

Electronic Therapeutic Contact for Adolescent Weight Management: The Loozit[®] Study

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Abstract

Objective: To examine adolescent and facilitator participation in the first 10 months of an obesity management intervention including electronic contact (e-contact) via e-mail and short message service (SMS) communication. **Materials and Methods:** Participants (n = 49) were overweight and obese (13–16 year olds) and were randomized to receive e-contact in the Loozit[®] trial. Adolescents were sent brief, semipersonalized health messages approximately

monthly, from 2 to 12 months. We analyzed adolescents' response patterns, reply content, satisfaction with e-contact intervention, and facilitator responsiveness. Two coding systems described the general attributes and content of adolescent replies and facilitator responses. **Results:** Adolescents' overall reply rate was 22%. There was no difference in age, sex, socioeconomic status, body mass index z-score, or initial group program attendance between the 27 adolescents who replied to 0–2 messages and the 22 who replied to ≥ 3 messages. Adolescent SMS replies had less characters and a quicker response time compared with e-mail replies. Adolescent responses were largely relevant to initial health messages sent (91%), with few using "SMS language" (17%) or emoticons (7%). Most adolescents rated e-contact as "somewhat helpful." Facilitators responded to 93% of adolescent replies, and most responses were personalized (93%), encouraging (88%), and educational (75%). **Conclusions:** Although adolescent engagement was modest, SMS and e-mail communication is a feasible and acceptable adjunct to group lifestyle intervention and telephone coaching in overweight and obese adolescents. Healthy eating messages and those concluding with "please reply" elicited the highest reply rates, and thus these message types should be included in future adolescent e-contact interventions.

Key words: adolescent, overweight, electronic contact, electronic mail, short message service

Introduction

Lifestyle intervention is the cornerstone of overweight and obesity management but outcomes in adolescents tend to be modest.¹ There is an increasing need to better engage adolescents in weight-management programs with the aim of enhancing clinical outcomes via improved retention rates and participant knowledge. Technological advances provide the opportunity

to use youth-friendly and potentially interactive communication modes, such as short message service (SMS) and e-mail, in weight-management interventions.

These modes of intervention are feasible in many westernized societies. In a 2008 study, 93% of surveyed adolescents in the United States had Internet access² and 71% owned a mobile phone, of which 38% sent SMS messages at least daily.³ Similarly, in 2007, most Australian adolescents had Internet access (93% of 12–14 year olds; 95% of 15–17 year olds) and owned a mobile phone (75% of 12–14 year olds; 90% of 15–17 year olds).⁴ In 2008, Australian adolescents spent 4–6 h per week sending or receiving SMS or computer instant messages.⁵

Several adolescent weight-management studies have incorporated electronic contact (e-contact), in the form of SMS⁶ or e-mail/Internet,^{7–10} either as the primary intervention or adjunct to the intervention. Participant satisfaction with e-mail/Internet intervention was quantified as high in two of these studies.^{7,9} In another study, participants found SMS messages effective in improving adherence to healthy lifestyle practices.⁶ However, to date, there have been no adolescent weight-management studies incorporating e-contact that have investigated a combination of SMS and e-mail, or examined both adolescent and facilitator participation in the intervention. Such information will inform appropriate health service delivery for overweight adolescents.

This study aimed to examine adolescent and facilitator participation in the first 10 months of an e-contact intervention for overweight management involving e-mail and SMS communication.

Materials and Methods

STUDY DESIGN

Details of the Loozit[®] study have been reported previously.¹¹ Briefly, the study is a two-arm randomized controlled trial (RCT) that aims to evaluate the effect of additional therapeutic contact (e-contact and telephone coaching) as an adjunct to the Loozit group program—a community based intervention for overweight and lower-grade obese adolescents. Arm 1 receives the Loozit group program. Arm 2 receives the Loozit group program plus additional therapeutic contact; this article focuses on adolescents randomized to arm 2. The Loozit study is registered with the Australian Clinical Trials Registry (ACTRN012606000175572) and has been approved by the Human Research Ethics Committees of The Children's Hospital at Westmead, Sydney West Area Health Service, and The University of Sydney.

PARTICIPANTS

Overweight or obese 13–16 year olds living in Sydney, Australia, were recruited in staggered cohorts commencing in mid 2006, with a

new cohort recruited approximately every 3 months until there were 11 cohorts in mid 2009. Adolescents in arm 2 who had received 12 months of intervention at the time of data analysis (i.e., cohorts 1–8) were included in the present study ($n = 55$). Prior to commencing the intervention, two adolescents withdrew as their cohorts were cancelled because of small numbers and four adolescents withdrew during the initial group sessions (two no longer wanted to take part, and two withdrew because of family circumstances); thus the analysis was limited to 49 adolescents for whom 12-month data were available.

E-CONTACT INTERVENTION

E-contact commenced at 2 months postbaseline with the purpose of reinforcing the key healthy lifestyle principles covered during the seven initial weekly Loozit group sessions and the subsequent booster group sessions held once every 3 months.

Adolescent preferences. During the prebaseline telephone screen, adolescents were asked whether they owned a mobile phone and had regular Internet access (including e-mail access), as this was a study requirement. However, no adolescent was excluded from the study on this basis alone. Adolescents' preference to receive e-contact via SMS and/or e-mail, along with their contact details, was determined at 2 months postbaseline. Cohorts 1 and 2 were given the option of receiving SMS or e-mail messages only, whereas later cohorts were given the option of receiving messages via both means. Contact details were confirmed during telephone coaching sessions and updated.

Message schedule and content. Facilitator-initiated semipersonalized (incorporating adolescent's first name), short (<160 characters) SMS and/or e-mail health messages were sent to adolescents approximately monthly until 12 months postbaseline. During school holidays, adolescents received a message once per fortnight. All adolescents received 8 messages but some received up to 13 messages (because of cohort timing and school holidays) from seven categories: e-contact commencement, healthy eating, being active, goal setting, booster session reinforcements, self-esteem/stress management, and holiday messages. To encourage interactivity, approximately half of the messages concluded with "please reply"; for example, "Hi (adolescents' first name), Remember to enjoy a healthy breakfast each day. What did you have today? Please reply. The Loozit Team." Other messages contained a statement; for example, "Hi (adolescents' first name), Do not let a lapse during the holidays get you down. It is only a temporary set back, so keep going. The Loozit Team." Adolescents were not explicitly instructed to reply to messages, but during phone coaching, facilitators informally

encouraged adolescents' reply. If an adolescent reply was received, the facilitator was permitted one tailored, short (<160 characters), relevant reply message to provide positive reinforcement, education, and encouragement.

Protocols. Written protocols detailing the predetermined content of the SMS and e-mail messages were followed by facilitators. Facilitators kept a record of e-contact sent to and received from adolescents, including delivery medium, date, time, and content. Facilitators checked the mobile phone and e-mail inbox during weekday business hours for adolescent responses.

MEASUREMENTS

Adolescent engagement in e-contact intervention. Engagement in the e-contact intervention was defined by the number of replies received overall from adolescents and was classified as high (≥ 3 replies) or low (0–2 replies).

Predictors of adolescent engagement in e-contact intervention. Adolescents' date of birth, sex, and residential postcode were recorded during the prebaseline telephone screen. Adolescents' postcode was used as a proxy for socioeconomic status, based on the Socio-Economic Indexes for Areas' Index of Relative Socioeconomic Advantage and Disadvantage, a continuum of advantage (high values) to disadvantage (low values).¹² Adolescents' measured height and weight were used to calculate body mass index (BMI) (kg/m^2) at baseline and at 2 and 12 months and BMI *z*-scores were calculated based upon age- and sex-specific reference values.¹³ Attendance in the initial group program was used as a measure of early engagement in the study.

DATA ANALYSIS OF E-CONTACT INTERVENTION

Characteristics and content of adolescent e-contact replies. Response rate, mode, time (hours since message was sent), and length (characters with spaces) of adolescent replies were calculated overall and separately for e-mail and SMS replies. For coding purposes, the first response received from adolescents was analyzed. The timing of sending and receiving SMS messages was not recorded for earlier cohorts and these data could not be retrieved retrospectively as messages were deleted from the mobile phone when it reached capacity. A coding protocol was developed for content analysis of adolescent replies. Messages were classified according to the presence of six general attributes: (a) SMS language; (b) emoticons; (c) greetings; (d) sign off; (e) polite sentiments; and (f) extra information volunteered. An adolescent's reply was also classified regarding its

relevance to the original message, type, and message-specific content. Messages were independently coded by two researchers and results were compared for consistency. Agreement between the researchers was 88% and discrepancies were resolved by consensus.

Adolescent satisfaction with e-contact intervention. Adolescents completed an anonymous satisfaction questionnaire at 12 months postbaseline, in which they were asked to rate on a Likert scale how helpful they found the SMS and e-mail communications (ranging from 1 "not at all helpful" to 7 "very helpful"). Adolescent responses were categorized as "not helpful" (1–2), "somewhat helpful" (3–5), and "very helpful" (6–7).

Characteristics and content of facilitator e-contact replies. Facilitator response rate, time (hours since receiving adolescent reply), and length (characters with spaces) were calculated. A coding protocol was developed for content analysis of facilitator replies. Messages were classified according to the presence of four general attributes: (a) personalized, indicated by use of the adolescent's name; (b) relevant, to adolescent reply content; (c) encouraging/positive reinforcing, for example, "keep up the great work"; and (d) educational, emphasizing key principles of the group program. Messages were independently coded by two researchers and results were compared for consistency. Agreement between the researchers was 92%, and discrepancies were resolved by consensus.

STATISTICAL ANALYSIS

Data entry records were entered by one researcher and checked by a second researcher for accuracy. Quantitative data were analyzed using SPSS for Windows version 17.0.1 (SPSS, Inc., Chicago, IL). Data were screened for normality and appropriate descriptive statistics are reported (mean and standard deviation [SD] for normally distributed variables or median and interquartile range [IQR] for nonnormally distributed data). Between group differences were analyzed using independent sample *t*-tests for normally distributed data and the Mann-Whitney *U* test for nonnormally distributed data. The Friedman test was used to compare variables between dependent groups.

Results

PARTICIPANT CHARACTERISTICS

There were 49 participants (45% male), with mean (SD) age of 14.3 (0.9) years at 2 months (the time point when e-contact began). Participants' mean (SD) 2-month BMI *z*-score was 2.0 (0.4), a modest

reduction of 0.04 (0.07) from baseline. Participants' mean (SD) Socio-Economic Indexes for Areas' Index of Relative Socioeconomic Advantage and Disadvantage was 1,053 (84), the Sydney metropolitan mean being 1,089.¹²

ADOLESCENT E-CONTACT PREFERENCES

Most adolescents owned a mobile phone ($n = 40$, 82%) or had home Internet access ($n = 47$, 96%). At 2 months, 13 adolescents opted to receive e-contact by e-mail only, 10 preferred SMS only, and 26 (53%) adolescents requested both SMS and e-mail messages.

ADOLESCENT ENGAGEMENT IN E-CONTACT INTERVENTION

Adolescent response rate and pattern of engagement. Facilitators sent a total of 592 e-contact messages to 49 participants (Table 1). In total, 130 adolescent replies were received, giving a 22% reply rate overall. At least one reply was received from most ($n = 43$) adolescents. Although half the sample received both SMS and e-mail messages, few (6%) responded via both means. Adolescent reply rates to individual messages ranged from 0% to 55%. Messages concluding with "please reply" had a mean reply rate of 32%, compared with 5% for statement messages. When grouped by category, healthy eating

Table 1. Summary of Adolescent Short Message Service and E-mail Replies

| MESSAGE | NUMBER (%) | | | | MEDIAN (IQR) | | | | NUMBER (%) OF ATTRIBUTES | | | | | |
|---------|-------------------------------|----------|-------------|----------------|------------------------------------|---------------------------------------|---------------------------|------------------------------|--------------------------|-----------|-----------|----------|------------------|-----------------------------|
| | MESSAGES SENT BY FACILITATORS | REPLIES | SMS REPLIES | E-MAIL REPLIES | LENGTH OF SMS REPLIES (CHARACTERS) | LENGTH OF E-MAIL REPLIES (CHARACTERS) | SMS RESPONSE TIME (HOURS) | E-MAIL RESPONSE TIME (HOURS) | SMS LANGUAGE | EMOTICONS | GREETINGS | SIGN OFF | POLITE SENTIMENT | VOLUNTEER EXTRA INFORMATION |
| 1 | 49 | 7 (14) | 2 | 5 | 48 | 106 | 24.1 | 22.0 | 2 | 2 | 4 | 4 | 4 | 2 |
| 2 | 49 | 27 (55) | 14 | 13 | 32 | 80 | 2.3 | 14.1 | 4 | 1 | 9 | 7 | 4 | 3 |
| 3 | 49 | 20 (41) | 8 | 12 | 75 | 91 | 2.8 | 8.0 | 4 | 2 | 6 | 7 | 3 | 1 |
| 4 | 49 | 2 (4) | 2 | 0 | 22 | N/A | 33.4 | N/A | 1 | 0 | 0 | 0 | 2 | 0 |
| 5 | 49 | 12 (25) | 5 | 7 | 52 | 147 | 1.0 | 5.9 | 2 | 1 | 1 | 2 | 1 | 0 |
| 6 | 49 | 14 (29) | 5 | 9 | 35 | 31 | 0.3 | 23.0 | 3 | 1 | 4 | 3 | 1 | 0 |
| 7 | 49 | 0 (0) | 0 | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 8 | 49 | 10 (20) | 6 | 4 | 41 | 135 | 0.7 | 6.9 | 3 | 0 | 2 | 1 | 0 | 0 |
| 9 | 44 | 12 (27) | 4 | 8 | 47 | 167 | 0.4 | 10.1 | 0 | 0 | 3 | 1 | 1 | 0 |
| 10 | 34 | 6 (18) | 2 | 4 | 61 | 115 | 1.2 | 25.3 | 0 | 1 | 2 | 2 | 0 | 0 |
| 11 | 47 | 16 (34) | 11 | 5 | 81 | 176 | N/A ^a | 68.2 | 3 | 2 | 9 | 7 | 5 | 3 |
| 12 | 38 | 1 (3) | 1 | 0 | 15 | N/A | 0.6 | N/A | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 37 | 2 (5) | 0 | 2 | N/A | 47 | N/A | 0.9 | 0 | 0 | 0 | 1 | 2 | 0 |
| Total | 592 | 130 (22) | 61 (10) | 69 (12) | 42 (25-75) | 109 (58-176) | 1.6 (0.2-3.8) | 15.5 (2.4-56.9) | 22 (17) | 9 (7) | 40 (31) | 35 (27) | 23 (17) | 9 (7) |

^aAll sent and received times not recorded for this message.
SMS, short message service; IQR, interquartile range; NA, not applicable.

messages and booster session reinforcement messages elicited the highest reply rates (42% and 34%, respectively), all of these messages concluded with “please reply.” The self esteem/stress management message, a statement message, had the lowest reply rate (4%).

Differences in adolescent SMS and e-mail responses. Sixty-nine (53%) adolescent replies were sent via e-mail, whereas the remaining messages were sent by SMS (47%). The median (IQR) character length for SMS replies was 42 (25–75), compared with 109 (58–176) for e-mail replies ($p < 0.001$). The median (IQR) response time for SMS replies was 1.6 (0.2–38.0) h, compared with 15.5 (2.4–56.9) h for e-mail replies ($p < 0.001$) (Table 1).

Content of adolescent e-contact replies. One hundred twenty-eight (99%) adolescent replies were relevant to the original message, with most adolescents ($n = 118$; 91%) replying directly to the health message, and the replies suggest that most were making healthy lifestyle choices consistent with Loozit principles. A greeting or sign off was included in 40 (31%) and 35 (27%) adolescent replies, respectively. Polite sentiments were expressed in 23 (17%) adolescent replies, and SMS language was included in 22 (17%) adolescent replies. Extra information and emoticons were each contained in nine of the adolescent replies (Table 1).

Adolescent characteristics associated with reply frequency. There were no significant differences between low ($n = 27$) and high responders ($n = 22$) in terms of age ($p = 0.916$), sex ($p = 0.097$), socioeconomic status ($p = 0.868$), 12-month BMI z-score ($p = 0.896$), baseline 12-month BMI z-score change ($p = 0.195$), or initial group program attendance ($p = 0.663$).

ADOLESCENT SATISFACTION WITH E-CONTACT INTERVENTION

Thirty-nine adolescent 12-month satisfaction questionnaires were available for analysis (seven questionnaires were not returned and three adolescents did not attend measurement sessions to receive questionnaires). The median (IQR) adolescent satisfaction rating was 5.0 (3.5–6.5) for e-mail and 5.0 (3.0–6.0) for SMS messages ($p = 0.782$). Most adolescents ($n = 17$) found SMS messages somewhat helpful, 10 found them very helpful, and 7 found them to be unhelpful. Most adolescents ($n = 16$) found e-mail messages somewhat helpful, 13 found them very helpful, and 4 found them to be unhelpful.

FACILITATOR RESPONSIVENESS

Facilitators responded to 121 (93%) adolescent replies (Table 2). Reasons for facilitator nonresponse included the adolescent reply acknowledging message receipt only or it was an automatically generated e-mail from a social networking Web site. Median (IQR) facilitator response time was 17.6 (3.1–43.9) h. Median (IQR) facilitator reply length was 155 (134–165) characters (Table 2). Almost all ($n = 120$, 99%) facilitator replies were relevant to the adolescents' reply content and 113 (93%) were personalized. Encouraging/positive reinforcing phrases were expressed in 107 (88%) facilitator replies. The remaining facilitator replies (12%) were neutral. Educational information was included in 91 (75%) facilitator replies.

Discussion

This is the first study to examine adolescent participation and facilitator responsiveness in an obesity management e-contact intervention involving e-mail and SMS communication. Adolescent engagement, via replying, in the intervention was modest and predictors of reply rate were not identified; however, reply rates varied according to message category and type. Adolescent replies were generally brief but relevant and were quicker for SMS compared with e-mail. Most adolescents perceived the e-contact intervention as “somewhat helpful.” As expected, facilitator responsiveness was high and most replies adhered to the recommended guidelines.

Almost one-eighth (12%) of adolescents failed to participate in the e-contact intervention, which is lower than the 31% reported in an RCT of an adolescent Internet-facilitated weight-loss intervention.¹⁰ Although adolescents feel obliged to reciprocate messages to their peers,¹⁴ the modest reply rate in the present study suggests that this does not extend to messages received from health workers. We recommend that future e-contact interventions seek to increase respondent interactivity by concluding messages with “please reply” as this elicited a higher mean reply rate compared with statement messages.

There has been much media attention focused on adolescents' use of abbreviations in e-mail and SMS messages. However, in the present study, few adolescents used abbreviated SMS language or emoticons in their replies, consistent with findings of Ling,¹⁵ who showed that only 6% of adolescent messages to their peers contained these forms of language.

As expected, adolescents' SMS replies had fewer characters and a quicker response time compared with e-mail replies. A study comparing SMS and e-mail as communication modes showed that SMS typically provides quicker access to messages and the ability to discreetly read messages when convenient,¹⁶ whereas e-mail messages,

Table 2. Summary of Facilitator Electronic-Contact Replies

| MESSAGE | NUMBER (%) | | MEDIAN (IQR) | | NUMBER (%) OF ATTRIBUTES | | | |
|---------|--------------------|---------------------|-------------------------------|-----------------------------------|--------------------------|----------|-------------|-------------|
| | ADOLESCENT REPLIES | FACILITATOR REPLIES | LENGTH OF FACILITATOR REPLIES | FACILITATOR RESPONSE TIME (HOURS) | PERSONALIZED | RELEVANT | ENCOURAGING | EDUCATIONAL |
| 1 | 7 | 4 (57) | 105 | 30.0 | 3 | 4 | 3 | 1 |
| 2 | 27 | 27 (100) | 159 | 16.4 | 26 | 27 | 25 | 25 |
| 3 | 20 | 20 (100) | 164 | 20.0 | 18 | 20 | 16 | 16 |
| 4 | 2 | 1 (50) | 57 | 0.2 | 1 | 1 | 0 | 1 |
| 5 | 12 | 12 (100) | 152 | 16.2 | 12 | 12 | 12 | 8 |
| 6 | 14 | 13 (93) | 138 | 12.3 | 11 | 13 | 12 | 10 |
| 7 | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 8 | 10 | 10 (100) | 155 | 10.4 | 10 | 10 | 9 | 10 |
| 9 | 12 | 11 (92) | 161 | 33.6 | 9 | 11 | 10 | 5 |
| 10 | 6 | 6 (100) | 137 | 19.3 | 6 | 5 | 5 | 4 |
| 11 | 16 | 16 (100) | 156 | 68.6 | 16 | 16 | 14 | 11 |
| 12 | 1 | 0 | N/A | N/A | N/A | N/A | N/A | N/A |
| 13 | 2 | 1 (50) | 82 | 0.4 | 1 | 1 | 1 | 0 |
| Total | 130 | 121 (93) | 155 (134–165) | 17.6 (3.1–43.9) | 113 (93) | 120 (99) | 107 (88) | 91 (75) |

NA, not applicable.

although cheaper and allow detailed replies, require Internet access to view messages.

There were no differences between low and high responders in terms of demographic characteristics, anthropometric outcomes, or prior program engagement, possibly indicating that this intervention is equally acceptable to a range of adolescents. It is difficult to directly compare these findings with other adolescent e-contact interventions as data examining participant reply rates are not well documented. An RCT of an Internet-facilitated intervention in overweight adolescents found no relation between adherence and outcomes (BMI and BMI *z*-score).¹⁰ In contrast, the findings of another study suggest that a higher level of adolescent participation in an Internet intervention was associated with a greater body fat reduction.⁸

Overall, participant satisfaction with e-contact was moderate; however, there was some divergence of opinion regarding adolescents' perceptions of the intervention. Two adolescent weight-management studies incorporating e-mail/Internet quantified participant satisfac-

tion as high,^{7,9} and in a study in which adolescents were sent daily SMS messages as an adjunct to obesity treatment, participants reported that messages were effective in improving adherence to healthy lifestyle practices.⁶ Similarly, in adult weight-management studies incorporating SMS interventions, most participants were satisfied with SMS messages¹⁷ and reported that SMS messages assisted with weight loss.¹⁸

Several studies suggest that e-contact interventions are effective in improving health behaviors in adolescents.^{6,8,19,20} In the present study, e-contact replies indicated that most adolescents were making healthy lifestyle choices consistent with the Loozit principles and also setting relevant Loozit-related goals.

As anticipated, facilitator reply rate was high (93%). Facilitator response time was slower than adolescent response time, possibly attributed to the limited facilitator access (weekday business hours) to e-mail and SMS messages, whereas adolescents had regular mobile and e-mail access.

Strengths of the present study include the investigation of both adolescent engagement and facilitator responsiveness to the intervention, analysis of different aspects of adolescent engagement and satisfaction, and classification of e-contact responses by independent coders (with a high agreement rate indicating robust coding schemes). Adolescents were not reimbursed for e-contact-related costs, and hence, this study may give an accurate estimate of real-life interventions.

Limitations of the present study include the relatively small sample size, which limits the ability to conduct subgroup analyses, and some missing date and time records for earlier cohorts. Future SMS interventions should use technologies such as online tools for sending SMS, which was adopted later in the present study, because these allow for easier message documentation and save time sending messages. Because of the use of anonymous satisfaction questionnaires, interrelationships between e-contact satisfaction and outcomes and adolescent reply rate were unable to be investigated. Adolescent engagement was limited to adolescent replies. Adolescents possibly read and acted upon messages but did not reply (cost may have been a barrier), and thus the true extent of adolescent engagement may not be effectively captured by analyzing adolescent replies alone.

Although adolescent engagement in this e-contact intervention was modest, SMS and e-mail communication is a feasible and largely acceptable adjunct to group lifestyle intervention and telephone coaching in overweight and obese adolescents. The present study provides valuable insights for researchers designing e-contact components of adolescent weight-management interventions. Researchers should aim to further engage adolescents when planning future e-contact interventions including exploration of adolescents' expectations and recommendations for improvement.

Acknowledgments

The authors thank the participated adolescents and their parents/guardians and previous research assistants Kate Stevenson, Kristy McGregor, and Helen Parish for assistance with e-contact. This study was funded by the University of Sydney Research and Development Grant (2006), a bequest from The Estate of the Late R.T. Hall (2006–2008), the Macquarie Bank Foundation (2006–2008), the Foundation for Children (2007–2008), and the Heart Foundation of Australia Grant-in-Aid G08S3783 (2009–2010). V.A.S. was supported by a National Health and Medical Research Council Biomedical Postgraduate Scholarship (no. 505009).

Disclosure Statement

No competing financial interests exist.

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Received: December 18, 2009

Revised: February 25, 2010

Accepted: February 25, 2010