ann. behav. med. (2009) 38:46–47
DOI 10.1007/s12160-009-9134-3

COMMENTARY

Enhancing the Scientific Foundation of Internet Intervention Research

Russell E. Glasgow, Ph.D.

Published online: 9 October 2009

The articles in this special series provide a timely and much needed synthesis of key conceptual and evaluation issues in the science of Internet-based interventions. Because of the diversity in content area, disciplines involved, and publication outlets, there has been little consistency in how Internet program are conceptualized, reported, and evaluated.

The articles by Barak et al. [1] and Ritterband et al. [2] take different but complementary approaches to conceptualizing Internet interventions. Barak et al. [1] propose a classification scheme along with key components on which Internet interventions vary. I found the key components described by Barak et al. [1] of program content, multimedia use, interactive activities, and feedback support to be especially helpful in differentiating among Internet interventions. Their Table 1 provides a useful differentiation among their four proposed categories of web-based interventions, online counseling and therapy, Internet-operated therapeutic software, and other online activities. These categories are helpful and move sequentially from more established intervention modalities to very recent, cutting edge applications about which much less is known. Their final category of other online activities, which might more descriptively be termed something like user defined interventions, encompasses many characteristics of Web 2.0 social interaction activities. This category also reminds us those Internet interventions, as well as the way in which users interact with the program, frequently evolve over time. A key implication is that interventions that seek to engage users for an extended time period may need to migrate from more static structured, developer-defined content to less structured, more user-defined interactions over time.

Ritterband et al. [2] highlight both the complexity of Internet interventions and the importance of context in this research area. Their model of nine components or nonlinear steps involved, and the areas and elements within each component, provide a relatively exhaustive framework within which to consider how Internet programs work and factors potentially associated with success. This overall model fills an important gap in the field and also presents an opportunity for subsequent, more specific theories to specify which areas (e.g., which mechanisms of change, which website characteristics) are most related to outcomes. In the absence of such theories, I offer some of my own speculations about key areas that future research can productively target within their model components. Under user characteristics, the areas of health literacy and numeracy, as well as race/ethnicity would seem to be important as does the number of comorbid conditions a patient has. In terms of website characteristic areas and elements, the level of interactivity and the use of different types of narrative (e.g., testimonials) seem especially promising.

The only component proposed by Ritterband et al. [2] with which I would quibble, is symptom improvement, which they propose as the ultimate goal of most Internet interventions. I would argue that health status or health-related quality of life should be the ultimate objective [3]. Some conditions such as obesity or smoking seem difficult to fit under symptoms, and others, such as hypertension or diabetes, are often asymptomatic. Health-related quality of life would also seem to more naturally accommodate the important areas of cost and time that fall under this component.

R. E. Glasgow (✉)
Institute for Health Research,
Kaiser Permanente Colorado, P.O. Box 378066, Denver,
CO 80237-8066, USA
e-mail: russg@re-aim.net

The articles by Danaher and Seeley [4] and Tate and colleagues [5] summarize methodological and evaluation issues especially relevant to Internet interventions. The Danaher and Seeley [4] paper provides a useful overview of key methods issues and lessons learned in web-based research. Their discussion of stages of research and the use of "blended" designs that can enhance the external validity of both stage II (efficacy) and stage III (effectiveness) research is useful. I would further suggest that within stage III, there are really two related, but different types of research. These are (1) implementation research that focuses on real-world effectiveness in a selected number of settings, and (2) dissemination research that focuses predominantly on uptake and implementation when Internet interventions are taken to scale. I would also add that in addition to blended designs, there is also a great need for mixed methods research that utilizes qualitative methods to help understand the quantitative results found.

Danaher and Seeley [4] rightly discuss the place of adjunctive designs, which provide a useful model for evaluating the impact of adding various types of human contact (e.g., e-mails from health coaches, phone calls, in-person visits) to automated interventions. With the increasing prevalence of more "convergence technologies," there is a need for such adjunctive design research that evaluates the impact of combining different interactive modalities.

Their recommendation for use of web-based control or comparison conditions in public health settings makes good sense, especially in the emerging era of comparative effectiveness research. One caveat is when comparing web-based to in-person interventions or other modalities, it may be advisable to use alternatives to or extensions of randomized designs, such as hybrid preference/randomized designs [6]. Such designs that allow a subset of participants to select their intervention condition can provide better estimates of program reach than do completely randomized designs which by definition require participants to be willing to participate in all possible conditions.

Finally, Danaher and Seeley [4] provide thoughtful comments on approaches to operationalizing engagement and appropriate cautions against making simple assumptions that more engagement is always better, or making causal interpretations of "dose-response" relationships with outcome when dose- or engagement-level is self-determined.

In addition to enhanced standardization of terminology and specification of measures, future Internet research will need to pay greater attention to economic issues and outcomes. Tate and colleagues [5] provide a useful summary of the small extant literature on the cost-effectiveness of Internet interventions and an excellent set of related resources. Possibly most helpful, they discuss and provide recommendations regarding some of the key issues in economic analyses including study perspective, incremental cost-effectiveness, and developmental costs.

Their distinction under development costs of "sunk" costs that would not be required in dissemination efforts versus nonsunk costs that would be required for adaptation and maintenance of an Internet intervention is especially important. As we see more replication and dissemination in Internet research, it will be interesting to quantify the percent of initial developmental costs that are actually sunk. Our own experience is that we have consistently underestimated the nonsunk costs required to adapt an Internet program for new settings.

One type of cost not explicitly discussed by Tate et al. [5] is recruitment costs. As discussed by Ritzwoller and colleagues [7] in a recent *Annals* article, recruitment costs are seldom reported in cost analyses but are required in any replication effort and can often be substantial. Recruitment approaches deserve greater attention in Internet research because they can vary dramatically not only in cost, but also in reach or take-up rate and in characteristics of the resulting participant sample.

In conclusion, the articles in this series provide excellent guidelines for future Internet intervention research. They should provide useful conceptual and methodological bases for much needed, direct experimental investigations of three of the most speculated about, but infrequently researched, Internet issues. These topics are the scalability of programs as they transition from initial demonstration projects to wider dissemination efforts; the reach of Internet vs other intervention modalities (and different recruitment approaches), and the extent to which different Internet applications reduce vs enhance health disparities.

References

1. Barak A, Klein B, Proudfoot JG. Defining Internet-supported therapeutic interventions. Ann Behav Med. 2009. doi:10.1007/s12160-009-9130-7.
2. Ritterband LM, Thorndike FP, Cox DJ, Kovatchev BP, Gonder-Frederick L. A behavior change model for Internet interventions. Ann Behav Med. 2009. doi:10.1007/s12160-009-9133-4.
3. Kaplan RM. The significance of quality of life in health care. *Qual Life Res*. 2003; 12(Suppl 1): 3–16.
4. Danaher BG, Seeley JR. Methodological issues in research on web-based behavioral interventions. Ann Behav Med. 2009. doi:10.1007/s12160-009-9129-0.
5. Tate DF, Finkelstein EA, Khavjou O, Gustafson A. Cost-effectiveness of Internet interventions: Review and recommendations. Ann Behav Med. 2009. doi:10.1007/s12160-009-9131-6.
6. Janevic MR, Janz NK, Dodge JA, et al. The role of choice in health education intervention trials: A review and case study. *Soc Sci Med*. 2003; 56(7): 1581–1594.
7. Ritzwoller DP, Sukhanova A, Gaglio B, Glasgow RE. Costing behavioral interventions: A practical guide to enhance translation. *Ann Behav Med*. 2009; 37(2): 218–227.