

# Developing a theory-driven method to design for behaviour change: two case studies

Anita Van Essen<sup>a</sup>, Sander Hermesen<sup>\*a</sup>, Reint Jan Renes<sup>a,b</sup>

<sup>a</sup> Research Group Cross-media Communication in the Public Domain, Utrecht University of Applied Sciences, Utrecht, The Netherlands

<sup>b</sup> Wageningen University, Wageningen, The Netherlands

\*Corresponding author e-mail: sander.hermesen@hu.nl. Orcid ID [orcid.org/0000-0001-8781-5445](https://orcid.org/0000-0001-8781-5445)

**Abstract:** Behaviour change design has much to gain with the integration of insights from the behavioural sciences in the design process. However, this integration needs to be done without hampering the creative process. In two rich design cases aimed at health and safety behaviour change, we describe our efforts to develop a method for theory driven design based on the Double Diamond. Our method attempts to integrate insights from the Persuasive by Design-model (PbD) for behaviour change into the entire design process. Our case studies demonstrate that our method indeed augments the integration of theory and evidence in our designs, but only if the Double Diamond process model is complemented with an evaluation phase, and insights from the PbD-model are derived using rich, well-developed tools.

**Keywords:** behaviour change; theory-driven design; design methods; safety behaviour; health behaviour

## 1. Introduction

This paper describes our effort in coming up with a method for theory-driven (and where possible evidence-based) design that (on the one hand) does justice to the strengths of designerly practices, while (on the other hand) providing enough anchoring to make sure theoretical aims are kept throughout the design process. In two rich case studies aimed at health and safety behaviour change, we describe our design method and the integration of behavioural scientific insights in the design process, and we analyse the benefits it had on our designs for behaviour change. Also, we look at shortcomings and what went wrong, and review the lessons learned.

When designs for behavioural change are based on relevant theories from the behavioural sciences, this greatly increases the potential of these designs to effectively support users in



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

changing their behaviour (cf. Michie et al., 2009; Noar, Benac, and Harris, 2007; Taylor, Connor, and Lawton, 2011). Furthermore, a solid foundation in theory increases the decisional accountability for designers: it makes it easier to explain to commissioners why you're doing what you're doing (Leeuwis and Aarts, 2011). Unfortunately, projects that ground their designs in theory are still an exception (Davies, Walker and Grimshaw, 2010; Prestwich et al., 2014). A disconnect remains between design research on the one hand, and the behavioural sciences on the other. Designers often see psychological research as 'impenetrable' (Pettersen and Boks, 2008), and those models and theories that do make it into design practice tend to suffer from limitations in applicability (Hermesen, Renes, and Frost, 2014).

When integrating evidence and theory from the behavioural sciences in design research, one issue that regularly crops up is that insights from theory are often presented in a way that is too prescriptive for creative use (e.g. as 'design patterns'). When, for instance, a very well known theoretic framework such as the Theory of Planned Behaviour (TPB; Ajzen, 1985) is used to inform a design process, this tends to limit designers to using the components of this theoretical model, i.e. intentions, attitudes, social norms, and perceived self-efficacy; designers using this model could easily neglect aspects of behavioural change not covered by the TPB, such as habitual behaviour, impulsive behaviour, resistance to change, and many others.

In other words, the fine detail of design 'patterns' and theoretical frameworks limit the designers' ability to 'drift'. This drifting, the utilization of creativity, freedom and unpredictability to come to unforeseen results, is generally seen as the largest advantage of the designerly approach (Gall Krogh, Markussen, and Bång, 2015). As a consequence, although better grounding of design process in theory and evidence from behavioural science is necessary, this has to be done in a way that gives structure to designerly drifting without limiting the design process. Design research needs to be informed by its own, specific methodology (Bång, Gall Krogh, Ludvigssen, and Markussen, 2012), to make sure it retains its strengths, such as a 'first person perspective' and a reflexive mode of inquiry that helps make practices explicit (Sevaldson, 2010).

In recent years, a range of efforts has been launched to facilitate the integration of knowledge from the behavioural sciences in designerly practice. One such effort is the Persuasive by Design-model (Hermesen, Renes, and Frost, 2014; Hermesen, 2015). This model aims to provide an evidence-based framework by which designers gain access to relevant theoretical insights (Hermesen, Mulder, Renes, and Van der Lugt, 2015). The model offers designers possibilities to enhance user research or concept development by taking the notion into account that most of our behaviours are executed in one of two modes: either automatically or with reflection; the latter being most reminiscent of a thermostat in which we compare our behaviour to our goals and adjust accordingly, if enough motivation, opportunity and skills are present. Previous research has shown the PbD-model is helpful in integrating behavioural insights in the design process, but too complex to use as is.

Therefore tools and methods have been developed within different research projects (Hermesen et al., 2014, 2015).

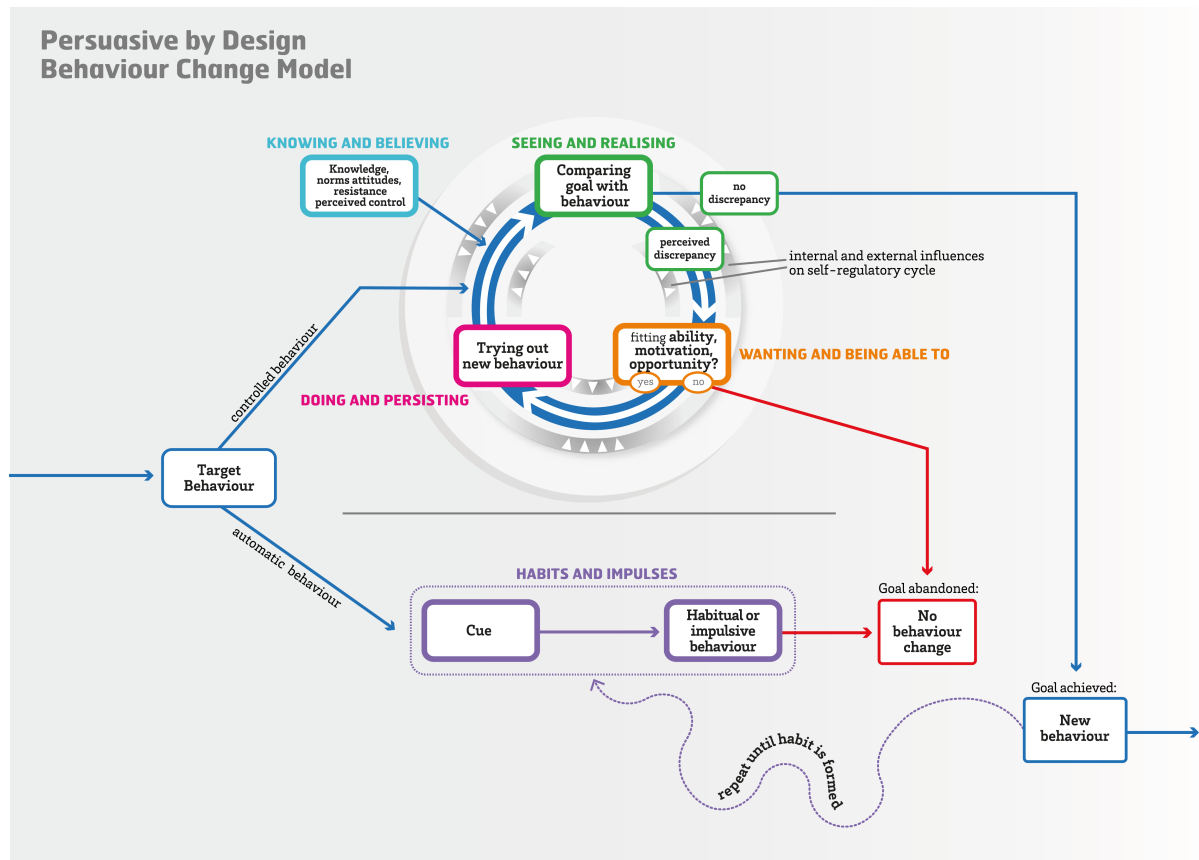


Figure 1 The Persuasive by Design-model

Our starting point is the Double Diamond process model of design (Design Council, 2015) and similar approaches (Howard, Culley, and Dekoninck, 2008). This serial approach to designerly drifting (Gall Krogh, Markussen, and Bång, 2015) divides the design process into roughly four steps or phases, usually labelled discover, define, develop, and deliver. We selected the Double Diamond model to inform our design process because of its similarities with well-known design process models used for setting up interventions in the behavioural sciences, such as the Person Based Approach (Yardley, Morrison, Bradbury, and Muller, 2015). During the design process we reflected on how we implemented this design method and where we adapted the Double Diamond to better fit our needs. Within the structure provided by the Double Diamond approach, we anchored the design processes in theoretic insights through constantly evaluating our design efforts with tools informed by the PbD-model.

To assess how we can keep the fine line between theory-driven design and creative freedom, we used our design method in two design cases aimed at health behaviour change. In the first case, we worked on interventions to improve the safety of elderly cyclists. In the second case, we developed designs aimed at parents to increase water drinking in very young children. In both cases, we used a serial design approach based upon the Double Diamond model, in which we used tools based upon the PbD-model to inform our designs behavioural scientific insights. During the design projects, we logged the use of the PbD-model and its tools during each phase of the design process.

For each case study, we first describe the project; subsequently, we present the design process, the way the PbD-model and its tools were used in the process, and our conclusions from the project.

## **2. Case 1: Improving safety of elderly cyclists in the communities of Amersfoort and Dronten**

### *2.1 Introduction*

The Dutch Ministry of Infrastructure and Environment commissioned this case, together with the municipalities of Amersfoort and Dronten. Amersfoort is a mid-size city situated in the centre of the Netherlands, with about 150.00 inhabitants. Dronten is a small town near Amersfoort, and has about 30.000 inhabitants. The Research Group Cross-media Communication in the Public Domain of the Utrecht University of Applied Sciences, together with service design agency Ideate, were asked to design evidence-based interventions that would encourage elderly people (50+) to undertake actions to improve their bicycle safety.

### *2.2 Method and Results*

Our design process roughly followed the phases of the Double Diamond model: Discover, define, develop and deliver. During the first phase (discover), we assessed the scientific literature on moderators of safe cycling behaviour and aging. Subsequently, we performed structured contextual interviews with elderly cyclists and local stakeholders, and gathered information by visiting activities for elderly target groups, and collecting current materials used to encourage safe cycling behaviour. A key finding in this stage was a mismatch between the current approach used by many cycling interventions and insights from literature. Current interventions attempt to increase cycling skills by providing lessons for motivated elderly cyclists, whereas insights from aging and safe behaviour literature show that a crucial factor in improving safe behaviour is that elderly people are often unaware of their changing status (e.g. in responding to the potential danger of a situation) and therefore feel little motivation to change their behaviour. Both literature and user research revealed a large variation in elderly cyclists' capabilities to reflect on the effects of aging and subsequently adapt their behaviour. This finding, together with four other factors that

transpired in the literature study and the user research (attitude towards cycling, attitude towards aging, relationship between cycling and identity, and reliance on cycling for daily life activities), led us to describe four distinctive personas that informed the development of our interventions.

In the next phase, define, we held a 'pressure cooker' co-creation session in which researchers from the Research Group Cross-media Communication in the Public Domain were joined by the project commissioners and designers from three service design agencies to develop intervention concepts. In the session, we developed thirteen concept ideas, which were then critically reviewed using a question set based on the PbD-model. This evaluation showed that most of the interventions were badly focused, with overly large or ambiguous behavioural goals, and sometimes did not solve the target group's problem. This initial critical review led to the formulation of four key behaviour change goals, which could be matched with the personas developed in the previous phase. Finally, we selected the most promising persona, Carla, and the associated behavioural goal (optimizing unsafe cycling routines) as the focus for the intervention.

In the next phases, develop and deliver, we plotted our concepts for the selected behaviour change goal of the persona using a customer journey-mapping tool. This comprised a chronological overview of the interaction between the persona's daily life and the intervention activities. We evaluated the resulting customer journey map using the question set tool based on the PbD-model. A crucial finding from this review was that our intervention was once again aimed at highly motivated participants and too many deliberate steps had to be taken by the elderly to take part in the intervention. Consequently, the intervention was adapted towards a more socially embedded approach that required less motivation and relied more on the social pressure of already existing social networks.



*Figure 2 Participants in a pilot workshop use an intervention to identify personal cycling risks*

We developed a service blueprint to map the different activities of the intervention on the daily routines and goals of the persona. Then we developed three final intervention concepts: firstly, an interactive workshop session in which elderly cyclists learn to reflect on their own behaviour, identify personal cycling risks, and formulate safe cycling intentions; secondly, a bicycle tour to help cyclists practice safe cycling, adjusting to identified risks with the help of a special coach; and lastly, a mobile version of the interactive workshop in which elderly cyclists could reflect on their behaviour and receive motivational and practical advice about their cycling behaviour.



*Figure 3 Participants in a pilot workshop set safe cycling goals*

To test the efficacy of our interventions, we added another phase to the design process. In this evaluation phase, the three interventions were tested in pilot-settings. The first pilot took place in Dronten, where 58 elderly people participated in an interactive workshop. The second pilot was a cycling tour with 15 elderly participants through Dronten. And in the third pilot we tested the mobile version of the workshop in which 15 people participated on a ferry starting from Amersfoort. After the second pilot, we interviewed 20 participants (both from the workshop and cycling tour) about their experiences and cycling behaviour. The materials used in the workshop were coded and analysed. Preliminary results show that the workshop was positively evaluated by the participants and motivated them to participate in the following pilot, the cycling tour. The conversion from the workshop to the cycling tour was 24%, which is substantially higher than the average conversion of these kinds of activities in the past, which is 3% (VVN, 2015).

### **2.3 Discussion**

During the design process we directly noticed that the Double Diamond approach lacks a proper evaluation phase to assess the achieved behaviour change. The existing four phases may be sufficient in product design or service design, where the end result of the design process is the designed artefact itself; but in behaviour change design, the final goal is not a tangible prototype, but measurable behaviour change, which needs to be assessed in a



structured way. Although some sort of evaluation already takes place at the end of each sub-phase of the Double Diamond model, the current process model does not provide a separate evaluation phase as a final stage of the design process. Therefore, we added a final phase to the design process, in which we developed and implemented an evaluation plan to assess the intervention's effect on our behaviour goals.

Furthermore, during the design process we experienced that the develop- and deliver phases, the second diamond, overlap greatly. Therefore, splitting these phases up in two separate stages seemed artificial and counterproductive. As a consequence, these phases were joined in one stage.



Figure 4 The bicycle tour in Dronten with the bicycle coach

#### 2.4 PbD-model use in design process

In the initial discover phase, designers struggled to use the PbD-model to analyse the data from literature and fieldwork because of the model's complexity. Instead, they opted to use more familiar design tools such as customer journey mapping tools. In the following define-phase, using the question set tool based on the PbD-model triggered the designers to recognize shortcomings of the behavioural goals defined in the previous phase, which led to re-formulating them into more specific behavioural goals and linking them to personas with a personalized customer journey map.

In the develop- and deliver phase, designers used the PbD-model as a review instrument, to critically evaluate the intervention. One of the team members took the role of 'guardian' of



the model's insights, by bringing the model-questions and its elements into the discussion. This enhanced the connection between the intervention and the behavioural goals, helping the designers to fine-tune the interventions to insights from literature and field study.

Furthermore, the model's distinction between automatic and reflective behaviours led the designers to shift their efforts away from designing an intervention that heavily relied on knowledge, self-monitoring and motivation, towards a more socially embedded program. This social approach matched the finding that many elderly people are unwilling to talk about the effects aging on cycling and (therefore) less motivated to join cycling safety interventions of their own accord.

## **2.5 Conclusion**

From our findings in this case study, we conclude that general 'serial' design process models such as the Double Diamond are not inherently suitable for behaviour change designs because they lack an evaluation phase to assess the impact of the design on behaviour. Furthermore, the Double Diamond's distinction between develop and deliver was not helpful.

The PbD-model aided the designers to critically review the creative process, especially to target the intervention means to behavioural goals. Furthermore, the model triggered the designers to consider intervention strategies that they would not normally take into account; their work automatically tended towards individual, reflective solutions, whereas the model helped them to consider a more social approach.

However, as in previous studies (Hermesen et al., 2014, 2015), the model proved too complex for some stages of the design process, and the accompanying tools did not help to alleviate this complexity. This limited the designers' ability to use theory and evidence to inform their designs. The model was used mainly as a critical reflection tool.

## **3. Case 2: Stimulating the daily water intake of young children in the municipality of Breda**

### **3.1 Introduction**

The municipality of Breda commissioned the second case study, as part of its Youth on Healthy Weight (JOGG) programme. Breda is a mid-size city in the south of the Netherlands, with 175.000 inhabitants. JOGG is an interdisciplinary public-private consortium to establish healthy behaviour in young people. In cooperation with the city's health service department, a mineral water producer, and a social marketing agency, MarkC, researchers from the Research Group Cross-media Communication in the Public Domain of the Utrecht University of Applied Sciences, and service design agency Ideate, researched and developed an intervention to stimulate water intake among 0 to 4-year-old children from families with a low socio-economic status.

### 3.2 Method and Results

Similar to the first case, we used the Double Diamond model to structure the design process; however, we amended the design process with our findings from the previous case. A final evaluation phase was added, and the deliver/develop-phases were integrated into one phase. To deal with the inherent complexity of grounding design research in findings from the behavioural sciences, we made use of a newly developed, rich tool based on the PbD-model, called the Behavioural Lenses. These lenses invite designers to consider different sets of determinants that play a role in changing behaviour, to wit: habits and impulses; knowing and believing; wanting and being able to; seeing and realizing; and doing and persisting (sustaining behaviour change). The lenses are presented in a booklet in which each lens is accompanied by a subset of behaviour related questions, references to relevant literature, and recommended persuasive strategies. The lenses can be used both to inform user research, and to evaluate design concepts.



Figure 5 The five behavioural lenses

In the first phase of the design process, discover, we performed a literature study into the determinants of drinking water instead of sugar-rich beverages amongst children (0-4) and their parents. Based on this literature review, contextual generative interviews were held with 9 parents. Furthermore, we interviewed 10 nutrition- and health-promotion professionals. During the define phase, using the Behavioural Lenses, we integrated these three sources of information into three main themes: an early (at 6 months after birth) formation of new drinking and eating habits, facilitating parents' ability to implement such

habits, and supporting parents in challenging situations. These themes corresponded with the three lenses 'wanting and being able to', 'habits and impulses', and 'doing and persisting'.

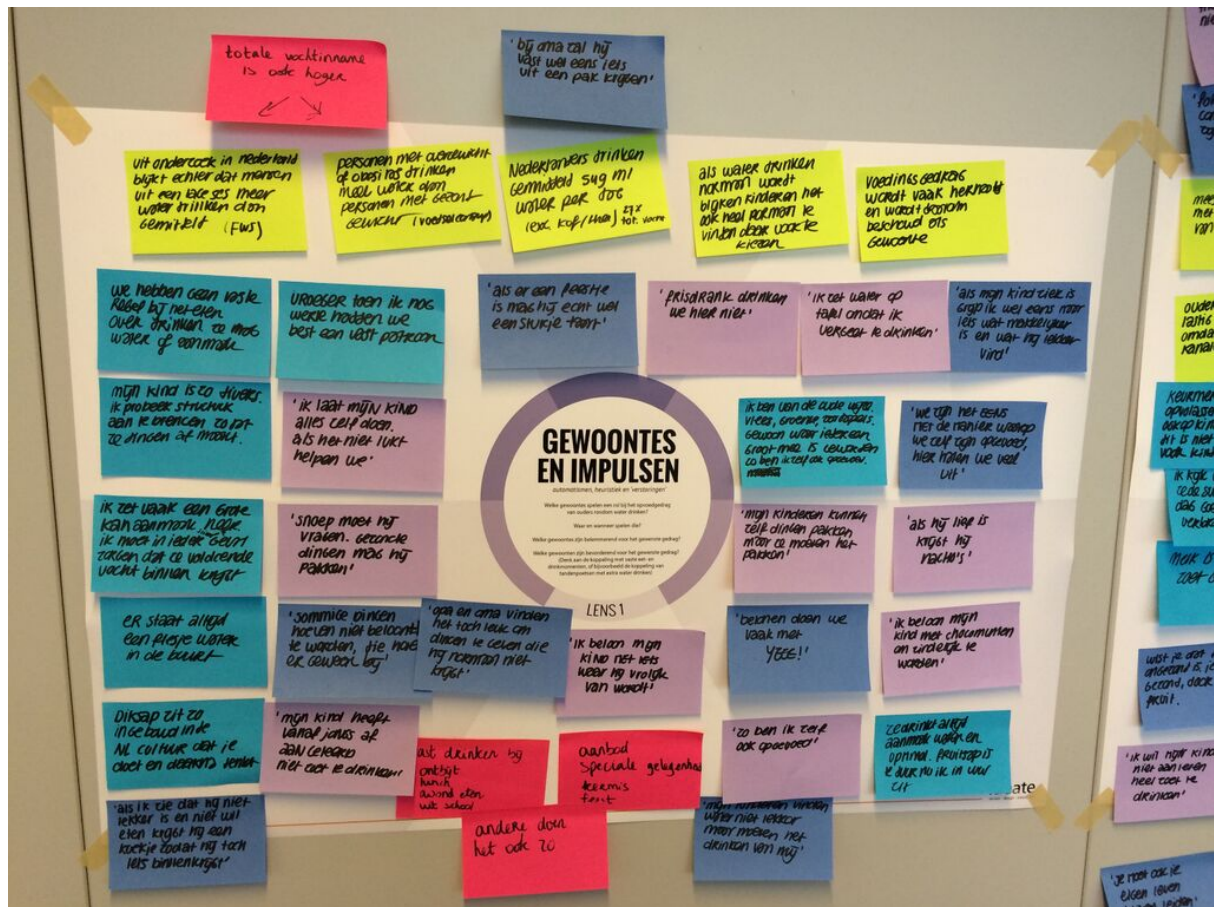


Figure 6 Using the behavioural lenses, in this case the lens Habits and Impulses (in Dutch)

In the develop/deliver phase, we organized a design pressure cooker in which the commissioners and the designers jointly developed intervention concepts based upon the three main themes. We then combined these three concepts into one intervention, using a customer journey-mapping tool to describe the target behaviour goals and place the intervention-parts into the daily context of the parents. We then once again used the Behavioural Lenses to further increase the focus of the intervention. As a result, we developed an intervention called the Waterbox, with an accompanying intervention plan. The Waterbox is a set of instruments (e.g. a special cup and a bib) to help parents integrate water-drinking moments in their daily life. In addition to this, a Facebook group was set up to support the parents in their daily experiences with the Waterbox and teaching their baby to drink water.

Subsequently, we designed a series of activities to test the Waterbox. To design the intervention implementation process, we engaged the Breda municipal health service. In co-creation with health workers, we developed a protocol for handing out the boxes through

the districts' clinics. Next, the assistants were briefed to hand out the boxes and motivate parents to participate in the pilot project. At the same time, a mother living in the district was engaged to setup the Facebook-group and to moderate this group during the pilot.

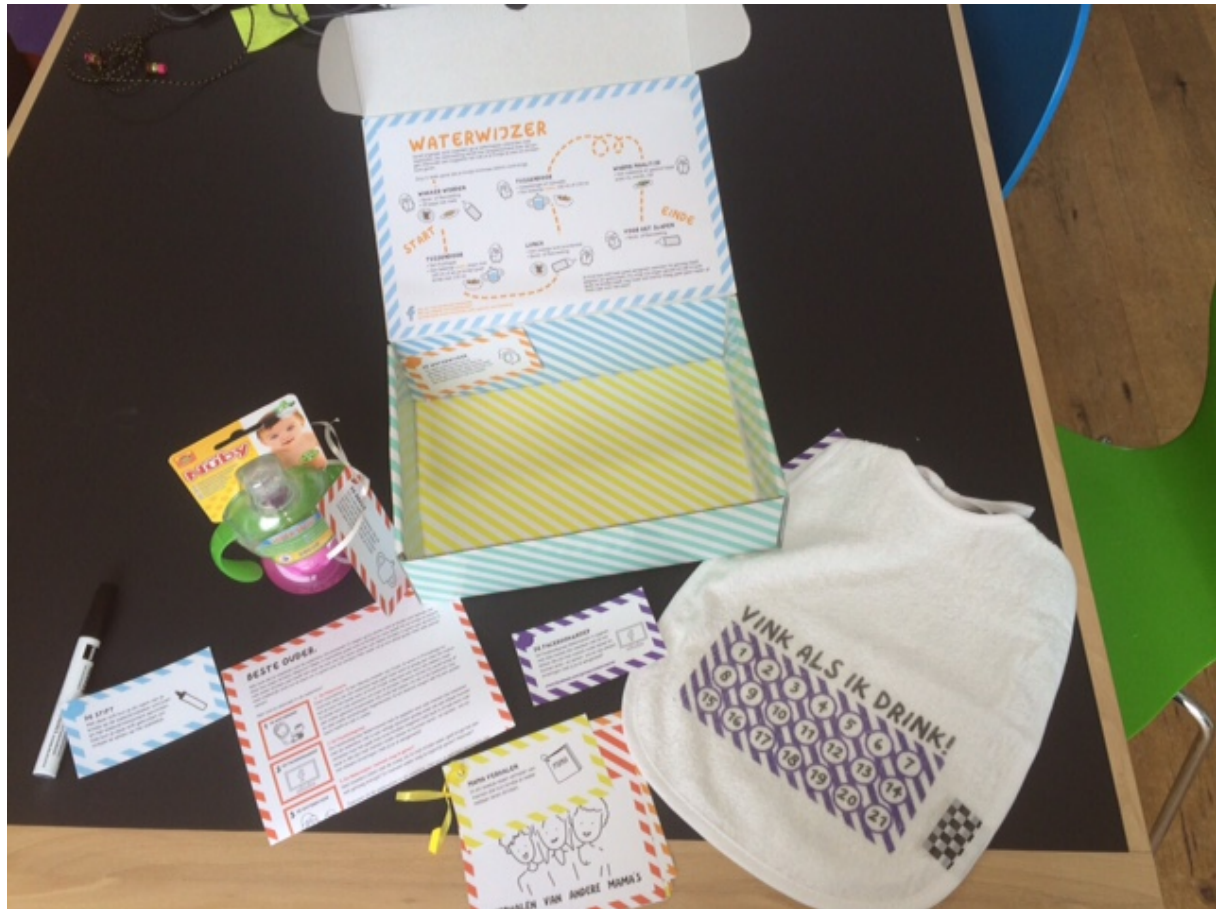


Figure 7 The Waterbox intervention set

To evaluate the impact of the pilot intervention, we will test the effect of using the Waterbox on 20 mothers. Participants will receive the Waterbox from a health care worker during a regular visit to the municipality health service infant clinic. Participants will take part in two interviews, one week and at three weeks after receiving the box. The interviews are structured using the Behavioural Lenses tool in combination with our predefined behavioural goals. At the moment of going to press, preliminary results are not yet available yet as the pilot is still running.

### 3.3 Discussion

Our evaluation of the design process in this case study substantiated our findings in the previous case. The addition of an evaluation phase enabled us to evaluate the efficacy of our designed intervention in changing the target behaviour. To do so, an evaluation plan was developed, consisting of interview guidelines and an observation scheme to assess the usage

of the Facebook group. The Behavioural Lenses helped inform the design of these evaluation tools.

Furthermore, this second case confirmed our notion that the develop and deliver phases of the Double Diamond model are intertwined. Developing an intervention means going back and forth in adapting the intervention to user-behavioural goals and evaluating our intervention ideas.

### *3.4 PbD-model use in design process*

The utilization of a new tool based on the PbD-model, the Behavioural Lenses, meant that the applicability of the model throughout the design process was greatly enhanced. In the initial discover phase, the tool proved easy to understand and apply for all parties involved, be it designers, behavioural scientists and social workers. In jointly analysing the research results with the lenses tool, we created a shared reference frame to interpret the research findings. In the define phase, the tool was used to prioritize the behavioural goals for the intervention. To support this selection process, we developed a tool derived from the Behavioural Lenses. Each lens was summarized in a poster on which participants could add their perceived strengths and weaknesses, chances and challenges for the intervention. This helped all stakeholders to weigh their options and make grounded choices for behavioural goals.

In the develop- and delivery phase, the tool was used to review and fine-tune the creative concepts. Initially, the intervention was built upon insights from only three of the lenses, but in this phase, a factsheet about water and a quiz to enhance knowledge of drinking behaviour were added. Using the lenses helped the designers to critically look at the coherence of the intervention and redesign the intervention towards the original behaviour goals.

In the final evaluation phase, we used the lenses to assess the efficacy of the intervention. When designing evaluation tools and protocols, the designers looked back at earlier results from using the lenses to indicate what they wanted to measure in relation to the behavioural goals. By making a schematic overview of the behavioural goals, the associated intervention means and the expected hypotheses, they could easily identify which evaluation means and measures would be appropriate.

### *3.5 Conclusions*

This second case confirms our notion that the Double Diamond design process model is only appropriate for behaviour change design when an evaluation phase is added. Furthermore, once again the distinction between a develop- and a deliver-phase proved of little use.

Furthermore, this case study not only demonstrates the necessity of rich, well-developed design tools to make insights from the behavioural sciences accessible for designers, but also shows the beneficial effects of these tools when they become available. Contrary to findings from the first study and previous, similar studies (Hermesen et al., 2014, 2015), the use of the



design tool Behavioural Lenses proved fruitful for the designers involved in every stage of the design process. To make full use of the tool's possibilities, additional methods were developed during the process, such as the 'chances and challenges canvas' and the evaluation phase set-up.

## 4 Discussion

In this work, we analysed two rich design case studies to answer the following question: how can we embed theories and evidence from behavioural sciences in a design method in such a way that this does not hinder creativity, but offers a theory-driven anchor to creative drifting? To do so, we adopted the Double Diamond model to structure the design process. However, we soon found out that much-used serial design process models as a rule do not offer an explicit evaluation/report phase. This may not be an issue in product design, service design, where often the artefact is the end result of the design process, but not in behaviour change designs, where the end result is the effect of the artefact on behaviour change. Therefore, in both cases, an extra evaluation phase was added to assess the efficacy of the developed interventions on behaviour change. Furthermore, we found that in our cases, the develop/deliver phases are greatly intertwined. This could be a unique feat of behaviour change design processes, or, more likely, a shortcoming of serial design models in general. As a result, we produced our own behaviour change design process model, which can be represented in a double-diamond-one-dot model: discover / define, develop / deliver, and evaluate.

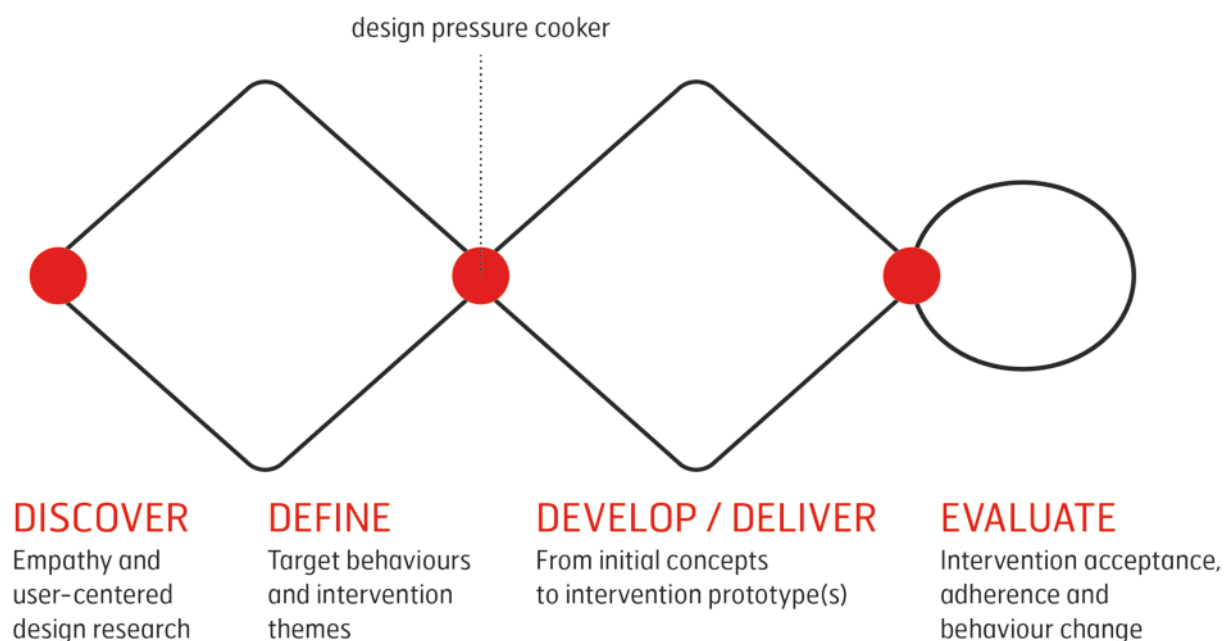


Figure 8 Double-Diamond-One-Dot process model for designing behaviour change interventions

These case studies show that the PbD-model in general is useful in using theory to inform designs, although the first case study proved once more that the inherent complexity of behaviour change theory hampers its integration into design research. However, the second case not only showed that rich, well-developed tools such as the Behavioural Lenses tool are needed to help designers apply the insights from behaviour models such as the PbD-model into their creative process, but also that such tools can indeed support the propagation of insights from initial phases in later design phases such as the develop and deliver phase, and give designers a framework to use theory to inform their designs in all phases of the design process. The efficacy of this tool in the design process needs further scrutiny in the form of structured testing in design cases, in order to evaluate the generalizability of its potential for other designs aimed at behaviour change.

From our case studies, it transpired that one notable shortcoming of the PbD-model, difficulties in bridging the gap between behavioural insights and a viable, evidence-based intervention strategy, was not alleviated by the Behavioural Lenses tool. The tool mainly helped to focus the intervention on behavioural goals. Although this implies that this tool is not restrictive for the creative process, as design patterns would be, this shows there is still a gap between developing empathy for the user and coming up with a successful behaviour change concept. This, on the one hand, provides room for designerly drifting, but, on the other hand, we need tools and methods to anchor this drifting in evidence; for instance by developing a structured overview of possible intervention strategies, with regard to their respective strengths and shortcomings, and circumstances in which their efficacy has been proven.

Our design process builds upon the Double Diamond process model. However, in current design practice, more agile and iterative design processes such as Scrum are increasingly preferred over more classic, serial processes. How our insights, and the models and tools we used, translate to more agile design processes is as yet unclear. Further research will be needed to shed light on this issue.

**Acknowledgements:** The authors would like to thank the commissioners of the design cases and the design project partners: Ideate (<http://www.ideate.nl>), and MarkC (<http://www.markc.nl>).

## 5. References

- Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior* (pp. 11-39). Springer Berlin Heidelberg.
- Davies, P., Walker, A. E., & Grimshaw, J. M. (2010). A systematic review of the use of theory in the design of guideline dissemination and implementation strategies and interpretation of the results of rigorous evaluations. *Implementation Science*, 5, 14. doi:10.1186/1748-5908-5-14
- Design Council, (2015). *Double diamond design process*. Retrieved on 22 september 2015 from <http://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond>.
- Hermesen, S. (2015, May 21). *How Can We Support Designers to Create Theory-Driven Designs for Behaviour Change?* [Web log post]. Retrieved 2016, March 7, from

- <https://medium.com/@sanderhermsen/how-can-we-support-designers-to-create-theory-driven-designs-for-behaviour-change-the-persuasive-a8e3f5a5f6de#.py20ba5t4>.
- Hermesen, S., Mulder, S., Renes, R.J., & Van der Lugt, R. (2015): Using the Persuasive by Design Model to inform the design of complex behaviour change concepts: two case studies. In: *Proceedings, 11th Conference of the European Academy of Design*. Paris, Université Paris René Descartes.
- Hermesen, S., Renes, R.J., & Frost, J.H. (2014). Persuasive by Design: a Model and Toolkit for Designing Evidence-Based Interventions. In: *Making the Difference. Proceedings, CHI Sparks 2014*. The Hague, Netherlands: The Hague University of Applied Sciences.
- Howard, T. J., Culley, S. J., & Dekoninck, E. (2008). Describing the creative design process by the integration of engineering design and cognitive psychology literature. *Design studies*, 29(2), 160-180.
- Leeuwis, C., & Aarts, N. (2011). Rethinking communication in innovation processes: creating space for change in complex systems. *Journal of Agricultural Education and Extension*, 17(1), 21-36.
- Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychology*, 28(6), 690.
- Noar, S. M., Benac, C. N., & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behaviour change interventions. *Psychological Bulletin*, 133, 673–693. doi:10.1037/0033-2909.133.4.673
- Prestwich, A., Sniehotta, F. F., Whittington, C., Dombrowski, S. U., Rogers, L., & Michie, S. (2014). Does theory influence the effectiveness of health behaviour interventions? Meta-analysis. *Health Psychology*, 33(5), 465. doi: 10.1037/a0032853.
- Sevaldson, B. (2010). Discussions & movements in design research. *FORMakademisk*, 3(1).
- Taylor, N., Conner, M., & Lawton, R. (2011). The impact of theory on the effectiveness of worksite physical activity interventions: A meta-analysis and meta-regression. *Health Psychology Review*, 6, 33–73. doi:10.1080/17437199.2010.533441
- Yardley, L., Morrison, L., Bradbury, K., & Muller, I. (2015). The person-based approach to intervention development: Application to digital health-related behavior change interventions. *Journal of medical Internet research*, 17(1).

#### About the Authors:

**Anita van Essen** is a lecturer and researcher at the Research Group Cross-media Communication in the Public Domain. Her research focuses on designs for behavioural change in applied contexts such as health and safety.

**Sander Hermesen** is a researcher at the same research group; his work focuses on evaluating designs for behavioural change and increasing their efficacy, and on developing models and toolkits that make insights from the behavioural sciences available for designers.

**Reint Jan Renes** is professor (lector) of cross-media communication in the public domain. He specializes in research into (health) communication and behavioural change.