

Author's Proof

Carefully read the entire proof and mark all corrections in the appropriate place, using the Adobe Reader commenting tools ([Adobe Help](#)). Do not forget to reply to the queries.

We do not accept corrections in the form of edited manuscripts.

In order to ensure the timely publication of your article, please submit the corrections within 48 hours.

If you have any questions, please contact science.production.office@frontiersin.org.

Author Queries Form

Query No.	Details required	Author's Response
Q1	The citation and surnames of all of the authors have been highlighted. Please check all of the names carefully and indicate if any are incorrect. Please note that this may affect the indexing of your article in repositories such as PubMed.	Please change "Stephan" to "Stephen". All other authors' names are correct
Q2	Confirm that the email address in your correspondence section is accurate.	The correspondence email, r.t.kane@curtin.edu.au is accurate.
Q3	Please ask the following authors to register with Frontiers (at https://www.frontiersin.org/Registration/Register.aspx) if they would like their names on the article abstract page and PDF to be linked to a Frontiers profile. Please ensure to provide us with the profile link(s) when submitting the proof corrections. Non-registered authors will have the default profile image displayed. Clare M. Roberts Yolanda Pintabona Donna Cross Stephan Zubrick	
Q4	If you decide to use previously published, copyrighted figures in your article, please keep in mind that it is your responsibility, as the author, to obtain the appropriate permissions and licenses and to follow any citation instructions requested by third-party rights holders. If obtaining the reproduction rights involves the payment of a fee, these charges are to be paid by the authors.	All figures are new and have not been published prior to this article.
Q5	Ensure that all the figures, tables and captions are correct.	All the figures, tables and captions are correct
Q6	Verify that all the equations and special characters are displayed correctly.	Equations and special characters are display correctly.
Q7	Ensure, if it applies to your study, the ethics statement is included in the article.	The ethics statement is included in the article.
Q8	Ensure to add all grant numbers and funding information, as after publication this is no longer possible.	We don't have the information on the grant number. The information about the funding grant is correct.
Q9	Please include the following references in the reference list. Merry et al., 2012; Collaborative for Academic, Social, Emotional Learning, 2007.	Merry et al., 2012 has been changed to Merry et al., 2011. Collaborative for Academic, Social and Emotional Learning. (2007). The benefits of school-based social and emotional learning programs: highlights from a forthcoming CASEL report. CASEL, Chicago, IL. Note: Due to the formatting issue, we are not able to include the reference in the reference list and would need Frontiers' help to insert the reference in the list.

Query No.	Details required	Author's Response
Q10	We have changed "Domitrovich et al., 2016" as "Domitrovich et al., 2010" inside the text as per the reference list. Kindly confirm if this is fine.	Domitrovich et al., 2016 to Domitrovich et al. 2010 is fine.
Q11	Kindly advise whether "P&F" here should be changed to "PF" as appeared throughout if it refers "parents and families".	Please change the "P & F" to PF.
Q12	Please confirm if the Ethics statement included here is fine.	The Ethics statement is correct.
Q13	We have edited "Author Contributions" statement. Kindly confirm if this is fine.	The edited "Author contributions" statement is fine
Q14	We have changed "Merry et al., 2005" to "Merry et al., 2004" in the reference list as well as inside the text. Kindly confirm if this is fine.	Merry et al., change to Merry et al., 2004 is fine
Q15	Please cite Tables 4,5 inside the text.	Table 4 and 5 are cited in the text, page 9, under the Diagnostic Outcomes.



Efficacy of the Aussie Optimism Randomized Controlled Trial: Promoting Pro-social Behavior and Preventing Suicidality in Primary School Students

Clare M. **Roberts**¹, Robert T. **Kane**^{1*}, Rosanna M. **Rooney**¹, Yolanda **Pintabona**,
Natalie **Baughman**¹, Sharinaz **Hassan**¹, Donna **Cross**^{2,3}, Stephan **Zubrick**³ and
Sven R. **Silburn**^{3†}

OPEN ACCESS

Edited by:

Jesus de la Fuente,
University of Almería, Spain

Reviewed by:

Manuel Soriano-Ferrer,
Universitat de València, Spain
Ruomeng Zhao,
MacPractice, Inc., United States

*Correspondence:

Robert T. Kane
r.t.kane@curtin.edu.au

† Present address:

Sven R. Silburn,
Menzies School of Health Research,
Casuarina, NT, Australia

Specialty section:

This article was submitted to
Educational Psychology,
a section of the journal
Frontiers in Psychology

Received: 28 April 2017

Accepted: 31 July 2017

Published: xx August 2017

Citation:

Roberts CM, Kane RT, Rooney RM, Pintabona Y, Baughman N, Hassan S, Cross D, Zubrick S and Silburn SR (2017) Efficacy of the Aussie Optimism Randomized Controlled Trial: Promoting Pro-social Behavior and Preventing Suicidality in Primary School Students. Front. Psychol. 8:1392. doi: 10.3389/fpsyg.2017.01392

¹ School of Psychology and Speech Pathology, Curtin University of Technology, Perth, WA, Australia, ² Child Health Promotion Research Centre, Edith Cowan University, Perth, WA, Australia, ³ Population Health, Telethon Institute for Child Health Research, Perth, WA, Australia

The efficacy of an enhanced version of the Aussie Optimism Program (AOP) was investigated in a cluster randomized control trial. Grade 6 students aged 10–11 years of age ($N = 2288$) from 63 government primary schools in Perth, Western Australia, participated in the pre, post, and follow-up study. Schools were randomly assigned to one of three conditions: Aussie Optimism with teacher training, Aussie Optimism with teacher training plus coaching, or a usual care condition that received the regular Western Australia Health Education Curriculum. Students in the Aussie Optimism conditions received 20, 1-h lessons relating to social and interpersonal skills and Optimistic Thinking Skills over the last 2 years of primary school. Parents in the active conditions received a parent information booklet each year, plus a self-directed program in Grade 7. Students and parents completed the Extended Strengths and Difficulties Questionnaire. Students who scored in the clinical range on the Emotional Problems Scale were given The Diagnostic Interview for Children and Adolescents IV, to assess suicide ideation and behavior, and depressive and anxiety disorders. Results indicated that the Aussie Optimism with teacher training plus coaching was associated with the best outcomes: a significant increase in student-reported pro-social behavior from pre-test to post-test 1 (maintained at post-test 2) and significantly lower incidence rates from suicidal ideation at post-test 2 and follow-up. No significant intervention effects on anxiety and depression disorders, and total difficulties were reported. These findings suggest that the AOP with Teacher Training along with Coaching may have the potential to positively impact on suicidality and pro-social behavior in the pre-adolescent years.

Keywords: suicidality, anxiety, depression, primary school children, Aussie Optimism Program

INTRODUCTION

Mental health problems are now ranked as a leading cause of the burden of disease worldwide. In particular, depression and anxiety rank as the leading causes of the non-fatal burden of disease. In 2003, Australian adult males lost 10% and females 18.1% of healthy years to disability because of mental health problems, specifically internalizing problems (Begg et al., 2007). To reduce this level of health burden, we need to engage in more prevention and mental health promotion at a number of levels and specifically target anxiety and depression. Begg et al. (2007) reported that Australian children up to 14 years of age already experience 8.4% of the total burden of disease, and almost a quarter of that is related to mental health disorders, including anxiety and depression, ADHD and autism spectrum disorders. Interventions with children and adolescents hold promise because they can prevent the development of internalizing problems at key developmental time points, as well as building resilience and positive developmental trajectories at times of transition such as the move from primary to secondary school (Neil and Christensen, 2009; Durlak et al., 2011).

Reviews of prevention programs to treat internalizing disorders such as anxiety (Feldner et al., 2004; Neil and Christensen, 2009; Rapee et al., 2009) and depression (Merry et al., 2004; Horowitz and Garber, 2006; Stice et al., 2009) have supported the efficacy of universal and targeted programs for anxiety, but not universal programs for depression (but see Merry et al., 2011). Targeted prevention programs are offered to groups who are at-risk of developing psychological disorders, while universal programs are delivered to the whole population, such as whole school classes regardless of risk status (Merry et al., 2011). Merry et al. (2004) found that only targeted psychological interventions achieved significant reductions in depression post-intervention, and Stice et al. (2009) reported larger effect sizes for programs targeting depression in high-risk adolescents. Rapee et al. (2009) found small but significant effects for a universal anxiety prevention program, with stronger effects for children versus adolescents; while Neil and Christensen's (2009) review indicated efficacy for both universal and targeted school-based anxiety prevention programs; however, indicated interventions, programs delivered to groups or individuals who exhibited early symptoms of psychological disorders, have shown more promise (Feldner et al., 2004). Anxiety is more likely to be identified in the universal programs as the prevalence rates of anxiety is higher than depression and it is often pre-dates depression (Brady and Kendall, 1992; Lawrence et al., 2015). Contradictory for depression, the occurrence rates is lower than anxiety, thus the potential for depression to be diagnosed in a universal program is less compared to the targeted intervention program. Moreover, the indicated prevention program has been evident in preventing anxiety disorders as it aims and focuses on the at-risk sample.

These studies are based on the deficit specific model rather than the competence enhancing model. Deficit specific models aim to prevent and reduce behavioral problems via utilizing a single intervention with specific mechanisms and take less consideration on other factors. Conversely, the

competence enhancing model primarily focuses on building and promoting social-emotional well-being by assimilating the social, emotional, interpersonal skills, behavior, and cognitive components (Greenberg et al., 2003). Thus the potential for the earlier model to address the psychological problems and underlying mechanism contributing to the disorders are lacking (Domitrovich et al., 2010). The prevention programs reviewed have limited features of competence enhancing models and mainly focused on targeting the selective factors to diminish the behavioral problems (Wilson and Lipsey, 2007). The universal programs typically implemented at primary school were generally found effective to inhibit anxiety while targeted programs were effective at reducing depression. Although these programs were successful at preventing anxiety and depression disorders, there was less effort to embed and build social-emotional competence and interpersonal skills, and lack of integration between the universal and targeted components (Weisz et al., 2005).

From a mental health perspective, the findings of three scientific reviews of studies of social and emotional learning (SEL) from kindergarten to Grade 8 indicate that universal SEL programs implemented by teachers and student support staff, improve child adjustment including anxiety and depression, reduce problem behaviors and enhance academic performance (Payton et al., 2008). Compared to control group children, SEL skills have increased, positive attitudes to self and others, improved and positive social behaviors have been more apparent in schools that teach SEL programs. Payton et al. (2008) reported that students who participated in SEL programs in primary school reported fewer conduct problems and reported less emotional distress such as anxiety and depression.

Payton et al. (2008) reviewed 180 school-based studies that investigated SEL curricula. These programs included identification of feelings and problems, goal setting, conflict resolution, and social problem solving strategies. Small to moderate effect sizes were found for school achievement ($ES = 0.28$) and for school Grades ($ES = 0.34$). Importantly, these effects were achieved with regular teaching and support staff using programs that focused on sequenced instructions, active learning strategies, and targeting of social and emotional skills.

Criticisms of universal depression prevention programs suggest that the intervention dose may not be sufficient when implemented with classes of 20–30 students, that there is a lack of ability to individualize program content, and a lack of symptom change in the majority of students (Stice et al., 2009). Spence and Shortt (2007) also comment on low power, limited follow-ups, lack of random assignment, use of no-intervention control conditions, few diagnostic measures and limited use of blind assessors. While many universal studies report non-significant results (Merry et al., 2004, 2011), there is evidence that statistical power may be a problem. Cuijpers (2003) indicates that the low base rate of depression in children and adolescents and small effect sizes for universal trials, make it difficult to detect effects without a substantial number of participants. One solution is to focus universal interventions on multiple disorders such as anxiety, depression, and suicidal behaviors.

The Aussie Optimism Program (AOP; Roberts et al., 2010) is a mental health promotion strategy designed to reduce and

229 prevent anxiety, depression, and suicidal behavior in young
 230 adolescents. AOP is comparable to the universal prevention
 231 program but yet it is distinctive from most of the evidence-based
 232 universal prevention programs. The AOP is grounded in the
 233 competence enhancing model which places strong emphasize on
 234 the integration of social, emotional, interpersonal skills, behavior
 235 and cognitive components to address the internalizing behaviors
 236 and psychological disorders. This current study evaluated two
 237 versions of the AOP, each containing two 10-week school-based
 238 components—Social Life Skills (SLS; Roberts C. et al., 2003)
 239 and Optimistic Thinking Skills (OTS; Roberts R. et al., 2003)
 240 implemented in Grade 6 and 7, respectively, plus a self-directed
 241 program for parents and families (PF; Drake-Brockman and
 242 Roberts, 2001) to be implemented in the second half of the last
 243 year of primary school. The difference between the two versions
 244 is that one version uses coaching in addition to the standard
 245 training to help teachers implement the program with fidelity,
 246 and to manage implementation issues with schools.

247 The content of the AOP: SLS and OTS programs target
 248 social, emotional, and cognitive skills. Following are the
 249 key components of the SLS and OTS programs. *SLS*: (1)
 250 identifying feelings, (2) decision making, (3) communication, (4)
 251 assertiveness and negotiation, (5) coping skills, and (6) social
 252 support networks. *OTS*: (1) connecting thoughts and feelings, (2)
 253 thinking styles, (3) challenging negative thinking styles, and (4)
 254 preparing for adolescence.

255 Intervention in late childhood provides an opportunity to act
 256 before prevalence rates of these disorders increase in adolescence
 257 in conjunction with the enhanced cognitive abilities that may
 258 result in pessimistic attributions, negative beliefs, and more
 259 obvious peer perceptions of social incompetence (Seroczynski
 260 et al., 1997). By teaching social skills and problem solving,
 261 plus cognitive attribution training, students will have more
 262 resources to become resilient. Enhancing protective factors,
 263 such as social support is also beneficial. The PF program
 264 (Drake-Brockman and Roberts, 2001) is provided for parents
 265 to enhance family protective factors, around the transition to
 266 high school. The program is implemented in Grade 7, the final
 267 years of primary school. The content is based on well-validated
 268 theories of depression, anxiety and suicide prevention, and
 269 incorporates validated techniques to change emotions, cognitions
 270 and behavior (e.g., Stark, 1990; Seligman et al., 1995; Kendall,
 271 2006; Payton et al., 2008). The key components of the PF program
 272 are: (1) preparing for challenges ahead, (2) working together as a
 273 family, (3) optimistic thinking, (4) friendship, peer pressure, and
 274 bullying, and (5) preparing for adolescence.

275 Earlier versions of the AOP implemented in Grade 7 have
 276 resulted in fewer depressive symptoms and more positive self-
 277 worth amongst adolescent girls 6 months after moving to
 278 high school (Quayle et al., 2001). In a randomized controlled
 279 trial, conducted with disadvantaged schools, parents reported
 280 significantly fewer internalizing problems immediately after
 281 the intervention (Roberts et al., 2010). The above mentioned
 282 studies provide initial evidence that the combination of the SLS,
 283 OTS, and PF components has the potential to reduce anxiety,
 284 depression, and suicidality through building resilience and social-
 285 emotional and cognitive skills in children and pre-adolescents.

286 Studies investigating the efficacy of other AOP have shown
 287 effective intervention effects in children aged 8 and 9 years
 288 old. The Aussie Optimism Program: Positive Thinking Skills
 289 (AOPTS) was designed to prevent anxiety and depression in
 290 Grade 4 and 5 students. A pilot study of AOPTS indicated
 291 that children who received the program had less depressive
 292 symptoms and disorders at post-test and 9-month follow-up
 293 (Rooney et al., 2006). A larger randomized controlled trial with
 294 910 students was conducted and found that, compared to the
 295 control group children, intervention children were significantly
 296 less depressed at post-test and their parents reported that they had
 297 lower levels of total difficulties immediately after the intervention;
 298 these effects were maintained at the 6-month follow-up (Rooney
 299 et al., 2013a). The same cohort of children was followed up at
 300 30 months and reported significant reductions in hyperactive
 301 behaviors (Rooney et al., 2013b).

302 The purpose of the current study was to evaluate the efficacy
 303 of two delivery strategies of the AOP: SLS and OTS programs
 304 in combination with the self-directed AOP for PF The study
 305 employed two active implementation strategies and one usual
 306 care control condition, the regular Western Australia Health
 307 Education Curriculum (Curriculum Council Western Australia,
 308 2001). The teacher training condition involved 16 h of teacher
 309 training in the implementation of the programs. The second
 310 strategy included the same 16 h of teacher training with the
 311 addition of 10, 1-h coaching sessions for teachers over the 2
 312 years of program implementation. The coaching sessions were
 313 designed to support teachers with program implementation and
 314 help principals and teachers to individualize and institutionalize
 315 the program. Outcomes for both a universal sample including
 316 all children regardless of their symptom levels, and an indicated
 317 sample of children who were already experiencing clinical
 318 levels of emotional symptoms, were measured. First, it was
 319 hypothesized that both active intervention conditions would
 320 show better mental health outcomes and more pro-social
 321 behaviors, compared to the usual care control group. Second,
 322 it was hypothesized that the indicated sample from both
 323 intervention groups would show reduced incidences of anxiety
 324 and depression disorders and suicidal ideation/behaviors, and
 325 increased recovery from these clinical disorders compared to
 326 the usual care control group. We expected to see these effects
 327 maintained at both post-test and 1-year follow-up.

328 MATERIALS AND METHODS 329

330 Participants 331

332 Sixty-three (69.2%) of the 91 government primary schools
 333 from three education districts in Western Australia (Fremantle,
 334 Rockingham, and Mandurah) were recruited to the study. Of the
 335 3288 Grade 6 students enrolled in the recruited schools, 69.6%
 336 ($n = 2288$) and 63.8% ($n = 2097$) of their parents agreed to
 337 participate. The students were aged between 9.67 and 12.45 years
 338 ($M = 11.05$, $SD = 0.33$); 48.9% ($n = 1118$) were female and 51.1%
 339 ($n = 1170$) were male. There were 863 students in the training
 340 only group, 794 students in the training/coaching group, and 630
 341 students in the usual care control group. 342

343 There were no significant between-group differences in
 344 student age, $F(2,2282) = 0.793, p = 0.466$, and male/female
 345 ratio, $\chi^2(2, n = 2287) = 1.26, p = 0.532$. There were no
 346 significant between-group differences in school socio-economic
 347 status (SES), $F(2,60) = 0.15, p = 0.86$, school size, $F(2,60) = 0.76$,
 348 $p = 0.47$, or the number of Grade 6 students in the schools,
 349 $F(2,60) = 0.52, p = 0.60$. Of the 2076 students who reported their
 350 ethnic origin, 80.7% ($n = 1675$) identified as Australian, 1.7%
 351 ($n = 36$) as Australian Aboriginal, 9.2% ($n = 191$) from other
 352 English speaking countries, 5% ($n = 104$) as Asian, 1.9% ($n = 39$)
 353 as European, and 1.5% ($n = 31$) from other non-English speaking
 354 countries. There were no significant between-group differences in
 355 ethnic origin $\chi^2(10, n = 2076) = 2.51, p = 0.113$.

356 A subsample of 211 students (9.2%; 76 males and 135
 357 females) who reported abnormal pre-test scores greater
 358 than six on the Emotional Symptoms scale of the student
 359 Strengths and Difficulties Questionnaire (SDQ-S) were assessed
 360 for clinical diagnoses including anxiety, depression and
 361 suicidal ideation (see **Table 1**). This indicated group was
 362 aged between 10.49 and 12.44 years ($M = 11.01, SD = 0.33$).
 363 Their mean SDQ-S total difficulty score (TDS) was 19.81
 364 (range 9–33), and their pro-social scale mean was 7.93
 365 (range 3–10).

367 Research Design

368 The 63 schools were stratified by SES¹, school size, and the
 369 number of Grade 6 students, and randomly allocated to training
 370 only, training/coaching, and a usual care control condition
 371 such that there were 20, 22, and 21 schools in each condition,
 372 respectively. Within schools, consenting students were assessed
 373 on four occasions: pre-test (at the beginning of Grade 6),
 374 post-test 1 (at the end of Grade 6), post-test 2 (at the end
 375 of Grade 7), and follow-up (at the end of Grade 8). The
 376 research design therefore included three categorical random
 377 effects (school, teacher, student), one categorical fixed effect
 378 (group: training only, training/coaching, usual care control), and
 379 one ordinal fixed effect (time: pre-test, post-test 1, post-test 2,
 380 follow-up).

382 _____
 383 ¹School SES was determined using the “H-Index,” developed by the Department
 384 of Education to assess the level of disadvantage in schools in Western Australia.
 385 Values range from 1 to 10, with 10 being the most disadvantaged and 1 the least
 386 (Department of Education, 2003).

388 _____
 389 **TABLE 1 | Means and standard deviations for the subsample students ($N = 211$).**

	<i>M</i>	<i>SD</i>
Total difficulty score		
393 Training	19.59	4.98
394 Training + coaching	19.92	4.66
395 Control	20.04	4.31
Pro-social score		
397 Training	8.05	1.68
398 Training + coaching	7.83	1.88
399 Control	7.76	1.55

400 Measures

401 Student-Reported Primary Outcomes

402 The SDQ-S (Goodman, 2001) assessed child-reported mental
 403 health problems. It consists of four, 5-item subscales for
 404 hyperactivity, emotional symptoms (anxiety and depression),
 405 conduct problems, and peer problems; subscale scores are
 406 summed to produce a total difficulty score (TDS). The
 407 SDQ-S also has a 5-item pro-social behavior subscale, which
 408 does not contribute to the TDS. The present study focused on
 409 the TDS and the pro-social score.

410 A Cronbach’s alpha coefficient of 0.79 on the TDS for the
 411 current sample indicated good internal consistency reliability.
 412 The subscales, however, were less reliable with Cronbach’s alphas
 413 of 0.58 for peer problems and 0.69 for emotional symptoms. For
 414 the TDS, Mellor (2005) reported a 2-week test–retest reliability
 415 of 0.75 for Australian children aged 11 years and older on the
 416 TDS and cross-informant correlations of 0.43 with parents and
 417 0.35 with teachers. The subscale scores correlate significantly with
 418 other tests such as the Child Behavior Checklist (Goodman and
 419 Scott, 1999). A cut-off score of 7 or above on the Emotional
 420 Problems subscale was used to identify an *at risk* group that
 421 would be assessed for incidence of, and recovery from, depressive,
 422 anxiety, and suicidal disorders (Goodman, 1999).

423 Clinical Diagnoses

424 The Diagnostic Interview for Children and Adolescents IV
 425 (DICA-IV; Reich et al., 1997), a computerized diagnostic
 426 interview suitable for children 6–16 years of age, was used
 427 to assess both previous and current depressive and anxiety
 428 disorders. The DICA-IV takes between 30 and 90 min to
 429 complete. The interviews were conducted by psychologists
 430 trained for 8 h in the use of the computerized schedule.
 431 Interview questions were presented on a computer screen
 432 and children endorsed an item by clicking “yes” or “no,” or
 433 typing a short answer. Items were read to the child and
 434 the child was given assistance to type answers if required.
 435 Students answered items on Major Depressive Disorder (MDD),
 436 Dysthymia (DD), Generalized Anxiety Disorder, Separation
 437 Anxiety Disorder, specific phobias including Social Phobia, Panic
 438 Disorder, Obsessive–Compulsive Disorder, and items relating to
 439 suicidal ideation or behavior. Endorsement of one or more of the
 440 10 items relating to suicidal ideation or behavior was counted as
 441 a positive case.

442 Reich (2000) reported that studies have found high agreement
 443 between the DICA and other measures such as the Child Behavior
 444 Checklist. Welner et al. (1987) found 81% agreement between
 445 clinical interviews and DICA-IV diagnoses. Inter-rater reliability
 446 varies across anxiety and depressive diagnoses (Klein et al., 2005),
 447 but has been reported at 0.9 for MDD (Hodges, 1990). Test–retest
 448 reliability coefficients between 0.11 and 0.50 have been reported
 449 for the DICA-IV (Reich et al., 1995).

450 Parent-Reported Primary Outcomes

451 The parent version of the Strengths and Difficulties
 452 Questionnaire (SDQ-P; Goodman, 1999) is designed for
 453 parents/caregivers of children aged 4–16 years. It has the same
 454 format as the SDQ-S and assesses the same child mental health
 455 problems. The present study focused on the TDS and the
 456

457 pro-social score. A Cronbach's alpha coefficient of 0.85 on the
 458 TDS for the current sample indicated good internal consistency
 459 reliability. Once again, the pro-social subscale was less reliable
 460 with a Cronbach's alpha of 0.69. For the TDS, a 2-week test-retest
 461 reliability of 0.96 and strong correlations with the Rutter Parent
 462 Scale and the Child Behavior Checklist have been reported
 463 (Goodman and Scott, 1999).
 464

465 **Program Implementation Measures**

466 Implementation of the SLS and OTS programs was measured by
 467 teacher log books, which recorded the number of implemented
 468 activities in each of the 10 modules. The log books were
 469 completed by teachers on a weekly basis. Each implemented
 470 activity was rated 0 (not completed), 1 (partially completed),
 471 and 2 (completed in full). Ratings were summed for each
 472 module and converted to a score out of 10. In addition, five
 473 student workbooks were randomly selected from each class to
 474 corroborate the program implementation. These were coded
 475 using the same metric as before.
 476

477 Teachers in the coaching condition were able to access five 1-h
 478 coaching sessions per year. Coaching dealt with program content,
 479 implementation of activities, class and student issues, plus parent
 480 and ethical issues that arose during the implementation phase. It
 481 was expected that teachers who had access to additional coaching
 482 support would be better able to individualize the implementation
 483 of the programs to meet the needs of the students. The
 484 coaching protocol included asking teachers what issues they
 485 wanted to discuss, supporting and praising their efforts with
 486 implementation and other issues, providing discrete corrective
 487 feedback as required, and reviewing the teacher logbook for
 488 program implementation and process issues. In addition, coaches
 489 checked for any problems brought up by students or parents as
 490 a result of the AOP lessons.
 491

492 **Procedure**

493 Institutional Review Board approval was granted by the Curtin
 494 University Human Ethics Committee. Principals from 91
 495 government primary schools in the Western Australian towns
 496 of Fremantle, Rockingham, and Mandurah were invited by letter
 497 and a phone call to participate in the study. A presentation was
 498 then made to the principals and the Grade 6 and 7 teachers,
 499 following which the Grade 6 and 7 teachers were provided with
 500 information and consent forms. Teachers and principals from 63
 501 schools agreed to participate in the study.
 502

503 The Grade 6 students from the consenting schools took home
 504 information and active consent forms for their parents, with
 505 reminders approximately 2 weeks later. Student questionnaires
 506 for the pre-test (at the beginning of Grade 6), post-test 1 (at
 507 the end of Grade 6), and post-test 2 (at the end of Grade 7)
 508 were administered in class time by trained research assistants
 509 blind to group allocation. At the follow-up (at the end of Grade
 510 8), the majority of students completed questionnaires in small
 511 groups at school. Students who could not be accessed at school
 512 received their questionnaires in the mail and returned them in
 513 a pre-paid envelope or completed them over the telephone.
 Parent questionnaires were either sent home with students or

514 mailed to the parents. Parents and students who did not complete
 515 questionnaires were followed up by mail and a phone call.

516 Students who scored in the clinical range on the SDQ-
 517 S Emotional Symptoms subscale were interviewed with the
 518 computerized DICA. Diagnostic interviews were carried out at
 519 pre-test, post-test 2 at the end of Grade 7, and the follow-up at
 520 the end of Grade 8. Students were interviewed at their school, or
 521 by phone at the Grade 8 follow-up. Students were interviewed
 522 away from their class to avoid stigmatization. Where clinical
 523 disorders were identified, parents were contacted immediately by
 524 a psychologist and the results of the assessment were discussed
 525 with them. Parents were given general advice on how to monitor
 526 and support their children, and referrals for psychological
 527 assistance were made if parents requested this. Students with a
 528 clinical disorder at any assessment point were followed up with
 529 the DICA at all subsequent assessments.
 530

531 **Intervention Conditions**

532 Three AOPs were used in this study: SLS (Roberts C. et al.,
 533 2003) and OTS (Roberts R. et al., 2003), both curriculum-
 534 based; and the AOP for PF, a self-directed family-based program
 535 (Drake-Brockman and Roberts, 2001). The suite of programs was
 536 implemented over 2 years: SLS in Grade 6, OTS in Grade 7, and
 537 PF in the second half of Grade 7.

538 SLS was developed to overcome interpersonal risks such as
 539 poor social skills and social problem solving, lack of social
 540 support (Rudolph et al., 1994), and friendship difficulties
 541 (Shanahan et al., 2008). OTS targets cognitive vulnerabilities
 542 such as pessimistic attribution style (Seligman et al., 1995), and
 543 negative self-perceptions and future expectations (Beck et al.,
 544 1979; Gibb and Coles, 2005).
 545

546 The SLS and OTS programs each contain ten 60-min
 547 modules that can be incorporated into regular primary school
 548 classes for health education or personal development (see
 549

550 TABLE 2 | Content of the Aussie Optimism Program modules.

Social Life Skills	Optimistic Thinking Skills	Aussie Optimism Program for families and parents
1. Introduction and feelings	1. Identification of feelings	1. Dealing with transitions
2. Decision making	2. Identification of thoughts	2. Working together as a family
3. Communication skills	3. Linking thoughts and feelings	3. Optimistic thinking
4. Assertiveness I	4. Different thinking styles	4. Friends
5. Assertiveness II	5. Review and quiz	5. Preparing for high school
6. Negotiation	6. Generating alternative thoughts	
7. Coping skills	7. Looking for evidence	
8. Networks	8. Challenging unhelpful thoughts	
9. Friends and family	9. Decatastrophizing	
10. Transition and review	10. Review and action plans	

Table 2). The modules include didactic information, interactive activities, games, co-operative learning tasks, Health and Physical Education cross-curriculum link, worksheets, and homework activities to help students generalize skills outside of the school setting. Modules are designed for implementation by teachers with whole classes. While the standard curriculum for Health and Physical Education provides students with skills and knowledge in various aspects of health and physical education, the AOP directly targets risk and protective factors that are associated with mental health difficulties, particularly anxiety and depression. The programs aim to develop emotional, social and cognitive skills and strategies such as communication, decision-making, social awareness, self-management, coping and optimistic thinking, as competencies in these areas are associated with better mental health (e.g., Collaborative for Academic, Social, and Emotional Learning, 2007). Proven CBT strategies are combined with role plays and discussions to train students to use the new skills and strategies in and out of the classroom.

Each program includes a Student and Parent booklet to accompany the SLS and OTS' contents taught at school. The Student booklet consists of 10 modules is structured with the following features to enhance the program implementation, i.e., (1) Resources Sheets for some of the skill-based modules, (2) A Practice Exercise to generalize the skills at home and community settings beyond the classroom, (3) A Key Message and important points from each module, (4) A Rating Sheet to describe enjoyment and usefulness of the module, and (5) A Skills Checklist for student to reflect their understanding and self-assessment. In addition, the incorporated Parent booklet was to inform parents of the program's contents and provide advice on how to support their child's use of the skills in the home environment. The Parent booklet contains 10 modules and each modules is a brief information on the lesson learnt by their children at school. There is no explicit instruction given to the parents on when and how to use the Parent booklet at home, however, it is expected that parents would review the Parent booklet, discuss the content and practice the skills taught together with their child once their child has completed the lesson.

The self-directed *AOP for PF*, was provided for parents of Grade 7 students in the second half of the year when schools and families were preparing their students for secondary school. It aims to enhance family protective factors for young adolescents over the transition to secondary school. Topics such as working together as a family, building new friendships, stress management in times of transition, and cultivating an optimistic perspective are discussed and families are encouraged to make plans to assist their teenagers over this time. All learning outcomes were compatible with the Western Australian Department of Education's Curriculum Framework for Health Education.

Intervention group teachers received 8 h of training per program. For SLS and OTS this included skills practice and feedback on the program activities, and discussion of implementation issues for individual classrooms. The majority of teachers taught either SLS or OTS; teachers who taught OTS also administered the P&F program in Grade 7. While teachers in both intervention groups received program manuals, resources,

and student workbooks, teachers in the training/coaching condition were able to access up to 5 h of coaching per year to support them in program implementation. The coaching was provided by school psychologists who were accredited trainers in AOP and had experience in school-based intervention programs. Teachers in this condition accessed coaching at their own convenience for a variety of issues including individualizing the program to the meet the needs of their students, advice on how to implement certain activities and motivate students, advice on how to adapt the content for children with special needs, encouraging parent participation, and assistance with dealing with referrals for children with more serious problems.

Control Group

Students in the control condition received their regular health education lessons, which were related to the development of self-management and interpersonal skills. Teachers used a variety of resources and teaching strategies.

These lessons had similar learning outcomes to AOP. Control group teachers received training and resources in AOP in the second year of the research project.

Data Analysis

The research design generated a hierarchical data structure in which time was nested within student, student was nested within teacher, and teacher was nested within school. The psychometric data (SDQ-S total difficulties, SDQ-S social skills SDQ-P total difficulties, SDQ-P social skills) were analyzed with a Generalized Linear Mixed Model (GLMM; Bryk and Raudenbush, 1987) as implemented through SPSS's (Version 22) GENLINMIXED procedure. In order to optimize the likelihood of convergence, a separate GLMM was tested for each outcome. Each GLMM assumed a normal probability distribution for the outcome and linked it to the fixed effects (group, time, group \times time) with an identity function. If the outcome did not have a normal distribution, then the parameter estimates of the covariance matrix were computed with robust statistics.

DICA assessments were conducted at pre-test, post-test 2, and follow-up. The DICA data (incidence: yes, no; recovery: yes, no) were analyzed with a GLMM that assumed a binomial probability distribution for the outcome and linked it to the fixed effects (group, time, group \times time) with a logit function. Once again, in order to optimize the likelihood of convergence, a separate GLMM analysis was run for each outcome.

Unlike repeated measures ANOVA (or ANCOVA), GLMM does not rely on participants providing data at every assessment point; GLMM uses all the data present at each assessment point thereby reducing the impact of subject attrition on statistical power. Moreover, GLMM is robust to unequal group sizes, can deal with unequally spaced data collection points, does not require equal variances at each time point or equal covariances between all pairs of time points, and is able to account for correlations among repeated measurements.

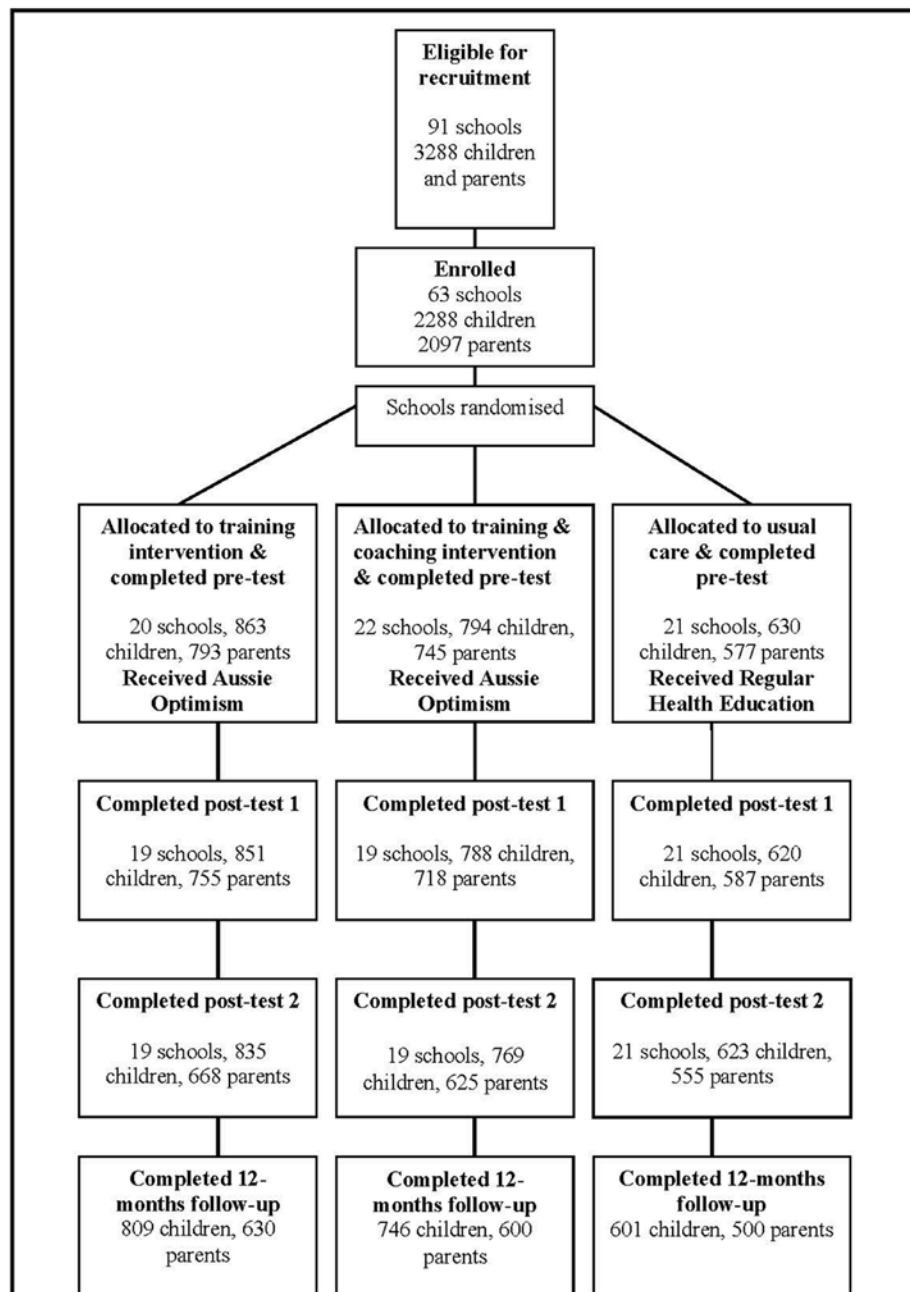


FIGURE 1 | CONSORT diagram of students' progress through the phases of the randomized control trial.

RESULTS

Attrition

The student cohort comprised 2288 students at pre-test (the beginning of Grade 6), of which 2259 responded at post-test 1 at the end of Grade 6 (1.22% attrition), 2227 at post-test 2 at the end of Grade 7 (2.62% attrition), and 2156 at the follow-up at the end of Grade 8 (5.73% attrition rate). At post-test 1, post-test 2, and follow-up, there were no significant differences on the pre-test outcomes

between those students who were retained and those who dropped out. Attrition rates did not differ significantly between the intervention and control groups. **Figure 1** provides a CONSORT (Consolidated Standards of Reporting Trials) diagram of student progress through the phases of the randomized control trial. The pre-test parent sample comprised 2115 parents, of which 2060 responded at post-test 1 (2.60% attrition), 1848 responded at post-test 2 (12.62% attrition), and 1730 responded at follow-up (18.20% attrition rate).

Implementation

In 2003, 61 teachers in the training only condition implemented an average of 9.16 SLS modules ($SD = 2.02$) and 54 teachers in the training/coaching condition implemented an average of 9.24 modules ($SD = 1.74$). In 2004, 52 teachers in the training only condition implemented an average of 7.92 OTS modules ($SD = 3.25$) and 48 teachers in the training/coaching condition implemented an average of 8.06 modules ($SD = 3.56$). There were no significant between-group differences in implementation dose for SLS [$t(113) = 0.22, p = 0.83$] or OTS [$t(98) = 0.21, p = 0.84$]. The dose for the PF program was difficult to calculate as the majority of families did not return their logbooks.

In 2003, SLS coaching was offered to the 54 teachers in the training/coaching condition; and in 2004, OTS coaching was offered to the 48 teachers who remained in the training/coaching condition. Coaching was not fully utilized by teachers. The Grade 6 mean per teacher was 2.27 h (range of 0–4 h). In Grade 7, the mean per teacher was just 0.30 h (range 0–1 h). The coaching involved discussion of positive and negative aspects of the program, implementation of specific content, program structuring and timetabling, student and class issues, and teacher and parent issues. It is not clear why teachers did not fully take up the opportunity to enhance their implementation with additional coaching. Explanations included a lack of teacher time to access coaching in their busy school day, a lack of time for school psychologists to coach teachers, teachers found the program relatively easy to implement without coaching, teachers did not allocate time for coaching.

Primary Analyses: Student-Reported Outcomes

SDQ-S Total Difficulties

The group \times time interaction was significant [$F(6,8917) = 2.35, p = 0.028$]. LSD *post hoc* comparisons tested for changes in total difficulties between adjacent time points within each of the three groups. The comparisons indicated that the training/coaching and control groups showed a significant decrease in total difficulties from pre-test to post-test 1 ($p < 0.001$), whereas the training only group showed no change in total difficulties during this time ($p = 0.731$). Each of the three groups showed a significant decrease in total difficulties from post-test 1 to post-test 2 (all $ps < 0.001$), but there was no significant change between post-test 2 and follow-up for the training only group ($p = 0.130$), the training/coaching group ($p = 0.107$), or the control group ($p = 0.231$).

SDQ-S Pro-social

The group \times time interaction was significant [$F(6,8917) = 3.13, p = 0.005$]. LSD *post hoc* comparisons tested for changes in pro-social behavior between adjacent time points within each of the three groups. From pre-test to post-test 1, there was a significant increase in pro-social behavior for the training/coaching group ($p = 0.045$), a significant decrease for the training only group ($p = 0.009$), and no change for the control group ($p = 0.105$). No changes in pro-social behavior were observed between post-test 1 and post-test 2 for the training/coaching group

($p = 0.985$), the training only group ($p = 0.527$), or the control group ($p = 0.479$). Significant decreases in pro-social behavior were observed between post-test 2 and follow-up for the training/coaching group ($p < 0.001$), the training only group ($p < 0.001$), and the control group ($p < 0.001$). Between post-test and follow-up, the time \times group interaction was non-significant [$F(2,4377) = 1.45, p = 0.234$] indicating that pro-social behavior significantly decreased at the same rate in all three groups during this time.

At Risk Analysis

A binary “at risk” variable was created by assigning a “1” (at risk) to students who scored 7 or above on the Emotional Problems subscale and a “0” to students who scored below 7 (not at risk). A significant group \times time interaction indicates an intervention effect. The at risk \times group \times time interaction was not significant for either of the student-reported outcomes. This indicates that the “at risk” factor did not moderate the previously reported intervention effects. The previously reported intervention effects therefore apply to both the “at risk” and the “not at risk” subsamples.

Secondary Analyses: Parent-Reported Outcomes

SDQ-P Total Difficulties

The group \times time interaction was not significant [$F(6,7741) = 1.27, p = 0.270$]. The group main effect was also not significant [$F(2,7741) = 0.55, p = 0.574$] indicating that the three groups were equivalent on parent-reported total difficulties at each of the four assessments. The main effect for time was significant [$F(3,7741) = 40.62, p < 0.001$] indicating that parent-reported total difficulties changed in the same manner for all three groups. LSD *post hoc* contrasts indicated that parent-reported total difficulties decreased significantly for all groups from pre-test to post-test 1 ($p < 0.001$), and from post-test 1 to post-test 2 ($p < 0.001$). In contrast, however, parent-reported total difficulties increased significantly for all groups from post-test 2 to follow-up ($p < 0.001$).

SDQ-P Pro-social

The group \times time interaction was not significant [$F(6,7743) = 0.44, p = 0.855$]. The group main effect was also not significant [$F(2,7743) = 1.71, p = 0.180$] indicating that the three groups were equivalent on parent-reported pro-social skills at each of the four assessments. The main effect for time was significant [$F(3,7743) = 39.43, p < 0.001$] indicating that parent-reported pro-social skills changed in the same manner for all three groups. LSD *post hoc* contrasts indicated that parent-reported pro-social skills increased significantly for all groups from pre-test to post-test 1 ($p < 0.001$), and from post-test 1 to post-test 2 ($p = 0.002$). In contrast, however, parent-reported pro-social skills decreased significantly for all groups from post-test 2 to follow-up ($p < 0.001$).

Table 3 provides the means and standard deviations for both the student-reported and parent-reported outcomes, broken down by group and time.

Diagnostic Outcomes

Incidence (yes, no) and recovery (yes, no) were treated as binary outcomes. Incidence was coded “0” for students who were healthy at pre-test and remained healthy at a subsequent assessment, and “1” for students who were healthy at pre-test but became clinical at a subsequent assessment. Recovery was coded “0” for students who were clinical at pre-test and remained clinical at a subsequent assessment, and “1” for students who were clinical at pre-test but became healthy at a subsequent assessment. Incidence and recovery were assessed at post-test 2 and follow-up in relation to anxiety (at least one anxiety disorder present) and/or depression (MDD or DD), and suicidal ideation. Incidence and recovery rates are reported by group and time in **Tables 4** and **5**. The results of the GLMMs are reported below.

Incidence

For depression and/or anxiety, there was no group × time interaction [$F(1,205) = 0.30, p = 0.745$] or group main effect [$F(1,205) = 0.14, p = 0.873$]. There was, however, a significant main effect for time [$F(1,205) = 12.95, p < 0.001$]. These results indicate that the three groups had similar incidence rates for depression and/or anxiety at post-test 2, similar incidence rates at follow-up, and showed a similar decrease in incidence rates between post-test 2 and follow-up. For suicidal ideation, there was no significant group × time interaction [$F(2,198) = 2.84, p = 0.061$]. There were, however, significant main effects for group [$F(2,198) = 3.41, p = 0.035$] and time [$F(1,198) = 6.14, p = 0.014$]. The main effect for group indicated that, at both post-test 2 and follow-up, the control group had significantly higher incidence rates than the training/coaching group ($p = 0.017$). No other between-group comparisons were significant. The main effect for time indicated that the three groups showed similar

significant decreases in incidence rates between post-test 2 and follow-up.

Recovery

For depression and/or anxiety, there was no significant group × time interaction [$F(2,156) = 0.32, p = 0.723$] or main effect for group [$F(2,156) = 1.99, p = 0.140$]. There was, however, a significant main effect for time [$F(1,156) = 5.91, p = 0.016$]. These results indicate that the three groups had similar recovery rates for depression and/or anxiety at post-test 2, similar recovery rates at follow-up, and showed a similar increase in recovery rates between post-test 2 and follow-up. For suicidal ideation, there was no significant group × time interaction [$F(2,163) = 0.10, p = 0.905$]. There were, however, significant main effects for group [$F(2,163) = 4.58, p = 0.012$] and time [$F(1,163) = 11.23, p = 0.001$]. The main effect for time reflected significant post-test 2 to follow-up increases in recovery rates for all three groups. The group main effect reflected significantly greater recovery rates at post-test 2 and follow-up for the training/coaching group compared to the training only group ($p = 0.001$). The training/coaching group had higher recovery rates than the control group at post-test 2 and follow-up, but the differences were not significant. In contrast, the training only group had lower recovery rates than the control group at post-test 2 and follow-up, but once again the differences were not significant.

DISCUSSION

The current study found two mental health effects relating to the beneficial outcomes of The Aussie Optimism. Compared to students in the training only and the control group, students in

TABLE 3 | Adjusted means and standard deviations for the student-reported and parent-reported Strengths and Difficulties Questionnaire.

	Pre-test		Post-test 1		Post-test 2		Follow-up	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Student report								
Total difficulty score								
Training	10.94	6.09	10.87	6.14	9.74	5.81	9.54	5.71
Training + coaching	10.95	5.62	10.40	5.90	9.10	5.42	8.73	5.25
Control	11.09	5.79	10.49	5.86	9.70	5.63	9.43	5.30
Pro-social score								
Training	8.01	1.68	7.78	1.79	7.82	1.64	7.08	1.89
Training + coaching	7.59	1.76	7.72	1.77	7.72	1.75	7.16	1.84
Control	7.81	1.71	7.72	1.72	7.65	1.76	6.94	1.92
Parent report								
Total difficulty score								
Training	9.16	5.95	8.70	5.92	7.91	5.99	8.42	6.02
Training + coaching	9.24	5.95	8.77	6.11	7.90	5.75	8.44	5.77
Control	9.37	6.29	9.05	6.30	7.90	6.30	8.78	6.13
Pro-social score								
Training	8.03	1.81	8.22	1.74	8.33	1.75	8.00	1.85
Training + coaching	7.91	1.99	8.06	1.85	8.24	1.81	7.87	1.94
Control	7.90	1.78	8.10	1.81	8.13	1.77	7.84	1.88

1027 the training and coaching group displayed significantly greater
 1028 increases in pro-social behaviors between pre-test and post-test
 1029 1 (end of Grade 6), which were maintained at post-test 2 (end
 1030 of Grade 7), and significantly lower incidence rates of suicidal
 1031 ideation at post-test 2 and follow-up. Contrary to the predictions,
 1032 results indicated no significant reduction in the incidence of
 1033 depressive and anxiety disorders, and total difficulties at the post-
 1034 test and follow-up for both intervention groups, the training only
 1035 as well as the training and coaching groups.

1036 These findings indicate that the SLS component when
 1037 implemented with training and coaching was beneficial for the
 1038 development of pro-social behavior for up to 1 year following
 1039 the intervention. In contrast, training without coaching had a
 1040 negative impact on pro-social behavior at post-test 1, suggesting
 1041 that coaching should be included when implementing SLS. The
 1042 fact that the pro-social behavior effects were found after the
 1043 SLS component of the program had been delivered, but before
 1044 OTS or the parent component of the program, suggests that
 1045 the Social Skills component had successfully targeted social skills
 1046 although this needs to be investigated further in future trials by
 1047 examining the mechanisms by which change occurs.

1048 The finding that the training only condition was ineffectual
 1049 at some time points, and counterproductive at others is

1084 consistent with findings yielded in other, international universal
 1085 intervention studies, that typically show no or small to
 1086 moderate effects (Cuijpers, 2003; Roberts et al., 2008; Conduct
 1087 Prevention Research Group, 2010). Our findings indicate,
 1088 however, that primary school teachers can be trained and
 1089 supported to implement universal mental health promotion
 1090 programs effectively in schools, when they receive coaching and
 1091 support in addition to the regular training for the programs.
 1092 The current research suggests that teacher training alone is not
 1093 sufficient to ensure that teachers impart mental health promotion
 1094 strategies to their pupils. They also need ongoing support and
 1095 coaching throughout the school year, if their students are to learn
 1096 and integrate mental health strategies.

1097 The results for suicidal ideation support the findings for
 1098 pro-social behaviors. Compared to the control condition, AOP
 1099 implemented with both training and coaching decreased the
 1100 incidence of suicidal ideation at the end of Grade 7 as students
 1101 were making their transition to Secondary school. In contrast,
 1102 compared to the control group, AOP implemented with training
 1103 increased the incidence of suicidal ideation at the end of Grade
 1104 7—although the increase was not statistically significant. These
 1105 findings suggest once again that training alone for teachers was
 1106 not sufficient to protect students. This may have been because
 1107 teachers did not have sufficient aid to individualize the program
 1108 for children in their classes.

1109 This is the first study to show effects for the prevention of
 1110 suicidal ideation with a CBT-based universal intervention in
 1111 a randomized controlled trial in Grade 7 students. The fact
 1112 that prevention of suicidal ideation effects were found after the
 1113 implementation of OTS is consistent with previous research,
 1114 which shows that optimism is a protective factor for non-suicidal
 1115 self-injury (Tanner et al., 2013). In the present study, however,
 1116 optimism was not assessed and suicidal ideation rather than
 1117 non-suicidal self-harm was assessed, although the latter has been
 1118 shown to be a risk factor for suicidality (Skegg, 2005). Future
 1119 research needs to include optimism, non-suicidal self-harm and
 1120 suicidality when investigating the mechanisms of change for
 1121 OTS. Nevertheless, this is the first study to suggest that the effects
 1122 of optimism may generalize beyond self-harm to suicidality.
 1123 Given the enormous burden of suicidality and self-harm in youth,
 1124 the AOP (OTS and SLS) has the potential to reduce this burden
 1125 when run universally in schools nation-wide. It should also be
 1126 noted, however, that the suicidality effects were found after the
 1127 parenting program was implemented, so the relative effects of
 1128 the SLS, OTS and parenting program to the suicidality outcomes
 1129 need to be identified in future studies.

1130 The AOP for PF provided in Grade 7, appeared to have
 1131 helped reduce suicidal risk in the follow-up assessment at the
 1132 end of Grade 8 although the precise mechanisms involved need
 1133 to be assessed. The contents include guidelines and skillful
 1134 strategies for parents to facilitate their children managing the
 1135 challenging situations in the pre-adolescent years. Although
 1136 program dose was difficult to assess, due to a limited number
 1137 of returned logbooks it appears that the PF program enhanced
 1138 parents' abilities to support their children through the social and
 1139 emotional changes associated with puberty and the transition
 1140 to high school. However, it is recommended that a structured

1051 TABLE 4 | Incidence of clinical disorders at post-test 2 and follow-up: proportions
 1052 of training, training and coaching, and control students who changed their pre-test
 1053 diagnosis from healthy to clinical.

	Pre-test	Post-test 2	Follow-up
	Healthy	Pre-test healthy to clinical	Pre-test healthy to clinical
1058 Depression and/or anxiety			
1059 Training	38	18.4% (7/38)	5.4% (2/37)
1061 Training + coaching	34	14.7% (5/34)	3.1% (1/32)
1062 Control	35	22.9% (8/35)	2.9% (1/35)
1063 Suicide risk			
1064 Training	40	27.5% (11/40)	2.6% (1/39)
1065 Training + coaching	33	9.1% (3/33)	3.3% (1/30)
1066 Control	31	22.5% (7/31)	19.3% (6/31)

1068 TABLE 5 | Recovery at post-test 2 and follow-up: proportions of training, training
 1069 and coaching, and control students who changed their pre-test diagnosis from
 1070 clinical to healthy.

	Pre-test	Post-test 2	Follow-up
	Clinical	Pre-test clinical to healthy	Pre-test clinical to healthy
1076 Depression and/or anxiety			
1077 Training	50	58.0% (29/50)	81.6% (40/49)
1078 Training + coaching	24	62.5% (15/24)	84.2% (16/19)
1079 Control	10	40.0% (4/10)	50.0% (5/10)
1080 Suicide risk			
1081 Training	48	43.8% (21/48)	74.5% (35/47)
1082 Training + coaching	25	76.0% (19/25)	95.2% (20/21)
1083 Control	14	64.3% (9/14)	85.7% (12/14)

1141 parenting program consisting of workshop activities and role
 1142 plays, to be incorporated as part of the AOP's suite in order
 1143 to enhance the quality of the program and optimize child and
 1144 parents outcomes. Research has shown that parenting programs
 1145 can be one of the best strategies for preventing mental health
 1146 issues in children (Bunting, 2004). An additional home visiting
 1147 program, e.g., once a week for few months, is recommended to
 1148 increase the amount of intervention dosage thereby increasing
 1149 the probability of a successful program implementation (Wasik
 1150 et al., 2013).

1151 Our findings suggest that increases in pro-social behaviors
 1152 and decreases in the incidence of suicidal ideation in a student
 1153 population are linked to teacher training and support. School
 1154 psychologists, counselors or specialized curriculum teachers
 1155 were trained to provide this support. Coaching activities that
 1156 supported the AOP trained teachers included assistance with
 1157 individualizing the program to meet the needs of their students,
 1158 advice on how to implement certain activities and motivate
 1159 students, advice on how to adapt the content for children with
 1160 special needs, encouraging parent participation, and assistance
 1161 with dealing with referrals for children with more serious
 1162 problems. An important direction for future research is to
 1163 determine the active ingredients of this coaching support and
 1164 the most effective level or dose for coaching sessions. It is
 1165 clear, however, that training alone in program implementation
 1166 is not sufficient to affect significant mental health outcomes
 1167 for students. Previous studies indicated that program content,
 1168 intensity, frequency, duration, and threshold of the training
 1169 dosage are crucial factors for program effectiveness (Zaslow et al.,
 1170 2010; Wasik et al., 2013).

1171 1172 1173 LIMITATIONS AND STRENGTHS OF THE 1174 CURRENT STUDY 1175

1176 Some methodological issues need to be considered in interpreting
 1177 the results as these may have affected the research outcomes. First,
 1178 contrary to expectations, no effects were found for internalizing
 1179 problems or disorders with effects being limited to pro-social
 1180 behaviors and suicidality. One possible reason for this is that
 1181 the overall incidence of anxiety and depression in this age
 1182 group for a universal sample is relatively low (Roberts et al.,
 1183 2008). Cuijpers (2003) recommends increasing the sample to
 1184 approximately 30,211 subjects in both, experimental and control
 1185 groups, in order to see significant reductions in the experimental
 1186 groups. Thus, this study was limited to the investigation of a small
 1187 number of internalizing disorders. While internalizing disorders
 1188 begin to increase in adolescence, they are still relatively rare in
 1189 the first year of High School. This and the loss of a number
 1190 of students at follow-up may have led to the limited effects for
 1191 incidence and recovery from clinical diagnoses at follow-up.

1192 Second, this study was further limited by the lack of
 1193 measurement of externalizing problems and comorbid disorders.
 1194 In addition, internalizing symptoms decreased in all groups over
 1195 the period of the study. This might reflect the fact that, at
 1196 all assessment points, the parents of any student identified as
 1197 being at risk or with a diagnosis of anxiety or depression were

1198 confidentially notified, so that they could seek professional help
 1199 outside of the school context. As such, screening for mental
 1200 health conditions and informing parents of concerning results
 1201 appears to be an intervention in itself, and seems to reduce
 1202 the likelihood of finding differences between the intervention
 1203 and control groups. Future studies should examine potential
 1204 mediators of change with regard to internalizing symptoms to
 1205 more fully understand the impact of the program on anxiety and
 1206 depression symptoms and disorders. Third, as the intervention
 1207 was conducted in natural settings, there is a possibility that
 1208 the treatment—related improvements may be influenced by
 1209 teacher allegiance effects. Teachers' fidelity, commitment and
 1210 enthusiasm to implement the programs increase the likelihood
 1211 of successful implementation (Pierangelo and Giuliani, 2008). It
 1212 is recommended that this aspect to be examined and take into
 1213 consideration when evaluating any new programs implemented
 1214 at school.

1215 The strengths of this study indicate that universal prevention
 1216 programs can impact on child and adolescent mental health.
 1217 Efficacy was found for both the universal and indicated samples.
 1218 Hence, the AOP could be used for population inoculation or for
 1219 indicated groups in schools (Mrazek and Haggerty, 1994).

1220 This study found that mental health programs in schools can
 1221 be implemented with relative fidelity by regular school teachers
 1222 with only 2 days of teacher training and a small amount of
 1223 ongoing coaching and support. This finding bodes well for the
 1224 sustainability of programs like Aussie Optimism and mental
 1225 health promotion programs generally.

1226 1227 1228 CONCLUSION 1229

1230 This research investigated the efficacy of an enhanced version
 1231 of the AOP. The design incorporated a large sample size and
 1232 used a cluster randomized control trial, to take account of the
 1233 clustering of students in schools. It involved a large number
 1234 of schools, teachers and students. Therefore, the results have
 1235 significant credibility. Aussie Optimism with teacher training
 1236 plus coaching resulted in the best outcomes, lower levels of
 1237 suicidality and higher levels of pro-social behavior at various
 1238 post-test assessments.

1239 1240 1241 ETHICS STATEMENT 1242

1243 This study was carried out in accordance with the
 1244 recommendations of the Curtin Research Ethics Committee with
 1245 written informed consent from all subjects. All subjects gave
 1246 written informed consent in accordance with the Declaration
 1247 of Helsinki. The protocol was approved by the Curtin Human
 1248 Research Ethics Committee.

1249 1250 1251 AUTHOR CONTRIBUTIONS 1252

1253 CR revised the draft and PI on the grant that financed the study.
 1254 RK contributed to methodology and data analysis. RR and NB

1255 contributed to “Introduction” and “Discussion” sections of the
 1256 manuscript. YP is the coordinator of the project and contributed
 1257 to conceptualization of the project. SH revised the final draft and
 1258 contributed to the “Discussion” section of the manuscript. DC,
 1259 SZ, and SS revised the draft and conceptual input, and CI on the
 1260 grant that financed the study.

1263 FUNDING

1265 The study was supported by grants from the Australian Research
 1266 Council and the Mental Health Division of the Western
 1267 Australian Department of Health.

1270 REFERENCES

- 1271 Beck, A. T., Rush, A. J., Shaw, B. F., and Emery, G. (1979). *Cognitive Therapy of*
 1272 *Depression*. New York, NY: Guilford Press.
- 1273 Begg, S., Vos, T., Barker, B., Stevenson, C., Stanley, L., and Lopez, A. D. (2007).
 1274 *The Burden of Disease and Injury in Australia 2003*. PHE 82. Canberra, ACT:
 1275 AIHW.
- 1276 Brady, E. U., and Kendall, P. C. (1992). Comorbidity of anxiety and depression in
 1277 children and adolescents. *Psychol. Bull.* 111, 244–255. doi: 10.1037/0033-2909.
 1278 111.2.244
- 1279 Bryk, A. S., and Raudenbush, W. (1987). Application of hierarchical linear models
 1280 to assessing change. *Psychol. Bull.* 101, 147–158. doi: 10.1037/0033-2909.
 1281 101.1.147
- 1282 Bunting, L. (2004). Parenting programmes: the best available evidence. *Child Care*
 1283 *Pract.* 10, 327–343. doi: 10.1002/14651858.CD003018.pub3
- 1284 Conduct Problems Prevention Research Group (2010). The effect of a
 1285 multiyear universal social-emotional program: the role of student and school
 1286 characteristics. *J. Consult. Clin. Psychol.* 78, 156–168. doi: 10.1037/a0018607
- 1287 Cuijpers, P. (2003). Examining the effects of prevention programs on the incidence
 1288 of new cases of mental disorders: the lack of statistical power. *Am. J. Psychiatry*
 1289 160, 1385–1391. doi: 10.1176/appi.ajp.160.8.1385
- 1290 Curriculum Council Western Australia (2001). *Health and Psychical Education:*
 1291 *Self-Management Skills*. Cannington, ON: Curriculum Council Western
 1292 Australia.
- 1293 Department of Education (2003). *H-Index Developed by the Department of*
 1294 *Education Western Australia*. East Perth, WA: Department of Education
 1295 Western Australia.
- 1296 Domitrovich, C. E., Bradshaw, C. P., Greenberg, M. T., Embry, D., Poduska, J. M.,
 1297 and Jalongo, N. S. (2010). Integrated models of school-based prevention: Logic
 1298 and theory. *Psychol. Sch.* 47, 71–88. doi: 10.1002/pits.20452
- 1299 Drake-Brockman, K., and Roberts, C. (2001). *Aussie Optimism for Families*
 1300 *and Parents. Building Optimistic Teenagers*. Perth, WA: Curtin University of
 1301 Technology.
- 1302 Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., and Schellinger,
 1303 K. B. (2011). The impact of enhancing students’ social and emotional learning: a
 1304 meta-analysis of school-based universal interventions. *Child Dev.* 82, 405–432.
 1305 doi: 10.1111/j.1467-8624.2010.01564.x
- 1306 Feldner, M. T., Zvolensky, M. J., and Schmidt, N. B. (2004). Prevention of anxiety
 1307 psychopathology: a critical review of the empirical literature. *Clin. Psychol.* 11,
 1308 401–424. doi: 10.1093/clipsy.bph098
- 1309 Gibb, B. E., and Coles, M. E. (2005). “Cognitive vulnerability-stress models of
 1310 psychopathology: a developmental perspective,” in *Development of Psycho-*
 1311 *Pathology: A Vulnerability-Stress Perspective*, eds B. L. Hankin and J. R. Z. Abela
 1312 (Thousand Oaks, CA: Sage), 104–135. doi: 10.4135/9781452231655.n5
- 1313 Goodman, R. (1999). The extended version of the strengths and difficulties
 1314 questionnaire as a guide to child psychiatric caseness and consequent burden.
 1315 *J. Child Psychol. Psychiatry* 40, 791–799. doi: 10.1111/1469-7610.00494
- 1316 Goodman, R. (2001). Psychometric properties of the strengths and difficulties
 1317 questionnaire. *J. Am. Acad. Child Adolesc. Psychiatry* 40, 1337–1345.
 1318 doi: 10.1097/00004583-200111000-00015

1312 ACKNOWLEDGMENTS

1313 This research was completed in collaboration with the
 1314 Departments of Education and Health in Western Australia,
 1315 in particular the Mental Health Division and the Fremantle –
 1316 Peel Education District. We acknowledge the significant
 1317 contribution of the primary schools, teachers, students, and
 1318 parents that participated in the research. We thank the
 1319 steering committee for their ongoing support and advice
 1320 throughout the project, and acknowledge the work completed
 1321 by research assistants who worked on this project. In
 1322 particular we thank Jessica George, Kristie Rostant, and Nicole
 1323 Walsh.

- 1324 Goodman, R., and Scott, S. (1999). Comparing the strengths and
 1325 difficulties questionnaire and the child behavior checklist: is small
 1326 beautiful? *J. Abnorm. Child Psychol.* 27, 17–24. doi: 10.1023/A:1022658
 1327 222914
- 1328 Greenberg, M. T., Weissberg, R. P., O’Brien, M. U., Zins, J. E., Frodericks, L.,
 1329 Resnik, H., et al. (2003). Enhancing school-based prevention and youth
 1330 development through coordinated emotional and academic learning. *Am.*
 1331 *Psychol.* 58, 466–474. doi: 10.1037/0003-066X.58.6-7.466
- 1332 Hodges, K. (1990). Depression and anxiety in children: a comparison of
 1333 self-report questionnaires to clinical interview. *Psychol. Assess.* 2, 376–381.
 1334 doi: 10.1037/1040-3590.2.4.376
- 1335 Horowitz, J. L., and Garber, J. (2006). The prevention of depressive symptoms in
 1336 children and adolescents: a meta-analysis. *J. Consult. Clin. Psychol.* 74, 401–415.
 1337 doi: 10.1037/0022-006X.74.3.401
- 1338 Kendall, P. (2006). *Child and Adolescent Therapy. Cognitive-Behavioural*
 1339 *Procedures*, 3rd Edn. New York, NY: Guilford Press.
- 1340 Klein, D. N., Dougherty, L. R., and Olino, T. M. (2005). Toward guidelines for
 1341 evidence-based assessment of depression in children and adolescents. *J. Child*
 1342 *Adolesc. Clin. Psychol.* 34, 412–432. doi: 10.1207/s15374424jccp3403_3
- 1343 Lawrence, D., Johnson, S., Hafekost, J., Boterhoven De Haan, K., Sawyer, M.,
 1344 Ainley, J., et al. (2015). *The Mental Health of Children and Adolescents. Report*
 1345 *on the second Australian Child and Adolescent Survey of Mental Health and*
 1346 *Wellbeing*. Canberra ACT: Department of Health, Canberra.
- 1347 Mellor, D. (2005). Normative data for the strengths and difficulties questionnaire
 1348 in Australia. *Aust. Psychol.* 40, 215–222. doi: 10.1080/00050060500
 1349 243475
- 1350 Merry, S., McDowell, H., Hetrick, S., Bir, J., and Muller, N. (2004). Psychological
 1351 and/or educational interventions for the prevention of depression in
 1352 children and adolescents. *Cochrane Database Syst. Rev.* 1:CD003380.
 1353 doi: 10.1002/14651858.CD003380.pub2
- 1354 Merry, S. N., Hetrick, S. E., Cox, G. R., Burdevold-Iversen, T., Bir, J. J.,
 1355 McDowell, H., et al. (2011). Psychological and educational interventions for
 1356 preventing depression in children and adolescents. *Cochrane Database Syst.*
 1357 *Rev.* 12:CD003380. doi: 10.1002/14651858.CD003380.pub3
- 1358 Mrazek, P. J., and Haggerty, R. J. (1994). *Reducing Risks for Mental Disorders:*
 1359 *Frontiers for Preventive Intervention Research*. Washington, DC: National
 1360 Academy Press.
- 1361 Neil, A. L., and Christensen, H. (2009). Efficacy and effectiveness of school-based
 1362 prevention and early intervention programs for anxiety. *Clin. Psychol. Rev.* 29,
 1363 208–215. doi: 10.1016/j.cpr.2009.01.002
- 1364 Payton, J., Weissberg, R. P., Durlak, J. A., Weissberg, R. P., Dymnicki, A. B.,
 1365 Taylor, R. D., et al. (2008). *The Positive Impact of Social and Emotional Learning*
 1366 *From Kindergarten to Eight Grade Students: Findings of Three Scientific Reviews*.
 1367 Chicago, IL: Collaborative for Academic, Social and Emotional Learning.
- 1368 Pierangelo, R., and Giuliani, G. (2008). *Classroom Management Techniques for*
 1369 *Students with ADHD: A Step-by-Step Guide for Educators*. Thousand Oaks, CA:
 1370 Corwin Press.
- 1371 Quayle, D., Dziurawiec, S., Roberts, C., Kane, R., and Ebsworthy, G. (2001). The
 1372 effects of an optimism and lifeskills program on depression in preadolescents.
 1373 *Behav. Change* 18, 194–203. doi: 10.1375/bech.18.4.194

- 1369 Rapee, R. M., Schniering, C. A., and Hudson, J. L. (2009). Anxiety disorders during
1370 childhood and adolescence: origins and treatment. *Annu. Rev. Clin. Psychol.* 5,
1371 311–341. doi: 10.1146/annurev.clinpsy.032408.153628
- 1372 Reich, W. (2000). Diagnostic Interview for Children and Adolescents (DICA).
1373 *J. Am. Acad. Child Adolesc. Psychiatry* 39, 59–66. doi: 10.1097/00004583-
200001000-00017
- 1374 Reich, W., Cottler, L. B., McCallum, K., Corwin, D., and VanEerdewegh, M. (1995).
1375 Computerized interviews as a method of assessing psychopathology in children.
1376 *Compr. Psychiatry* 36, 40–45. doi: 10.1016/0010-440X(95)90097-F
- 1377 Reich, W., Welner, Z., Herjanic, B., and Mhs Staff. (1997). *Diagnostic Interview*
1378 *for Children and Adolescents – IV. Windows TM Version. User's Manual for the*
1379 *Child/Adolescent and Parent Version.* Toronto, ON: Multi-Health Systems Inc.
- 1380 Roberts, C., Ballantyne, F., and van der Klift, P. (2003). *Aussie Optimism. Social Life*
1381 *Skills. Teacher Resource.* Perth, WA: Curtin University of Technology.
- 1382 Roberts, C., Bishop, B., and Rooney, R. (2008). "Paediatric depression and bipolar
1383 disorder," in *Handbook of Child Behavioural Issues: Evidence-Based Approaches,*
1384 eds T. Gullotta and G. Adams (Dordrecht: Kluwer Academic Publishing).
- 1385 Roberts, C. M., Kane, R., Bishop, B., Cross, D., Fenton, J., and Hart, B. (2010).
1386 The Prevention of anxiety and depression in disadvantaged schools. *Behav. Res.*
1387 *Ther.* 48, 68–73. doi: 10.1016/j.brat.2009.09.002
- 1388 Roberts, R., Roberts, C., Cosgrove, S., Honston, K., Ludlow, T., Mar, D., et al.
1389 (2003). *Aussie Optimism Optimistic Thinking Skills Teacher Resource.* Perth,
1390 WA: Curtin University of Technology.
- 1391 Rooney, R., Hassan, S., Kane, R., Roberts, C., and Nesa, M. (2013a). Reducing
1392 depression in 9-10 year old children in low SES schools: a longitudinal
1393 universal/randomised controlled trial. *Behav. Res. Ther.* 51, 845–854.
1394 doi: 10.1016/j.brat.2013.09.005
- 1395 Rooney, R., Morrison, D., Kane, R., Hassan, S., and Mancini, V. (2013b).
1396 Prevention of internalizing disorders in 9-10 year old children: efficacy of the
1397 aussie optimism positive thinking skills program at 30-month follow-up. *Front.*
1398 *Psychol.* 4:998. doi: 10.3389/fpsyg.2013.00988
- 1399 Rooney, R., Roberts, C., Kane, R., Pike, L., Winsor, A., White, J., et al. (2006). The
1400 prevention of depression in 8 to 9 year old children: a pilot study. *Aust. J. Guid.*
1401 *Couns.* 16, 76–90. doi: 10.1375/ajgc.16.1.76
- 1402 Rudolph, K. D., Hammen, C., and Burge, D. (1994). Interpersonal functioning
1403 and depressive symptoms in childhood: addressing the issues of specificity and
1404 comorbidity. *J. Abnorm. Child Psychol.* 22, 355–371. doi: 10.1007/BF02168079
- 1405 Seigman, M. E. P., Reivich, K., Jaycox, L., and Gillham, J. (1995). *The Optimistic*
1406 *Child: A Revolutionary Approach to Raising Resilient Children.* Sydney, NSW:
1407 Random House.
- 1408 Seroczynski, A. D., Cole, D. A., and Maxwell, S. E. (1997). Cumulative
1409 and compensatory effects of competence and incompetence on depressive
1410 symptoms in children. *J. Abnorm. Psychol.* 106, 586–597. doi: 10.1037/0021-
1411 843X.106.4.586
- 1412 Shanahan, L., Copeland, W., Costello, E. J., and Angold, A. (2008). Specificity
1413 of putative psychosocial risk factors for psychiatric disorders in children and
1414 adolescents. *Child Psychol. Psychiatry* 49, 34–42. doi: 10.1111/j.1469-7610.2007.
1415 01822.x
- 1416 Skegg, K. (2005). Self-harm. *The Lancet* 366, 1471–1483. doi: 10.1016/S0140-
1417 6736(05)67600-3
- 1418 Spence, S. H., and Shortt, A. L. (2007). Research review: can we justify
1419 the widespread dissemination of universal, school based interventions
1420 for the prevention of depression among children and adolescents?
1421 *J. Child Psychol. Psychiatry* 48, 526–542. doi: 10.1111/j.1469-7610.2007.
1422 01738.x
- 1423 Stark, K. D. (1990). *Childhood Depression. School-Based Intervention.* New York,
1424 NY: Guildford Press.
- 1425 Stice, E., Shaw, H., Bohon, C., Marti, C. N., and Rohde, P. (2009). A meta-analytic
1426 review of depression prevention programs for children and adolescents: factors
1427 that predict magnitude of intervention effects. *J. Consult. Clin. Psychol.* 77,
1428 486–503. doi: 10.1037/a0015168
- 1429 Tanner, A. K., Hasking, P., and Martin, G. (2013). Effects of rumination and
1430 optimism on the relationship between psychological distress and non-suicidal
1431 self-injury. *Prev. Sci.* 15, 860–868. doi: 10.1007/s1121-013-0444-0
- 1432 Wasik, B. A., Matterna, S. K., Lloyd, C. M., and Boller, K. (2013). *Intervention Dosage*
1433 *in Early Childhood Care and Education: It's Complicated (OPRE Research Brief*
1434 *OPRE 2013-15).* Washington, DC: Department of Health and Human Services.
- 1435 Weisz, J. R., Sandler, I. N., Durlak, J. A., and Anton, B. S. (2005). Promoting
1436 and protecting youth mental health through evidence-based prevention and
1437 treatment. *Am. Psychol.* 60, 628–648. doi: 10.1037/0003-066X.60.6.628
- 1438 Welner, Z., Reich, W., Herjanic, B., Jung, K. G., and Amado, H. (1987). Reliability,
1439 validity and parent-child agreement studies of the diagnostic interview for
1440 children and adolescents (DICA). *J. Am. Acad. Child Adolesc. Psychiatry* 5,
1441 649–653. doi: 10.1097/00004583-198709000-00007
- 1442 Wilson, S. J., and Lipsey, M. W. (2007). School-based interventions for aggressive
1443 and disruptive behavior: update of a meta-analysis. *Am. J. Prev. Med.* 33(Suppl.
1444 2), S130–S143. doi: 10.1016/j.amepre.2007.04.011
- 1445 Zaslow, M., Anderson, R., Redd, Z., Wessel, J., Tarullo, L., and Burchinal, M. (2010).
1446 *Quality Dosage, Thresholds, and Features in Early Childhood Settings: A Review*
1447 *of the Literature.* Washington, DC: Department of Health and Human Services.
- 1448 **Conflict of Interest Statement:** The authors declare that the research was
1449 conducted in the absence of any commercial or financial relationships that could
1450 be construed as a potential conflict of interest.
- 1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482