

Symptom or Sentiment? Considerations for mHealth Interventions Designed for HIV+ Adolescents

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ABSTRACT

It is well documented that adolescents living with HIV (ALHIV, 10 – 19 years) face numerous barriers that are associated with poor adherence to clinical visits and medications. These are exacerbated in resource poor settings where transport costs often limit face-to-face clinical interactions. Despite marked poverty in many regions of South Africa, there has been a significant rise in the number of households that report cell phone ownership, with smartphones showing strong market preference in recent years. In the face of AIDS-related mortality that disproportionately affects ALHIV, an interactive and purely visual mHealth application may provide a novel pathway to promote continuity of care among young people. This early stage research investigates the potential to leverage technology to mitigate some of the extant challenges experienced by HIV+ adolescents in South Africa. This phase of the study focuses on the application's reliability when used to collect and interpret self-reported data. Differentiating between symptom and sentiment is key, as adolescence is a period during which experiential interpretations are particularly confounding.

CCS CONCEPTS

• **General** → **Conference Proceedings** • **Introductory and Survey** • **Special Purpose and Application-Based Systems**

KEYWORDS

Adolescents, Avatars, Efficacy, Emojis, HIV, mHealth, Reliability, Self-report, Sentiment, Symptom

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1 INTRODUCTION

Interventions for ALHIV designed to strengthen adherence to medicines and retention in healthcare may find benefit from leveraging the growing accessibility of digital technologies, and changing norms of communication and interaction. Interventions reliant upon SMS reminders [9], peer education [3], cash transfers [2] and treatment literacy workshops [7] have demonstrated efficacy in improving health outcomes. A range of social and economic factors may limit and obstruct the accessibility and sustainability of these interventions, for example, reading and writing literacy challenges [15]. Evidence of “what works” for HIV-positive adolescents can be scrutinised for its applicability and resonance with mHealth, including the use of virtual communication to foster greater understanding of illness symptoms [13]. Knowledge of Human-Computer Interaction [5,12] and the burgeoning use of Persuasive Technology [10,11] portends new mechanisms for understanding and promoting health-seeking behaviours among ALHIV.

However, to validate this hypothesis, it is first necessary to measure user motivation to engage via mobile pathways, and to further demonstrate precision of the tool. Core to the latter is a determination of intentionality of self reported, subjective experiences of feeling, be they clinical (e.g. pain) or emotional (e.g. sadness). Tackling this brings us to a more granular range of concepts, including Emoji Sentiment Ranking [8], sentiment analysis [4], and patient-reported outcomes reliability [6].

2 FORMATIVE RESEARCH

Early stage research to determine how to merge accessible tech innovation and unmet need within the adolescent HIV sector involved a feasibility study (manuscript in preparation). The findings from three geographically-distant participatory action research sessions with ALHIV in South Africa yielded valuable insights into: 1) how adolescents wish to engage with – and be represented virtually *within* –mHealth spaces; 2) steps required to

promote adoption and use of the tool; and 3) best practices for adhering to the *Nine Principles for Technology and Development in Innovation* to support future scalability. The Principles, defined by UNICEF, include a range of elements, including user design, requirements, sustainability, open standards, iteration, and collaboration [14]. With these insights documented and analysed through a lens of efficacy, the team found value in continuing to the development and testing phases of the project, outlined below.

3 INTERVENTION DESIGN

The mHealth intervention, dubbed “vizool.eyes” (Visual, Electronic Youth-Engaging Spaces), allows for users to select and drag an emoji to an area on their personalised avatar to report pain or discomfort (Figure 1). The purpose of this action is for participants to self-report on clinical symptoms. In the example shown, the subject may be



reporting a headache, possibly related to anti-retroviral drug side effects. Alternately, it may indicate sadness.

Figure 1: Drag-and-drop self-report user interface

3.1 Methods

To unpack differences of intention, the research will initially measure the reliability of self-report at enrolment (T_0). Subjects will be asked to use the app to report 10 symptoms known to be prevalent in HIV (e.g. fever, nausea, etc.) using a range of 10 emojis. This will allow for simplified measurement of concordance between the subject report and the automated interpretation. Reliability will be measured using the kappa statistic (Table 1). Reliability coefficients using visual analogue scales (the closest available reference aligned with this study) should measure ≥ 0.70 in a research environment to be deemed acceptable [1]. Based on this approach, a set of binary outcome measures for 5% significance and 80% power requires a sample size of 118 subjects.

Table 1: Reliability measures for kappa calculations

	Subject Interpretation		
	Clinical	Sentiment	Total
Automated	Clinical	a	b
	Sentiment	c	d
	Total	f1	f2
			n

*g1 and g2 correspond to the marginal totals for the application, and f1 and f2 to the marginal totals for the subject's interpretation

4 DISCUSSION

This abstract provides a brief of findings and considerations owing to emergent research, the purpose of which is to take the critical first step towards understanding efficacy of mHealth for

ALHIV. The authors acknowledge the potential for modification of methods and approach owing to discussion during the DH2017 conference proceedings.

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