

A Prospective Study of the Effects of Optimism on Adolescent Health Risks

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KEY WORDS

optimism, psychological style, depression, anxiety, substance use, antisocial behaviors, adolescence

ABBREVIATIONS

GEE—generalized estimating equations
CI—confidence interval

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WHAT'S KNOWN ON THIS SUBJECT: Optimism later in life is protective against a range of health problems. It has commonly been a focus in adolescent mental health promotion. Cross-sectional studies suggest a protective effect against adolescent health risks, but prospective studies have been lacking.



WHAT THIS STUDY ADDS: Optimism is somewhat protective against adolescent health risks; the strongest effect was seen against the onset of new depressive symptoms. Its protective effect against heavier substance use and antisocial behavior was modest and only for the highest categories compared to the lowest. Promoting optimism along with other positive aspects of psychological and emotional style has a role in mental health promotion that is likely to be enhanced if an intervention also addresses risk and protective factors in an adolescent's social context.

abstract

FREE

CONTEXT: The promotion of optimism has been widely advocated for children and adolescents, but epidemiologic data to support this approach are scant.

METHODS: This was a 3-wave longitudinal study of health and social development in younger adolescents from 3 Australian states. The 5634 student participants, initially aged 12 to 14 years, were assessed for optimistic thinking style, emotional problems, substance use, and antisocial behaviors.

RESULTS: Cross-sectional associations between optimism and each of the study outcomes were strongly protective but tended to differ according to gender in extent. In prospective analyses of the onset of new cases of each study outcome, protective associations were weaker. Those in the highest optimism quartile had risks for depressive symptoms that were reduced by almost half (odds ratio: 0.54 [95% confidence interval: 0.42–0.70]) compared with those in the lowest category. No effect was seen in prevention of anxiety symptoms after adjustment for other aspects of psychological style. In predicting the onset of heavy substance use and antisocial behavior, high optimism had modest protective effects.

CONCLUSIONS: Optimistic thinking style is somewhat protective against adolescent health risks; the clearest effects are seen against depressive symptoms. Promoting optimism along with other aspects of psychological and emotional style has a role in mental health promotion that is likely to be enhanced if an intervention also addresses risk and protective factors in an adolescent's social context. *Pediatrics* 2011;127:000

Optimism has long been linked to academic, occupational, and political success.^{1,2} Its role in both mental and physical health has also attracted attention.³ In later life it predicts good global health status,⁴ lower rates all-cause mortality,^{5,6} cardiovascular deaths,^{7,8} and depressive symptoms.⁹ Various explanations have been put forward. Its potential role in buffering against the negative emotional consequence of social adversity^{1,10} has led to a view of optimism as an index of resilience.¹¹ Optimists may also be more likely to adopt lifestyles that promote health or a favorable progression through disease.^{12,13} Were such an association with healthy lifestyle to begin early in life, the cumulative effects might be profound.^{10,14}

For these reasons, optimism has often featured prominently in mental health promotion in children and adolescents.^{15,16} Yet, a failure to find consistent positive outcomes from recent interventions raises a question about how protective it may be in younger people.^{15–17} Indeed, optimism has been linked to some health hazards in adolescents, because optimists may not avoid risks that they perceive to be unlikely to affect them.¹⁸ Unwarranted optimism about the personal health risks has been found in young smokers¹⁹ and drug users.²⁰

To date, most studies that have examined the effects of optimism on adolescent health have been cross-sectional and generally considered single health outcomes.²¹ One recent prospective study of more extreme pessimism found that a perceived likelihood of early death predicted a range of health and behavioral outcomes in young adulthood.²² In our study, we prospectively examined the association between optimistic thinking styles and the commoner emotional problems and health risk behaviors of younger adolescents.

METHODS

Ethics approvals were obtained from the appropriate bodies in each state. Participation required written parental consent. The study was designed as cluster-randomized trial of an intervention to improve individual coping and social skills.²³ The outcomes were reported recently with no difference in outcomes between the intervention and control groups.²⁴

Procedure and Sample

Schools were recruited through an “expression-of-interest” process; an invitation was extended to each school in each state with at least 100 8th-grade students. The 105 schools that responded were stratified according to sector (government, Catholic, and independent) and whether they were metropolitan. Twenty-five school pairs (50 schools in total) were selected with matching on socioeconomic status, enrollment size, and education sector to enroll a typical range of schools in each state. All but 2 of the selected schools participated. Participating schools were in Queensland ($n = 18$), South Australia ($n = 16$), and Victoria ($n = 16$). Of the 50 schools, 42 were mixed-gender and 8 were single-gender schools. Thirty-four schools (68%) were government funded and 16 (32%) were privately funded. Thirty-eight (76%) were metropolitan and 12 (24%) were nonmetropolitan.

Students completed the baseline assessment in term 2 (May through June) 2003. The academic year in Australia begins in February and ends in early December. Follow-up assessments took place in all schools in term 4 each year to follow the cycle of curriculum intervention (October through December) in 2004 and 2005 when the students were in 9th and 10th grade.

Measures

Depressive Symptoms

The 20-item Centre for Epidemiologic Studies Depression Scale (CES-D) was used to assess depressive symptoms.^{25,26} Respondents rated their experience of each symptom in the previous week on a 4-point scale from rarely or none of the time (<1 day) to most or all of the time (5–7 days). Summed scores could range from 0 to 60; higher scores indicated more depressive symptoms. A cutoff score of ≥ 16 identified adolescents with mild or greater levels of depression.²⁷

Anxiety Symptoms

A short 8-item scale adapted from the Spence Children’s Anxiety Scale²⁸ was used to assess anxiety symptoms. Participants were asked to indicate how often they experienced each symptom by using a 4-point scale (never, sometimes, often, or always). Total scores ranged from 0 to 24; higher scores reflected higher levels of anxiety symptoms. Internal consistency was high (Cronbach’s $\alpha = 0.89$). A cutoff point of ≥ 12 was used to define high anxiety, which reflected those who scored in the top 15% at baseline assessment.

Substance Use

Substance use was measured by self-report of frequency of tobacco, alcohol, and cannabis use. Tobacco use in the previous week was defined on 3 levels: nonsmokers and ex-smokers who reported having stopped for more than 1 month; current smoking on <3 days in the previous week; and smoking on at least 3 days in the previous week. Alcohol use was defined on 3 levels: no use in the previous week; drinking <3 days in the past week; and drinking ≥ 3 days in the previous week and/or binge-drinking (≥ 5 standard drinks in a row) on at least 2 occasions in the previous 2 weeks. Cannabis use was defined as no use in the previous 6

months; use at least once in the previous 6 months but less than weekly; or at least weekly use. “Any substance use” was defined as having used alcohol, tobacco, or cannabis at least at the intermediate level. “Heavy substance use” was as any alcohol, tobacco, or cannabis use at the highest level defined above.

Antisocial Behavior

Antisocial behavior was assessed with 5 items from the Self-reported Early Delinquency Scale that cover getting into physical fights, driving a car without permission, running away from home, being suspended from school, and doing graffiti in a public place in the previous 6 months.²⁹ Participants responded on a 3-point scale (not at all, once, or more than once), which provided a total score that ranged from 0 to 10. Internal consistency was acceptable (Cronbach’s $\alpha = 0.79$). “Any” antisocial behavior referred to at least 1 instance of any of the 5 behaviors in the previous 6 months, and “frequent” referred to either 2 or more instances of the same behavior or 2 or more different antisocial behaviors on at least 1 occasion.

Optimistic Thinking Style

A 12-item scale was developed to assess students’ thinking style. The structure of the scale was designed to reflect Beck’s cognitive triad, which relates to positive thoughts about the self, the world, and the future.³⁰ The measure incorporated a tendency for the children to perceive themselves in a favorable light.¹ Participants rated the experience of specific positive thoughts over the previous week. Exploratory factor analysis using baseline data revealed a single factor (eigenvalue = 7.11) that explained 59.25% of the variance with all items loaded strongly (>0.6). Cronbach’s α for the total scale was 0.94. In this study, optimistic thinking style was categorized

on 4 levels to allow evaluation of any dose-response relationships in associations: very low (0–17), low (18–23), high (24–29), and very high (30–36), which corresponded to the quartile-value cutoff points at baseline. This categorization allowed exploration of associations with the study outcomes without the assumption of linearity.

Interpersonal Competence

Interpersonal competence was assessed through a modified version of the Adolescent Interpersonal Competence Questionnaire.³¹ The modified scale included 15 items that assessed initiating relationships, providing emotional support, asserting influence, self-disclosure, and conflict resolution. Cronbach’s α for the scale was 0.89. Scores were coded on 3 levels: low (<25), intermediate (25 to <32), and high (32–45), which corresponded to the tertile scores at baseline.

Negative Coping Style

Coping style was measured by using the Coping Actions Scale, which consists of statements that assess coping skills taken from the Social Problem Solving Inventory-Revised³² and the Self-reporting Coping Scale.³³ The negative-coping-strategies dimension included 8 items that assessed the tendency to react to or deal with problems in an avoidant or unconstructive manner. Cronbach’s α for the scale was 0.88. These scores were coded on 3 levels: low (<10), intermediate (10 to <15), and high (15–32), which corresponded to the tertile scores at baseline.

Life events over the previous 12 months were evaluated by using an adaptation of the List of Threatening Experiences Questionnaire, a brief measure of 12 events with considerable long-term contextual threat.^{34,35} The events included serious illness or injury in a participant or close relative, death of a close friend or relative, break-up of a steady relationship, sus-

pension from school, problems with the police, serious conflict with a close friend, and major financial problems for the participant or family. The variable was categorized as none, 1 or 2, or more than 2 life events.

Analysis

For the summary statistics for the overall prevalence rates of depression, anxiety, substance use, and antisocial behavior, we took into account the clustering of students in schools by using robust SEs. The relationship between concurrent optimism and study outcomes across the 3 waves were analyzed by using logistic generalized estimating equations (GEE).³⁶ Models were adjusted for wave, demographic variables of interest (child’s age, gender, country of birth, parental marital status), intervention status, and other factors known to be related to the outcomes (negative coping style, interpersonal competence, and recent life events). Interactions between optimism and gender, optimism and wave, and optimism and life events were tested by using the Wald test. Gender was a focus for interaction testing, because gender differences in the prevalence of the outcomes raised a possibility of different causal processes.³⁷ Transitional logistic GEE regression models were used to examine associations between optimism 12 months earlier and the onset of the outcomes studied. Those who had scored above the relevant cutoff point at the previous wave were excluded from these models. Initial models controlled for wave, demographic variables of interest, intervention status, and, where appropriate, outcome measures at the previous wave. Fully adjusted models also controlled for previous negative coping style and interpersonal competence and concurrent recent life events. Interactions between optimism and gender, life events, and intervention status were tested. For depressive

symptoms, the population-preventable fraction was calculated to estimate proportion of cases of depression potentially prevented by having an optimism level higher than the lowest category.³⁸ All estimates of prevalence and association are presented with 95% confidence intervals (CIs). Data analysis was undertaken by using Stata 11.³⁹

RESULTS

Within the individual schools, 64% of students in the targeted year level completed the survey at baseline. Of these 5634 adolescents, 92% had complete demographic variables and at least 1 outcome of interest at wave 1, 85% at wave 2, and 75% at wave 3. Thirty-six percent of the sample was from the state of Victoria, 35% from Queensland, and 29% from South Australia. The mean age of the sample at the outset in 2003 was 13.1 years (SD: 0.5). The sample was 53% female. Seventy-five percent of the sample came from families with both parents living at home, and 93% of the sample was Australian born, which is consistent with national population estimates.⁴⁰

Baseline rates of high depressive symptoms (Centre for Epidemiologic Studies Depression Scale scores \geq

16) were 29% in boys and 39% in girls. Similar rates were found at waves 2 and 3 for boys (27% and 28%, respectively) and girls (43% and 43%, respectively). High anxiety symptoms (≥ 12) were reported by 11% of the boys and 19% of the girls at baseline. These rates remained consistent over subsequent waves. Rates of any substance use increased across the waves for boys (21%, 35%, and 45%) and girls (17%, 30%, and 41%). Rates of heavy substance use also increased for boys (8%, 17%, and 22%) and girls (5%, 12%, and 18%). Antisocial behavior was reported by just less than half of the boys and approximately one-third of the girls at each wave (boys: 45%, 45%, and 41%; girls: 29%, 32%, and 28%) at each wave. At wave 1, 19% of boys and 11% of girls reported frequent antisocial behavior; these rates were similar for the succeeding waves. At baseline, 20% of boys had very low optimism, 25% had low optimism, 29% had high optimism, and 25% had very high optimism, whereas $\sim 25\%$ of girls had each level of optimism. For boys these rates remained similar across waves, but for girls the rates of low optimism increased (wave 3: 30% very low optimism, 26% low optimism, 24% high optimism, 20% very high optimism).

Cross-sectional Associations of Optimism With Health Risks

Table 1 shows the prevalence of the study outcomes according to gender across the 4 optimism levels at baseline. At baseline, adolescents who reported higher levels of optimism tended to report lower levels of depression, anxiety, substance use, and antisocial behavior. This pattern was repeated at waves 2 and 3 (data not shown).

Table 2 shows concurrent associations between study outcomes and optimism after controlling for demographic and other factors known to be related to the outcomes. Significant interactions were found between optimism and gender for all the outcomes except anxiety. Optimism had a strong protective association for depression, which differed between boys and girls. Compared with girls with very low levels of optimism, boys with the same level of optimism were approximately half as likely to be depressed. The risk of depression for boys and girls decreased as the level of optimism increased, but boys had a lower risk of depression for each level of optimism. Optimism had a protective association with anxiety. Boys were less likely to

TABLE 1 Prevalence of Study Outcomes at Wave 1 in 5634 8th-Grade (12- to 13-Year-Old) Secondary School Students Categorized According to Gender and Concurrent Optimism Level

Optimism Level	Emotional Problems ^a		Substance Use ^a		Antisocial Behavior ^a	
	Depression	Anxiety	Any ^b	Heavy ^c	Any	Frequent
Boys (N = 2635)						
Very low	59 (53–64)	22 (18–26)	30 (25–35)	13 (9–17)	62 (58–67)	32 (27–36)
Low	31 (27–36)	11 (8–14)	17 (13–21)	7 (5–9)	49 (45–53)	19 (15–23)
High	18 (15–21)	7 (4–10)	10 (8–13)	6 (4–8)	40 (36–44)	15 (12–18)
Very high	15 (12–17)	6 (4–8)	10 (7–12)	5 (3–8)	34 (30–39)	12 (8–16)
Overall	29 (26–32)	11 (9–13)	21 (18–24)	8 (6–10)	45 (43–48)	19 (17–21)
Girls (N = 2972)						
Very low	76 (72–80)	36 (32–40)	32 (27–37)	11 (8–14)	49 (44–54)	23 (19–26)
Low	43 (39–47)	19 (15–22)	23 (19–27)	5 (3–8)	32 (28–35)	10 (8–12)
High	25 (22–28)	13 (10–15)	17 (15–20)	2 (1–3)	22 (18–25)	7 (5–9)
Very high	16 (12–19)	9 (7–12)	15 (12–18)	2 (1–4)	17 (14–20)	5 (3–7)
Overall	39 (37–42)	19 (17–20)	17 (14–19)	5 (4–7)	29 (27–32)	11 (9–13)

^a Prevalence estimates are presented with 95% CIs with adjustment for clustering within schools.

^b Any substance use was defined as using tobacco or alcohol in the previous week or cannabis in the previous 6 months.

^c Heavy substance use refers to using tobacco at least most days, binge-drinking (≥ 5 units in a row) in the previous week, or weekly cannabis use.

TABLE 2 Cross-sectional Associations of Study Outcomes With Optimism Across 3 Annual Waves of Data Collection in 5607 Secondary School Students Initially in 8th Grade

	Emotional Problems, OR (95% CI)		Substance Use, OR (95% CI)		Antisocial Behavior, OR (95% CI)	
	Depression ^a	Anxiety ^b	Any ^c	Heavy ^d	Any ^e	Frequent ^f
Optimism level						
Very low						
Girls	1.0		1.0	1.0	1.0	1.0
Boys	0.44 (0.37–0.54)	1.0	1.22 (1.00–1.49)	1.35 (1.05–1.74)	1.66 (1.41–1.95)	1.65 (1.35–2.02)
Low						
Girls	0.28 (0.24–0.33)		0.67 (0.56–0.80)	0.56 (0.45–0.70)	0.49 (0.51–0.67)	0.47 (0.40–0.56)
Boys	0.17 (0.14–0.21)	0.57 (0.51–0.64)	0.97 (0.80–1.19)	0.90 (0.74–1.10)	1.36 (1.15–1.61)	1.09 (0.90–1.33)
High						
Girls	0.13 (0.11–0.15)		0.53 (0.44–0.64)	0.46 (0.37–0.57)	0.35 (0.30–0.40)	0.32 (0.26–0.40)
Boys	0.07 (0.06–0.09)	0.41 (0.36–0.47)	0.74 (0.63–0.86)	0.73 (0.60–0.89)	1.06 (0.91–1.23)	0.88 (0.76–1.02)
Very high						
Girls	0.07 (0.05–0.09)		0.37 (0.30–0.46)	0.32 (0.22–0.46)	0.34 (0.29–0.40)	0.32 (0.23–0.45)
Boys	0.06 (0.05–0.08)	0.41 (0.33–0.50)	0.70 (0.57–0.84)	0.77 (0.60–0.98)	0.86 (0.73–1.00)	0.91 (0.73–1.13)

Associations were estimated by using GEE with adjustment for age, gender, country of birth, parental marital status, recent life events, negative coping style, and interpersonal competence. OR indicates odds ratio.

^a Statistical significance of main effects for optimism, gender, and their interaction was $<.001$ for each.

^b No interaction between optimism and gender.

^c Statistical significance of main effects of optimism, gender, and their interaction was $<.001$, $.05$, and $.004$, respectively.

^d Statistical significance of main effects of optimism, gender, and their interaction was $<.001$, $.02$, and $.04$, respectively.

^e Statistical significance of main effects for optimism, gender, and their interaction was all $<.001$.

^f Statistical significance of main effects of optimism, gender and their interaction was $<.001$, $<.001$, and $.004$, respectively.

report anxiety, but association with optimism did not differ with gender. Optimism, gender, and the interaction between optimism and gender were all found to be related to any substance use. The risk of any substance use declines as optimism increases; girls were less likely to use than boys, especially for very high levels of optimism. A similar result was found for heavy substance use. For any antisocial behavior, there again were associations with optimism, gender, and the interaction between them. Boys were more likely to report antisocial behaviors. The risk of antisocial behavior decreased as optimism increased; the reduction in risk differed slightly between boys and girls. Similar effects were also found for frequent antisocial behavior. These relationships did not vary over time.

Optimistic Thinking Style and the Onset of New Problems

We conducted prospective analyses to examine optimism as a predictor of the onset of emotional problems, substance use, and antisocial behaviors 12 months later.

Depressive and Anxiety Symptoms

In predicting new depressive symptoms, optimism had protective effects in the partially adjusted model, and there was a trend to increasing protection with higher levels of optimism (Table 3). In the fully adjusted model, optimism had a similar protective effect, and there was some evidence for a possible variation between genders; boys had lower levels of risk of depression at any given level of optimism. Multiple life events were associated with an almost fourfold increase in risks for depressive symptoms. Estimates of the population-preventable fraction suggested that up to 32% more incident cases of depressive symptoms would have occurred if those with higher levels of optimism had not been exposed to its protective effects. The risks for anxiety were lower in all 3 higher-optimism groups compared with the very-low-optimism group in the partially adjusted model. In the fully adjusted model, the protective effect of optimism was much reduced after ad-

justment for interpersonal competence, negative coping style, and reported life events. There was no interaction between optimism and gender in either the partially or fully adjusted model. There was no interaction found between optimism and life events in the prediction of either new depressive symptoms ($P = .74$) or anxiety symptoms ($P = .51$).

Substance Use

Incident substance use was defined on 2 different levels: any and heavy substance use (Table 4). Level of optimism was protective against any substance use, and its effect varied between boys and girls. In the partially adjusted model both boys and girls with the high and very high levels of optimism had a reduced risk of new substance use. In the fully adjusted model, the protective effect of high and very high levels of optimism remained only for girls. Those with the highest level of optimism, compared with those with the lowest level, had almost half the risk for the onset of heavy substance use in the partially adjusted model.

TABLE 3 Prospective Associations Between Optimism and the Onset of Emotional Problems 12 Months Later

	Depressive Symptoms (<i>N</i> = 3307), OR (95% CI)		Anxiety Symptoms (<i>N</i> = 4191), OR (95% CI)	
	Partial Adjustment ^{a,b}	Full Adjustment ^{c,d}	Partial Adjustment ^{a,e}	Full Adjustment ^{c,f}
Optimism level				
Very low	1.00	1.00	1.00	1.00
Low	0.82 (0.65–1.03)	0.78 (0.62–0.98)	0.62 (0.49–0.79)	0.71 (0.56–0.92)
High	0.68 (0.54–0.86)	0.65 (0.51–0.83)	0.66 (0.54–0.81)	0.82 (0.65–1.04)
Very high	0.55 (0.43–0.72)	0.54 (0.42–0.70)	0.69 (0.55–0.89)	0.92 (0.70–1.21)
Life events				
None	NA	1.00	NA	1.00
1–2	—	1.66 (1.41–1.94)	—	1.44 (1.14–1.81)
≥3	—	4.35 (3.70–5.11)	—	3.87 (2.94–5.11)
Negative problem-solving				
Low	—	1.0	—	1.0
Intermediate	NA	1.17 (1.00–1.36)	NA	1.24 (1.01–1.52)
High	—	1.51 (1.24–1.84)	—	1.74 (1.40–2.15)
Interpersonal competence				
Low	NA	1.00	NA	1.00
Intermediate	—	0.91 (0.74–1.10)	—	0.76 (0.59–0.97)
High	—	0.85 (0.65–1.11)	—	0.70 (0.53–0.92)

Odds ratios (95% CIs) were estimated by using GEE. OR indicates odds ratio; NA, not applicable.
^a Partially adjusted models included wave, intervention, age, parental marital status, and earlier subthreshold symptoms.
^b Statistical significance of main effects of optimism, gender, and their interaction was <.001, .03, and .12 respectively.
^c Fully adjusted models included life events, negative coping style, and interpersonal competence at the previous wave.
^d Statistical significance of main effects of optimism, gender, and their interaction was .002, .07, and .05.
^e Statistical significance of main effects of optimism and gender in the partially adjusted model was <.001 for each.
^f Statistical significance of main effects of optimism and gender in the fully adjusted model was .02 and <.001 respectively.

This protective effect was substantially reduced in the fully adjusted model after adjustment for interpersonal competence. There was no interaction between optimism and gender in either model.

Antisocial Behavior

Antisocial behavior was defined on 2 levels (any and frequent); with the

models we examined the transition to frequent antisocial behavior, adjusted for any antisocial behavior at the previous wave (Table 5). Protective effects of optimism in predicting any and frequent antisocial behavior were reduced after fully adjusting for negative life events, negative coping style, and interpersonal competence;

each covariate reduced the association. No interaction was found between gender and level of optimism in predicting either outcome.

DISCUSSION

In the cross-sectional analysis, optimistic thinking style had strong protective associations with adolescent emotional and conduct problems and substance use. In prospective analysis these associations were weaker. In predicting new depressive symptoms, the highest optimism category had almost half the risk of the lowest optimism category. Without the protective effect of higher levels of optimism, incidence rates for depressive symptoms might have been 32% higher than those observed. For anxiety symptoms, modest reductions in risk that largely disappeared after adjustment for other psychological attributes were found. In predicting the onset of substance use, optimistic thinking style had a protective effect for girls but not boys. For frequent antisocial behavior and heavier substance use, high optimism had modest protective associations in both genders.

By later life, optimism seems stable,³⁵ although social and cultural context in early life are important influences.⁴¹ In our study, optimism seemed less sta-

TABLE 4 Prospective Association Between Optimism and the Onset of New Substance Use

Optimism Level	Any Substance Use (<i>N</i> = 4040), OR (95% CI)				Heavy Substance Use (<i>N</i> = 4636), OR (95% CI)	
	Partial Adjustment ^{a,b}		Full Adjustment ^{c,d}		Partial Adjustment ^{e,f}	Full Adjustment ^{e,g}
	Girls	Boys	Girls	Boys		
Very low	1.00	0.80 (0.63–1.02)	1.00	0.85 (0.66–1.09)	1.00	1.00
Low	0.78 (0.63–0.97)	0.88 (0.67–1.15)	0.80 (0.64–1.00)	1.00 (0.73–1.35)	0.87 (0.71–1.06)	0.94 (0.77–1.17)
High	0.66 (0.52–0.84)	0.77 (0.59–1.00)	0.69 (0.54–0.88)	0.91 (0.69–1.21)	0.69 (0.56–0.84)	0.79 (0.64–0.97)
Very high	0.45 (0.35–0.58)	0.71 (0.54–0.93)	0.50 (0.38–0.66)	0.81 (0.60–1.08)	0.59 (0.48–0.72)	0.74 (0.59–0.93)

Odds ratios (95% CIs) were estimated by using GEE. OR indicates odds ratio.
^a Partial adjustment for wave, intervention status, age, country of birth, and parental marital status.
^b Statistical significance of main effects of optimism, gender, and their interaction in the partially adjusted model was <.001, .07, and <.001, respectively.
^c Fully adjusted models also adjusted for recent life events, negative coping style, and interpersonal competence at the previous wave.
^d Statistical significance of main effects of optimism, gender, and their interaction in the fully adjusted model was <.001, .20, and .002, respectively.
^e Partial adjustment for wave, intervention status, age, country of birth, parental marital status, and any substance use at the previous wave.
^f Statistical significance of main effects of optimism and gender in the partially adjusted model was <.001 for each.
^g Statistical significance of main effects of optimism and gender in the fully adjusted model was .02 and <.001, respectively.

TABLE 5 Prospective Association Between Optimism and the Onset of Antisocial Behavior

Optimism Level	Any Antisocial Behavior (N = 3189), OR (95% CI)		Frequent Antisocial Behavior (N = 4268), OR (95% CI)	
	Partial Adjustment ^{a,b}	Full Adjustment ^{c,d}	Partial Adjustment ^{e,f}	Full Adjustment ^{c,g}
Very low	1.00	1.00	1.00	1.00
Low	0.88 (0.72–1.07)	1.01 (0.81–1.25)	0.73 (0.60–0.89)	0.84 (0.70–1.01)
High	0.72 (0.60–0.87)	0.86 (0.70–1.05)	0.68 (0.54–0.85)	0.83 (0.64–1.06)
Very high	0.58 (0.46–0.74)	0.74 (0.57–0.97)	0.60 (0.47–0.76)	0.74 (0.55–0.98)

Odds ratios (95% CIs) were estimated by using GEE. OR indicates odds ratio.

^a Partial adjustment for wave, intervention status, age, country of birth, and parental marital status.

^b Partial adjustment for wave, intervention status, age, country of birth, parental marital status, and any antisocial behavior at the previous wave.

^c Fully adjusted models include life events, negative coping style, and interpersonal competence at the previous wave.

^d Statistical significance of main effects of optimism and gender in the partially adjusted model was <.001 for each.

^e Statistical significance of main effects of optimism and gender in the fully adjusted model was .05 and <.001, respectively.

^f Statistical significance of main effects of optimism and gender in the partially adjusted model was <.001 for each.

^g Statistical significance of main effects of optimism and gender in the fully adjusted model was .12 and <.001, respectively.

ble because young girls showed a decline over the 2 years of follow-up. Whether this decrease reflects pubertal development or the influence of social context in early adolescence is uncertain.

This study had notable strengths in size, high retention rates, and coverage of a relevant age group for the onset of emotional and behavioral problems. However, limitations should be noted. The sample was chosen for mounting a cluster-randomized trial. In part, because active consent was required, initial participation rates were only fair. It is possible, therefore, that the distribution of optimism and the study outcomes may differ somewhat from a truly representative sample, which could make a modest difference in the associations found but seems unlikely to account for the main findings. The measure of optimistic thinking style was broader than some used in earlier studies in that it incorporated current attitudes to the self and others together with future-oriented elements. This scale had excellent internal consistency, and subanalyses in which only the future-oriented items

were used produced similar findings to those of the complete scale.

The explanatory style of optimists may be responsible for the protective effect against depressive symptoms. An optimist generally asserts that the good things happening to me will continue to happen in the future and they are of my doing; bad things can happen occasionally by chance but are unlikely to recur.⁴² A possibility that such attitudes may buffer against social adversity was not borne out in that optimism's effects were independent of life events.⁴³ Optimism neither predicted life events nor had any interaction with life events in predicting depressive symptoms or other study outcomes.⁴⁴ The results of other work have suggested that optimists tend to use more problem-focused coping strategies than pessimists.⁴⁵ However, a lesser tendency to adopt negative coping strategies did not explain optimism's protective effects against depression.

A gender difference in the effects of optimism was apparent in regard to substance use, for which optimism

was protective for girls but did little to reduce risks for boys. Earlier reports have suggested that dispositional optimism may lead to an underestimation of both later health risks and a person's capacity to control a particular behavior.⁴⁶ Why this risk relationship should differ for boys and girls is less clear but could be related to evolutionary pressures on adolescent boys to take risks to improve their social status.⁴⁷

CONCLUSIONS

The presence of protective effects across a range of adolescent health outcomes provides support for promoting an optimistic thinking style in adolescents. Yet, a focus on optimism alone, without addressing other aspects of cognitive, interpersonal, and emotional style, seems unlikely to have large effects.^{15–17} Preventive interventions around adolescent mental health and behavior should also address other aspects of psychological functioning and, given the large effects of life events in this and other studies, also consider the social context in the intervention strategy.^{48,49}

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