Theory content of digital interventions for reducing alcohol consumption: a systematic review

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Background

Excessive alcohol consumption…
- serious problem for population health
- costs the UK £21 billion each year

Digital interventions
- Cost-effective
- Broad reach
- Intervention effectiveness
  - Can be effective
  - Substantial heterogeneity

Evidence of association between intervention effectiveness & theoretical basis
- But often unclear if a theoretical basis exists to interventions
Background

Importance of using theory…
- Method for selecting & refining intervention techniques
- Accumulate evidence of effectiveness across different contexts, populations and behaviours
- Help to understand what makes an intervention effective
- Basis for refining theory & improving future interventions

Current state of reporting theory use:
- Often not reported in intervention development and evaluation
- If an intervention is described as “theoretically based”, not clear what the basis for this description is
Aims

This systematic review aimed…

i) to assess the extent to which digital alcohol reduction interventions report theory use in their development and evaluation, and

ii) whether reporting of theory use is associated with intervention effectiveness.
Research questions

1. Which theories are mentioned?

1. How is theory use reported in the interventions?

1. Explore whether reporting theory use is associated with intervention effectiveness and could explain the heterogeneity within the literature.
Methods

Included studies
- RCTs of a digital intervention targeting drinking behaviour
- Participants
  - Identified as hazardous/harmful drinkers
  - Or experienced problems as a result of drinking behaviour
- 40 trials involving 41 comparisons
  - Digital intervention vs control
  - 19,026 participants

Primary outcome measure
- Change in quantity of alcohol consumption in grams of ethanol per week at the longest follow-up time point
Methods

Theory coding procedure

- Used the Theory Coding Scheme (Michie & Prestwich, 2010)
- A reliable 19 item scale to assess extent to which behavioural interventions are theory-based
- Coding conducted by 2 researchers (good IRR)
- Differences resolved through discussion or consulting a 3rd researcher

Analysis

- Frequency counts and descriptive statistics
  - Describe theoretical basis of digital alcohol interventions
- Meta-regression analyses
  - Assess if an association exists between reporting of theory use and intervention effectiveness
## Results – Mentioned theories & models of behaviour

<table>
<thead>
<tr>
<th>Theory</th>
<th>Number of studies mentioning theory/model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivational Interviewing Theory</td>
<td>8</td>
</tr>
<tr>
<td>Transtheoretical Model</td>
<td>6</td>
</tr>
<tr>
<td>Social Norms Theory</td>
<td>5</td>
</tr>
<tr>
<td>Theory of Planned Behaviour</td>
<td>4</td>
</tr>
<tr>
<td>Social Comparison Theory</td>
<td>3</td>
</tr>
<tr>
<td>Social Impact Theory</td>
<td>3</td>
</tr>
<tr>
<td>l-change Model</td>
<td>3</td>
</tr>
<tr>
<td>Self-regulation Theory</td>
<td>3</td>
</tr>
<tr>
<td>Social Cognitive Theory</td>
<td>3</td>
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<tr>
<td>Social Learning Theory</td>
<td>3</td>
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<tr>
<td>Social Identity Theory</td>
<td>3</td>
</tr>
<tr>
<td>Theory of Social Influence</td>
<td>2</td>
</tr>
<tr>
<td>Decision-making Theory</td>
<td>2</td>
</tr>
<tr>
<td>Social Determination Theory</td>
<td>2</td>
</tr>
<tr>
<td>Health Belief Model</td>
<td>2</td>
</tr>
<tr>
<td>Expectancy Theory</td>
<td>2</td>
</tr>
</tbody>
</table>

[Graph showing the number of studies mentioning each theory/model]
Results – How theory use is reported most frequently

- Theory of behaviour mentioned: 20
- Theory/predictors used to select/develop intervention techniques: 16
- Targeted construct mentioned as predictor of behaviour: 16
- Results discussed in relation to theory: 12
- Theory-relevant constructs are measured: post-intervention: 11
- >=1 intervention techniques are explicitly linked to >=1 theory-relevant construct/predictor: 11
Results – How theory use is reported least frequently

- Theory/predictors used to select recipients for the intervention
  - Number of studies reporting this item: 0
- Refine theory: specifying that the interrelationships between theoretical constructs should be changed
  - Number of studies reporting this item: 0
- Refine theory: adding/ removing constructs to the theory
  - Number of studies reporting this item: 0
Results

Association between reporting of theory use and intervention effectiveness

• Participants receiving a digital intervention drank 23.6g of alcohol per week less than controls

• Significant level of heterogeneity between studies ($I^2=78\%$, $p<.001$)

• Potentially explained by study-level covariates such as reported theory use
Results

Associations between reporting of theory use and intervention effectiveness

• No significant univariable associations were detected
• Effect size of two variables sufficient to examine in multivariable regression model

\[ I^2 = 74\% \quad \text{adj } R^2 = 27\% \]

<table>
<thead>
<tr>
<th>Theory Coding Scheme item</th>
<th>B (SE)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one, but not all, of the intervention techniques are explicitly linked to at least one theory-relevant construct/predictor</td>
<td>28.0 (14.5)</td>
<td>.061</td>
</tr>
<tr>
<td>Changes in measured theory-relevant constructs/predictor</td>
<td>-32.5 (16.8)</td>
<td>.061</td>
</tr>
</tbody>
</table>
Conclusions

• Limited reporting of theory use in digital alcohol interventions

• $\sim \frac{1}{2}$ mentioned a theory or model of behaviour

• $> \frac{1}{3}$ reported using theory to develop the intervention

• None reported using theory to
  – select intervention recipients
  – refine theory

• No evidence reporting of theory use is associated with substantial heterogeneity between interventions
  – current literature is insensitive to addressing more general question of whether good quality use of theory in designing digital alcohol interventions may be associated with more effective interventions
Limitations

• Meta-regression analysis had limited power
  – Needed over 200 trials for a power of 80% (Hempel et al., 2013)
  – Cannot draw a conclusion as to whether an association does not exist or there was insufficient power to detect one

• Can only code for the reporting of theory use
  – Lack of reporting ≠ lack of use

• There is room for improvement in the way we currently report use of theory
  – Not applied thoroughly or consistently
  – Unclear selection, application & reporting of theory use
  – Use of inappropriate theories
Discussion

• Digital interventions provide a great opportunity to…
  – Report behaviour in real-time
  – Improve our understanding of behaviour & theories of behaviour
  – Develop & use dynamic, temporally sensitive theories

• Need to report theory use more clearly in digital intervention studies so we can…
  – Assess how useful theory is in this field
  – Use findings to refine the relevant theory and advance this field of research
Thank you for listening. Any questions?

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