Research Paper ■

User Acceptance of HIV TIDES—Tailored Interventions for Management of Depressive Symptoms in Persons Living with HIV/AIDS

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Abstract **Objective:** The **T**ailored **I**nterventions for management of **DE**pressive **S**ymptoms (TIDES) program was designed based on social cognitive theory to provide tailored, computer-based education on key elements and self-care strategies for depressive symptoms in persons living with HIV/AIDS (PLWHAs).

Design and Measurement: Based on an extension of the Technology Acceptance Model (TAM), a cross-sectional design was used to assess the acceptance of the HIV TIDES prototype and explore the relationships among system acceptance factors proposed in the conceptual model.

Results: Thirty-two PLWHAs were recruited from HIV/AIDS clinics. The majority were African American (68.8%), male (65.6%), with high school or lower education (68.7%), and in their 40s (62.5%). Participants spent an average of 10.4 minutes (SD = 5.6) using HIV TIDES. The PLWHAs rated the system as easy to use (Mean = 9.61, SD = 0.76) and useful (Mean = 9.50, SD = 1.16). The high ratings of behavior intention to use (Mean = 9.47, SD = 1.24) suggest that HIV TIDES has the potential to be accepted and used by PLWHAs. Four factors were positively correlated with behavioral intention to use: perceived usefulness (r = 0.61), perceived ease of use (r = 0.61), internal control (r = 0.59), and external control (r = 0.46). Computer anxiety (r = −0.80), tailoring path (r = 0−.35) and depressive symptoms (r = −0.49) were negatively correlated with behavioral intention to use.

Conclusion: The results of this study provide evidence of the acceptability of HIV TIDES by PLWHAs. Individuals are expected to be empowered through participating in the interactive process to generate their self-care plan. HIV TIDES enables information sharing about depression prevention and health promotion and has the potential to reframe the traditional patient-provider relationship.

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Introduction

The **T**ailored **I**nterventions for management of **DE**pressive **S**ymptoms (TIDES) program was designed based on social cognitive theory to provide tailored, computer-based education on key elements and self-care strategies for depressive symptoms in persons living with HIV/AIDS (PLWHAs). This study was conducted to evaluate PLWHAs' acceptance of HIV TIDES and factors associated with PLWHAs' ratings of behavioral intention to use, perceived ease of use, and perceived usefulness of HIV TIDES.

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Background

In recent years, behavioral scientists and health care providers have become more interested in empowering health care consumers with information and decision-making support on disease self-care management. Increasing access to health information can enhance patients' education about their conditions, motivate patients to participate in their care, foster social support, evaluate treatment options, and build effective coping strategies.[1,2] Consequently, many interactive computer-based interventions have been developed to provide professionally-vetted information, decision support, behavior change strategies, and emotional support for health issues.

Studies have demonstrated that use of interactive computer-based systems can improve quality of life and promote more efficient use of health care services. Positive outcomes were reported by studies that targeted people with cancer, cardiovascular disease, diabetes, asthma, as well as for caregivers of persons with chronic illnesses.[3–7] In the area of HIV/AIDS, two systems targeting the needs of PLWHAs have been developed and evaluated.

Computer-Based Health Enhancement Support Systems (CHESS) is an Internet-based system that includes an instant library, question and answer resources, means for gaining

support, a referral directory, health risk assessment, strategies for managing medical decisions, and personal stories of peers who have experienced similar problems.[8–10] In addition to HIV/AIDS, specific modules exist for breast cancer, heart disease, prostate cancer, asthma, adult children of alcoholics, and caregivers of those with Alzheimer's disease.[11]

The utility of CHESS for PLWHAs has previously been evaluated. Findings from a randomized clinical trial showed that while CHESS was in the home, its users reported increased quality of life, active life style, cognitive function, social support, and participation in health care, and decreased negative emotions.[10] They also reported spending less time during ambulatory care visits, made more phone calls to providers, and experienced fewer and shorter hospitalizations.

ComputerLink is another interactive consumer-oriented system for PLWHAs. It provides integrated information, communication, and decision support via computer terminals placed in the patients' homes.[12] A six-month randomized trial involving 57 participants demonstrated that the use of ComputerLink reduced social isolation once participants' levels of depression were controlled and that decision making confidence, but not skill, improved as a function of number of system accesses.[13]

The Science Panel on Interactive Communications and Health[14] concluded that few other health-related interventions have the potential of interactive health communications to simultaneously improve health outcomes, decrease care costs, and enhance consumer satisfaction. Communication empowers people; it can raise awareness of health problems and recommended actions and give people the health information they need to make informed decisions.

Depression and HIV

Although HIV infection and AIDS still cannot be cured, the introduction of highly active antiretroviral therapy in 1996 reduced morbidity and mortality for PLWHAs. However, it is well documented that depressed PLWHAs report more somatic symptoms, including wasting and neurologic symptoms, than do non-depressed PLWHAs. Such symptoms are associated with poor health-related quality of life, decreased functional status, and increased mortality.[15–26] Depression is identified as the most significant mental health problem and has been reported to be prevalent in nearly 50% of PLWHAs.[16,27–32]

At the present time, no mental health-related interventions other than counseling after HIV testing are recommended by the treatment guidelines.[33] No other mental health interventions have been included as the standard of care. Thus, it is a major challenge for clinicians to identify and provide proper care or referral for PLWHAs who are affected by depressive symptoms. Given the complexity of recurring courses of depression, plus the challenge of managing the mental health needs associated with living with HIV/AIDS as a chronic illness, it is a priority to develop an approach to identify individuals at risk of being depressed and to provide them with strategies for self management of depressive symptoms as a complement to the professional services that may be required.

Studies report that PLWHAs have a high drop-out rate from psychological counseling and support groups due to fear of stigmatization, distrust of the health care system, and lack of support for attendance.[34] As a strategy for early detection of and interventions for depressive symptoms in PLWHA, HIV TIDES aims to empower users not only with increased knowledge, but also through their participation in an interactive decision making process that may enhance feelings of control in their lives. A number of studies have demonstrated that populations typically characterized as underserved can learn to use such systems and may in fact differentially benefit from their use, given appropriate design and support.[35–37]

Design of HIV TIDES

Development of the framework of HIV TIDES was guided by Social Cognitive Theory[38] to provide education on key elements for managing depressive symptoms. The tailoring algorithm was based upon the results of the initial Center for Epidemiologic Studies-Depression (CES-D) assessment and the secondary assessment (Stages of Change Questionnaire, Cognitive Event Schedule, and Social Activities Questionnaire).[39–42] Messages were developed following Kreuter's tailoring framework concepts.[43]

The 20-item CES-D was the first level assessment in HIV TIDES. CES-D scores were used for the intervention pathways because the instrument is multi-factorial thus facilitating tailoring of specific self-care interventions. The instrument has sensitivity for detecting major depression between 80% and 95% when a cutoff of 16 points or greater is used. The average score for the general population is eight. The score represents the level of depressive symptoms instead of identifying specific depressive disorders. The cut-off points of 8 and 16 (total range from 0 to 60) were used to divide system users into three major groups which determined the tailoring path the users would experience (minimum, moderate, or severe level of depressive symptoms). Individuals with minimum level of depressive symptoms receive messages to reinforce their health behaviors related to physical activity, positive thoughts, pleasant social activity, and medication adherence. Those with severe level of depressive symptoms are educated with the definition of depression diagnoses and the available treatment options. They are highly encouraged to have the psychiatric evaluation done by their clinician to confirm the possible diagnosis. For individuals with moderate level of depressive symptoms, depending on the score of CES-D sub-scales, they are divided into three groups to work on increasing physical activity, practicing positive thoughts, and participating in more pleasant social activities. HIV TIDES then provides symptom education, secondary assessment, review of current status, interactive goal setting, practice planning, and the final summary of all the information provided. The users are encouraged to print the summary to keep as their personal reference and discuss it with their providers. The user can also track his or her past history with HIV TIDES every time they log into the system to review their progress.

The prototype of HIV TIDES was created with Dreamweaver MX 2004 by using HTML, JAVA script, and PHP computer language and supported by a MySQL database. The system's compliance with the majority of usability concepts and current standards were confirmed by a heu-

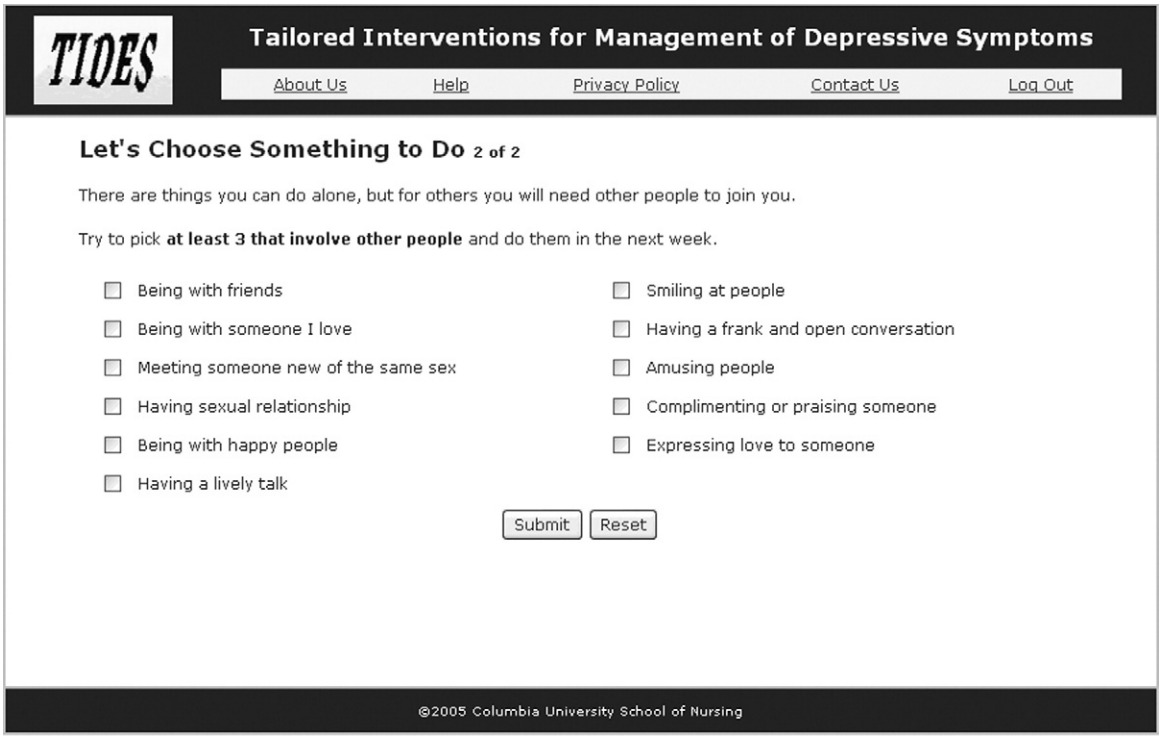

Figure 1. Sample Message for Individuals with CES-D Score between 8 and 16 and Checked Higher Score on Interpersonal Sub-scale for Personal Goal Setting.

ristic evaluation and usability tests with intended end-users.[44] HIV TIDES was iteratively refined based upon review by domain experts and the results of the usability evaluation. This included adding more content related to depression and its treatment and decreasing the readability level and word count of the tailored messages. The final prototype consists of 73 messages with an average readability level of 6.0 and word count of 103 (Figure 1).

Technology Acceptance Model

The Technology Acceptance Model (TAM) suggests that two specific beliefs—perceived ease of use (PEOU) and perceived usefulness (PU)—determine one's behavioral intention to use (BI) a new technology, which has been linked to subsequent usage behavior.[45–48] It is assumed that when someone forms an intention to act, he or she will be free to act without limitation. Consequently, BI is considered as equivalent to technology acceptance in the study.

Venkatesh and Davis proposed an extension of TAM, TAM2, which incorporates additional theoretical constructs spanning social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and PEOU).[47] Later, Venkatesh (2000) published the modified TAM that was mainly focused on behavioral constructs related to PEOU.[49] The modified model proposes control (internal and external), intrinsic motivation, and emotion as anchors that determine early PEOU of a new system. With increasing experience, it is expected that system-specific PEOU, while still anchored to the general beliefs regarding computers and computer use, will adjust to reflect objective usability, perceptions of external control specific to the new system environment, and system-specific perceived enjoyment.

Both TAM2 and modified TAM were used to build the conceptual model of HIV TIDES acceptance (Figure 2). Two constructs in modified TAM (computer playfulness and perceived enjoyment) and four in TAM2 (voluntariness, image, output quality, and result demonstrability), were excluded due to their lack of relevance to HIV TIDES design and implementation. Sociodemographic variables, including age, education, and level of health literacy were considered variables that would have moderating effects on objective usability associated with PEOU of HIV TIDES and were added to the conceptual model.

Research Questions

The cross-sectional design of this study was intended to answer the following research questions:

1. What are PLWHAs' ratings of BI, PEOU, and PU related to HIV TIDES?
2. What are the correlations among PLWHAs' ratings of BI, PEOU, and PU and other factors in the conceptual model?

Methods

Sample and Setting

The study received IRB approval from Columbia University Medical Center (CUMC). Users were recruited at the HIV clinic at East Harlem, New York using the IRB approved flyer. In the first two months of the pilot study, the investigator only received five subjects referred from this clinic. Consequently, an IRB modification was submitted to add an individual medical office in the Bronx to increase the number of subjects referred. Clinicians (nurse practitioners and physician assistants) in the clinic distributed recruitment flyers to their patients with HIV/AIDS. The snowball technique was also adopted. Individuals who learned about the

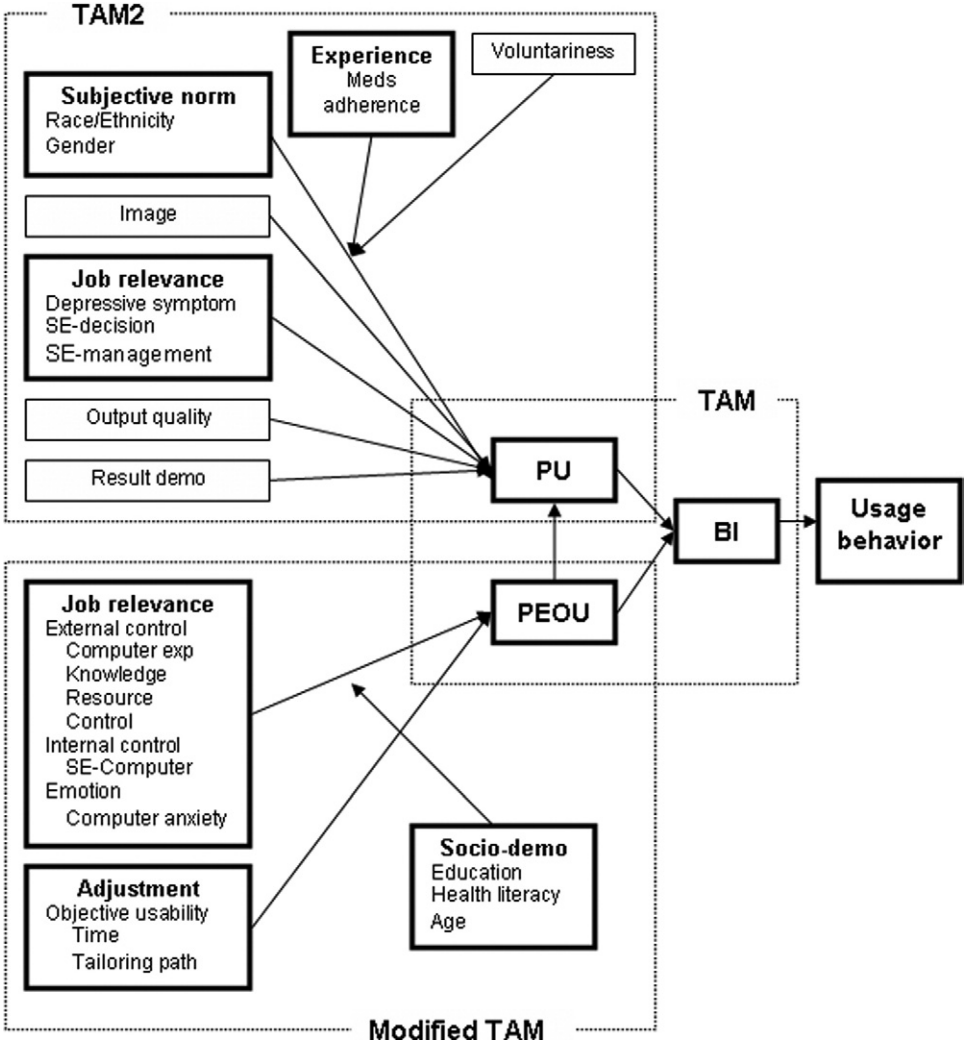

Figure 2. Conceptual Model for HIV TIDES Acceptance Evaluation.

pilot study case recruitment from their friends living with HIV/AIDS were also included. Inclusion criteria were self-identified as HIV positive and English literate. Age under 18 and pregnancy were two exclusion criteria.

Measurement

Operationalization of Study Concepts

Based on the proposed conceptual model, variables were selected to represent the concepts that were intended to be assessed. For three concepts covered that representing anchors that related to PEOU, emotion was operationalized by computer anxiety; *internal control* was defined as an individual's belief about her/his ability to perform a specific task/job using a computer and operationalized by computer self-efficacy; and, *external control* was defined as facilitating conditions, and operationalized by knowledge, resource, and control. Computer experience was added and was operationalized by questions related to experience with computers, the Internet, and e-mail. On the other hand, *objective usability* was relevant to users' actual interaction with the system. It was operationalized by variables that affected the user's experience with HIV TIDES, including the time the user spent on the individual session and the tailoring path that the user experienced based on user's CES-D score (CES-D group).

HIV TIDES was designed for self-care management of depressive symptoms. Therefore, the construct of *job relevance* of PU in this model was operationalized by variables that related to this purpose, such as level of depressive symptoms, self-efficacy of shared decision making with health care providers (SE-decision), and self-efficacy of disease management in general (SE-management). The *subjective norm* in this conceptual model was set to represent values of the culture and gender groups. *Experience* was considered to have a direct effect on PU and was defined by another self-care activity similar to the acceptance of the self-care strategy (i.e., HIV TIDES), including medication adherence and self-efficacy for medication adherence (SE-adherence).

Measurement Instruments

Seven standardized instruments were used for data collection: the Rapid Estimate of Adult Literacy in Medicine (REALM), scales for SE-decision and SE-management, Morisky Non-adherence Scale, SE-adherence in HIV treatment, Beck Depression Inventory II (BDI II), and the TAM Scale.[39,49–54] Two questionnaires were created to collect information on computer experience and socio-demographic background (Table 1).

REALM[50] was used to evaluate the level of health literacy. The three-item SE-decision and five-item SE-management

Table 1 ■ Constructs in the Conceptual Model and Measurement

Construct/Concept	Variable	Measurement
BI		TAM Scale
PEOU		TAM Scale
PU		TAM Scale
PU-Job Relevance	Depressive symptoms	BDI II
	SE-decision	SE- decision scale
	SE-management	SE-management scale
PU-Subjective Norm	Race/Ethnicity	Sociodemographic survey
	Gender	Sociodemographic survey
PU-Experience	Medication adherence	Morisky Non-adherence Scale, SE-adherence
PEOU-Anchor		
External Control	Computer experience	Computer experience survey
	Knowledge	TAM Scale
	Resource	TAM Scale
	Control	TAM Scale
Internal Control	Computer self-efficacy	TAM Scale
Emotion	Computer anxiety	TAM Scale
PEOU-Adjustment		
Objective Usability	Time	Time to complete the session
	Tailoring path	CES-D assessment
PEOU-Sociodemographics	Health literacy	REALM
	Education	Sociodemographic survey
	Age	Sociodemographic survey

assessments were based upon the scales developed by Lorig and her colleagues.[51] The Morisky Non-Adherence Scale and two questions related to SE-adherence were used to evaluate the medication adherence in PLWHAs.[52–53] The BDI II, a validated instrument with 20 items for assessing level of depressive symptoms in the past two weeks, was used to collect information related to participants' current mood status.[54] Although BDI II scores are more limited in scope (primarily addressing mood), it was used for comparison with other interventions that assess level of depressive symptoms. The TAM scale contains eleven questions comprising the constructs of BI, PU, PEOU, and three concepts (internal control, external control, and emotion) related to the construct of "anchor" in TAM.[49] Respondents rated their agreement with each TAM scale question on a scale of 1 to 10. The background questionnaire collected information related to gender, race, age, ethnicity, and education and the computer experience survey asked questions related to prior computer, Internet, and e-mail experience, as well as the location and frequency of computer usage.

Data Collection Process

The study was conducted in the usability laboratory at CU School of Nursing. Participants spent less then ten minutes to complete all the paper-based questionnaires except for the TAM Scale before they started HIV TIDES. Those who had no prior computer experience received a brief computer skills orientation using TIDES training session. All participants worked on their own session independently. Only one participant requested assistance and that was related to clarification of a CES-D question. After the completion of the TAM Scale at the end of HIV TIDES session, a short individual debriefing session was conducted by the investigator to ensure that the user did not experience any mental distress due to the study participation. All participants completed all questionnaires. There were no missing data.

Analysis

Descriptive, correlational analyses, paired-t tests, and analyses of variance (ANOVA) were conducted using SPSS 13.0 for Windows (Chicago, IL).

Results

Descriptive Analyses

Thirty-two PLWHAs were recruited for the study. This sample size meets minimal criteria for correlational research and was considered adequate for the pilot study. The sample was predominantly African American (AA) (69%), male (66%), in their 40s (63%), and had high school or less education (69%). More than half (56%) of the participants had only high school level health literacy. Most subjects (94%) had prior computer experience but only eight (25%) had used a computer on a regular basis. The majority (81%) had used the Internet and 66% had used e-mail before.

Participants spent an average of 10.4 minutes (SD = 5.6) completing their HIV TIDES sessions. The amount of time associated with the three tailoring paths in HIV TIDES (CES-D < 8: n = 11, Mean = 6.4, SD = 2.1; CES-D $> = 8$ and <16: n = 3, Mean = 24.3, SD = 0.6; CES-D $> = 16$: n = 18, Mean = 10.6, SD = 3.1) was significantly different ($p < 0.001$). Twenty-seven participants (84%) had a minimal level of depression as measured by BDI II = <13. Individuals generally reported a high level of SE-decision (Mean = 29.4, SD = 1.9) and a high level of SE-management (Mean = 44.1, SD = 6.93). Regarding medication adherence, less than half (44%) of the participants reported that they had forgotten to take their medication in the past. Few participants agreed that they were careless at times about taking their medication (n = 6, 19%), and sometimes would stop taking medication when they felt better (n = 3, 9%) or worse (n = 7, 22%). Most of the participants (n = 28, 88%) were confident or very confident of their ability to medication and have considered taking medications to be mostly or totally a part of daily routine (n = 30, 100%).

Participants reported high levels of BI (Mean = 9.5, SD = 1.2), PU (Mean = 9.5, SD = 1.2), and PEOU (Mean = 9.6, SD = 0.8) related to HIV TIDES.

Correlational Analyses

The correlational analyses focused on the relationships among BI, PU, and PEOU, as well as their relationships with other proposed factors in the conceptual model. Four factors were positively correlated with BI: PU ($r = 0.61$), PEOU ($r = 0.61$), internal control ($r = 0.59$), and external control ($r = 0.46$). Computer anxiety ($r = -0.80$), tailoring path ($r = -0.35$) and BDI II depressive symptoms ($r = -0.49$) showed a significant negative correlation with BI.

Table 2 ■ Relationships Between BI, PU, PEOU and Variables in the Technology Acceptance Model

	Internet Experience			E-mail Experience			Computer Use			African-American		
	Y	N	p	Y	N	p	Y	N	p	Y	N	p
BI												
n										22	10	<.01
M										9.91	8.50	
SD										0.29	1.90	
PU												
n	26	6	<.05				21	11	<.05	22	10	<.01
M	9.73	8.50					9.81	8.91		9.91	8.60	
SD	0.83	1.87					0.68	1.64		0.29	1.78	
PEOU												
n	26	5	<.01	21	10	<.05				22	10	<.01
M	9.77	8.80		9.81	9.20					9.86	9.00	
SD	0.65	0.84		0.51	1.03					0.35	1.12	

PU was significantly and positively correlated with PEOU ($r = 0.85$), internal control ($r = 0.81$), and SE-decision ($r = 0.51$) and negatively correlated with computer anxiety ($r = -0.36$). When the level of PEOU increased, external control ($r = 0.77$) increased and computer anxiety ($r = -0.48$) decreased. Other variables, such as SE-management, SE-adherence, and health literacy were not significantly correlated with BI, PU, or PEOU.

There were some significant differences in BI, PU, and PEOU between individuals with and without Internet experience, e-mail experience, and current computer use, as well as between AAs and non AAs (Table 2). Participants with Internet experience rated HIV TIDES as more useful ($p < 0.05$) and easier to use ($p < 0.01$) than those who had no prior experience. Individuals with e-mail experience reported higher levels of PEOU ($p < 0.05$) than individuals without e-mail experience; and those who reported current computer usage considered HIV TIDES more useful ($p < 0.05$) than their counterparts. AAs reported significantly higher ratings of BI ($p < 0.01$), PU ($p < 0.01$) and PEOU ($p < 0.01$) than non AAs (Hispanic and other).

Discussion

Although the conceptual model for evaluation of HIV TIDES acceptance was based on TAM, TAM2, and modified TAM, the results did not fully support the proposed relationships in the model.

Relationships between BI, PU, and PEOU

According to TAM, system acceptance is predicted by BI, which is related to PU and PEOU. Consistent with TAM, in this pilot study, PU and PEOU were both highly correlated with BI ($r = 0.61$, $p < 0.01$). Findings reported by Lederer et al. supported that both PU and PEOU predicted web use for work-related tasks.[55] However, many other studies reported that only one major factor, either PU or PEOU were significantly related to BI. In studies recruiting college students, administrative staff, knowledge workers, and system developers PEOU was considered the most important factor affecting the acceptance and actual use of technology.[47,56–57] On the other hand, PU was a strong determinant of BI but not PEOU when targeting subjects with professional backgrounds, such as physicians, and others such as online shoppers.[58–62] Keil et al. concluded that PU is more important than PEOU in determining whether or not to use a technology especially for professionals, and explained that "no amount of ease of use will compensate for low usefulness."[63]

Regarding the relationship between PU and PEOU, the results of this study indicate that there is a strong positive correlation ($r = 0.85$, $p < 0.01$). In contrast, many workplace technology adoption studies[55,63] have found the relationship between PU and PEOU to be less significant than that with BI. Given the small sample size of this study, the investigators were not able to explore how other factors mediate the relationship between PU and PEOU.

Relationships between BI and Other Variables

Computer Anxiety and BI

Computer anxiety showed the highest correlation level with BI ($r = -0.80$, $p < 0.01$) among all other factors proposed in the conceptual model, indicating that PLWHAs with higher levels of anxiety tended to report lower levels of HIV TIDES acceptance. These findings are consistent with the results of Werner and Karnieli[64] who reported that higher levels of technology anxiety were associated with less positive attitudes to telemedicine and indirectly affected willingness to adopt the information technology for health management. Other studies have also demonstrated that technology anxiety is a key variable related to attitudes towards and acceptance of technology.[65–66] However, most studies examining the outcomes of telemedicine applications showed little technology-related anxiety among users and concluded that technology anxiety is a barrier that can be overcome by providing appropriate information.[65–67]

In this study, in which PLWHAs did not have frequent computer access in the daily lives, computer anxiety was the dominant determinant that predicted the intention to use HIV TIDES. Training and participation in implementation promote the acceptance of technology. The science of training is well established. Not surprisingly, well designed training programs have been shown to promote end user acceptance of technology.[68–70] In addition, training promotes self-efficacy and intrinsic motivation, key variables associated with acceptance of technology.[47–50] Appropriately designed end user participation in the implementation of new technology can also increase the likelihood of acceptance.[71–73]

Level of Depressive Symptoms and BI

Individuals with a higher level of depressive symptoms as measured on the BDI II tended to report a lower level of BI

($p < 0.01$). An increased BDI II score indicates a higher possibility of a depression diagnosis, which may show the typical symptoms of hopelessness, helplessness, and loss of interests. While this finding is consistent with studies that report that HIV risk reduction interventions are less accepted by individuals who report higher levels of depressive symptoms,[74–75] given that only five persons had BDI II scores indicating greater than a minimal level of depression further study is warranted to determine if this relationship is confirmed in a larger study.

CES-D Group

The tailoring path was considered to be a variable related to PEOU since PLWHAs received tailored information based on their CES-D score. Individuals who had CES-D scores greater than 16 had lower levels of BI than those with lower CES-D scores. The HIV TIDES user interface reflected a standard template that showed very few differences on each page, however, a possible variable affecting BI was the tailored information that was delivered based upon CES-D score. Comments received in the debriefing session provided some insights about this result. Several participants who received a CES-D score above 16 stated that at the time of receiving a possible depression diagnosis, users would like to learn as much as possible about depression and the information provided by HIV TIDES for this specific subgroup was not sufficient for this purpose. The future refinement of HIV TIDES is planned to reflect this input. The differences of BI among CES-D sub-groups might also partly be affected by their level of depressive symptoms as described in the previous section, since there was a significant correlation ($r = 0.50$, $p < 0.01$) between BDI II score and CES-D group.

Self-efficacy

In this pilot study, two different components of self-efficacy, SE-decision and SE-management, were measured to reflect the different aspects of PLWHAs' levels of confidence in managing depressive symptoms. The results from the correlational analyses showed that SE-decision was positively correlated with PU ($p < 0.01$), but had no significant relationship with PEOU. There were no significant correlations between SE-management and PU or PEOU.

Although an improvement in general self-efficacy has been reported by several interactive health education interventions that teach disease self-management skills and information,[76–78] it is difficult to compare the results of this study with findings from previous studies since this was not an intervention study. Plus, most published studies did not explore the relationship between self-efficacy and the acceptance of the interventions.

Werner and Karnieli conducted a survey to assess attitudes toward acceptance of telemedicine, indicating that positive attitudes toward a more traditional relationship between doctor and patient were associated with decreased willingness to use telemedicine for routine care.[64] On the other hand, Klonoff and Schwartz reported that patients' active involvement in their own health care improves health outcomes. "Activated patients" are central to both the process and the ultimate outcome of several proposed models for patient empowerment, including informed choice of insurance plan, shared decision making, and self-management.[79] Both processes and outcomes can be affected by patients' active participation in their own health care. However, further research is needed to clarify why SE-decision rather than SE-management was significantly associated with PU of HIV TIDES, a self-care management intervention. In addition, a longitudinal study should be conducted to explore how users of HIV TIDES utilize the system assessment and recommendations to meet their self-care and disease management needs.

Computer Experience

Computer experience (current computer use, e-mail experience, and Internet experience), variables were not significantly associated with BI. However, PLWHAs who reported prior Internet experience reported had higher PU ($p < 0.05$) and PEOU ($p < 0.01$) scores than those without Internet experience.

A possible explanation of the finding could be that similar computer operating skills were required to use HIV TIDES as to use the Internet. Plus, the design was compliant to the usability rules of a general web site.[44] It is also possible that PLWHAs with Internet experience had prior experience with using the Internet for health-related purposes. Based on the report from Pew Internet and American Life Project,[80] more than half of Internet users state that they have searched the Web for health information and believe that Web-based health information improved the way they take care of themselves, affected their decisions about treatments and care, and led to more questions for their physician or to obtaining a second opinion. This suggests that individuals who are involved in more Internet activities, not merely the computer experience, might have a greater tendency to accept a disease management information intervention and the related technology. However, more information should be collected to further explore how Internet use affects the acceptance of an information intervention such as HIV TIDES.

Race/Ethnicity

Differences among racial and ethnic groups have been widely reported in studies of self-care management health behaviors. In this study, AAs showed a higher level of BI, PU ($p < 0.01$) and PEOU ($p < 0.01$) than non AAs ($p < 0.01$).

Racial and ethnic differences in beliefs about treatment modalities were found in a study recruiting 829 depressed adults (659 non-Hispanic whites, 97 AAs, 73 Hispanics), but did not explain differences in the acceptability of depression treatment or depression self-care management.[81] Chou recruited 358 PLWHAs to evaluate their self-care strategies for HIV infection and reported that race was the predominant predictor for the use of symptom self-care strategies.[82] Race (non-white vs. white = 190:168) was the only statistically significant variable in predicting the likelihood of self-comforting (odds ratio = 2.17) and help seeking (odds ratio = 5.71) being used as self-care strategies. The investigator concluded that people of color were more likely to use self-comforting and help-seeking strategies but less likely to use medications.

There is a possibility that the significant associations between AA and technology acceptance variables were confounded by computer experience since significantly more AA participants reported previous Internet experience that

those who were not AAs. Future studies are needed to explore the specific racial and ethnic issues that related to the acceptance of HIV TIDES and the confounding effect of prior computer experience.

Limitations

The generalizability of the results is limited by the sample size, inclusion criteria, and settings. Although the sample size meets the minimum criteria for correlational analyses, the relationships may vary in a larger sample. The inclusion criteria of English literacy mean that the findings may not be relevant to those who speak other languages or do not read at the 6th grade level or above. The settings were not representative of HIV clinics in New York City because we purposefully chose clinics in medically underserved areas with a high incidence of HIV/AIDS. Furthermore, the fact that only three participants received CES-D score between 8 and 16 does not provide sufficient information regarding PEOU and PU of HIV TIDES in those with a moderate level of depressive symptoms.

The main concern of the correlational research design is that the method can only assess the level of relationships between factors rather than infer causal relationships. An experimental design is needed to further explore the relationships found in this study. The efficacy of HIV TIDES should be tested in a randomized controlled trial. In addition, future longitudinal studies should examine relationships between users' intentions and actual behavior.

Conclusion

Depression is associated with all dimensions of health-related quality of life for PLWHAs. Screening tools improve case finding and encourage early treatment. HIV TIDES is designed to assess users' level of depressive symptoms, identify individuals in the high risk group and those who require medical attention, automatically generate tailored self-care management strategies that correspond with PLWHAs' level of depressive symptoms and other factors, and provide tailored messages related to symptoms, diagnoses, and treatment options. The results of this study provide evidence of the acceptability of HIV TIDES by PLWHAs. Individuals are expected to be empowered through participating in the interactive process of exploring their mental health status and generating their self-care management plan. HIV TIDES has the potential to promote information sharing focusing on health promotion and disease prevention related to depression and to reframe the traditional patient-provider relationship.

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