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Peer Review

Review of: "Development of a Tool (CACTIS) to Aid the Design of Behaviour Change Interventions Using the COM-B Model, Behaviour Change Wheel, and Behaviour Change Techniques Ontology"

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The purpose of this article is to report on the development of the CACTIS ('COM-B Assessment Criteria to Intervention Strategy') online research tool for developing behavior change interventions. This work is an extension of previous work conducted by authors that included creating the Capability, Opportunity, Motivation-Behavior (COM-B) model and the Behavioral Change Wheel framework designed to help practitioners and researchers maximize the potential impact of interventions. The online tool is designed to help users move through three steps of the framework, including problem specification, identifying targets to attempt to influence to achieve the behavioral goal, and selecting the behavior change functions and techniques most appropriate for influencing those targets.

The goal of CACTIS is to present users with a "curated set of potential mappings of COM-B targets to IF/BCT combinations…to promote interoperability with existing research and to maximize the contribution of any evidence gathered to research going forward." In addition, the tool was designed to provide users with a mechanism for documenting decisions and incorporating qualitative feedback in addition to quantitative evaluation metrics. Finally, CACTIS includes a set of criteria to assist intervention developers in making choices throughout the process. These criteria include acceptability, practicality, effectiveness/cost-effectiveness, affordability, spill-over effects, and equity.

The article describes in detail how the CACTIS Reference Database was created, with specific attention paid to potential COM-B targets, potential IF/BCT combinations, and the mapping of COM-B targets to relevant IF/BCT combinations for users' consideration. In addition, some information is provided on the

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development of the CACTIS User Interface that would draw on the Reference Database to prompt users for relevant information to consider for each of the three intervention steps. The authors describe the stakeholders that were engaged in this work as: the Behavioral Science Team in Public Health Wales, its community of practice made up of behavioral practitioners and public health officials, intervention developers in national government, international governmental organizations, private companies, and university academics.

Strengths and limitations of the article

Approaches to standardize the process and enhance the rigor involved in designing behavior change interventions are greatly needed. While there is agreement that health behaviors (particularly related to avoiding tobacco and smoking, eating a healthy diet, and being physically active) are the most effective approaches for mitigating the risk of chronic disease (Dwyer-Lindgren et al, 2017), there are surprisingly few scientifically grounded and widely accessible approaches for designing population-level interventions. Several important approaches have been developed, including Green and Kreuter's Precede-Proceed model (Green and Kreuter, 2005), Intervention Mapping (Bartholomew Eldredge et al, 2016), Lytle's four-phase, 12-step approach for designing community interventions (Lytle, 2022), and the work by Michie and colleagues on the Behavior Change Wheel and Behavior Change Techniques (Michie et al 2011,2013; 2021). Tools that make these tested intervention approaches more accessible to practitioners and researchers are greatly needed.

The description of the tool is very thorough. However, it would be very helpful to add some information in the Background section of the paper, possibly in a table, that briefly describes the COM-B, BCT taxonomy, and the Intervention functions for readers who are not very familiar with these tools and concepts.

An important limitation of the manuscript is that it does not present sufficient information on qualitative or quantitative feedback collected during the development process from stakeholders who were less directly involved in creating the underlying framework. Although the manuscript indicates that behavioral practitioners and public health officials were among the stakeholders engaged in developing CACTIS, there is little detail on how they were involved in the design, development, and early user testing of CACTIS. No information is provided on how user experience was elicited, the behavioral science expertise of the users, what changes resulted from stakeholder feedback, or measures of usability, perceived utility, or user burden collected. Most of the comments about the development and review of

CACTIS refer to decisions made by team members who were closely involved with developing the existing ontology and framework.

In a related concern, a question that remains is whether, and to what extent, researchers and practitioners will actually use CACTIS. The resulting Reference Database is quite complex and includes 27 COM-B targets, 112 BCTs, 148 IF/BCT combinations, and 239 COM-B Target to 1F/BCT mappings. As noted in the Discussion section, using the tool requires an in-depth understanding of the Behavioral Change Wheel framework, the COM-B model, and an understanding of behavior change techniques and intervention functions. This raises an important issue concerning the intended audience for the tool. The vast majority of individuals responsible for implementing interventions in communities have little to no experience in the behavioral sciences. Even master's level practitioners working on community intervention teams can struggle to understand behavior change taxonomies and intervention functions and, more importantly, how they translate into intervention content and strategies (Lytle et al, 2022).

Before the use of CACTIS is widely promoted, evidence of its utility and usefulness by practitioners and behavioral researchers should be established. The authors acknowledge that CACTIS has not yet been formally evaluated. The evaluation of CACTIS should include formative work whereby practitioners and researchers who are not part of the team responsible for the ontology are asked to engage with CACTIS to design a hypothetical intervention. Both quantitative and qualitative methods should be used to assess user experience, including usability, comprehension, perceived utility, time required, confidence in decisions, and the extent to which different users arrive at similar intervention strategies. However, an evaluation will be challenged by the intent stated in the Discussion section that CACTIS is intended, '...to be a living tool rather than a fixed artifact.' The authors should therefore identify the core components of CACTIS that will remain sufficiently stable to permit formal evaluation.

Beyond the need to evaluate how CACTIS is used and the extent to which it is useful to practitioners and researchers, the development of CACTIS raises several broader questions about intervention-design frameworks and their contribution to population health. One important question is whether the use of systematic intervention-design approaches actually results in more effective interventions and, ultimately, greater improvements in public health. While there is good evidence that considering behavior change techniques in the development of interventions leads to greater behavior change (Nadal et al, 2024), there is limited evidence to suggest that the use of any of the available intervention design approaches leads to more effective interventions. In addition, there are no comparative trials that evaluate the effectiveness of one intervention design approach compared to another or to a usual control

condition. An even greater need is to better understand how non-behavioral scientists, specifically those researchers developing community intervention trials and those practitioners working in local health departments and other health agencies, use the intervention tools being developed.

The ultimate goal of health research is to improve population health. To that end, the approaches, frameworks, and tools we develop should be evaluated not only on process measures such as reach, feasibility, acceptability, usability, and cost, but also on whether their use produces more effective interventions and, ultimately, better health outcomes. CACTIS is a potentially valuable contribution to the field, but establishing its utility will require evidence that extends beyond the development and description of the tool itself.

Citations:

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Declarations

Potential competing interests: No potential competing interests to declare.