

Case Title

Procedures and challenges of adapting an existing public health intervention for use in another setting: The ToyBox-Scotland preschool obesity prevention programme

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Published Articles

Malden, S., Hughes, A. R., Gibson, A. M., Bardid, F., Androutsos, O., De Craemer, M., ... & Reilly, J. J. (2018). Adapting the ToyBox obesity prevention intervention for use in Scottish preschools: protocol for a feasibility cluster randomised controlled trial. *BMJ open*, 8(10), e023707.

Abstract

Childhood obesity is a major public health issue, which is reflected in the high number of interventions which have been developed to target the behaviors which cause obesity in childhood such as a lack of physical activity, poor diet, and sedentary behavior. The ToyBox programme was originally developed and tested in mainland Europe, and has now been adapted for use in Scottish preschools. This case describes the systematic approach that was taken to adapt the ToyBox programme. The intervention mapping protocol was used to guide the adaptation process in the absence of guidelines for adapting existing interventions. A Co-creation approach was used to involve stakeholders in intervention adaptation procedures. Preschool practitioners participated in workshops, where proposed intervention components were discussed and agreed upon. Proposed intervention activities were trialed out in a volunteer preschool, and an experienced preschool practitioner assisted in the adaptation of classroom materials, intervention content, and methods of delivery in order align the intervention with Scottish preschool practice. The adaptations resulted in the ToyBox-Scotland intervention being significantly different from the original European programme, whereby two major components of the original intervention were removed, and substantial

adaptations were made to the delivery and content of the remaining components. Involving stakeholders in the adaptation of an existing intervention is important to ensure the programme is suitable for those who will be delivering and receiving it. However, it is currently unclear as to how much adaptation should be undertaken, highlighting the need for the creation of evidence-based guidelines for intervention adapters.

Learning Outcomes

By the end of this case, students should be able to:

- Describe the steps taken to adapt a pre-existing intervention for use in another setting.
 - Identify existing guidelines for the development of interventions, and describe the recommended steps.
 - Highlight the challenges faced when adapting an intervention using a co-creation approach, and identify potential solutions.
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Project Overview and Context

Public health intervention research focuses on the development of programmes that target a specific health issue, within a specific population group. Typically, when a similar issue is identified within another population group, or within a different geographical location, a new intervention is usually developed to address these issues. Examples of this are abundant within the intervention development literature, where multiple interventions that address the same outcomes, often using markedly similar components, exist for a number of health conditions. This is particularly apparent within childhood obesity prevention research. A recent systematic review identified multiple distinct interventions aimed at preventing obesity in childhood (Brown et al., 2019). This likely reflects the need for such interventions at

present, with childhood obesity rates remaining high internationally, after rising drastically within the last three decades (Ebbeling, Pawlak, & Ludwig, 2002). However, another reason may be the lack of guidance regarding how to transfer or adapt an intervention between different population groups or settings. At present, there is no published guidance that details how to achieve this, although guidelines are under development (Evans et al., 2019).

Despite the tendency for researchers to develop new interventions, there have been some recent examples where existing interventions have been transferred to other settings within childhood obesity research. Two such examples are the Napp Sacc trial (Langford et al., 2019) and the healthy habits, happy homes study (Gillespie et al., 2019); which target obesogenic behaviors and environments at preschools and in children's homes, respectively. Both interventions were originally developed in the United States, following specific guidelines and frameworks for the development of complex public health interventions (Craig et al., 2008). Prior to implementation of the interventions within the UK, considerable adaptation was undertaken of the intervention components, in collaboration with both the original research teams and relevant stakeholders within the communities where the interventions were set to be delivered. However, these adaptations were not guided by specific recommendations.

We were faced with a similar issue when we adapted the ToyBox preschool obesity prevention programme for use in Scottish preschools (Malden et al., 2018). ToyBox was chosen as a viable intervention to develop as it has proven effective at improving health behaviors associated with childhood obesity in multiple European countries, indicating that the intervention could be transferred to other settings and still achieve its desired aims. However, significant differences exist between Scottish preschools and European preschools (age, ethos, level of teacher training etc), therefore we had to carefully plan our approach to

intervention adaptation in order to ensure the programme was suitably tailored to the Scottish preschool context.

This paper will describe how, in the absence of specific guidelines, we adapted the ToyBox intervention for use in Scotland. The tendency to develop new interventions rather than adapting existing ones may be due to there being extensive guidance documents available for intervention development in comparison to intervention adaptation. Therefore, we will also discuss challenges we encountered during adaptation, and how we overcame these. We will also highlight areas where additional guidelines would have been beneficial to the adaptation process.

Section summary

- *Adapting pre-existing interventions for use in other settings is becoming more common*
- *There is no published recommendations or guidelines regarding how to adapt an intervention to another setting*

Research Design

We employed a systematic approach to the adaptation of the intervention, by loosely following guidelines for the development of complex public health interventions (Craig et al., 2008; Eldredge et al., 2016). However, as these guidelines do not address the adaptation of interventions, we were required to seek alternative approaches in addition to intervention development guidelines. We opted to use a co-creation approach (Greenhalgh, Jackson,

Shaw, & Janamian, 2016) as an integral aspect of the intervention adaptation, as such methods have been shown to enhance the acceptability of interventions in the literature (Greenhalgh et al., 2016). This involved collaboration with the original ToyBox research team, preschool practitioners, and Glasgow City council representatives throughout the study. Following intervention adaptation, we conducted a feasibility cluster randomized controlled trial of the intervention in six local authority preschools in Glasgow (three intervention versus 3 usual curriculum control). Testing feasibility and acceptability is an integral aspect of intervention development and evaluation (Craig et al., 2008), and assists researchers in determining whether the intervention is functioning as intended, and whether the proposed evaluation methods are feasible before progressing to a full-scale trial. This case study will primarily focus on the steps taken to adapt the intervention, with details of the feasibility study published elsewhere (Malden et al., 2018). The following sections detail the steps we took to adapt the intervention:

Step 1: Identifying the problem and potential solutions

Our first step involved the identification of the problem that is to be addressed. In this case, childhood obesity rates in Scotland are at %, with little sign of this number decreasing. It was also identified that at present, there is no preschool curriculum component, which specifically focuses on physical activity and sedentary behavior in Scotland, although aspects of this are covered under health and wellbeing outcomes. We also conducted literature reviews, both of the consequences of obesity in early childhood, and of the effectiveness of existing interventions at preventing obesity (Malden et al., 2019; Reilly, Hughes, Gillespie, Malden, & Martin, 2019). From these literature searches, we identified key components of obesity prevention in the early years that would need to be incorporated into any adapted intervention we developed. Specifically, interventions that focused on multiple health behaviors, (i.e.

physical activity, sedentary behavior, and diet) and were implemented in more than one setting (i.e. schools and homes), were generally most effective and preventing obesity. The ToyBox study (Manios et al., 2012), was identified as a viable intervention to be adapted for use in Scotland considering it is delivered in both preschools and homes, and addressed multiple health behaviors. Additionally, the fact that the intervention had been adapted for use in six culturally different European countries (Greece, Belgium, Spain, Germany, Bulgaria and Poland), demonstrated that it had the potential to be adapted for use in Scotland. Following the identification of an appropriate intervention for adaptation, it was also important to identify the differences that exist between the original population group, and Scottish preschool population. These differences are highlighted in table 1. Careful consideration of these differences would be required during the intervention adaptation process.

Differing factors	Mainland Europe (original ToyBox programme)	Scotland (adapted ToyBox programme)
Children's age	4-6 years old	3-5 years old
Weather	Central and southern European countries with low rainfall and warm temperatures	Glasgow wettest city in western Europe
Sociodemographic factors	Majority of participating regions have narrower inequalities than Scotland (with exception of Bulgaria and Poland).	Wider health and social inequalities evident in Scotland. Glasgow most deprived city in Western Europe
Preschool policies	Policies range from teacher led to child led	Focus on child-led learning
Language	Original materials translated to American English	Specific Scotland-specific language used in education documents in Scotland.

Table 1. Differences between Scotland and the original population group targeted by ToyBox

Step 2: Stakeholder involvement and consultation

The first step in commencing the adaptation process was to begin collaboration with key researchers from the original ToyBox study research team. This allowed us to obtain all the materials needed to implement and evaluate the intervention such as the classroom activity guides, teacher logbooks, and parental materials. Another benefit of creating close links with the original intervention developers, was that we could learn from their knowledge and experiences regarding challenges with intervention implementation. Specifically, the research teams suggested that we should have a stronger focus actively involving parents in the delivery of the intervention at home, as opposed to the passive approach that was adopted by the original intervention.

We also established strong links with Glasgow City Council from the outset, holding a number of meetings with the Education Services team. These meetings allowed us to identify where within the preschool curriculum any adapted ToyBox intervention would fit. It also allowed us to coordinate recruitment efforts so that the intervention was not implemented in preschools that were already running programmes that would compromise the delivery of the intervention. The classroom manuals were shared with members of the Education Services team, who then analysed them to identify any components that would need to be adapted or removed from the programme prior to implementation.

Step 3: Demonstrating the need for ToyBox in Scottish preschools

Once we had established our target population (3-5 year old children who attend a local authority preschool in Glasgow, Scotland) we set out to investigate the extent to which the ToyBox programme would be needed in Glasgow's preschools. Firstly, through our contacts with Glasgow City Council, we arranged hour-long observations of four preschool settings in the city. During these observations, we recorded the number of children who engaged in active play and prolonged periods of sitting (>approximately 15 minutes). Secondly, we

conducted a small needs assessment study involving 15 children, who wore an ActivPAL accelerometer on their leg for three full days at preschool and at home. The ActivPAL measures posture and movement to determine the amount of time an individual spends in active, upright or sedentary activities (Ridgers et al., 2012). The results of this needs assessment study revealed that children were physically active for an average of 144 minutes per day (almost 40 minutes below the recommended amount for under 5's), and had multiple bouts of sedentary time lasting more than 30 minutes.

Following the needs assessment study, we conducted a half-day workshop with 11 preschool teachers, where we discussed topics such as current health and wellbeing practices in preschools, areas for improvement with regards to PA and the classroom environment, and health behaviors in children's homes. We also had an interactive discussion involving the ToyBox classroom materials, where teachers viewed the documents and provided feedback. Finally, we presented evidence that supported the need for ToyBox in Scottish preschools, both national surveys (Reilly, Johnstone, McNeill, & Hughes, 2016) and the results of our observations and needs assessment study, and discussed a number of important aspects such as time constraints, curriculum targets, and space/resources that we would need to consider while adapting the intervention.

Step 4: Co-creation of The adapted ToyBox Scotland intervention

In order to ensure that the adaptations made to the original ToyBox materials were acceptable to Scottish preschool teachers, we adopted a co-creation approach during the adaptation process. Co-creation is becoming a more common tool within intervention development research, which involves stakeholders who will participate in the delivery-and receipt of an intervention in its development (Greenhalgh et al., 2016). We therefore recruited an early years practitioner who worked in a managerial role within a local authority preschool in

Glasgow. This practitioner was provided with all the classroom materials, and asked to deliver the activities within the programme over a 4-week period within her preschool, and record how each session was received by the children and other staff. We also worked closely with the co-creating practitioner to identify aspect of the language within the manuals that would need to be adapted before implementation.

Step 5: Development of additional interactive parent-child activities

In order to develop more interactive home materials, we consulted previous literature on successful home materials for childhood obesity (Epstein et al., 2001), and followed advice gathered from teacher's workshops on how to engage parents. We recruited a graphic designer to assist us in the development of interactive games and sticker incentives for parents to deliver to their children.

Step 6: testing the feasibility and acceptability of the adapted intervention in Scottish preschools

Once all adaptation processes had taken place, we implemented the intervention in three preschools in Glasgow. A further three preschools were recruited to continue to deliver the usual curriculum as control schools. We employed a feasibility cluster randomized controlled design, and measured participating children at baseline, and 15-17 weeks later. Feasibility testing is an integral aspect of intervention development and evaluation, and is recommended by the UK Medical Research Council (Craig et al., 2008). The primary outcome of interest was the feasibility and acceptability of both the intervention, and our methods of evaluation. The specific methods of evaluation were:

1. BMI z score (height and weight measured by a trained researcher)

2. Objectively measured physical activity and sedentary time (measured by wearing the ActivPAL accelerometer)
3. Sociodemographic information and home snacking, water consumption and screen time (measured by parental questionnaire)
4. Intervention fidelity (measured by teacher logbooks and parental questionnaire)

Throughout the intervention adaptation process, we followed the steps presented in the intervention mapping protocol where applicable (table 2), which was used to develop the original toybox intervention. Additionally, as intervention adaptation requires different approaches to intervention development, we were required to diverge from the guidelines.

Table 2. Intervention mapping protocol (Eldredge et al., 2016).

Step 1: Needs assessment	<ul style="list-style-type: none"> • High childhood obesity rates in Scotland • Objective measurement of physical activity in sample of pre-schoolers
Step 2: Matrices	<ul style="list-style-type: none"> • Define expected changes to behaviour and environment • Define objectives
Step 3: Selection of methods and strategy	<ul style="list-style-type: none"> • Consult with potential participants • Select strategies • Match strategies to objectives
Step 4: Development of programme components and design	<ul style="list-style-type: none"> • Consult with stakeholders (co-creation) • Identify resources needed for programme • Develop materials of the programme • Pre-test developed materials with all relevant stakeholders
Step 5: Programme adoption and implementation plan	<ul style="list-style-type: none"> • identify adopters and users (Preschool children and their parents in Glasgow, via preschool practitioners) • Define objectives relating to adoption, implementation and sustainability
Step 6: Evaluation plan	<ul style="list-style-type: none"> • Feasibility cluster randomised controlled trial

Section summary

- *A systematic approach was employed to adapt the ToyBox preschool obesity prevention intervention to Scottish preschools*
- *Co-creation was used to engage and involve stakeholders throughout the adaptation process*

Method in Action

The approach we took to adapt the intervention was systematic, building on existing theory and literature before actively involving stakeholders in the adaptation process. The co-creation approach taken allowed us to identify any potential issues, which may have arisen early on in the adaptation process, and work to find solutions to rectify these together with those who would be responsible for delivering the intervention. A surprising example of this was that both Glasgow City Council and preschool staff felt strongly that the eating/snacking components of the intervention were not needed within the preschool environment, mainly due to most Glasgow preschools having strict policies in place regarding junk food and sugar-sweetened beverages. This is not something that we would have foreseen had we not consulted with stakeholders early during adaptation. The result of this was that these components were ultimately removed from the preschool aspect of the intervention, but were retained for the home component, where all agreed that these behaviors still needed targeting in the home.

Co-creation also had a major influence on the nature of the physical activity and sedentary behavior components of the intervention, in addition to the language used in the preschool activity manuals. One issue identified during the initial trial run of the activities, was that the majority were more practitioner-led than what is now encouraged by the Scottish preschool curriculum, which favors child-led activities (where children are given autonomy to guide the activities themselves), to be used wherever possible (Priestley & Humes, 2010). Therefore, a significant proportion of PA and SB games were removed as they required major practitioner guidance, while some were adapted to make them more child-led. A major asset of the adapted intervention, was that we were able to work with a preschool practitioner to align the intervention activities with existing health and wellbeing objectives set out by the national education policies in Scotland. This meant that by participating in the intervention, practitioners were contributing towards their remit as preschool educators, as opposed to being burdened with additional workload. Considering extra workload is a major barrier to intervention fidelity in school-based programmes, this was an important aspect of the adaptation process.

The end result was considerably different to the original toybox programme. We made extensive adaptations, detailed in table 3. This was considerably more adaptation than we had initially anticipated, and had we not involved stakeholders and practitioners from the outset, we likely would not have made the adaptations a number of the adaptations in the table, meaning the intervention would have looked substantially different, and may not have been as acceptable to practitioners. These components were adapted solely based on the feedback received during co-creation sessions. However, this raises another important issue; which is, at which point does adaptation change an intervention to the point where it is no longer reflective of the original intervention? The fact that we removed the eating/snacking and water consumption components from the preschool setting, and

reduced the number of PA activities, means that we essentially delivered half of the original intervention in Scottish preschools. Is there a limit to how much we can allow stakeholders to influence content of the adapted intervention? Similarly, the development of an additional home component in the form of parent-child interactive activities and sticker incentives added an additional behavioral change component to the intervention that was previously not part ToyBox. This raises the question of whether the adapted intervention is in fact now a distinctly different intervention from ToyBox, and reinforces the need for robust, evidence-based guidance on intervention adaptation.

Table 3. Resulting adaptations to the ToyBox-Scotland programme with reasons

Original ToyBox intervention components	ToyBox Scotland adaptations	Reasons for adaptations
26 physical activity sessions	11 physical activity sessions retained, 15 removed	<ul style="list-style-type: none"> • Teacher-led style of delivery • Younger age of children made some activities too complex
Health behaviours targeted at preschool: physical activity, sedentary behaviour, eating/snacking, water consumption	Physical activity and sedentary behaviour retained; eating/snacking and water consumption removed from preschool component	<ul style="list-style-type: none"> • Stakeholders believed that Scottish preschools already have good policies in place which prevent unhealthy eating and drinking within preschools
Classroom materials written in seven languages, including American English	English version of classroom materials adapted so language was reflective of wording used in Scottish preschool documents	<ul style="list-style-type: none"> • Stakeholders felt materials would be more user friendly if the language used was more familiar
Passive parental involvement using tip cards, newsletters and posters	Active parental component added in form of parent-child homework activities, and sticker incentives	<ul style="list-style-type: none"> • Original ToyBox research team recommended actively involving parents more in the intervention. • Stakeholders agreed and that home materials

		needed to be interactive
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Section summary

- *The adapted intervention was considerably different from the original ToyBox programme in a number of ways*
- *Stakeholders may have considerably different views than the research team*

Practical Lessons Learned

Lesson 1: Collaboration is key

Collaborating with the original research team is not necessarily required when adapting an intervention, but in this case it was of benefit to the adaptation process. The inside knowledge regarding the barriers and facilitators to getting an intervention up and running often go unpublished, so by creating good working links with the original intervention developers, we were able to discuss these points which helped inform decisions made during adaptation. We were also given access to all the relevant materials, such as classroom activity guides, logbooks, and questionnaires along with support and guidance from the original researchers.

Lesson 2: Co-creation is a useful tool for intervention development and adaptation when used appropriately:

Taking the time to do the relevant groundwork with practitioners who will be responsible for delivering the intervention can be very beneficial to ensuring an intervention is

appropriate for the setting. The considerable changes to the intervention's content that were made due to the consultations with the City council, practitioner workshops, and trialing of activities within preschools demonstrates how influential the stakeholders were in adapting the intervention. Additionally, having access to relevant "gatekeepers" was essential for recruitment and buy-in. For example, having Council representatives on board from the outset meant that we had instant access to relevant head teachers, all preschools in Glasgow, and a viable recruitment pathway for the RCT. A caveat to this is that co-creation activities must be adequately planned in advance of any workshops or meetings taking place. It became clear that both council workers and preschool staff had limited time to dedicate to co-creation activities, therefore all the meetings which took place needed to be well structured with clear objectives in order to maximize benefit from the process.

Lesson 3: Engaging parents in the co-creation processes can be difficult

While we had positive experiences working with practitioners during intervention development, we struggled to engage parents in the process to the same degree. Research has shown that specific barriers exist for parents, which can prevent them from engaging in research activities, for example time constraints. Socially disadvantaged groups are particularly difficult to engage with, which may have influenced our lack of success with regards to involving parents in the co-creation process. Incentives and school presentations are two methods that have proven successful in engaging parents in other interventions, which we should consider employing should we look to do any further adaptation work with parents in the future.

Lesson 4: There remains a need for further guidance on adapting interventions:

Co-creation has potential in intervention development/adaptation research, but should be used cautiously as stakeholders may want to change an intervention significantly, as we observed here, to the point that a number of key components of the original programme are either removed or considerably adapted. At present, there is no formal guidance for adapting existing interventions to other settings, and it is therefore unclear as to how much adaptation is acceptable, and how much constitutes the creation of a distinctly new intervention. Intervention development guidelines and models such as the intervention mapping protocol used here, can offer a systematic blueprint for adaptation to an extent. However, there remains considerable gaps within these current guidelines. The strong views of both the practitioners and council staff that preschool policies would render the eating/snacking component of the intervention useless in preschools, conflicts with the existing research on this area, which indicates that there may still be a need to improve preschool dietary habits in the UK (Lucas, Patterson, Sacks, Billich, & Evans, 2017). However, we respected the views of the stakeholders and removed these components from the intervention. Had we been able to demonstrate that diet was still in fact an issue in preschools, as we did with our needs assessment study for physical activity, then we may have been able to include the eating/snacking components without undermining the stakeholder's observations.

Section summary

- *Parents are difficult to engage in co-creation exercises*
- *More guidance is needed with regards to intervention adaptation guidelines*

Conclusion

This case study describes the approach taken to adapt the ToyBox preschool obesity prevention intervention for use in the Scottish preschool context. We used a systematic approach, involved stakeholders throughout using co-creation, resulting in significant adaptations to the content and delivery of the ToyBox programme in Scotland. The difference between an adapted intervention and a newly developed intervention is currently a grey area within public health research. Major components were omitted from the Scottish version of ToyBox based on the views and recommendations of stakeholders who had experience of the preschool education system. The development of guidelines on the adaptation of existing interventions would help to determine the extent to which an intervention can be adapted, and what approaches to take to achieve optimal results.

Section summary

- *Preschool staff were extensively involved in the adaptation of the intervention*
- *ToyBox Scotland is significantly different to the original ToyBox intervention.*
- *It is unclear whether the level of adaptation was sufficient, insufficient, or too extensive. The development of guidelines would help to clarify this*

Classroom Discussion Questions

- Discuss some of the advantages and disadvantages that involving stakeholders in the intervention development/adaptation process can create.

- Why are guidelines such as the “intervention mapping protocol” helpful for intervention development purposes?
 - What factors should be considered when choosing an intervention to adapt for use in another setting?
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Multiple Choice Quiz Questions

1. How did we demonstrate to preschool staff that children were not getting enough physical activity? A) We objectively measured children’s physical activity levels and showed the results to practitioners (CORRECT). B) We showed them results from a systematic review of the literature. C) We told them to take our word for it
 2. What intervention development guidelines did we partly follow during intervention adaptation? A) 6SQuID. B) PRECEDE-PROCEED Model. C) Intervention mapping protocol (CORRECT)
 3. What did we do to ensure the ToyBox programme complimented preschool staffs’ workload, without creating an extra burden? A) aligned intervention components with the Scottish curriculum objectives (CORRECT). B) Made activities shorter. C) Told them not to do it if they did not have time.
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Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest

Further Reading

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Web Resources

<http://www.toybox-study.eu/>

<https://education.gov.scot/Documents/health-and-wellbeing-eo.pdf>

https://www.activehealthykidsscotland.co.uk/files/2018/11/AHKSRC_short_form.pdf

<https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-children-under-five-years/>

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