physical copy of a resume, and (3) have access to an internet-enabled device. We recruited from a large Midwestern region. Prospective participants completed screening questions based on the aforementioned requirements, which we used to examine their eligibility.

We used offline and online methods for recruiting. We established connections with local workforce development programs to aid in our recruitment following suggestions from [10]. We circulated advertisements via workforce development mailing lists, public library bulletin boards, community centers, and bus stops in primarily low-income areas. We also used snowball sampling. Online recruitment methods included advertising to active (e.g., more than 500 members and at least one new post every day) Facebook groups for job information within the region, and the volunteer section of Craigslist.

We used sequential randomization [32] to assign participants into one of the two tool groups or the control group. Sequential randomization mitigates bias by enabling researchers to balance group assignment by specifying factors to balance such as age, gender, and, in our case, job search activity interests. We wanted to achieve balance in tool assignments by preventing those job seekers who were most interested in specific job skills like resume writing and interviewing from being assigned to a single tool that emphasized that skill. We asked participants to provide their interest rankings for a variety of randomly presented job search activities such as practicing job interviews, creating and polishing resumes, and identifying skill sets. Participants were not informed of their assigned tool until the onboarding session. Because we faced more difficulties contacting Review-Me assigned participants than others, we began oversampling for this group in June 2019.

Pre-treatment session

We conducted pre-treatment sessions, which lasted 60-80 minutes each, to onboard study participants. This session included a 10-minute survey, a 15-minute overview of their assigned tool, and a 40- to 55-minute interview session. We held 42 pre-treatment sessions with individual job seekers and four group pre-treatment sessions.

Survey

The survey comprised TPB measures adapted from past literature on job search interventions [36, 38, 39], including questions about participants' experience with the job search, and their demographic information. The TPB scales included six questions to assess self-efficacy, two questions to assess subjective norms, and three questions to assess attitudes.

To assess *self-efficacy*, we asked job seekers to rate their confidence on completing six job-search-related tasks: making the best impression and getting their points across in interviews, contacting employers to consider them for the job, completing a good job application or resume, using friends or other contacts to discover promising job openings, using friends and other contacts to find out about employers that needed their skills, and making a good list of their job skills. This scale used a 5-point Likert scale ranging from "not confident at all" to "extremely confident." These questions formed a reliability coefficient of .87 in [38].

To assess *subjective norms*, we asked job seekers to indicate how hard their significant others wanted them to try to get a job in the next month. We also asked how hard other important people to them, such as family and close friends, wanted them to try to get a job. This scale used a 7-point Likert scale ranging from "not hard at all" to "extremely hard." These two questions formed a reliability coefficient of .80 in [38].

To assess *attitude*, we asked job seekers to specify the extent to which it was beneficial or harmful, wise or foolish, useful or useless to try hard in the next one month to get a job. This construct used a 7-point Likert scale ranging from extremely beneficial (wise, useful) to extremely harmful (foolish, useless). The scale's authors constructed a 3-item index from the responses with a reliability coefficient of .86 [38].

The TPB scale for the pre-treatment session also assessed participants' intentions to try 11 different job-search activities in the next month. The question statement was: "In *the next one month*, how much effort do you intend to spend on trying the following job search activities?" Sample activities included visiting job fairs, preparing and revising their resumes, and reading classifieds/help wanted advertisements [36, 38]. This construct used a 5-point Likert scale ranging from "no effort at all" to "a great amount of effort." These questions formed reliability coefficients of .92 (employed participants) and .94 (unemployed participants) in [36].

Tool Tutorial and Practice

The research team provided a 5-minute tutorial to participants in the treatment group to onboard and walk them through their assigned tool. Participants had an additional 15-20 minutes to practice relevant tasks. For example, we asked those in the Review-Me group to upload their digital resume and review the feedback to confirm that they could successfully retrieve their feedback. The research team walked participants in the Interview4 group through a sample recording. We provided participants in the Interview4 group with external USB cameras in case they did not have their own.

Semi-structured Interviews

We asked participants in each group to describe their employment status and recent job search experience. We asked them questions that reflected the three TPB cognitive factors to enrich our survey results, such as "In your job search, which activities do you feel the most/least confident about?" (self-efficacy). "Among the people you know, who has provided you with the most support in your job search in the past month?" (subjective norms); and "What are your thoughts about the job search in general?" We then followed up with questions to understand their feelings about their job search and outcomes (attitude). We also asked participants about their experience using digital tools in their job search. We asked those in the Review-Me group about their general thoughts on the tool, the feedback they received, and their past experience in seeking resume feedback from others. We asked Interview4 participants their general thoughts about the tool and their practice videos, the tool's sharing feature, and their past experience practicing job interviews.

One-Month Deployment

We assigned tool-based tasks to each group. We asked Review-Me participants to complete at least two iterations of resume uploads so that they could obtain feedback and revise their resumes. We asked Interview4 participants to practice interviewing using the tool each week; the tool included a set of default questions such as: "Please tell me about yourself"; and "If I contacted your previous manager, what would they say about you?" Because the tool only offered one set of interview questions, we provided four additional sets of questions drawn from job websites [31, 43] on an instruction sheet. These included core interview questions such as "What do you know about the company [you are applying to]?" We encouraged participants to use their assigned tool any time they needed. Finally, we asked participants to maintain a diary for a month to track their weekly job-search-related tasks. We provided a diary template and accepted their diary entries via SMS, email, or in person.

Post-treatment session

After one month, participants attended a 60- to 80-minute post-treatment session, which included a survey and an interview. The post-treatment survey was identical to the pre-treatment survey. The only exception was that we rephrased the questions assessing intention so that they referenced participants' previous month's job search behaviors (i.e. "In the *past month*, how much effort did you spend on the following job search activities?"). These questions formed reliability coefficients of .89 (employed participants) and .93 (unemployed participants) assessing behavior [36]. Upon survey completion, we conducted semi-structured interviews to understand their job search in the last month and how the assigned tool, if applicable, supported them.

Participant and Data Overview

We achieved gender balance among the 55 job seekers who filled out the pre-treatment survey (women: N = 27). The mean age was 45.44 (SD = 11.26) and the median household income was $14,444. Among participants who reported their education, a large majority (N = 33) had less than a college degree and 18 had a bachelor's degree or higher. More than half our participants reported their ethnicity as Black or African American (N = 32), 20 as White, eight as Other, three as American Native or Alaskan Native, and one as Asian. Most participants were unemployed at the time of pre-treatment session (N = 36). Ten had a part-time job, five were self-employed, two worked full-time, one was retired, and one disabled. The two full-time employees were making career transitions.

We achieved gender balance among the 23 participants who completed the study (women: N = 12). These participants were slightly older (mean = 48.74, SD = 10.06) and had a slightly higher household income (median = $18,000) than our initial 55 participants. This group was also slightly more educated: over half (N = 12) had a bachelor's degree; 10 had less than a college degree. The last participant specified that she had a certificate of nursing that did not require a bachelor's degree. About half of the 23 participants reported their ethnicity as Black or African American (N = 12). Eight identified as White, two as American Indian and Alaskan Native, and four as Other. At the post-treatment session, more than half of our participants were still unemployed (N = 14). One participant, who was retired in the pre-treatment session, had become a student. Another participant who was unemployed got a part-time job. For the other seven participants — four who were employed part-time, one full-time, one self-employed, one who was disabled — job status did not change. The sequential randomization was successful and we achieved even distribution across participant activity interests.

Our interview data included 46 pre-treatment sessions and 23 post-treatment sessions. The total length of these recordings was about 27 hours. We relied on our observation notes for P71 because that participant had a corrupted audio file.

Data Analysis

We collected a large amount of data across multiple formats in our study. Recruitment challenges and high attrition led to a small sample size. Therefore, we could not conduct statistical analyses with sufficient statistical power. Nevertheless, we report general quantitative trends and descriptive statistics to better contextualize our qualitative data and assure the validity of our results via data triangulation. We used our survey results, interviews, and the diary entries available as support materials to triangulate our data and analyze our results. This approach also allowed us to find insights that were not salient with only one format of data. Note that we received diary entries, although many were not rich in detail, and some participants noted no activity for weeks.

We used *initial coding* [33] in the first-round analysis. We started by reviewing the transcripts line-by-line and highlighting the quotes that were related to the three tools. We assigned a code to each highlighted quote. These codes covered topics such as participants' thoughts about the tools, the tools' effects on participants' job search and the three TPB cognitive factors, and participants' tool feedback.

In the second and following rounds of analysis, we adapted *provisional coding* [33] and began with an initial codebook drawn from the TPB — self-efficacy, subjective norms, and attitude. We iteratively revised the codebook over multiple rounds of analysis and grouped the coded quotes from the first round of analysis under these three factors.

In the following rounds of analysis, we iteratively grouped coded quotes into subcategories under the three categories. For example, under attitudes, we included the subcategories "positive attitude," "negative attitude," and "changed attitude." We also expanded the codebook by adding three categories beyond the TPB framework: perceived benefits of the tool (e.g., receiving resume feedback on Review-Me); tool concerns and improvements; and effects of participation in the study. The second author coded all the interview transcripts and all authors met regularly to discuss the codebook. We report our findings as they relate to the TPB.

RESULTS

Overall, our *interview* data suggested that the two tools positively effected the three TPB factors, but our survey results were mixed (Table 1 and Figure 4). Review-Me interview

	Self-efficacy (Scale range: 1 to 5)			Subjective Norms (Scale range: 1 to 7)			Attitudes (Scale range: 1 to 7)			Intention & Behavior (Scale range: 1 to 5)		
	Mean & SD (Pre)	Mean & SD (Post)	Percentage Change	Mean & SD (Pre)	Mean & SD (Post)	Percentage Change	Mean & SD (Pre)	Mean & SD (Post)	Percentage Change	Mean & SD (Pre)	Mean & SD (Post)	Percentage Change
Review-Me (N = 6)	3.44 (1.20)	4.33 (0.47)	25.9%	5.33 (2.07)	6.08 (1.43)	14.1%	6.61 (0.80)	5.50 (1.49)	-16.8%	3.80 (0.84)	3.14 (0.88)	-17.4%
Interview4 (N = 8)	3.85 (0.77)	4.00 (0.59)	3.9%	5.38 (2.00)	6.31 (0.88)	17.3%	5.67 (2.07)	6.38 (0.88)	12.5%	3.39 (0.88)	3.54 (0.91)	4.4%
Control (N = 9)	3.85 (0.67)	3.94 (0.60)	2.3%	5.17 (0.83)	6.06 (0.73)	17.2%	6.11 (0.76)	5.44 (1.56)	-11.0%	3.70 (0.99)	3.64 (0.92)	-1.6%

Table 1. Mean TPB values (standard deviations), and percentage change, $(Mean_{post} - Mean_{pre})/Mean_{pre}$. In the intention column, pre-treatment refers to job search intention; the post-treatment column refers to job search behavior.

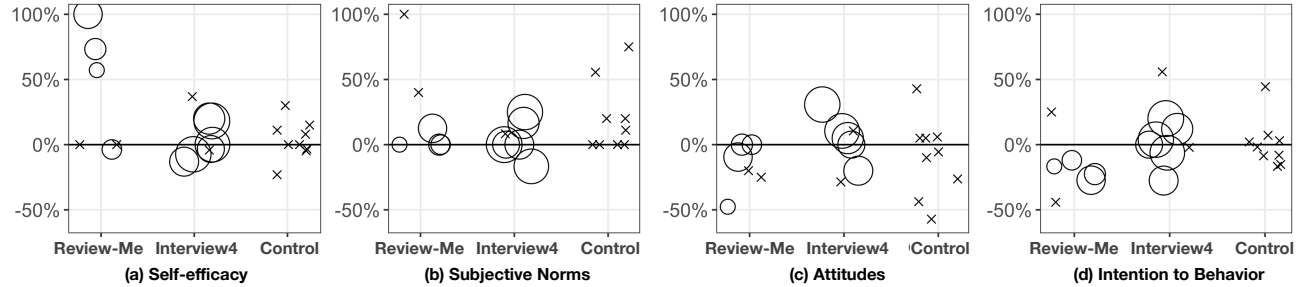

Figure 4. Each circle in the diagrams represents a participant and their percentage change, $(Val_{post} - Val_{pre})/Val_{pre}$, in each of the three TPB factors. The circle size represents how much time participants used their assigned tools (i.e., the larger the circle, the more time they spent using the tool). Crosses represent participants who did not use the tools during the deployment. Note: To improve legibility, a participant is not shown in Figure 4 (b) and another participant not shown in Figure 4 (c). Both had a percentage change of 600% in each factor. Their data has been included in our analysis.

results suggest that it was effective in improving job seekers' self-efficacy and subjective norms, which aligned with our survey results. We also saw an increase in self-efficacy with our interview and survey results for Interview4. However, despite having the highest percentage change and as we discuss later, Interview4 did not have as strong of an effect on participants' subjective norms per our survey and interview results. Our Review-Me and control participants' attitudes declined, while Interview4 participants' attitudes did not. Our Interview4 interview results suggest that it mitigated negative attitude changes. Although our control group did not receive a digital intervention, their survey trends showed a negligible change in their self-efficacy but a noticeable increase in their subjective norms. Job search intention and behavior varied across groups.

We cross-checked areas sensitive to social desirability bias when possible. The number of participant diary entries were on par with the number of Interview4 videos and Review-Me log data. Participants openly noted challenges and concerns using the tools and reported minor usability issues encountered when using the tools. The usability issues reported were outside the scope of this article and therefore not discussed in detail. Demographic data that was reported, such as average income was aligned with that of the local area census. We observed potential outliers in our survey results and provide a detailed discussion of them. However, we first explain tool usage and high attrition rate.

Tool Usage

Review-Me participants who completed the study uploaded 2.67 resumes on average, including the one they uploaded in the pre-treatment session. Four Review-Me participants spent an average of 22 minutes using the tool to upload resumes, review comments, and read articles about resume preparation. Two Review-Me participants (P2 and P63) did not use the tool within the one-month deployment due to changes in their job search strategies. We discuss their changes in detail in the *Job Search Intention and Behavior* subsection.

Interview4 participants who completed the study created an average of 14.88 interview video clips, with an average length of 41.23 seconds. Six Interview4 participants spent an average of 147.3 minutes using the tool, which included video recording, watching interview tips, and resolving connection issues (i.e., P119 reported spending an hour fixing Interview4's connection issues). Two Interview4 participants (P6 and P55) did not use the tool during the one-month deployment. P6 was nervous about seeing a video of herself. She also had privacy concerns about being video-recorded and wanted Interview4 to provide an audio-only recording option. Because P55 did not have a home computer, he had to access public computers to use Interview4 and did not have time. He also felt uncomfortable practicing interviews in a public space.

Reasons for Participant Attrition

Within the 8-month recruitment window (late November 2018 to mid-July 2019), 131 job seekers signed up for the study. However, only 23 participants fully participated in the 1-month field deployment, resulting in an 82.44% attrition rate. We noted several contributing factors to our high participant attrition rate. In more than 50% of these cases (N = 67), participants never responded to our calls or text messages to schedule their pre-treatment session. We learned later that nearly 30% of their contact numbers were out of service. We lost the remaining participants because of time (e.g., many found jobs, others needed more time to prepare for their actual interviews).

Participants' Past Experience with the Job Search

We learned from our interviews that participants were pessimistic about their job search. The most commonly used word to describe the process was "frustrating" and the most common strategy was to continue submitting job applications to as many open positions as they could find. Job search websites like Indeed.com and Monster.com were commonly used, but these websites did not always lead to employment and were a double-edged sword: while participants saw the Internet as a convenient channel to access numerous job openings, it remained competitive because of its accessibility to others

[45]. Participants most relied on family and close friends for job leads and emotional support.

Three TPB Cognitive Factors and Job Search Intention

Job Search Self-efficacy

The most positive change among the three factors was self-efficacy. Our survey results suggest that participants' self-efficacy increased after one month across all groups. The Review-Me group had the highest positive change 25.9%; however, the Review-Me group had the lowest rated self-efficacy during the pre-treatment session.

Consistent with our survey results, our interview results showed that Review-Me and Interview4 both supported participants' self-efficacy. However, they did so in different ways. Review-Me participants' self-efficacy increased because they received positive external feedback from reviewers, while Interview4 participants' self-efficacy increased as a result of self-assessments after reviewing their practice videos. In one case, there was an external review process; on the other hand, the review process happened internally.

Our results suggest that access to Review-Me volunteers was the main reason for participants' increased job seeking self-efficacy. Most participants saw an opportunity to improve their resumes immediately after receiving Review-Me feedback. Four participants felt more confident about their resumes (P50, P52, P71, and P98) and themselves (P50 and P98). For example, P50 received multiple job interviews after she revised her resume.

"*I know that my resume beforehand was not very good, as often as I tried to get help from other people and tried to figure it out. I believe that especially because then [after revising her resume using Review-Me], two or three companies responded immediately with asking for an interview whereby before I was searching and turning in my resume for four years long and getting no responses.*"

Another factor that influenced job seekers' self-efficacy per our results was how the feedback was presented. Most participants described the feedback they received as positive. The positive tone of the feedback was something that P63 liked: "*I don't think they [reviewers] were hyper-critical, and I like their suggestions.*" P127 also stated that the comments were encouraging. In synthesizing job seekers' comments, receiving positive and constructive resume feedback, as opposed to negative, might have also played a role in job seekers' self-efficacy. Supporting this conjecture, P98 said that the ratings she received from reviewers were more positive than she had expected, which made her feel more confident.

"*It [Review-Me] certainly helps me feel a bit more confident to see the ratings I got. Lowest being four out of five [five as the most positive]. I was not expecting that, to be honest. I was expecting one star all the way down the board.*"

Interview4 participants' self-efficacy had a small positive change (3.9%). We attribute this to Interview4's capability to allow them to focus on their self-presentation, see their own value, and practice and prepare for their interviews multiple times. Nine participants stated that Interview4 made them aware of their self-presentation, which they were able to improve over time. P38 shared her thoughts after she reviewed her practice videos:

"*I'm looking like 'wow is that me? I'm really doing that?' My eyes are all over here and over there. Wow, I know if I was part of the employer, I'd be like 'OK she's not even paying attention. I'm not gonna hire her.'* "

Interview4 helped job seekers improve their self-presentation and as a result improve their self-efficacy. Three participants (P40, P64, P116) stated that by reviewing their practice videos and improving their self-presentation, they were able to calm down and build their confidence. P40 stated,

"*The research for the interview helped me to be more confident in interviewing, because I realize when I watch the videos that I needed to have more eye contact and just relax a little bit. So it [Interview4] kind of helped me to gain confidence, but also just focus more on what I need to do to successfully have a good interview in the future.*"

P73 also stated that reviewing her practice videos made her aware of how she was presenting herself and reminded her of her own value: "*Okay, you don't even need to do that [be nervous]. Because you have all these skills. You know what your worth is. Just let them know what your worth is.*"

As participants improved their self-presentation, their confidence increased. For instance, P64 answered Interview4's default questions and felt even more prepared after he addressed the additional questions we prepared.

"*It really was interesting to narrow down the types of questions that you get in interviews or at least the essential types of questions. So as I went through and progressed, I think I got better answering them... I would like to concentrate on maybe a little bit smoother delivery... the ums or the ahs... So I think I got a little bit better at that over the four weeks.*"

We saw a small increase of 2.3% in our control group's results. These changes could have been related to their study participation (e.g., completing the diary, meeting researchers), or resources they received outside of the study; however, two control group participants (P108 and P109) explicitly mentioned that keeping track of their job search using diaries was beneficial. P108 described the diary as a helpful non-digital tool that she learned about through participating in the study. She also stated that she got a few interviews during the study and talked about how keeping her diary helped her to plan and review her search.

"*[Keeping a diary] is really helpful. The planning I talked about earlier. Not just being busy, but in a good way - planning. So planning helps me see what I'm going to do the next day or within the next hour, do I need to follow up, do I need to write an email saying thank you? ... So the diary gives you another picture of what you're doing ... you always have to go back to look at what happened and what didn't happen.*"

Subjective Norms

Per our survey results, all three groups had positive changes in their subjective norms, or perceived social support. Note

that among the 23 participants, nine did not have a significant other so they skipped the corresponding question. Review-Me participants' subjective norms increased by 14.1%, and Interview4's by 17.3%. However, one Interview4 participant who did not use the tool and whose change likely resulted from other network support, had an increase of 600% (P6). Excluding P6's data shows a small increase of 3.5% in the Interview4 group's subjective norms.

We saw from our interview data that participants in both Review-Me and Interview4 groups saw the tools' potential to improve their subjective norms. However, there were personal barriers that participants needed to overcome before they could fully benefit from Interview4's "share video" feature.

By connecting job seekers to reviewers, Review-Me indirectly supported those job seekers with limited social connections to individuals who could provide them with feedback. According to P89, "*I don't have anybody to critique my resume. And uploading it on here [Review-Me], they [volunteers] pointed out a couple different things that are really going to help me fix my resume.*"

We saw Review-Me's potential to support job seekers' subjective norms. In one case, P50 perceived an increase in social support through her use of Review-Me and felt that the tool mitigated her social isolation in the job search. P50's connections were all long-term employees with outdated knowledge and experience of the current job search and job market. She could not count on them for feedback or suggestions and felt isolated. Review-Me provided her with opportunities to get feedback from people outside of her network:

"*I really appreciated because it [Review-Me] is a very personal website. It's not like I'm working with a machine and the machine is giving me feedback... It also helped that I didn't feel as alone with the process... If I'm using the tool [Review-Me] and I'm getting a very specific answer, I feel like there's a person on the other side who's really responding to me and hears what I'm saying, sees my need, right? And is responding to it. That makes me feel less alone in the process.*"

P50 also provided feedback on how to improve Review-Me going forward. She thought that Review-Me could provide a better communication channel between the job seeker and the reviewer; she wanted to follow up with reviewers and ask specific questions about their feedback. Although unsupported at the time, this is a feature that could provide job seekers with an opportunity to benefit from making new connections.

Interview4's key feature enabled job seekers to review their mock interviews and share their interview videos with others for feedback. Among the 21 who participated in the pre-treatment session, eight participants wanted to share their videos with experts such as job consultants and even employers. Some participants stated in their interviews that they would share their practice videos with family (N = 4) or close friends (N = 5). They felt that these contacts would provide them with honest and supportive comments.

Despite what job seekers *said* they would do, we found that none of our participants shared their videos using Interview4's sharing feature. However, P40 did share her video with her partner in person — she did not use the built-in sharing feature. P116 thought that no one in his network would be able to provide him with useful feedback. In fact, his expectation was that Interview4 would help job seekers match with interview experts who could provide them with feedback. P119 did not think anyone he knew would be interested in reviewing the videos, especially because they were not tech-savvy. P64 said that he never considered sharing his videos with others. Finally, the other two participants (P38, P59) were uncomfortable sharing their videos. P59 said in the pre-treatment session that he would share his videos with his career coach, although a month later, he had not shared his videos with anyone:

"*I don't know. Still it's ... I don't know. I'm just not that comfortable sending my interview practice to other ... Yeah, I don't know. I just don't feel comfortable doing that, and to even who I would send it to, you know? So, it's just kind of awkward... Just doing an interview and sending it to people - I don't feel confident in doing that. It's uncomfortable.*"

However, we also observed a 17.2% increase in our control group's subjective norms. These participants might have received other network support or felt support by partaking in the study. In one case, P5 attended a job-seeker support group. An increase in all groups' subjective norms suggests impact beyond Review-Me and Interview4.

Job Search Attitude

Recall that job search attitudes reflect one's evaluation of their job search efforts on their employment outcomes. Our survey results show negative attitude changes among the Review-Me -16.8% and control groups -11.0%, which reflects past findings of decreased job search attitude after long-term unemployment [41]. Our survey results suggest positive attitude changes among Interview4 participants 12.5%; however, this change was inflated by a participant who had a positive percentage change of 600%. Excluding this participant resulted in a negative but negligible -0.7% change in our results. We attribute the seemingly stable attitude change to Interview4's ability to inspire job seekers' self-reflection, as discussed next, which thus mitigated negative changes in their attitude.

At least three Interview4 participants (P38, P40, P119) described having clearer employment goals, in their interviews, and making adjustments as a result. This suggests changes in their assessment of their job search progress, their job search strategy, and consequently, their job search attitudes. For instance, after participating in the study, some participants planned how they would develop their careers versus how they would find their next job. P38 stated that she developed an awareness of what she wanted to do during the time she spent in our study. Answering the Interview4 questions and going through the job search fostered P38's attitude change.

"*Interview4 along with just doing the job searching. It just made [me] more aware, like what I want to do... [It] made me think of more career than just getting a job.*"

After becoming more aware of what she wanted to do, P38 began to break her job search into multiple steps and decided to find an internship before getting a job in her focus area. We

did not observe such attitude changes in our interviews with Review-Me or control group participants.

Job Search Intention and Behavior

In terms of intention and behavior, our results varied across groups. There was a modest increase in Interview4 participants' intention and behavior change 4.4%, and a small negative change among our control group -1.6%. In contrast, Review-Me participants' changes were more negative -17.4%, which suggests that they spent much less effort on job search activities than they intended to, and our interview results suggest that this occurred because participants changed their job search strategy.

Five of the six Review-Me participants began to plan their long-term goals to have a career and work-life balance, and recognized the effort required to achieve their goals. P52, one of the few participants who had a bachelor's degree, was looking for a position as a social worker. An employer declined her application because she did not have the training required for the position. After the post-treatment session, P52 continued to look for part-time jobs but kept in contact with the research team for advice about available educational resources at the university to complete the training she needed. Similarly, P2 and P63, both of whom had physical impairments and were in their 60s, decided not to look for a job. Instead, P2 participated in a training program and P63 decided to start a business. This made their use of Review-Me less relevant and they stopped using the tool. As a result of planning for other intermediary goals, their intentions did not directly transfer to the behavior that our scales assessed. P98 and P127 slowed their job search because of family and health issues but continued to use Review-Me for resume feedback during the deployment.

DISCUSSION

We begin by discussing our most salient results, which highlight the importance of designing tools to incorporate positive feedback and self-reflection. Our results suggest that this helps to promote self-efficacy among resource-constrained job seekers. We then briefly offer suggestions for tools to increase job seekers' sense of social support or subjective norms given positive changes in subjective norms and perceived social support. Finally, we reflect on challenges uncovered in our research. We propose strategies going forward to make research more accommodating for underrepresented job seekers to participate in field studies. This is especially important given our retention challenges.

Positive Feedback, Self-reflection, and Self-efficacy

Although we did not conduct in-depth statistical analyses due to our small sample size, we saw positive trends in job seekers' self-efficacy, primarily among our Review-Me participants. Our interview results suggest that positive resume feedback from volunteers and job seekers' self-review of their videos led to *self-reflection*, which was key in increasing self-efficacy. We draw from past HCI and psychology literature in the employment domain to help contextualize our results.

Self-efficacy is the only mediator of behavior [4] and is a key predictor of performance [4]. People with high self-efficacy show more commitment to reaching goals and find creative ways to reach them [23]. Self-efficacy can also lead to promising employment and enhance successful coping with unemployment [34]. Finally, interventions that increase job seekers' self-efficacy are associated with their perseverance in the job-procurement process [44].

Review-Me participants perceived the positive feedback they received from volunteers as a source of social support. Wenzel found perceived social support and reassurance of worth to be significant predictors of efficacy in a study investigating the social-psychological characteristics of employment training among socioeconomically-disadvantaged individuals [44]. Going forward, research should investigate additional techniques for providing positive job search feedback and ways to demonstrate social support. Our interview results suggest that job seekers need feedback in other aspects of the job process such as their self-presentation, as seen from our Interview4 results, and planning, as suggested from participants' feedback about the use of their diaries.

Self-reflection was another feature that our qualitative results suggested leads to enhanced self-efficacy. Lengelle et al. defined reflection as "*an active and intentional process of becoming conscious of and understanding experiences in order to learn from them for the future*." [22, p. 100]. Past HCI research proposed that tools like Indeed provide job seekers with an ability to reflect on the number of jobs they applied to, to help them understand whether they need to modify their job search strategies [45]. We saw from our results that Interview4 participants began to self-reflect after reviewing their videos. This self-reflection helped them to modify their interview behaviors and, for some, to modify the types of positions for which they applied. After reflecting, some of our participants realized they needed to properly train, seek self-employment, or find a temporary position to get their foot in the door.

Reflection is necessary for successful career-identity development. However, it is important that self-reflection does not lead to rumination [22], which we did not see from our results. Going forward, researchers should investigate ways for employment interventions to incorporate methods such as career narratives, which foster reflection and support people's ability to design their possible selves [22]. While one's job search attitude might be more positive earlier in the job search process, these attitudes are likely to decline over time, especially for long-term unemployed job seekers [41]. However, these reflections offer an opportunity to put forth effort toward new strategies and possibly improve job search attitudes. Opportunities exist to investigate whether such techniques could buffer the effects of long-term unemployment on job search attitude. This is essential given the changing nature of work and overall decline in opportunities for stable employment.

Enhanced Subjective Norms and Social Support

We assessed subjective norms by asking our participants to indicate how much their significant other or those important to them thought they should try to get a job. Given that Interview4 included a feature that allowed them to share their videos with others, we believed this tool would increase subjective norms. While Review-Me sent our participants' resumes

to volunteers automatically, Interview4 required our participants to send their videos on their own and none of them used this feature. While it is difficult to pinpoint a specific reason why they did not use this feature, we saw evidence that they had limited support networks, low self-efficacy, and privacy concerns. Future studies could investigate ways to address these limitations – for instance, automatically sending their videos to volunteers. This, however, would not address privacy concerns.

Although Review-Me and Interview4 provided job seekers with feedback, they did not offer job seekers a direct connection to reviewers. Ultimately, populations with limited social resources encounter difficulties in finding employment [16, 15, 45] and often face these issues alone [45]. Therefore, as suggested by one of our participants, connecting them to someone directly might have been more beneficial. Past research as it relates to job searching among low-resource job seekers speaks to the limited social support these individuals have in the process and the benefit of social capital in the job search. Future iterations of Review-Me and Interview4 should investigate whether volunteers would be willing to connect to job seekers directly to provide in-depth feedback, social support, and even mentorship.

Managing Job Seeker Attrition

Our study focused on unemployed job seekers, a significant proportion of whom had less than a college education, who were recruited from low-resource areas in a Midwestern U.S. region. As mentioned in our findings, we had an 82% attrition rate. Therefore, the data we report are primarily qualitative in nature. Nevertheless, quantitative methods have dominated in unemployment research and our results address a call for more qualitative research [30]. Such methods enhance rapport, trust, and our understanding of unemployment, and involve the researchers as co-learners [30]. We learned through further analyzing our retention rate by education that 71% of the participants we lost had less than a college degree. Slightly more than half (52%) of those who remained in the study had a college degree or higher. Again, we lost participants to time, personal issues, and more pressing events. A small amount of past research recognizes that such circumstantial factors can have an impact on job seekers' employment success and job search intensity [42]. Researchers have consequently argued for a broader understanding of these factors [40, 42]. Therefore, we propose strategies from our study and from past research to increase retention among underrepresented populations in longitudinal studies of digital interventions.

There has been a general sense of distrust in medical research among racial and ethnic minorities [5, 7], which has led to high attrition rates; however, employment challenges are slightly different. Finding employment can be a long, emotional, and frustrating process [35]. In addition, individuals facing socioeconomic disadvantage are hard to reach given the transient nature of their lives [6]. For instance, they encounter situations where they run out of money or bus passes by the end of the month, and experience very chaotic lives [6, 25]. Therefore, consistent with prior research, maintaining contact was especially challenging in our context. Our initial strategies included partnering with local organizations for participant recruitment [6] and employing multiple research assistants to manage and maintain regular contact with participants. Going forward, we suggest the use of additional researcher strategies, such as collecting close family members or friends' contact information [6] and budgeting for multiple modes and methods of contact during the study (e.g., compensation to cover participants' monthly phone bills).

In addition to meeting in person, we offered flexible data collection methods [6] such as opportunities for participants to send us their diary entries via SMS, phone calls, or in person. We provided participants with a USB camera to record their interviews in case they did not have access to such devices. We also compensated participants for their time [6], conducted a study that inherently supported their employment goals, and potentially provided an additional source of social support. We believe that a combination of our intervention, regular contact with job seekers, and the diary might have been a positive experience for our job seekers. In fact, we lost some participants because they *found* employment, which we view as an overall gain.

CONCLUSION AND FUTURE WORK

We contribute results of a longitudinal deployment of two job feedback tools across 23 underrepresented job seekers. This is a population that has received little attention in past work especially in the context of digital employment interventions [12, 17, 46]. The results of our study extend practice by providing design implications for digital employment tools: specifically, feedback features that result in self-reflection and positive feedback lead to positive trends in job-seeker self-efficacy. Our results also suggest a need for interventions that lead to self-reflection about one's career strategy to mitigate the negative changes in attitudes that can result from long-term unemployment. We contribute recommendations for designers and practitioners going forward to provide features that directly connect job seekers to those who are providing feedback for opportunities to increase social capital. We reflected on our attrition challenges and contributed new strategies [47] to increase the retention rate of deploying digital interventions among underrepresented populations in the future.

The Theory of Planned Behavior helped to frame our discussion, which led to useful insights. However, there are opportunities to consider alternative frameworks given the changing nature of work. We found that the TPB questionnaires might be slightly outdated and do not account for the changes in job search strategies encountered in our context, which is a future research opportunity [14].

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