The effectiveness mobile phone apps for mental health: a meta-analysis of randomised control studies.

Goldberg SB, Lam SU, Simonsson O, Torous J, Sun S (2022) Mobile phone-based interventions for mental health: A systematic meta-review of 14 meta-analyses of randomized controlled trials. PLOS Digit Health 1(1).

Problem statement

Mobile phone apps are often used as a tool for mental health self-care to reduce the symptoms and burden of mental distress and illness. This study scans and analyses the results of 145 randomised control trials to evaluate the effectiveness of mental health apps. Despite the exponential growth in literature on mobile phone mental health apps there are no clear answers on their efficacy (i.e. performance in ideal conditions) and effectiveness (i.e. performance in naturalistic contexts).

Study aim

To rigorously summarise and evaluate the strength of the available empirical evidence by bringing together a range of meta-analyses to assess the collective evidence of mobile phone app effectiveness on improving the mental health of users.

Background

The global pandemic and COVID-19 have accelerated interest and uptake of mobile health interventions, and today there are thousands of mental health apps available for immediate download. Intuitively they seem a worthwhile intervention, both in terms of accessibility (most people have a smartphone which is usually at arms-length) and scale (apps have the potential to reach many people).

The landscape has expanded to the extent that professional societies have created evaluation frameworks for MH apps, and healthcare regulators around the world are exploring new ways to categorise and regulate this burgeoning space. As interest and uptake of mobile phone-based intervention and mobile mental health interventions generally has increased, so has research on their efficacy yet definitive answers on whether they have the effect that they aim for is unclear.

Methodology

This study is meta-review of 14 meta-analytic studies that have examined mobile phone-based interventions. The studies reviewed:

- Represent 145 primary studies of randomized controlled trials;
- Represent the views of 47,940 participants;
- Were published since 2005, with 2017 being the median year of publication.

Selecting for randomised control trials was important as a measure to overcome inconsistent reporting of methodology and outcomes in the literature (such as terms of engagement, control group coding, testing of moderators, and publication bias).

Evidence was graded using the '**umbrella review methodology'** which involves applying a set of standards for stratifying and standardising evidence from multiple existing reviews to allowing for comparison.

Efficacy was measured by '**effect size'**, which is is a statistical concept that measures the strength of the relationship between two variables on a numeric scale.

Finding

In general, the study failed to find consistently convincing evidence of the efficacy of mobile phone mental health apps.

More specifically twelve of the 34 effect sizes were found to be *insignificant*, while thirteen provided *weak* evidence for mobile phone-based interventions. As the comparison parameters were tweaked to became more rigorous, the magnitude of effects and strength of evidence tended to diminish.

It is worth noting that small effect sizes were found in relation to the following:

1. There was *highly suggestive evidence* for eight effect sizes (which had a large sample) including:
   - Smartphone interventions outperforming the control group on measures of psychological symptoms (anxiety, depression, stress) and quality of life.
   - Text message-based interventions out-performing non-specific controls (i.e placebo) and active control (i.e compared with established treatment known to have a degree of effectiveness) for smoking cessation.
2. There was *suggestive evidence* that smartphone interventions produce small magnitude effects relative to active controls on depression.

Implications of this study for future of phone app use

Identifying only small effect sizes for mobile phone apps, and finding that they rarely outperformed other therapeutic interventions (described as specific active controls) raises questions of reliance on mobile phone apps for addressing the mental health crises. The article notes that this question is timely since many more apps in the pipeline.

A caveat: conclusion perhaps overstated

This article also admits that by scanning broadly, it may have missed the nuance, and that some apps are likely to have more value in terms of efficacy than others.

In addition to the lack of standardised assessment of app quality (and related constructs such as usability, acceptability, engagement), other limits and biases in the methodology included:

- *Small sample bias*: Possibility that the strength of evidence may have been underestimated due to lack of publication bias assessments within the meta-analyses themselves.
- Risk of bias associated with *lack of blinding of personnel and participants* as well as incomplete outcome data.
- *High and rapid drop-out rate of user engagement* with apps.

Revising the general conclusion about the ineffectiveness of apps is also made based on the finding that nine effect sizes were found to be 'suggestive' and 'highly suggestive'.

A revised finding

Even though the authors found no evidence of the effectiveness of mobile phone apps on reducing symptoms of mental ill-health, they conclude that apps may have a place in the landscape by virtue of being relatively low cost, having high scalability and in some cases suggestive effect sizes.

With regards to suggestive effect sizes, apps could be taken as proof-of-concept evidence that mobile phone-based interventions can at least modestly reduce some psychological symptoms (e.g., depression, anxiety).

The article suggests mobile phone-based interventions may be worth considering as one of many prevention tools, and as an initial intervention within a stepped care model. They might be useful as an adjunct to traditional treatments, even though there is only weak evidence for this use it could be trialled and followed with close evaluation.

Recommendations

The findings of this study have public health and health policy implications. Standardised, transparent, and formal evaluations of these interventions should be developed to test clinical efficacy (e.g., by the TGA), and guide consumers and providers. This possibility is dependent on future primary studies and meta-analytic research being deployed to establish under what circumstances these approaches are most effective, acceptable, and safe.

The current study highlights several important future directions for research:

- The potential of text-based notification interventions for addictive behaviours needs more understanding. Text message-based interventions appear particularly effective in supporting smoking cessation.
- Determining safety of these interventions is also essential; discussion of adverse events was almost entirely absent from the meta-analytic literature.
- Future meta-analysts could consider grading the strength of their meta-analytic evidence using umbrella review methods and include a publication bias assessment at the effect size-level (i.e., not across the full sample if studies used differing comparison types).