A process evaluation of an adolescent weight management intervention: findings and recommendations

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SUMMARY

Process evaluation is valuable in guiding development of effective intervention programmes but rare in adolescent weight management. This paper presents a process evaluation of the Loozit® randomized controlled trial, a community-based behavioural lifestyle intervention for obese 13–16 year olds. Adolescents were randomized to receive the two-phase Loozit® group programme, with (n = 73) or without (n = 78), additional therapeutic contact (telephone coaching, short message service and/or emails) in Phase 2. Quantitative and qualitative process data were collected. Facilitators used a standardized evaluation form to document participant attendance, and comment on lesson adherence and process delivery. Adolescents and parents completed satisfaction questionnaires at 2-, 12- and 24-month follow-ups. Following the intervention, 14 adolescents who provided informed written consent were interviewed about their experience with additional therapeutic contact. Data were analysed using descriptive statistics, parametric and non-parametric tests to compare group means, and thematic analyses. Group attendance rates averaged 85 and 47% during Phases 1 (0–2 months) and 2 (3–24 months), respectively. Facilitators frequently noted that participants reported making healthy lifestyle changes. Elements enjoyed in the sessions included practical activities, fun active games, resistance training and forming new friendships. Adolescents struggled with setting specific, measurable, achievable, realistic and timely (SMART) goals. Overall, participants were satisfied with the help received including the telephone and electronic contact. More than 80% of participants found the programme changed adolescents’ eating and physical activity habits, and 89% of parents reported changing parenting strategies. Future adolescent group-based programmes may enhance participant engagement and programme effectiveness by including more interactive and frequent telephone and electronic contact.

Key words: adolescent; obesity; randomized controlled trial; evaluation

INTRODUCTION

Adolescent obesity has become a public health priority (Wang and Lobstein, 2006). Well-evaluated, high-quality interventions that are effective in treating obese adolescents are needed now in various healthcare settings (Oude Luttikhuis et al., 2009). In contrast with the growing literature on primary and secondary outcomes in adolescent weight management trials, publication of detailed process evaluation data from such trials is scant. Most published process evaluations in the field have either been school-based obesity prevention programmes (Singh et al., 2009; Mathews et al., 2010; Naylor et al., 2010; Ezendam et al., 2012) or treatment...
programmes targeting pre-adolescent children (Jones et al., 2010). Process data can assist with interpreting both successful and unsuccessful programme outcomes, monitoring of programme implementation and determining whether null outcomes are a result of a poorly implemented, or ineffective, intervention. Process evaluations can also improve existing programmes by providing information relating to intervention dose (delivered and received), fidelity (extent to which the intervention was implemented as planned) and how participants received the programme (satisfaction with various programme aspects). Process evaluations may also shed light on barriers for participants (for example, what prevented programme attendance) and contextual factors (such as aspects of the environment) that could influence programme outcomes (Steckler and Linnan, 2002).

The Loozit® programme was developed to address the gap in the literature on contemporary community-based, behavioural family lifestyle interventions for overweight and mildly obese adolescents (Shrewsbury et al., 2009). We conducted a randomized control trial (RCT) that aimed to evaluate the effect of additional therapeutic contact (ATC), in the form of telephone coaching and electronic communications, as an adjunct to the Loozit® group programme. The statistically significant short- (2 months) and long-term (24 months) outcomes of the Loozit® RCT were modest reductions in the mean body mass index (BMI) z-score and waist-to-height ratio, and improvements in secondary metabolic outcomes and psychosocial well-being (Shrewsbury et al., 2011; Nguyen et al., 2012b, 2013). However, the ATC intervention did not affect outcomes beyond that of the Loozit® group programme alone, at either 12 or 24 months (Nguyen et al., 2012b, 2013). Our published outcome papers (Nguyen et al., 2012b, 2013) reported brief details on the dose of the delivered intervention and the finding, at the final follow-up, that 87 and 97% of adolescent and parent RCT completers, respectively, would recommend the Loozit® programme to others. However, a wealth of data were collected about the process of intervention implementation and adolescent and parent participants’ perceptions of the programme. It is these data which have the potential to reveal the reasons why some intervention components were shown to be more successful than others.

The aims of this paper were to: (i) report findings from the process evaluation of the Loozit® programme including the ATC component, in terms of delivery (dose and fidelity), participant engagement and interaction, participant knowledge and skill acquisition, and adolescents’ and parents’ perceptions of the programme; and (ii) provide recommendations for future trials.

METHODS

Study design

The full RCT protocol has been published (Shrewsbury et al. 2009). Briefly, the Loozit® RCT was a two-arm, community-based, lifestyle intervention for overweight to mildly obese adolescents that aimed to evaluate the effect of ATC (telephone coaching and electronic communications) as an adjunct to the Loozit® group programme.

Participant details

This trial screened 474 potential participants primarily via schools and media coverage (Nguyen et al., 2012a). In accordance with the trial eligibility criteria, adolescent participants (n = 151) were 13–16 years old (mean age: 14.1 ± 0.9 years), overweight to obese (BMI z-score: 1.0–2.5; mean BMI z-score: 2.02 ± 0.33) but otherwise healthy, available to attend the initial group sessions with a parent/carer, and had landline telephone and email and/or mobile phone access. Randomization to the Loozit® group programme (‘G’ only; n = 78) or group programme plus ATC (‘G+ATC’; n = 73) was stratified by sex, age and intervention site, and occurred after participants provided informed written consent to join the RCT. There was no significant difference in the number of formal dropouts between the ‘G’ arm (n = 7) and ‘G+ATC’ arm (n = 10) at the final 24-month follow-up. Full details of participant flow throughout the study are shown in Figure 1. This study was registered with the Australian New Zealand Clinical Trials Registry (ACTRN1260600175572) and was approved by Human Research Ethics Committees of The Children’s Hospital at Westmead (CHW), Sydney West Local Health District, and the University of Sydney.

Intervention

The Loozit® group behavioural lifestyle intervention was conducted in 11 cohorts between 2006
Fig. 1: Participation from recruitment to 24-month follow-up in the Loozit® programme. Source: extracted from Nguyen et al., 2013. aOne of these adolescents refused to have their anthropometry/blood pressure measured but continued in the study. bThe balance of adolescents who had their anthropometry/BP assessed at the previous time point did not attend this measurement session nor did they formally withdraw from the study. cBooster attendance was not significantly different between arms and declined from 69% to 31% between the first and final session. dIn some cohorts both arms started the Phase 1 intervention mid-school term and for this reason had an extra scheduled booster session, telephone coaching session and SMS and/or email message above that specified in the study protocol. Some adolescents received less telephone coaching sessions or SMS/email messages than specified in the protocol because they opted out of the ATC intervention or could not be contacted. eThe median [range] proportion of messages sent to adolescents that they replied to was 12% [0 to 55].
and 2011 in group education rooms at a community health centre and CHW in Sydney, Australia. Each cohort had one ‘G’ group and one ‘G+ATC group’. The randomization design ensured an approximately equal number of groups in each study arm received the programme at both intervention sites. The group programme adhered to clinical practice guidelines (National Health and Medical Research Council of Australia, 2003) and was based upon a cognitive behavioural approach using behavioural principles to change dietary intake and activity levels, and social cognitive approaches to modify self-efficacy, motivation, perseverance and self-regulation (Baranowski et al., 2002).

In Phase 1, seven 75-min weekly group sessions were held separately, but simultaneously, for adolescents and parents/carers in the same study arm. To further prevent potential contamination, participants in the ‘G’ and ‘G + ATC’ study arms attended group sessions on different days of the week. In Phase 2 (2–24 months), adolescents continued in the same group and were offered five 60-min booster group sessions held quarterly. Adolescent sessions included ~20 min of indoor resistance activities and/or fun active games and focused on healthy eating, increasing physical activity, reducing sedentary activity and improving self-esteem and stress management. Parent sessions encouraged practical support of the lifestyle behaviour change in adolescents and role modelling of healthy lifestyle behaviours. Time was allocated to setting and reviewing specific, measurable, achievable, realistic and timely (SMART) goals in every group session. At the start of Phase 1, each adolescent/parent group had five to nine participants and was usually run by the same dietitian facilitator. Six and three facilitators were involved in delivering the adolescent and parent groups, respectively.

During Phase 2, adolescents randomized to the ‘G+ATC’ arm also received a 10-min telephone coaching call or an electronic communication approximately once a fortnight [overall 14 telephone coaching sessions and 32 short message service (SMS) messages and/or email messages]. Given that telephone and electronic communications are embedded in the lives of contemporary adolescents, it was thought that modest ATC contact would be a low-cost (i.e. potentially sustainable in health services) strategy to motivate, support and retain adolescents in the weight maintenance phase of the programme. Facilitators followed detailed written protocols for the semi-structured telephone coaching calls and the predetermined content of the email and SMS messages. Telephone coaching calls were made by the adolescent’s group facilitator where possible and aimed to assist adolescents with lifestyle changes through problem solving and goal setting. Electronic messages were semi-personalized, encouraging, educational and reflected material covered in the group sessions. About half of the messages ended with ‘please reply’ to encourage participants to respond and facilitators were allowed one short, tailored reply to each message received from adolescents. Some participants did not receive all ATC contact scheduled in the study protocol because they either dropped out of the ATC intervention or could not be contacted for telephone coaching sessions after multiple attempts. Cohorts that commenced Phase 1 during the middle of the school term received an extra telephone coaching session and electronic message.

**Process evaluation measures**

Following each intervention component, i.e. group sessions or ATC, facilitators completed standardized evaluation forms which focused on programme delivery and fidelity to the intervention protocol.

**Programme delivery dose and fidelity**

Data were recorded on the number of occasions and duration of all intervention components delivered to individual participants (dose), and facilitator adherence to the programme protocols regarding content and timing (fidelity).

**Participant engagement and interaction**

Facilitators recorded participants’ involvement in scheduled activities and interaction with co-participants in group sessions.

**Participant knowledge and skill acquisition**

These data were not systematically requested from facilitators but were sometimes recorded on evaluation forms.

**Adolescents’ and parents’ perceptions of the programme**

At 2-, 12- and 24-month follow-ups, adolescents and parents independently completed similar anonymous programme satisfaction questionnaires,
adapted from a study involving obese preadolescent children (Golley et al., 2007). Collected data included participants’ overall satisfaction with the interventions, perceived usefulness of the programme content and resources, impact on adolescent lifestyle changes and parenting strategies, recommendations for programme improvement and reasons for group session absences. The questionnaire for the ‘G+ATC’ arm at 12 and 24 months included items evaluating perceived usefulness of each mode of ATC communication received. A separate questionnaire was later developed (and used in six cohorts) that included additional questions regarding participant satisfaction with ATC communications. Participants were asked about how often they read electronic messages, how frequently they would have liked to receive telephone calls and how these calls helped them pursue their goals. The programme satisfaction questionnaires used a combination of 7-point Likert scales (scale details shown in Tables 1 and 2), yes–no questions, response options and open-ended comments/questions. Responses to Likert scale items were categorized as ‘not helpful’ (1–2), ‘somewhat helpful’ (3–5) and ‘very helpful’ (6–7). Questionnaires and a reply paid envelope were mailed to participants who were unable to attend follow-ups.

**In-depth exploration of the novel ATC intervention**

Fifty-one adolescents in the ‘G+ATC’ arm, who had completed the study before September 2010, were sent an invitation (followed up by a telephone call) to participate in a 10- to 20-min telephone interview on their experiences with ATC. Informed written consent to participate in the interview was received from 14 adolescents/their parents. Adolescents were subsequently interviewed by one of two Loozit® team members who were not known to the adolescents. The standardized interview protocol included both open-ended and closed questions—17 questions were about telephone coaching, 21 questions regarded SMS/emails and there were three more general questions. Participants were asked about why they thought they received ATC, their communication preferences, their interactions with facilitators, their understanding of ATC communications received, the content and perceived usefulness of ATC communications and how they felt about receiving ATC.

**Statistical analysis**

Data analysis was conducted using SPSS, v.19 (SPSS Inc., Chicago, IL). The median (range) values were calculated for ATC communications received by/from adolescents from ATC records. The median (interquartile range, IQR) values were derived for questionnaire responses to Likert scale items. Frequencies are reported for categorical responses including yes–no responses. Differences between group means were evaluated using independent sample t-tests for normally distributed continuous data. Mann–Whitney U-tests for non-normally distributed continuous data and \( \chi^2 \) tests for categorical data. Statistical significance was accepted at \( p < 0.05 \). Qualitative data sourced from facilitator evaluations, programme evaluation questionnaires and the telephone interviews were extracted from the database. The primary author (B.N.) manually identified and coded common themes within the qualitative data and compiled a summary of the results which was reviewed by the co-authors.

**RESULTS**

**Programme delivery**

**Dose**

Phase 1 attendance declined between the first and seventh week, from 93 to 81% in adolescents and from 93 to 74% in parents. In Phase 2, adolescent attendance declined between the first and final booster session from 69 to 31%. There were no statistically significant differences in attendance between study arms. Out of 73 adolescents randomized to the ‘G+ATC’ arm, 64 (88%) commenced the ATC intervention in Phase 2 (Nguyen et al., 2013). The median (IQR) number of telephone coaching sessions received was 12 (2–15), with over two-thirds of adolescents receiving >75% of scheduled sessions. The median (IQR) number of electronic messages that were sent and to which adolescents replied was, respectively, 31 (14–33) and 4 (0–18).

**Fidelity**

Facilitators were generally highly compliant with the content and timing of each pre-determined group session plan.

**Participant engagement and interaction**

A total of 243 group session evaluation forms were available for analysis. Facilitators frequently
described participant enjoyment of elements in the group sessions and good levels of interaction amongst participants. In 18% of session evaluations, the facilitator recorded that participants formed friendships, showed displays of support when sharing experiences or exchanged their contact details (email addresses, telephone numbers and social media details for adolescents).
Participant knowledge and skill acquisition

Facilitators recorded that adolescents/parents reported making healthy lifestyle changes (noted in 56% of group session evaluations) and demonstrated gaining knowledge or skills (21% of group session evaluations). Facilitators specifically reported that the knowledge/skills gained by adolescents included being able to: recall Loozit® healthy lifestyle guidelines, interpret food labels, remember recommended food portion sizes, distinguish organized vs. incidental activity, demonstrate resistance activities, recognize overeating/non-hungry eating cues, apply problem solving skills and set SMART goals. Facilitators perceived that both adolescents and parents appreciated practical activities (12% of group session evaluations) such as reading food labels, taste testing, visual demonstrations (for example, sugar and fat content in different foods and drinks) and comparing the caloric content of takeaway foods.

Adolescents enjoyed participating in fun active games (noted in 38% of facilitator group session evaluations) and resistance training exercises (23% of facilitator group session evaluations). Food preparation was well received by adolescents in the one Phase 1 session in which it was offered (91% of group session evaluations). Facilitators also commented that adolescents struggled with setting SMART goals, notably during Phase 1 (31% of Phase 1 group session evaluations). During each group session, facilitators encouraged adolescents and parents to share with the group the barriers to adolescents achieving their set goals and strategies for overcoming these barriers. Barriers recorded by facilitators included poor time management, lack of motivation/supervision, emotional eating, not eating lunch at school, difficulty breaking unhealthy habits and other family members not setting good examples.

Adolescents’ and parents’ perceptions of the Loozit® programme

Table 1 presents quantitative measures of participants’ perceptions of the group programme whilst Table 2 presents their perceptions of the
ATC received in the ‘G+ATC’ arm, as reported in participant programme satisfaction questionnaires.

When asked about their expectations of the programme, only 54% of adolescents said that they wanted to lose weight. Sixty-four per cent of parents mentioned seeking motivation/support for lifestyle change, with >90% of participants responding that they had received this help. Throughout the intervention, adolescents and parents were highly satisfied with the programme, with at least 87% of adolescents and parents agreeing that they would recommend the programme to others. At 24 months, adolescents in the ‘G+ATC’ arm, compared with the ‘G’ arm, were more satisfied with the amount of help received during the programme ($p = 0.01$).

At 12 and 24 months in the ‘G+ATC’ arm, SMS/emails were perceived as ‘somewhat helpful’ and >70% of adolescents reported reading these all or most of the time. Adolescents rated telephone coaching sessions as ‘somewhat helpful’ at 12 months and ‘very helpful’ at 24 months. Parents perceived telephone coaching sessions for their adolescent as ‘very helpful’ at 12 months and ‘somewhat helpful’ at 24 months.

**Usefulness of the content and resources**

The majority of adolescents in the ‘G+ATC’ arm were happy with the number of telephone calls received and reported that the calls helped them set/achieve their goals. Between 30 and 40% of adolescents found the telephone sessions helpful in other ways, including feeling more positive and motivated.

**Impact on adolescent lifestyle changes and parenting strategies**

As shown in Table 1, most adolescents and parents reported that the group programme had helped adolescents be more aware of, or make, healthier food choices, and increase their physical activity. Many adolescents and parents found that the group programme had an impact on other areas of adolescents’ lives, particularly increased self-confidence/self-esteem, and greater sociability. The majority of parents reported that the group programme improved their knowledge and helped them to nag their child less often. The only statistically significant group differences regarding adolescent lifestyle were a higher proportion of adolescents (24 months; $p = 0.01$) and parents (2 months; $p = 0.03$) in the ‘G+ATC’ arm reporting that the programme had a positive impact on adolescents’ healthy eating habits. The only statistically significant group difference in parenting strategies was at 12 months, with a higher proportion of parents in the ‘G’ only arm reporting that the programme had an impact on their parenting ($p = 0.04$).

**Recommendations for improving the programme**

More than half of the participants had suggestions for improvement, including more physical activity/resistance training and more frequent booster sessions for adolescents, and longer/more frequent parent sessions with the addition of parent booster sessions. At 24 months, adolescents and parents who indicated they would have liked to receive extra help most commonly wanted more motivation or guidance and follow-up sessions, respectively.

**Reasons for group session absences**

The most common reasons given by adolescents ($n = 129$) and parents ($n = 116$) for adolescents being unable to attend Phase 1 group sessions were adolescent illness (23%) and transport issues/parent work commitments (18%). In Phase 2, family commitments (34%), transport issues/parent work commitments (31%) and school commitments (28%) were the most common reasons for session non-attendance reported by adolescents ($n = 92$) and parents ($n = 79$).

**In-depth exploration of the novel ATC intervention (based on telephone interviews)**

The median amount of time that had elapsed from programme completion to the phone interview was 8.0 months (range, 0–33 months). When adolescents ($n = 14$) were asked why they thought they received electronic communications and telephone coaching, more than two-thirds reported that it was to help/encourage them with goal setting, motivation to achieve their goals and to assist with making healthier decisions. While most did not have a preference as to who sent them the electronic messages, the majority expressed that they liked and appreciated speaking to their group leader for telephone coaching. Adolescents could generally recall the healthy lifestyle topics covered in the electronic messages and found these helpful in providing encouragement/motivation, reminders and focus. Most adolescents described the telephone sessions as
dealing with goal setting, motivation and achievements. The majority of participants indicated that the ATC intervention helped them achieve some of their healthy lifestyle goals.

Most adolescents did not think that a reply was expected for messages not concluding with ‘please reply’. Generally, participants were willing and not embarrassed to receive messages/telephone calls when surrounded by others. Most appreciated that someone was thinking of them and did not have suggestions to improve the ATC. While emails were rated as ‘somewhat helpful’, SMS text messages and telephone coaching sessions were perceived as ‘very helpful’. When asked which of the three ATC options participants would prefer if they were now given the choice, half of the sample chose SMS and the other half preferred telephone calls, preferably once to every few weeks.

**DISCUSSION**

To our knowledge, this is the first study to provide detailed process data on a community-based, adolescent weight management programme. Overall, facilitators reported that the Loozit® intervention was delivered as intended to most participants and was well received by both adolescents and parents. The high attendance rates during the initial, more intense, phase of the programme are consistent with average attendance rates reported for comparable adolescent behavioural lifestyle interventions of similar (Wadden et al., 1990) or higher intensity (Lloyd-Richardson et al., 2012). Although the trend in attendance is not commonly reported, the decrease in adolescent attendance during Phase 2 is consistent with findings from similar interventions in pre-adolescent children (Warren et al., 2007; Jones et al., 2010). Despite providing mail and telephone reminders to families about scheduled booster group sessions, it is possible that adolescents may have felt less motivated to attend booster sessions as these were only held once every 3 months. However, participants indicated that barriers for attending the group sessions included transport difficulties and other conflicting adolescent/parent commitments. Due to limited resources, each intervention group was held on only one of two different days of the week (the specific day depending upon group assignment). Participant attendance may have been improved if more resources had been available, giving participants the flexibility to attend the group sessions on several days of the week, or at different times, or if more frequent booster sessions had been provided. Importantly, parental involvement during Phase 2 of the intervention, which was considered acceptable to the adolescents, may have resulted in improved adolescent attendance rates during Phase 2 and greater improvements in lifestyle changes.

Feedback from facilitators indicated that adolescents particularly appreciated active games, resistance training and making new friends, in other words developmentally appropriate activities. Including more fun physical activities and opportunities for social interactions in adolescent group sessions could help enhance participant engagement, social skills, self-confidence and peer support in making healthy lifestyle changes. Consistent with findings from a pilot study among urban obese adolescents (Alm et al., 2008), facilitators frequently reported that adolescents had difficulty setting SMART goals. In this study, adolescents were engaged with the goal setting activity but they often struggled to include all elements of the SMART mnemonic. Although SMART goal setting was discussed in the first group session and time was allocated for goal setting in each session, it may have been useful for learning and cognitive stage to revisit the concept throughout the programme.

Adolescents and parents were highly satisfied with the programme and reported that the programme had an impact on adolescents’ healthy lifestyle goals. Parents also reported that the programme had impacted on their parenting strategies and sometimes other areas of adolescents’ lives. High parental satisfaction rates and a stated positive impact on parenting style are in agreement with findings from similar community-based interventions in pre-adolescent children (Jones et al., 2010; Magarey et al., 2011). Participants in this study were satisfied with the ATC received. Importantly, although ATC did not affect outcome measures, it achieved its purpose, with adolescents confirming that ATC helped them with their goals and decision making. Electronic messages and in particular, telephone coaching, were found useful in achieving healthy lifestyle goals. It is difficult to reconcile these levels of satisfaction with the failure of ATC to improve weight loss or weight maintenance when compared with the Loozit® group programme alone (Nguyen et al., 2012b, 2013).
Findings from this process evaluation seem to indicate that ATC may have been ineffective in the format used in this RCT, rather than being a result of poor implementation. Interviewed adolescents indicated that they would have liked to receive ATC once to every few weeks. In previous studies which did not examine body weight outcomes, adolescents found daily SMS messages and weekly telephone coaching sessions to be acceptable adjuncts to weight management programmes (Alm et al., 2008; Woolford et al., 2010). Assessing young people’s preferences for frequency of contact and providing contact accordingly may help to optimize treatment outcomes and participant satisfaction in future studies.

In addition, more interactive electronic communications may have helped to enhance ATC effectiveness. As shown in a previous study describing participant engagement with the electronic intervention (Kornman et al., 2010), adolescents were more likely to reply to messages concluding with ‘please reply’. Future studies with electronic interventions should investigate ways to increase interactivity in the development of tailored message content (Woolford et al., 2011). Consideration should also be given to other electronic communication means that may engage youth including use of social media platforms such as closed Facebook groups and use of smartphone applications for lifestyle change.

An interesting finding from the telephone interviews was that adolescents would prefer therapeutic contact via SMS and telephone coaching rather than email. At the time the Loozit® RCT was originally designed, email appeared to be an appealing, youth friendly communication tool to incorporate in the intervention and mobile phone usage was less extensive than is now the case. However, it is possible that the more immediate nature of SMS, and more direct, personal and instantaneous support received via telephone coaching could have appealed to young people in our study. Telephone coaching may also help obese adolescents in setting more manageable goals for changing lifestyle behaviours (Alm et al., 2008) and provide more time to address relevant issues.

One strength of this study is that it fills a gap in the literature by providing a comprehensive process evaluation of the Loozit®, combined with practical recommendations for other researchers involved in community-based, adolescent weight management trials. Respondent bias was minimized by making programme satisfaction questionnaires anonymous and giving respondents the opportunity to provide both positive and negative feedback for open-ended questions and comments. It would have been valuable to provide a better linkage between process data and trial outcomes. However, the anonymity of satisfaction questionnaires is a major limitation which precluded the linking of these data to either attendance (intervention dose) or weight loss outcomes. Other limitations include the lack of objective evaluation of group sessions (for example, by using independent observers), the small sample size for the telephone interviews and potential recall bias based on time elapsed between completion of the programme and the telephone interview.

Overall, findings from this process evaluation confirm the Loozit® programme was implemented as intended, successfully engaged and educated participants and was well received by them. However, several changes to the programme were recommended. These include (i) increasing the intervention dose, for example more frequent adolescent booster sessions and the introduction of parent booster sessions; (ii) providing additional motivation/guided support in helping adolescents to establish goals and (iii) more frequent contact by telephone, SMS and/or email for adolescents receiving ATC. Facilitator evaluations indicated that more focus on practical components, e.g. physical activities and setting SMART goals, may have been helpful. In addition, adolescents receiving ATC may have benefitted from more interactive and directive electronic messages.

Process evaluations complement outcome evaluations by providing greater ability to interpret intervention outcomes. It is recommended that future trials develop detailed resources to ensure intervention fidelity, include structured process evaluations in their planning and, depending on available resources, consider the following lessons learnt from the Loozit® trial:

- Include fun, practical, interactive and physical activity elements in adolescent group sessions, and opportunities for building group rapport between sessions (e.g. participation in closed social media groups).
- Incorporate techniques to increase participant attendance and engagement (e.g. more physical activities in group sessions, more frequent adolescent booster and telephone coaching sessions, more frequent and interactive
electronic messages and booster sessions for parents).
- Investigate ways to increase participants’ electronic interactivity.
- Offer the group programme on multiple days and/or times at an easily accessible venue for participating families. Provide frequent booster sessions for adolescents and possibly, concurrent booster sessions for parents.

AUTHORS’ CONTRIBUTIONS

The chief investigators of the Loozit® study, including L.A.B., K.S.S., J.O. and A.J.H., contributed to the conception and design of the study, obtaining ethics approval, the acquisition of funding and overseeing study implementation. L.A.B., K.S.S., J.O., A.J.H., V.A.S. and B.N. contributed to developing the precise content of process data materials. J.O., V.A.S., B.N. and C.L. contributed to the acquisition of process data. B.N. conducted the statistical analysis of the process evaluation data. All authors were responsible for the interpretation of the data, drafting of the manuscript and critical revision of the manuscript for important intellectual content. All authors have read and approved the final manuscript.

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