



# CO-DESIGNING BEHAVIOUR CHANGE PROTOTYPES WITH PAEDIATRIC PHYSICAL THERAPISTS: INTEGRATING INSIGHTS ON BEHAVIOUR AND SOCIAL SYSTEMS IN A PARTICIPATORY DESIGN PROCESS

Anita van Essen<sup>1</sup>, Sander Hermsen<sup>2,3</sup>, Eline Bolster<sup>2</sup>, Manon Bloemen<sup>2</sup>,  
Christa van Gessel<sup>1</sup> and Remko van der Lugt<sup>1</sup>

<sup>1</sup>Co-Design Research Group, Utrecht University of Applied Sciences, Utrecht, NL

<sup>2</sup>Lifestyle and Health Research Group, Utrecht University of Applied Sciences, Utrecht, NL

<sup>3</sup>One Planet Research Center, Wageningen, NL

## Abstract

('Co-)Designing for healthy behaviour greatly benefits from integrating insights about individual behaviour and systemic influences. This study reports our experiences in using insights about individual and systemic determinants of behaviour to inform a large co-design project. To do so, we used two design tools that encourage focusing on individual determinants (Behavioural Lenses Approach) and social / systemic aspects of behaviour (Socionas). We performed a qualitative analysis to identify 1) when and how the team applied the design tools, and 2) how the tools supported or obstructed the design

process. The results show that both tools had their distinctive uses during the process. Both tools improved the co-design process by deepening the conversations and underpinnings of the prototypes. Using the Behavioural Lenses under the guidance of a behavioural expert proved most beneficial. Furthermore, the Socionas showed the most potential when interacting with stakeholders, i.c. parents and PPTs.

Keywords: co-design, behaviour change, social systems, participatory design, physical therapists



## Introduction

Designing for healthy behaviour greatly benefits from integrating theory and evidence on individual behaviour change (Hagger & Weed, 2019) and socio-systemic influences on behaviour (Dahlgren & Whitehead, 1999). Unfortunately, using theory and evidence to inform the design process remains exceedingly difficult: they are often seen as 'impenetrable' (Pettersen & Boks, 2008), suffer from limitations in applicability (Hermsen, Renes, & Frost, 2014), and tend to limit 'designerly drifting' (ibidem). Designing for the tension between individual behaviour and its context (e.g. the social system) remains especially problematic (Tarquino et al., 2015).

The past years have seen a range of efforts to support designers in using behavioural scientific theory and evidence in their work (cf. Tromp, Daalhuizen, & Renes, 2018). Most of these methods lack rigorous evaluation, however (Hermsen, 2019; Tromp & Hekkert, 2016). Furthermore, there are as yet no studies looking into the possibilities of combining insights on both individual and socio-systemic aspects of behaviour change.

The current paper contributes to bridging this gap by presenting a case study in which a method for designing for individual behavioural change (Behavioural Lenses Approach; Hermsen et al. 2019) is combined with a method for designing for social-systemic influences (Socionas; Postma, 2012). To answer our main research question, whether these tools contribute to the design process and outcomes of the case study, we assess three aspects of design performance (Tromp & Hekkert, 2016): design quality (DQ), process quality (PQ), and process efficiency (PE). DQ refers to the extent the design outcomes are effective in addressing the intended behaviour change and social dynamics; PQ refers to the extent the design team uses the behavioural insights and social dynamics provided by the tools throughout the design process; and PE refers to the extent the design team works efficiently when applying the tools.

## Case Study: 'Wat Beweegt Jou'

'Wat Beweegt Jou' ('What moves you') is a participatory design project to develop a toolkit for paediatric physical therapists (PPTs) to promote a physically active lifestyle in children with physical disabilities. The project consisted of a range of design activities, centered around four five-day design sprints and three four-hour co-creation sessions. The sprints were performed by an interdisciplinary design team consisting of two design practitioners, two design researchers and two PPT's. The first two sprints focused on the development of tools to improve PPTs' physical activity coaching; and stimulating children's physical activity in their own life settings, respectively, resulting in eight prototypes. These were mid-fi prototypes, i.e. testable plywood or paper artefacts made with a laser cutter and color printer (see Figure 1 for an example) to represent an early model of a product.



Figure 1: An example of a physical prototype; the plywood prototype 'question dice'

The third and fourth sprint aimed at the development of a tool for establishing contact and cooperation between PPTs and social care workers, resulting in a concept for a mobile application. After the first two sprints, the mid-fi product prototypes were distributed among 14 PPTs for usability testing. 10 PPTs tested the usability of the mobile application (Sprint 3 and 4) with a clickable mock-up. Subsequently, during a 2-day session, the mid-fi product prototypes were adjusted accordingly and combined in a final 'toolbox'.

### Tools used in the case study: The Behavioural Lenses, Socionas

The Behavioural Lenses Approach (Hermsen et al. 2019) supports designers in integrating insights on individual determinants of behaviour in design activities. It consists of several tools, based on five so-called 'lenses' that represent different subsets of behavioural determinants (see Figure 2). A complete overview of all available tools, background texts, and scientific publications is available from Hermsen, 2019.



Figure 2: The five Behavioural Lenses

The Socionas (Postma, 2012) are an approach to help a design team build understanding of social structures and their influences on people's daily lives. The current project uses an iteration on the Sociona approach proposed by Van Gessel, Van der Lugt and De Vries (2018). While the original approach relies heavily

on play acting as a means for designers to develop insight in social dynamics, Van Gessel et al concentrate on developing visual descriptions of the systemic dynamics of people in different social roles, using basic personas as building blocks to capture variations in prototypical dynamics (see Figure 3 for an example).

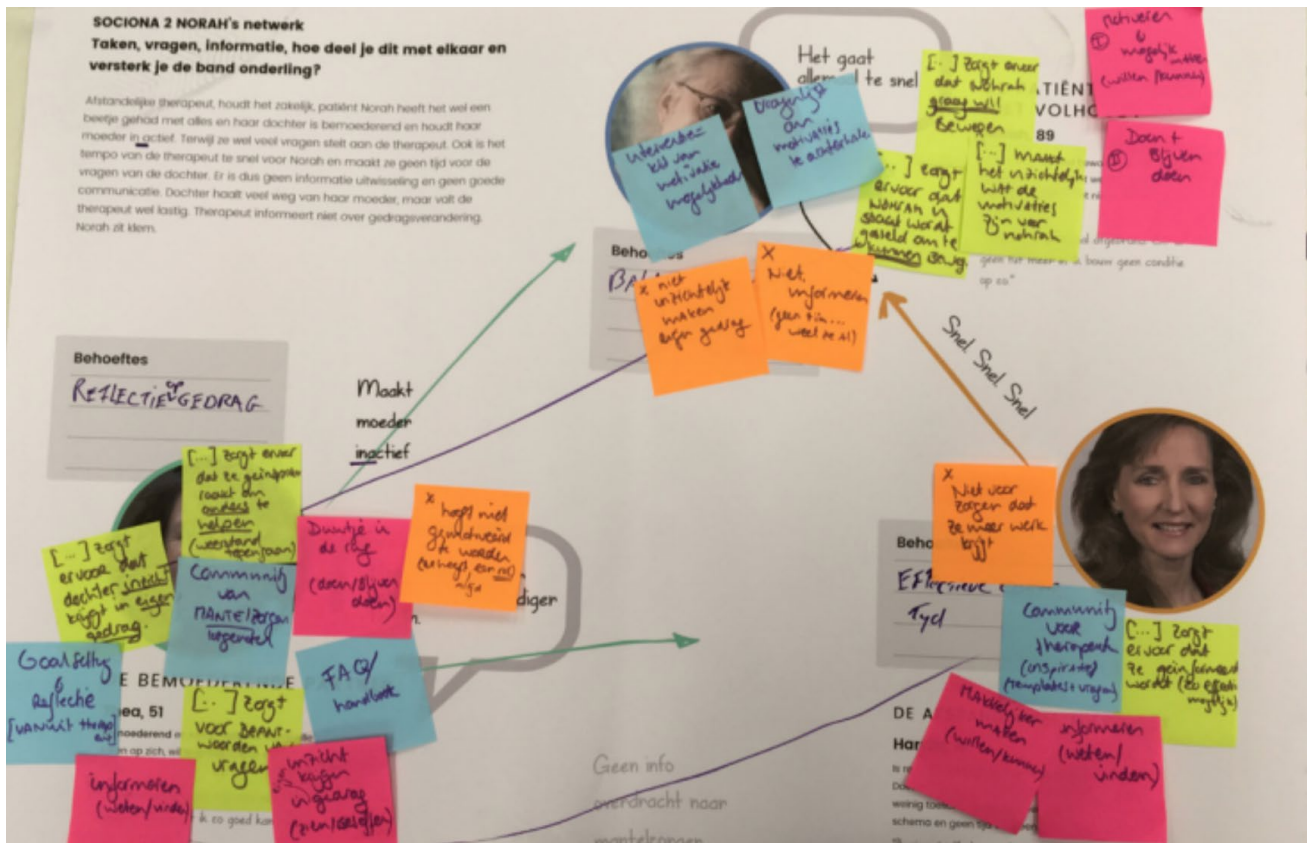


Figure 3: A Sociona as a visual description of the dynamics in a system of three personas.

## Materials and Methods

To shed light on if and how the behavioural and social-systemic insight tools supported the designers in enhancing design performance, the authors of this paper collected and analysed the available process data from the case study: video captures, photos, documentation, presentations, observation reports, transcripts of reflective sessions and triangulation sessions, and the final designs. All references to use of the tools from all sources were entered in Atlas.ti and coded. We visualised the preliminary findings from this descriptive analysis on a 5x1-meter paper banner, which the authors of the paper and the design team reviewed for indicators of DQ, PQ and PE.

Finally, to assess DQ, we performed an expert review session integrating both the behavioural and socio-systemic perspective. Two behavioural scientists reviewed DQ with respect to the integration of behavioural insights in the prototypes. To do so, the experts firstly identified for each

prototype which Behavioural Lenses were addressed. Then, they assigned perceived Behaviour Change Techniques derived from a taxonomy by Michie et al. (2013) to the prototypes. Two experts in social-systemic dynamics pointed out where prototypes responded to social aspects of behavioural change. Next, experts and design team discussed the findings of the session. The first author of this paper analysed the results of this session.

## Results

### Application & development of the Behavioural Lenses & Socionas

The design team used the Behavioural Lenses during the entire design process, in almost every design activity (see Figure 3). The Behavioural Lenses were applied during all sprints and in the third co-creation session, whereas the Socionas were applied during all co-creation sessions and indirectly applied (i.e. referred to) in the sprints.

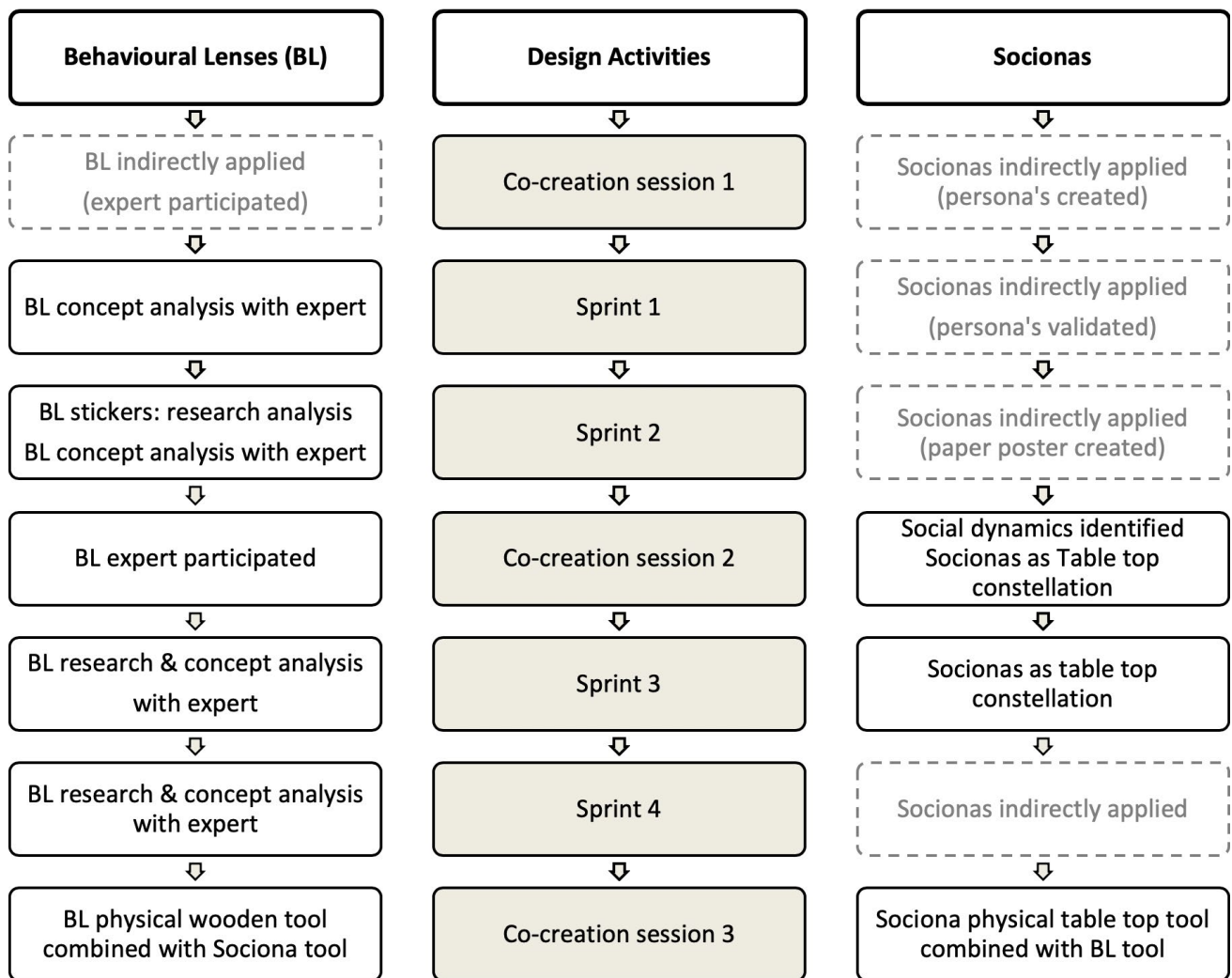


Figure 3: Overview of the design process and the application of the Behavioural Lenses and Socionas

### Behavioural Lenses

The Behavioural Lenses (BL) were ready to use in the design process, a feat aided by the availability of a behavioural expert during the sprints. At the start of the project this expert presented the tool to the design team. Every third day of the sprint the expert helped the team review their prototype concepts using the BL. The BL also invited the development of new design tools. To deal with lacking time for extensive user research analysis, the team created a sticker set in the second sprint, which helped speeding up the analysis of user insights. In the third sprint, the team developed a physical tool (figure 3) to make the BL more usable for PPTs in their practice.

### Socionas

It took more time to develop the Socionas into a form that was applicable in the sprints. During the first co-creation session and sprint, the design team constructed 'static' Socionas consisting of three Personas (parent, child, PPT) in a network. The results of this approach felt overly simplistic and not representative of real life. In the third sprint, the design team developed a new tool to create dynamic, table-top Persona constellations. This physical Sociona tool (Figure 4, customizable wooden puppets and cards with generic social dynamics) turned out a lot easier to apply, and also capable of generating valuable insights, especially in combination with the wooden BL tool and tiles representing potential prototypes.



Figure 4: the combined physical BL and Sociona tool

## Behavioural Lenses: design performance

### *Process Quality*

By offering a framework, the Behavioural Lenses helped the team review concept storyboards, brainstorm ideas, and prototypes. Furthermore, this framework also provided insight in underlying mechanisms, which informed a critical discussion of the behavioural goals of the prototypes and their expected effects on the user.

Having the behavioural expert in the design team proved a key factor in the application of the Behavioural Lenses tool. Even though consulting the expert did not always radically change the concepts, it helped the team to 1) improve and strengthen the underpinnings of the ideas and prototypes, (2) make underlying mechanisms explicit, and (3) increase confidence in decision making during the sprints. All this meant that the design team felt the Behavioural Lenses, combined with expert availability, were sufficient to integrate insights from behavioural sciences in the design process.

### *Process Efficiency*

Application of the BLs showed to be compatible with the design sprints, improving their efficiency. Developing the stickers helped the team to apply the BLs without the expert in analysing user research insights quickly. Performing an review with the BLs guided by the behavioural expert improved decision making and thereby guaranteeing the high pace of the sprint.

### *Design Quality*

During the expert review of the prototypes, the experts sometimes assigned more and different BLs to the prototypes than the design team had. The experts assigned lenses referring to the behavioural effects of the prototypes, whereas the design team assigned lenses referring to the behavioural goal that the prototype would contribute to. Overall, the experts indicated that the prototypes fitted the behavioural goals of the project only partially, supporting deconstruction and reframing of problematic situations (e.g. the BCTs 'framing and reframing', 'information about

antecedents', 'self-monitoring of behaviour'), but potentially lacking in strategies to establish new behaviours. The fact that the experts assigned substantially more lenses to the prototypes than the design team may indicate that the BLs alone are not enough to replace expert knowledge in behavioural change; the experts saw potential behavioural effects that the designers were not aware of.

## Socionas: design performance

### *Process quality*

As mentioned before, the design team felt that the preliminary Socionas tool (using paper persona constellations) was too static to be helpful in the sprints. When the design team developed the table top constellations tool, this enabled a dynamic setup which proved easy to use for PPTs, parents and other stakeholders. This tool helped review concepts and their potential impact on existing social dynamics.

The design team felt the need to use different approaches to take the social systemic aspect into consideration, such as inviting different stakeholders for focus groups. This may serve as indication that the Socionas, especially in their former, paper form, were not sufficient to capture systemic dynamics.

### *Process efficiency*

In the first part of the project, constructing Socionas by combining personas and identifying social dynamics hindered sprint progress rather than enhance it. A key factor that delayed the process during the sprints was determining the scope of the social system, and decision making on which dynamics seemed most valuable. In the more slow-paced co-creation settings, where participants had more time to identify social dynamics, Socionas proved more useful, but even then, the allotted timeslots were not enough for in-depth discussions.

### *Design quality*

The expert review showed that some of the prototypes succeed in explicitly involving the social network (caregivers and social care workers ) when using them (for instance; the 'conversation placemat', the 'question dice' and 'looking glass', and the 'photo frame'). This was also reflected by the assigned BCT 'restructuring the social environment' in some prototypes. The experts recognized that some tools might address and disrupt existing social dynamics (such as 'parents being overprotective of the child'), however they were not convinced that the prototypes could adjust the dynamics to support the desired behaviour change.

## Discussion and Conclusion

This paper reports a case study of how insights on individual and systemic aspects of behavioural change can be incorporated in a (co)design process. To do so, the paper analyses a design process in which a design team developed a toolkit with Paediatric physical therapists (PPTs) stimulate physical activity in everyday life settings of 6–12yo children with physical disabilities. For each aspect (individual and systemic), the design team used a design tool and input from experts. The study shows that the design process benefitted from applying the two tools; each tool with a different application and design performance.

Firstly, the usability of the two tools for design sprints and co-creation sessions differed. The Behavioural Lenses showed to be applicable and efficient in the sprints, whereas the Socionas proved to be more beneficial and suitable during co-creation sessions. This could be explained by: 1) the presence of a trained Behavioural Lenses expert, 2) different maturity of the tools at the start of the project, 3) different origins, as the Socionas come from an 'empathic design' perspective and the Behavioural Lenses from a behavioural science background.

Secondly, the tools had a different process quality. The Behavioural Lenses mostly enhanced the underpinnings of the design decision during the sprints. The Socionas mostly enhanced the conversation with users and stakeholders and the identification of social dynamics. Interestingly, the design team returned from the chosen approach based on Van Gessel (2018) to the original, more theatrical, approach of Postma (2012). An explanation for this change could lie in the co-design nature of the project. The interactive and customizable form facilitated the conversations with end-users better than the posters.

Thirdly, the difference in efficiency of both tools points towards having a defined 'end-point' or criteria in a design method that describes when to take the next step. The Socionas differed from the Behavioural Lenses in that the design team had no way of knowing when sufficiently rich information was obtained. This hindered the design process by repeatedly reopening the discussion between users, stakeholders and the design team.

With respect to the design quality, all experts agreed that the prototypes mostly focused on breaking through current behaviours and less on supporting new behaviours and social dynamics. However, from the review itself an essential difference between the two tools transpired. Namely, the Behavioural Lenses tool was developed to make existing insights about behaviour change accessible. Reviewing the design quality was thereby easily linked back to theory by using the BCT taxonomy. Socionas do not represent a set of theoretical insights but makes an insight (social dynamics play a role) tangible. Thus reviewing this could not be linked to a specific theoretical model, which makes it hard to define underlying mechanisms for behavior change. Until the prototypes are tested for efficacy, it remains unclear whether the application of the tools results in better prototypes to change social dynamics.

Lastly, an important notion is that these two tools separate two perspectives (individual and social) that designers naturally integrate simultaneously. This project made a first attempt to integrate both in a final physical tool, yet this is still very premature. Further research should focus on integrating both perspectives in a method to improve design performance in practice.

## Acknowledgements

We would like to thank the designers from the Sprint team, Jasper Huitink, Suze van Houten and Claire Suurmond, and all the parents, PPTs, experts and other stakeholders who made this project possible. This project is funded by a grant from SIA, the Netherlands Taskforce for Applied Research, number RAAK. MKB08.006.

## References

- Hagger, Martin S., & Mike Weed. "DEBATE: Do Interventions Based on Behavioral Theory Work in the Real World?" *International Journal of Behavioral Nutrition and Physical Activity* 16, no. 1 (April 25, 2019). doi:10.1186/s12966-019-0795-4.
- Dahlgren, Göran & Margaret Whitehead. "Policies and strategies to promote social equity in health. Background document to WHO – Strategy paper for Europe". Stockholm: Institute of Future Studies, 1991.
- Pettersen, Ida & Casper Boks. 2008. "User-centred design strategies for sustainable patterns of consumption." In *Proceedings: Sustainable Consumption and Production: Framework for action. Conference of the Sustainable Consumption Research Exchange, Brussels, Belgium, 10-11 March 2008*. p. 107-127.
- Hermsen, Sander. 2019. "Behavioural Lenses Approach." OSF. October 11. doi:10.17605/OSF.IO/6FRSY.
- Hermsen, Sander, Reint Jan Renes, & Jeana Frost. "Persuasive by Design : a model and toolkit for designing evidence-based interventions. In *Proceedings, Making the Difference: CHI Sparks 2014*, (pp. 74–77).



The Hague, Netherlands: The Hague University of Applied Sciences.

Tarquino, Cyril, Joëlle Kivits, Laetitia Minary, Joël Coste, and François Alla. "Evaluating Complex Interventions: Perspectives and Issues for Health Behaviour Change Interventions." *Psychology & Health* 30, no. 1 (October 21, 2014): 35–51. doi:10.1080/08870446.2014.953530.

Tromp, Nynke, Reint Jan Renes, and Jaap Daalhuizen. "Heuristics for Selecting and Using Behavioural Design Methods." In *Proceedings, DRS2018: Catalyst* (June 28, 2018). doi:10.21606/drs.2018.607.

Hermesen, Sander. "Designers Should Evaluate Their Work. You Say Those Are Scissors You Are Running with, but Do They Even Cut?" *The Design Journal* 22, no. sup1 (April 1, 2019): 2235–2238. doi:10.1080/14606925.2019.1595844.

Tromp, Nynke, and Paul Hekkert. "Assessing Methods for Effect-Driven Design: Evaluation of a Social Design Method." *Design Studies* 43 (March 2016): 24–47. doi:10.1016/j.destud.2015.12.002.

Postma, Caroline. "Creating Socionas: Building creative understanding of people's experiences in the early stages of new product development." (2012). Delft, Netherlands: Doctoral thesis.

Van Gessel, Christa, Remko Van der Lugt, & Rosa de Vries. "Socionas: Bringing the systemic view into the design for health and sustainability." In: *Proceedings of RSD7, Relating Systems Thinking and Design 7, Oct 2018, Turin, Italy*, p. 23-26.

Michie, Susan, Michelle Richardson, Marie Johnston, Charles Abraham, Jill Francis, Wendy Hardeman, Martin P. Eccles, James Cane, and Caroline E. Wood. "The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions." *Annals of Behavioral Medicine* 46, no. 1 (March 20, 2013): 81–95. doi:10.1007/s12160-013-9486-6.