

EHPS *Herman Schaalma PhD Award*

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Summary of PhD thesis

My PhD thesis describes the systematic process of developing an evidence-based behaviour change intervention for obese adults with additional risk factors. It outlines in detail the steps that have been completed to develop an intervention, from design to open pilot testing.

The thesis identified three issues in the literature on behaviour change for obesity:

1. **Component specificity issue:** Although many randomised controlled studies reported heterogeneous study outcomes for behaviour and weight change, detailed evidence regarding the effectiveness of specific intervention programme components was lacking.
2. **Targeting issue:** Few interventions specifically targeted obese adults at serious risk for ill health (i.e. obese adults carrying additional risk factors) in reviews and studies of behaviour change interventions – a population in great need of behaviour change.
3. **Transparency issue:** A lack of transparency in outlining precisely how evidence and theory have been translated into an intervention as recommended by intervention development frameworks and recommendations.

Each of these issues were addressed through the work undertaken during the PhD. This work was undertaken in three consecutive phases (see also Figure 1 below):

1. **Systematic review** of complex behaviour change interventions for obese adults with additional risk factors to identifying ‘active ingredients’.
2. **Intervention development** based on the obtained systematic review evidence and psychological theory.
3. **Open-pilot** testing of the developed intervention to test and optimise acceptability and feasibility.

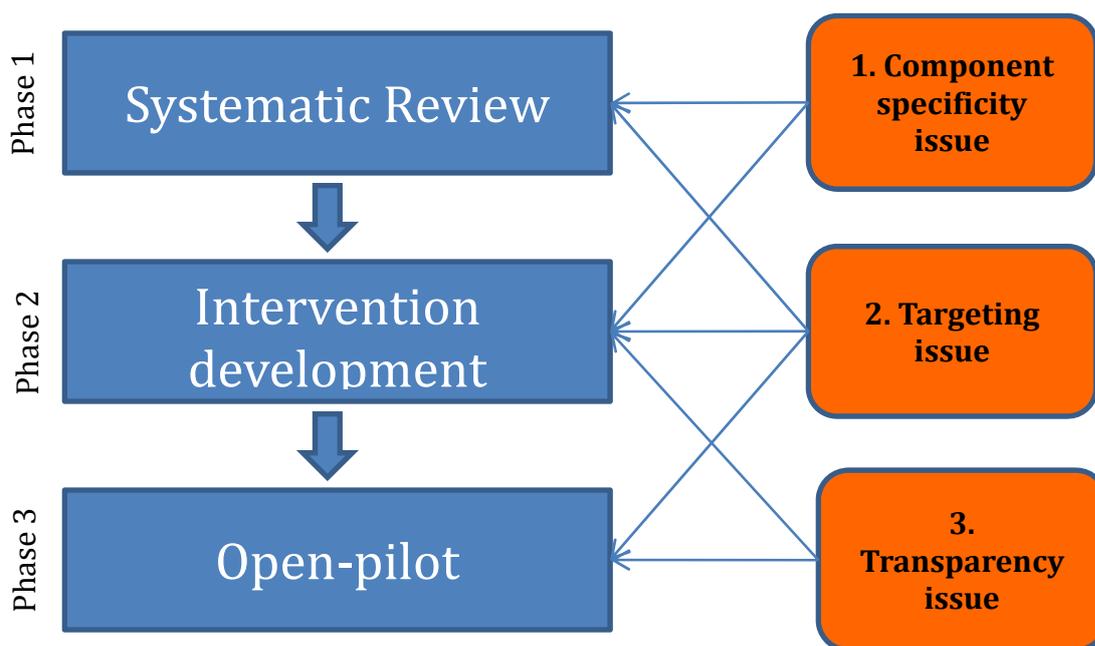


Figure 1: Integration of PhD work phases and identified issues in the literature.

Below I will briefly outline the work undertaken for each of the three phases.

Phase 1: Systematic review

The systematic review examined randomised controlled trials of behaviour change interventions for obese adults with additional risk factors. The inclusion criteria were a mean BMI of 30 or over, a mean age of 40 years or over, at least one additional risk factor for morbidity, and follow-up data of 12 weeks or over. Using the taxonomy of behaviour change techniques (BCTs) developed by Abraham & Michie (2008), the content of the interventions was identified from written intervention accounts.

Forty-four studies met inclusion criteria and were reviewed in terms of intervention effects on weight and disease risk factors as well as behaviour. Modest positive effects in all three outcome categories were detected, suggesting that behavioural interventions in the sampled populations are effective in bringing about improvements in health behaviour and health measures. Significant heterogeneity between studies was detected for all reviewed study outcomes.

To explain some of the variability of behaviour change intervention effects, the review examined whether intervention components moderated any of the observed effects. Moderator analyses focused on the identified BCT. This work specifically focused on associations between (1) the number of BCTs, (2) the type of BCTs and (3) theory-congruent clusters of BCTs on changes in behaviour and/or weight.

Meta-regression suggested that increasing the number of BCTs does not lead to better intervention outcomes and revealed several BCTs, including provision of instructions ($\beta=-0.54, p=.01$), self-monitoring ($\beta=-0.58, p<.001$), relapse prevention ($\beta=-0.50, p=.02$) and prompting practice ($\beta=-0.57, p<.001$), which were linked to more successful interventions in terms of weight loss. Using BCTs specified by Control Theory was associated with greater weight loss.

Thus, the findings of the review suggested that using more BCTs does not necessarily lead to more effective intervention and suggests specific BCTs that moderate effects of changes in weight. These components informed the development and design of evidence-based and theory coherent behaviour change interventions. Additionally, the review suggested that Control Theory might provide a useful framework to further inform the design of such an intervention.

Phase 2: Intervention development

Following a component based systematic review, the collected evidence was used as a basis for the intervention development phase. The aim of this phase was the integration of evidence and theory into a deliverable intervention package. Identified BCTs were integrated into a theoretically coherent intervention. This original intervention targeted dietary and physical activity behaviour change in obese adults carrying additional risk factors for morbidity. Precise procedures demonstrating how evidence and theory were identified, extracted, utilised and integrated were described. All decision points taken which led to the development of the intervention were outlined in detail. This allows tracing of each of the intervention

components from evidence-base and theory coherence to their systematic integration into an intervention package. This intervention development procedure is in line with intervention development recommendations. The intervention development phase culminated in an intervention ready for testing in obese adults with additional risk factors to determine acceptability and feasibility of intervention content, materials and procedures.

Phase 3: Open-pilot testing

The final PhD phase was an open-pilot study testing and optimising acceptability and feasibility of intervention content, procedures and materials of the newly developed evidence-based and theory coherent behaviour change intervention for obese adults with additional risk factors. The intervention was delivered to obese participants in a clinic secondary care setting by a research nurse (external funding was obtained to finance health professional intervention delivery). Feedback was collected during and after intervention delivery from both, facilitator and participants.

The intervention was acceptable to both facilitator and participants, as indicated by comments and ratings on intervention elements, with varied intervention feasibility. Delivery procedures for the intervention were feasible for both, participants and facilitator, indicated by the positive comments and ratings on programme procedures. However, the feasibility of intervention implementation in the specific context was limited, indicated by a slow recruitment process, low retention numbers and a lack of integration of the intervention into the care setting. Various alterations in light of the feedback received were made to optimise the intervention. Positive before and after changes on PA and weight change were observed. The final outcome of all three PhD phases was an intervention which was found to be acceptable for facilitators and participants and feasible for delivery.

Submitted/published papers based on PhD

PUBLICATIONS

Peer-reviewed journal articles

- Dombrowski SU**, Araújo-Soares V, Johnston M, Broom J, Kulkarni U, Brown J, Murray L, Sniehotta FF (2012). Open pilot of an evidence-based behavioural intervention for obese adults with additional risk factors: testing and optimising acceptability and feasibility. *Patient Education and Counselling*, 87(1), 108-119.
- Dombrowski SU**, Sniehotta FF, Avenell A, Araújo-Soares V, MacLennan G (2012). Identifying active ingredients in complex behavioural interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-morbidities: A systematic review. *Health Psychology Review*, 6(1), 7-32.
- Sniehotta FF, **Dombrowski SU**; Avenell A, Johnston M, McDonald S, Murchie P, Ramsay CR, Robertson K, Araujo-Soares V (2011). Randomised controlled feasibility trial of an evidence-informed behavioural intervention for obese adults with additional risk factors. *PLoS ONE*, 6(8), e23040.
- Michie S, Ashford S, Sniehotta FF, **Dombrowski SU**, Bishop A, French DP (2011). Specifying interventions to change physical activity and healthy eating: Development of a revised 40-item taxonomy of behaviour change techniques, *Psychology & Health*, 26(11), 1479-1498.
- Dombrowski SU**, Avenell A, Sniehotta FF (2010). Behavioural interventions for obese adults with additional risk factors for morbidity: systematic review of effects on behaviour, weight and disease risk factors, *Obesity Facts*, 3(6),377-396.
- Dombrowski SU**, Sniehotta FF, Avenell A, Coyne JC. (2007). Towards a cumulative science of behaviour change: Do current conduct and reporting of behavioural interventions fall short of best practice? *Psychology & Health*, 22, 869-874.

Articles in submission

- Prestwich A, Sniehotta FF, Whittington C, **Dombrowski SU**, Rogers L, Michie S Does theory influence the content and effectiveness of behavior change interventions? A meta-analysis of physical activity and healthy eating studies. *Health Psychology*.

PRESENTATIONS

Conference presentations (peer reviewed)

- Dombrowski SU**, Araújo-Soares V, Johnston M, Broom J, Kulkarni U, Brown J, Murray L, Sniehotta FF 'Implementing effective behaviour change techniques in an intervention for obese adults with risk factors: Findings from an open pilot study' Oral presentation at the Division of Health Psychology conference, Belfast, UK, September 2010.
- Dombrowski SU**, Araújo-Soares V, Johnston M, Broom J, Kulkarni U, Brown J, Murray L, Sniehotta FF 'Behaviour change intervention development and optimisation for obese adults with risk factors for morbidity: An open pilot

study' Oral presentation at the European Health Psychological Society conference, Cluj, Romania, September 2010.

Araújo-Soares V, **Dombrowski SU** Johnston M, Brown J, Murray L, Broom J, Kulkarni U, Sniehotta FF 'Evidence Based Intervention for Weight Loss.' Poster presentation at the International Conference on Support for Self Management of Health, Stirling, UK, May 2010.

Dombrowski SU, Johnston M, Leighton-Beck L, Ross-Archer D 'Systematic integration of psychological evidence into staff behaviour change training – A practical example from Keep Well, NHS Grampian.' Oral presentation at the Anticipatory Care Conference NHS Scotland, Glasgow, UK, June 2009.

Dombrowski SU, Sniehotta FF, Avenell A, Araújo-Soares V 'Systematic creation of an evidence base for intervention development: A systematic review of behaviour change interventions in obese adults.' Oral presentation at the Social Dimensions of Health Institute conference, University of St. Andrews, UK, September 2008.

Dombrowski SU, Sniehotta, FF, Avenell A, Araujo-Soares V, MacLennan G, C Comerford C, Buchanan N, & Penny I. 'Systematic development, application and refinement of an evidence- and theory-based behaviour change intervention.' Poster presentation at the joint Division of Health Psychology/European Health Psychological Society conference, Bath, UK, September 2008.

Dombrowski SU, Sniehotta FF, Avenell A, Araújo-Soares V 'Systematic review of behavioural intervention effects on weight loss in obese adults with additional risk factors.' Oral presentation at the 3rd Scientific Meeting of the UK Society of Behavioural Medicine: 'Health and Behaviour: population or individual action for change?', Warwick, UK, December 2007.

Dombrowski SU, Sniehotta FF, Avenell A, Araújo-Soares V 'Systematic review of behavioural interventions on obese adults with additional risk factors.' Oral presentation at the 10th Annual British Psychological Society Division of Health Psychology conference, Nottingham, UK, September 2007.

Dombrowski SU, Sniehotta FF, Avenell A 'Systematic review: behavioural intervention effects on weight in obese adults' Oral presentation, at the 21st Annual Conference of the European Health Psychology Society, Maastricht, Holland, August 2007.

Dombrowski SU, Sniehotta FF, Avenell A, Araújo-Soares V. 'Systematic review: effects of behavioural intervention components on weight loss in overweight and obese adults.' Oral presentation at the 13th Symposium of the Aberdeen Centre for Energy Regulation and Obesity (ACERO), Aberdeen, UK, May 2007.

Dombrowski SU, Sniehotta FF, Avenell A 'The art of behavioural obesity intervention trials - Lessons learned from a systematic review.' Poster presentation at the 9th Annual British Psychological Society Division of Health Psychology conference, Essex, UK, September 2006.

Invited presentations:

Dombrowski SU 'The importance of techniques for health behaviour change to support and maintain weight loss'. Invited keynote given at the NHS Grampian

Weight Management Conference, Aberdeen, UK, September 2011.

Dombrowski SU 'Behaviour Change Techniques Associated With More Successful Interventions for Obesity' Invited talk given at the Scottish Parliament, Cross Party Group on Obesity, Edinburgh, UK, October 2010.

Dombrowski SU 'Integrating evidence-based behavioural change techniques into weight management programmes.' Invited talk given at the NHS Grampian Weight Management Conference, UK, August 2009.

Contributions to the field

The research conducted throughout my PhD was one of the first investigations attempting to systematically examine the ‘active ingredients’ in the form of behaviour change techniques (BCTs) within the wealth of heterogeneous randomised controlled studies in the area of behaviour change for obesity. At the start of my PhD, the now widely used and cited taxonomy of behaviour change techniques by Abraham and Michie (2008) had just been developed. This research was the first project to apply this taxonomy, outside of the research team that originally developed it, and has contributed to validating and extending the possible applications of technique-based behaviour change intervention development. Although there have by now been various different reviews examining BCTs as moderators of intervention effectiveness, few have followed systematically obtained evidence, and/or resulted in intervention development and refinement. The thesis was the first to outline the development of an intervention based on a taxonomy-based systematic review. Additionally, the thesis was one of the first to use an original format to test and optimise acceptability and feasibility of an intervention. Through the development of the flexible open-pilot methodology as a feedback system for continuing improvement and re-testing this research has contributed to methodological development of pilot methodology for behavioural interventions.

In terms of significance to the field of health psychology, the thesis has contributed to the understanding and methods of systematic intervention development, outlining a traceable and transparent development pathway. As behavioural intervention development is complex, the thesis work provides a concrete and replicable example of how this task can be accomplished in areas where multiple studies have given rise to heterogeneous study effects. The thesis has also led to significant follow-on work, which further contributes to the field of behaviour change science. The intervention developed as part of the PhD has subsequently been tested in a randomised controlled pilot trial with promising findings. Beyond formal research, the BCTs linked to effectiveness have also been integrated into a public health weight management programme and present the core content of the service. To date, the programme has been delivered to more than 500 participants and is still on-going. Moreover, through the application of the BCT taxonomy, my colleagues and I have been able to further refine and extend the original 26-item taxonomy to the current 40 item taxonomy - the Coventry, Aberdeen, and London – Revised (CALO-RE) taxonomy.

All the work that has been undertaken has been in line with intervention development frameworks, which place great emphasis on developing interventions based on relevant evidence and theory. The PhD work took advantage of the recent and timely development of BCT taxonomies and this allowed new means of appraising psychological evidence and theory using the highest methodological standards. Notwithstanding the many practical challenges faced by providing and evaluating behaviour change interventions, the thesis demonstrates a transparent and replicable way of integrating and optimising psychological evidence and theory into acceptable and feasible interventions designed for application in health service settings.

Proof of PhD award



UNIVERSITY OF ABERDEEN

By authority of the Senatus Academicus
the Degree of

Doctor of Philosophy

PSYCHOLOGY

was conferred upon

STEPHAN ULRICH DOMBROWSKI

ON 5 JULY 2010



Ian Strain
Principal & Vice-Chancellor

[Signature]
University Secretary