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Research paper

Specific anxiety and depression symptoms are risk factors for the onset of suicidal ideation and suicide attempts in youth

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ABSTRACT

Background: Suicidality research has typically focused on affective disorders to identify at-risk youth. Investigating the predictive role of individual symptoms, particularly anxiety symptoms, may allow for preventative targeting of additional risk factors for suicidal ideation and attempts.
Methods: This analysis used the Sources of Strength Australia project dataset, a cluster randomised controlled trial which assessed the impact of a schools-based intervention for youth help-seeking over 18 months (Calear et al., 2022). Symptoms of anxiety, depression and distress at baseline were used to predict the onset of suicidal ideation, planning for suicide and suicide attempts at 18 months.
Results: Worry, lack of sleep and anxiety interfering with everyday activities at baseline predicted new onset of suicidal ideation 18 months later. Worry about the future and past, reduced appetite and a belief that life wasn't worth living were risk factors for later suicide plans and attempts. Total scale scores on the scales were typically poor predictors of onset of suicidal behaviours.
Limitations: Analyses were impacted by dropouts over the 18 month study period and restricted further investigation into potential behaviour transition trajectories.
Conclusions: These findings identify individual symptom profiles associated with later onset of suicidal behaviour. Broadening the focus beyond depression and hopelessness to incorporate anxiety, worry and reduced sleep as risk factors for suicidality is important for public health and clinical settings.

1. Introduction

Suicide is the second-highest cause of death in young people worldwide (Glenn et al., 2020; World Health Organization, 2014). The burden of disease associated with attempted suicide and suicide death are substantial and include secondary distress, healthcare pressures, and societal and financial impacts (Comans et al., 2013; Kinchin and Doran, 2018; Lyszczarz, 2021; Palmer et al., 1995). As a major public health concern in this age group, young people should be targeted for suicide intervention (Glenn et al., 2020), however many youth who attempt suicide do not seek or receive appropriate support (Kaess et al., 2022) and more targeted prevention is needed (Arango et al., 2021).

Factors associated with an increased risk of suicide-related thoughts and behaviours in young people are many and varied, and include psychological and family factors, socioeconomic and demographic dynamics (Cha et al., 2018; Hawton et al., 2012; Wasserman et al., 2021). In particular, the presence of a mental disorder confers significant risk for suicidal behaviour (Gili et al., 2019; Wasserman et al., 2021). Among mental disorders, the association between affective disorders and suicide in youths is well established (Gili et al., 2019; Gould et al., 2003), however there is also growing evidence for the role of anxiety disorders in suicide-related thoughts and behaviours for young people (Bentley et al., 2016; Boden et al., 2007; Doering et al., 2019; Hill et al., 2011). Longitudinal research has shown that anxiety disorders increase the risk of suicidal behaviours by up to 2.8 times, even when controlling for other mental disorders, suggesting a unique contribution to suicidality risk (Boden et al., 2007). This parallels adult research which has shown a significant predictive role for anxiety in suicidal behaviours (Batterham et al., 2013; Bentley et al., 2016; Nock et al., 2009; Nock et al., 2010; Sareen et al., 2005), particularly when

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Table 1
Participant characteristics at baseline, 18 months and 18 months onset (excluding participants with outcome present at baseline) data.

		Baseline		18 months: All participants		18 months: Onset subsample	
		N	*n* (%)	*N*	*n* (%)	*N*	*n* (%)
Gender	Male	1428	583 (40.8 %)	786	323 (41.1 %)		
	Female		829 (58.1 %)		447 (56.9 %)		
	Other		12 (0.8 %)		14 (1.7 %)		
	Missing		4 (0.3 %)		2 (0.3 %)		
Age	11	1428	15 (1.1 %)	786	0 (0 %)		
	12		418 (29.3 %)		1 (0.1 %)		
	13		442 (31.0 %)		116 (14.8 %)		
	14		326 (22.8 %)		310 (39.4 %)		
	15		131 (9.2 %)		214 (27.2 %)		
	16		69 (4.8 %)		89 (11.3 %)		
	17		21 (1.2 %)		36 (4.6 %)		
	18		0 (0 %)		18 (2.3 %)		
	Missing		6 (0.4 %)		2 (0.3 %)		
Language	English	1428	1234 (86.4 %)	786	685 (87.2 %)		
	Eng & Other		144 (10.1 %)		71 (9.0 %)		
	Missing		50 (3.5 %)		30 (3.8 %)		
Suicidal ideation	No	1387	979 (70.6 %)	751	538 (71.6 %)	455	372 (81.8 %)
	Yes		408 (29.4 %)		213 (28.4 %)		83 (18.2 %)
Planned suicide	No	1388	1264 (91.1 %)	752	693 (92.2 %)	594	559 (94.1 %)
	Yes		124 (8.9 %)		59 (7.8 %)		35 (5.9 %)
Attempted suicide	No	1267	1180 (93.1 %)	636	599 (94.2 %)	498	479 (96.2 %)
	Yes		87 (6.9 %)		37 (5.8 %)		19 (3.8 %)

comorbid with affective disorders (May et al., 2012; Simon et al., 2007). Further research is needed to examine the role of anxiety disorders in youth as a potential modifiable risk factors for suicidal behaviour.

While research on mental health risk factors for suicidal behaviours typically examines diagnoses or global scores on screening tools, there have been calls for a shift in focus to the predictive role of individual symptoms (Bentley et al., 2016; Cha et al., 2018; Coryell et al., 2019; Crawford et al., 2019; Hill et al., 2011). Identifying individual symptom features as risk factors for suicide-related behaviours is advantageous for several reasons: it addresses issues with individual item overlap within and across scales (Carter et al., 2008), can facilitate more accurate risk prediction (Batterham et al., 2013; Coryell et al., 2019), and allows for more focused targeting of malleable mechanisms (Cha et al., 2018). This approach may also allow differentiation of factors that predict different forms of suicidal behaviour, by distinguishing unique predictors for distinct outcomes such as ideation, plans and attempts (Cha et al., 2018; Coryell et al., 2019; Hawton et al., 2012).

One means of quantifying the role of risk factors in predicting later suicidality is through calculation of the Population Attributable Fraction (PAF; also known as Population Attributable Risk PAR) (Greenland and Drescher, 1993), which combines calculated measures of risk with estimates of prevalence to indicate the proportion of cases that can be attributed to each risk factor. PAFs have been used to identify and quantify predictors of suicidal behaviour in adults (Batterham et al., 2013; Krysinska and Martin, 2009) and youth (Witt et al., 2019), although typically in clinical samples.

1.1. The current study

This analysis utilised an existing dataset from the Sources of Strength Australia Project, a cluster randomised controlled trial (ACTRN12616000048482) (Calear et al., 2016). This trial evaluated the effectiveness of the Sources of Strength suicide prevention program in increasing help-seeking intentions in adolescents (Calear et al., 2022). The dataset from this trial provided a measure of mental health symptoms at baseline and the 'onset' of suicide-related behaviours could be calculated between baseline and the fourth time point 18 months later. The current study examined predictors of the onset of suicidal ideation, plans, and attempts using three sets of symptom measures covering anxiety, depression and general psychological distress. PAFs were calculated based on prevalence data for the entire sample at baseline, providing an estimate of the proportion of cases in the 18 month sample attributable to that risk factor.

2. Methods

2.1. Participants

The Sources of Strength Australia Project (Calear et al., 2016) recruited a sample of students from 13 secondary schools located in rural and metropolitan settings in the Australian Capital Territory and New South Wales (Australia) from Years 7 to 11 (aged 12–17). The current study analysed data from a subset of students who completed surveys at both baseline and the 18 month follow-up. Table 1 presents participant characteristics for the sample at baseline and the 18 month follow-up.

2.2. Procedure

Ethical approval was obtained from the Human Research Ethics Committee at the Australian National University (protocol number 2015/199), as well as from the Education Departments responsible for the schools involved in the study. Informed consent was obtained from all participating students and their parent or guardian before commencing. Participants in the Sources of Strength Australia Project completed a pre-intervention survey that took approximately 30 min to complete. Surveys were self-completed under the supervision of teachers and members of the Sources of Strength Australia investigator team. Participants were invited to complete a pre-intervention survey, post-intervention survey, 6-month follow-up and 18-month follow-up survey, with data from pre-intervention (baseline) and 18-month follow-up surveys (as the longest baseline-final survey interval) being used in the current analysis.

2.3. Measures

2.3.1. Outcome variables

The outcome variables included a measure of active suicidal ideation (past month) and presence of suicidal behaviour (plan and attempt) in the past 12 months. Severity of active suicidal ideation was assessed using the Suicidal Ideation Attributes Scale (SIDAS), a five-item screener assessing the frequency, and controllability of suicidal thoughts, distress

and impairment related to suicidal thoughts, and closeness to suicide attempt (van Spijker et al., 2014). Items were rated on a scale from 0 to 10 with controllability reverse scored and collated into a global score ranging from 0 to 50, with higher scores indicative of greater suicidal ideation severity. For the purpose of the current study, responses to this scale were dichotomised into absence of suicidal ideation (0) and presence of suicidal ideation (1 or more).

The presence of suicidal plan and attempt in the past 12 months was assessed using two questions from the Youth Risk Behaviour Survey (YRBS) (Centers for Disease Control and Prevention, 2005). Suicidal plan was determined by responses to the item 'During the past 12 months did you make a plan about how you would kill yourself?' with No (0) and Yes (1) response options. Suicide attempt was determined by participants reporting the number of times they had tried to kill themselves in the past 12 months. Responses to this item were dichotomized into 'No attempts' (0) or 'One or more attempts' (1).

All three suicide-related measures were converted into dichotomous 'onset' variables defined as presence or absence at 18 months, excluding participants reporting those behaviours at baseline.

2.3.2. Independent risk factors

Independent risk-factors were assessed using individual items from three mental health symptom scales collected at baseline.

The Generalised Anxiety Disorder (GAD) subscale of the Screen for Child Anxiety Related Disorders (SCARED) (Birmaher et al., 1997) were used to report symptoms of anxiety over the last 3 months. The nine items were rated on a 3-point scale from 0 (Not true or hardly ever true), 1 (Somewhat true or sometimes true), and 2 (True or Often true). For the purpose of this study, each item was dichotomised with response options of 1 and 2 combined to indicate agreement with the statement. The total score was also used as a predictor, dichotomised using the established cut off of 0 to 8 as absence and 9 and higher as presence of substantial anxiety symptoms.

The Major Depression Inventory (MDI) (Bech et al., 2001) was used to report symptoms of depression in the past two weeks. Eleven items of the original scale were used, with the item on sleep modified into two separate items 'Have you been sleeping too little?' and 'Have you been sleeping too much?' to make it comparable to items on appetite and activity levels. Items were rated on a 6-point scale ranging from 0 (At no time) to 5 (All the time). Each item was dichotomised with response options with 0 to 2 coded as no or low depression symptoms and 3 to 5 as high depression symptoms. The total scale score was dichotomised into 0 to 20 as absence and 21 and higher as presence (established cut off for absence vs. mild/moderate/severe presence) of depression symptomatology (Bech et al., 2015).

The five items from the Distress Questionnaire 5 (DQ5) (Batterham et al., 2016) were used to report symptoms of psychological distress in the past 30 days. Items were rated on a 5-point scale from 1 ('Never') to 5 ('Always'). Each item was dichotomised with response options 1 to 3 coded as low psychological distress and 4 to 5 coded as high psychological distress. The total scale score was dichotomised using the established cut off of 13 and lower as low overall distress and 14 and higher as high overall distress.

2.3.3. Analysis

Logistic regression analyses, adjusted to control for intervention group and gender, were used to assess the association (odds ratios) between individual predictors at baseline and the onset of suicidal ideation, plans and suicide attempts at the 18 month follow-up. Age was not included given the limited age range in the sample. Prevalence estimates were calculated based on symptoms reported in the sample at baseline. The PAF for each symptom and total scale score was calculated incorporating the adjusted odds ratio and prevalence estimates using the formula described by Bruzzi et al. (1985).

3. Results

Participant characteristics and descriptive suicide data at baseline and 18 month follow-up are presented in Table 1. Suicide onset data (i.e., data for baseline and 18 months excluding those with the outcome present at baseline) is also reported in the Table. A total of 1428 participants completed baseline data and 786 completed the 18 month follow-up. At baseline participants were predominantly between 12 and 14 years of age (83.1 %), female (58.1 %) and spoke English at home (86.4 %). Baseline suicidal ideation in the last month was reported by 29.4 % of the cohort, 8.9 % had made a suicide plan in the last 12 months, and 6.9 % reported a suicide attempt in the last 12 months.

3.1. Suicidal ideation

Table 2 depicts adjusted odds ratios, prevalence and estimated PAFs for onset of suicidal ideation at the 18 month follow-up as predicted by anxiety, depression and distress symptoms and overall scale scores. Several individual symptoms had significant predictive value using odds ratios and showed substantial (> 30 %) PAFs. Specifically, these were anxiety symptoms "I worry about people liking me" and "I worry about how well I do things", and the depression symptom of sleeping too little, which had the largest PAF at 43.9 %. The distress symptom "anxiety or fear interfered with my ability to do the things I needed to do at work or at home" was also a significant baseline predictor of developing suicidal ideation at the 18 month follow-up and showed a PAF of 31.2 %. A small number of other predictors had significant odds ratios but smaller PAFs, including measures of worry ("I am a worrier" "I worry about things working out" "my worries overwhelm me"), being restless, and lacking energy and focus. Scoring above the cut points for the depression and distress scales did not significantly predict onset of 18 month suicidal ideation, but the anxiety scale cut point was significantly predictive and was associated with a PAF for suicidal ideation of 35.1 %.

3.2. Suicide plans

Table 3 examines the same predictors for the onset of making a plan to die by suicide at the 18 month follow-up, showing a very different pattern of predictors to those risk factors observed with suicidal ideation. Agreement with the statement "life wasn't worth living" was strongly associated with making a plan, with a PAF of 37.6 %. The other two significant predictors were anxiety symptoms - worrying about both future (31.8 %) and past events (34.6 %). Sleeping too little and scoring above the anxiety cut point were not significant predictors but showed substantial PAFs. Scoring above the cut point for depression or distress was not associated with the onset of a suicide plan at 18 months.

3.3. Suicide attempt

The predictors for the onset of making a suicide attempt at the 18 month follow-up are presented in Table 4 and are comparable to results for making a plan to die by suicide, namely worry about the future (PAF: 51.0 %) and thinking life wasn't worth living (PAF: 40.1 %), with sleeping too little and worry about the past no longer significant but still with substantial PAFs. In addition, reduced appetite and agreement with the statement "I worry about other people liking me" were also significant predictors. Scoring above the cut point for either depression or anxiety was associated with substantial PAF but was not a significant predictor of suicide attempt onset at 18 months.

4. Discussion

The role of individual symptoms in the development of suicide-related behaviour revealed substantial differences in the relative contribution of different symptoms, even within the same scale, in predicting suicidal thoughts and behaviour longitudinally. Some

Table 2
Adjusted odds ratios, prevalence, population attributable risk fraction of anxiety, depression and distress symptoms at baseline predicting onset of suicidal ideation at 18 months ($n = 455$).

	Adj OR	Prevalence	PAF
Anxiety Symptoms (GAD SCARED)			
I worry about other people liking me	**3.20***	**24.8 %**	**35.3 %**
I am nervous	2.16	19.8 %	18.6 %
I worry about being as good as others	1.62	23.3 %	12.6 %
I worry about things working out	2.33*	24.5 %	24.6 %
I am a worrier	2.62*	25.9 %	29.6 %
People tell me that I worry too much	1.51	14.3 %	6.9 %
I worry about what is going to happen in the future	1.67	27.3 %	15.5 %
I worry about how well I do things	**2.76***	**31.9 %**	**35.9 %**
I worry about things that have already happened	2.05	27.7 %	22.6 %
Total score cut point	**2.36***	**39.8 %**	**35.1 %**
Depression Symptoms (MDI)			
Low in spirits or sad	1.75	21.5 %	13.9 %
Lost interest in daily activities	2.39	18.6 %	20.5 %
Lacking energy and strength	2.36*	24.7 %	25.2 %
Less self-confident	2.02	25.8 %	20.8 %
Bad conscience or feelings of guilt	1.46	18.9 %	8.0 %
Life wasn't worth living	1.59	11.4 %	6.3 %
Difficulty concentrating	1.77	17.9 %	12.1 %
Very restless	2.51*	21.4 %	24.5 %
Subdued or slowed down	1.69	14.8 %	9.3 %
Sleeping too little	**3.43***	**32.2 %**	**43.9 %**
Sleeping too much	0.69	8.4 %	−2.7 %
Reduced appetite	2.02	14.2 %	12.7 %
Increased appetite	1.25	11.9 %	2.9 %
Total score cut point	2.15	24.30 %	21.9 %
Distress Symptoms (DQ5)			
My worries overwhelmed me	2.76*	20.7 %	26.7 %
I felt helpless	2.07	16.0 %	14.6 %
I found social settings upsetting	1.46	12.5 %	5.4 %
I had trouble staying focused on tasks	2.33*	31.5 %	29.5 %
Anxiety or fear interfered with my ability to…	**3.60***	**17.4 %**	**31.2 %**
Total score cut point	2.29*	32.3 %	29.4 %

Notes. Odds ratios adjusted for gender and intervention group. GAD SCARED = Generalised Anxiety Disorder subscale of the Screen for Child Anxiety Related Disorders. MDI = Major Depression Inventory. DQ5 = Distress Questionnaire 9.
* $p < .01$. PAFs >30 % in bold.

symptoms showed high predictive validity, while others showed no association with later ideation, plans or attempts. Overall scale scores and associated typical cut offs for presence or absence of a disorder/mental health concern were less effective at predicting behaviour. These findings suggest that focusing on individual symptoms may be more efficient and effective in identifying risk in this population and provide insight into potential targets for future prevention and intervention programs. The findings of the current study also further the field by identifying the potential role of specific anxiety symptoms in the prediction of suicidal thoughts and behaviour in adolescents.

Across the analyses one common risk factor was the role of too little sleep in later suicidal ideation and behaviour. This effect accords with the accumulating literature identifying a role for sleep disturbance as a risk factor for subsequent suicidal thinking and behaviours (Harris et al., 2020). The involvement of insufficient sleep specifically in adolescent suicidality has previously been reported cross-sectionally (Lee et al., 2012). The results from this study extend these findings by identifying a longitudinal relationship between insufficient sleep and later suicidal ideation and behaviour in young people. This role of sleep disturbance in suicidality suggest that interventions could appropriately target sleep disturbance as a way to reduce suicide risk. This is encouraging given that effective interventions for sleep disturbance, such as cognitive behavioral therapy for insomnia (CBT-I) already exist (van Straten et al., 2018). Such interventions may therefore be feasibly incorporated into suicide prevention programs that are either delivered universally or targeted to young people most at risk, in order to reduce suicidal thoughts and behaviours in this population.

Worry about other individuals' perceptions was also a common predictor across the suicidality outcome variables. This is consistent with previous findings that social concerns are significantly associated with suicidal ideation and attempt among this age group (Campisi et al., 2020). One way to explain this is that social factors are particularly salient in this age group, as adolescents negotiate social networks and place an increased importance on their peer relationships (Nelson et al., 2005; Youniss, 1982). The findings from this study align with what is known about the social sensitivity experienced by young people, suggesting that even *concerns* about social rejection can increase risk for suicidal thinking and behaviours. The findings are also consistent with previous cross-sectional investigations of this sample, which demonstrated significant main effects of interpersonal factors in suicidal ideation (Calear et al., 2021), consistent with the Interpersonal-Psychological Theory of Suicidal Behaviour (Ma et al., 2016; Stewart et al., 2017; Van Orden et al., 2010).

The findings from our study also revealed a distinct pattern of predictors for suicidal ideation at the 18 month follow-up compared with suicidal plans and attempts. Suicidal ideation was significantly associated with two components of worry and with meeting overall criteria for anxiety, along with an item on functional impairment related to anxiety. In contrast, suicide plans and attempts 18 months later were predicted by endorsement of the statement that 'life wasn't worth living', and worry about both the future and the past. These patterns may provide an avenue for identification of risk at different phases of suicidality, with the plan and attempt predictors more salient for immediate risk than the anxiety-associated measures identified for ideation.

Another key finding of the current analyses was that both worry about the future and rumination about the past clearly hold important roles in the development of subsequent suicidal behaviour. It may be that suicidal plans and attempts reflect a literal lack of ability to see

Table 3
Adjusted odds ratios, prevalence, population attributable risk fraction of anxiety, depression and distress symptoms at baseline predicting onset of a suicide plan at 18 months ($n = 594$).

	Adj OR	Prevalence	PAF
Anxiety Symptoms (GAD SCARED)			
I worry about other people liking me	1.37	24.8 %	8.5 %
I am nervous	1.64	19.8 %	11.3 %
I worry about being as good as others	0.96	23.3 %	−1.0 %
I worry about things working out	1.85	24.5 %	17.2 %
I am a worrier	1.67	25.9 %	14.8 %
People tell me that I worry too much	1.25	14.3 %	3.5 %
I worry about what is going to happen in the future	**2.71***	**27.3 %**	**31.8 %**
I worry about how well I do things	1.72	31.9 %	18.7 %
I worry about things that have already happened	**2.91***	**27.7 %**	**34.6 %**
Total score cut point	**2.39**	**39.8 %**	**35.6 %**
Depression Symptoms (MDI)			
Low in spirits or sad	2.56	21.5 %	25.1 %
Lost interest in daily activities	2.02	18.6 %	16.0 %
Lacking energy and strength	1.77	24.7 %	16.0 %
Less self-confident	2.05	25.8 %	21.4 %
Bad conscience or feelings of guilt	1.96	18.9 %	15.3 %
Life wasn't worth living	**6.28***	**11.4 %**	**37.6 %**
Difficulty concentrating	1.40	17.9 %	6.7 %
Very restless	1.89	21.4 %	15.9 %
Subdued or slowed down	2.03	14.8 %	13.2 %
Sleeping too little	**2.43**	**32.2 %**	**31.5 %**
Sleeping too much	0.52	8.4 %	−4.3 %
Reduced appetite	2.03	14.2 %	12.7 %
Increased appetite	0.56	11.9 %	−5.6 %
Total score cut point	2.20	24.3 %	22.6 %
Distress Symptoms (DQ5)			
My worries overwhelmed me	2.13	20.7 %	19.0 %
I felt helpless	2.90	16.0 %	23.3 %
I found social settings upsetting	2.07	12.5 %	11.8 %
I had trouble staying focused on tasks	2.02	31.5 %	24.2 %
Anxiety or fear interfered with my ability to…	1.35	17.4 %	5.7 %
Total score cut point	1.22	32.3 %	6.6 %

Notes. Odds ratios adjusted for gender and intervention group. GAD SCARED = Generalised Anxiety Disorder subscale of the Screen for Child Anxiety Related Disorders. MDI = Major Depression Inventory. DQ5 = Distress Questionnaire 9.
* $p < .01$. PAFs >30 % in bold.

other ways out – of being unable to coherently imagine positive events in the future (Hallford et al., 2018), or too vividly imagining negative outcomes (Du et al., 2022). This in/ability to visualise change or escape from present/past pressures has been linked the role of entrapment as a key risk factor in the integrated motivational-volitional model of suicidal behaviour (O'Connor and Kirtley, 2018; van Mens et al., 2020; Wetherall et al., 2018).

Overall, the findings of these analyses suggest that individual symptoms may be a more useful indicator of suicidal ideation and behaviours in young people than overall diagnostic categories. In this study, overall depression caseness did not significantly predict later suicidal ideation or behaviour, and a majority of individual depression symptoms (except sleep disturbance) were not associated with the key suicide outcomes. In contrast, anxiety symptoms were repeatedly identified as predictors of suicidal ideation, plans and attempts. This is consistent with recent cross-sectional evidence for a key role of anxiety in suicidal behaviour in both adolescents and adults (Bentley et al., 2016; Boden et al., 2007; Doering et al., 2019; Hill et al., 2011) and justifies the call for inclusion of anxiety measures, in particular at the symptom level, to be included when assessing suicide risk. The role of anxiety in the development and progression of suicidal behaviour, either comorbid with or independent from depression, requires further study to distinguish their relative roles.

4.1. Limitations

The current analyses use data from a large, longitudinal community-based sample of young people. The majority of research conducted with this age group is cross-sectional, but only longitudinal data allows the identification of predictive factors as conducted here. The inclusion of several suicidality outcomes measures also facilitated the identification of differential predictors of the outcome variables, a key contribution of these analyses. However, the current analyses are impacted by the dropout rate over the 18 months of the trial, which reduced participant numbers, particularly in terms of the suicide attempt outcome, and may have reduced power to identify significant predictors. This factor also restricted our ability to track patterns of transition from suicidal ideation to plan/attempt. Further research with larger samples could identify the factors differentially associated with moving from ideation to attempt, or conversely from ideation back to a non-ideation state. Relatedly, it is possible that a small proportion of participants who reported new onset of suicidal thoughts or behaviours at 18 months may have experienced previous suicidality >12 months before the baseline assessment. Finally, while specific symptoms such as sleep disturbance explained a large proportion of the prevalence of suicidal thoughts and behaviours, it should be noted that the presence of such symptoms is not deterministic and may not be useful for the purposes of screening for future risk: a high proportion of young people experience these symptoms but only a minority progress to suicidal distress.

5. Conclusion

By identifying significant specific symptom predictors of suicidal thoughts and behaviour, the current study raises awareness of the importance and potential contribution of individual symptoms to predicting future suicidality. In particular the key role of insufficient sleep, worry about the future, and anxiety about social concerns suggest targets for potential interventions to reduce suicidality among adolescents. Future research should consider analysis at the symptom rather than full scale level in suicide studies, and focus on the potential role of anxiety

Table 4
Adjusted odds ratios, prevalence, population attributable risk fraction of anxiety, depression and distress symptoms at baseline predicting onset of a suicide attempt at 18 months ($n = 498$).

	Adj OR	Prevalence	PAF
Anxiety Symptoms (GAD SCARED)			
I worry about other people liking me	**2.95**	**24.8 %**	**32.6 %**
I am nervous	2.82	19.8 %	26.5 %
I worry about being as good as others	1.15	23.3 %	3.3 %
I worry about things working out	0.73	24.5 %	−7.2 %
I am a worrier	1.84	25.9 %	17.9 %
People tell me that I worry too much	2.06	14.3 %	13.1 %
I worry about what is going to happen in the future	**4.81***	**27.3 %**	**51.0 %**
I worry about how well I do things	2.07	31.9 %	25.5 %
I worry about things that have already happened	**3.11**	**27.7 %**	**36.8 %**
Total score cut point	**2.26**	**39.8 %**	**33.4 %**
Depression Symptoms (MDI)			
Low in spirits or sad	2.83	21.5 %	28.2 %
Lost interest in daily activities	2.87	18.6 %	25.8 %
Lacking energy and strength	2.58	24.7 %	28.0 %
Less self-confident	2.19	25.8 %	23.6 %
Bad conscience or feelings of guilt	3.06	18.9 %	28.0 %
Life wasn't worth living	**6.87***	**11.4 %**	**40.1 %**
Difficulty concentrating	2.62	17.9 %	22.5 %
Very restless	2.04	21.4 %	18.2 %
Subdued or slowed down	1.81	14.8 %	10.7 %
Sleeping too little	**2.84**	**32.2 %**	**37.2 %**
Sleeping too much	0.000	8.4 %	−9.2 %
Reduced appetite	**4.93***	**14.2 %**	**35.8 %**
Increased appetite	0.54	11.9 %	−5.8 %
Total score cut point	**3.53**	**24.3 %**	**38.1 %**
Distress Symptoms (DQ5)			
My worries overwhelmed me	2.62	20.7 %	25.1 %
I felt helpless	3.30	16.0 %	26.9 %
I found social settings upsetting	2.33	12.5 %	14.2 %
I had trouble staying focused on tasks	1.10	31.5 %	3.1 %
Anxiety or fear interfered with my ability to…	2.52	17.4 %	21.0 %
Total score cut point	1.62	32.3 %	16.6 %

Notes. Odds ratios adjusted for gender and intervention group. GAD SCARED = Generalised Anxiety Disorder subscale of the Screen for Child Anxiety Related Disorders. MDI = Major Depression Inventory. DQ5 = Distress Questionnaire 9.
* $p < .01$. PAFs >30 % in bold.

symptoms in subsequent development of suicidal thoughts and behaviours.

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Contributors

ALC and PJB designed the trial and secured the funding. ALC, SMM and AW were involved in conducting the trial. JB designed and conducted the analyses with support from PJB and drafted the article. All authors critically edited the manuscript and approved the final version.

Ethics approval

Ethical approval for this study was obtained from the Human Research Ethics Committee at the Australian National University (protocol number 2015/199), and from the Education Departments responsible for the schools involved in the study.

Clinical trial registration

The trial was registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12616000048482).

Conflict of interest

The authors declare they have no conflicts of interest.

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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