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Incomplete Reporting of Attrition in Digital or Online Health Intervention Studies: A Methodological Concern

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Dear Editor,

The rapid growth of digital health interventions, ranging from web-based diet programs to mobile mental health apps, has created diverse opportunities for health promotion research and practice. However, these opportunities are accompanied by persistent methodological problems that have not been adequately addressed, particularly the incomplete reporting of attrition in digital health interventions.

"Reporting of attrition" refers to the transparent documentation of when participants drop out, why they drop out if reasons are collected, and how dropouts differ from those who complete the intervention (1). Attrition rates vary widely across studies and populations. For example, one systematic review reported a mean attrition rate of 23.3% for digital eating disorder interventions among adolescents and young adults (2), whereas another review of culturally adapted digital mental health interventions found individual study attrition rates ranging from 5.3% to 87% (3). However, most studies report only an overall attrition percentage and omit the timing of dropout, reasons for discontinuation, and comparisons between completers and dropouts, although these details are essential for assessing internal and external validity.

One of the most important, yet least considered, stages affecting attrition is the early phase of an intervention. One study of adults using a lifestyle-promotion app found that 30.1% of participants used the app only on the day of installation, and another reported a 26.6% attrition rate during the onboarding phase alone (4, 5). Extending these findings to older populations, Hurmuz-Bodde et al. (6) observed that 32.2% of older adults dropped out in the first week and 22.2% dropped out in the second or third week, and only 45.6% completed the four-week intervention in full. This evidence indicates that a substantial proportion of participants, sometimes between 20% and 30%, drop out within the first week or during the initial registration and familiarization process.

Studies have identified a range of content-, user-, and culture-related factors as reasons for early dropout. Irrelevant or repetitive content, technical difficulties, and a lack of visual appeal are cited as major barriers to engagement with interventions (7). In addition, low digital literacy, a perceived lack of time, and a perceived lack of need for the intervention from the user's perspective also play key roles in early dropout (7, 8). In a systematic review of culturally adapted digital mental health interventions in non-Western populations, Tandon et al. (3) found that surface-level cultural adaptation, such as translation without content localization, was associated with dropout rates up to 56%, whereas deep, participatory adaptation was associated with dropout rates below 11%. These findings illustrate the potential influence of cultural factors on attrition, but they derive from a specific review and may not be generalizable across all intervention types or populations. Additionally, implicit and explicit negative user attitudes toward digital health technologies and distrust of data security have also been identified as important predictors of attrition (9). Unfortunately, most studies do not report these early attrition events separately and instead provide only final completion rates. This approach may distort the true picture of intervention adoption and retention.

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Beyond underreporting, nonrandom attrition poses a more fundamental threat to research validity. High overall attrition limits generalizability, or external validity, and the results may apply only to the most persistent participants. *Nonrandom attrition*, in which dropouts systematically differ from completers, biases effect size estimates and thereby threatens internal validity. *Nonrandom attrition* occurs when participants drop out of a study according to variables relevant to the outcome; for example, individuals with lower health literacy, less Internet access, or higher symptom severity may be more likely to drop out. This type of selective attrition biases the remaining sample and usually leads to overestimation of the true effect size of the intervention. In such cases, studies should conduct sensitivity analyses to test the robustness of the results across different methods of handling missing data.

Although studies may report only overall unit attrition rates, such as 30% attrition, they rarely provide critical information, including 1) the timing of dropout, such as during enrollment, the first week, or the last phase; 2) participant-reported reasons for discontinuation; and 3) characteristics of attrition, including comparisons of baseline characteristics between completers and dropouts. To assess nonrandom attrition, studies should routinely compare baseline characteristics between participants who complete the intervention and those who drop out. Without this information, it is not possible to determine whether the observed effectiveness reflects a true intervention effect or simply that only the most motivated and digitally literate participants remained in the study.

Collecting and reporting reasons for attrition in anonymous online studies is challenging. However, without standardized reporting, readers cannot assess whether nonrandom dropout biases effect estimates, affecting internal validity, or whether high dropout limits generalizability, affecting external validity. Therefore, we propose a minimal reporting set for dropout. Addressing this problem requires concerted action at three levels. At the researcher level, transparent reporting of attrition, including the timing of attrition, number of attritions at each stage, reasons for withdrawal, initial comparisons of completers and dropouts, and management of missing outcome data, should become a professional standard. At the journal level, journals should require authors to complete a standard checklist for reporting attrition in digital health intervention studies at the time of submission, and peer reviewers should consider this checklist as part of manuscript evaluation. At the health policy level, funding agencies and health technology assessors should interpret evidence on attrition as an indicator of readiness for implementation in real-world settings. Early or selective attrition may indicate limited acceptability, applicability, cultural appropriateness, or scalability of an intervention, even when efficacy outcomes appear desirable. Therefore, decisions about funding, acceptance, or implementation of a digital health intervention should consider not only intervention effectiveness but also the transparency, pattern, and potential bias of attrition.

Footnotes

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