Original article

Adverse Adolescent Relationship Histories and Young Adult Health: Cumulative Effects of Loneliness, Low Parental Support, Relationship Instability, Intimate Partner Violence, and Loss

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A B S T R A C T

Purpose: To examine the associations between adverse interpersonal relationship histories experienced during adolescence and health in young adulthood in a large, nationally representative sample.
Methods: Using data from Waves I, II, and III of the National Longitudinal Study of Adolescent Health, multiple adverse relationship experiences were examined, including high loneliness, low perceived parental support, frequent transitions in romantic relationships (relationship instability), exposure to intimate partner violence, and loss by death of important relationship figures. These histories are assessed, both individually and in a relationship risk index, as predictors of self-reported general health and depressive symptoms at Wave III (ages, 18–27), controlling for baseline (Wave I) health and for demographic and health behavior covariates.
Results: Net of baseline health and covariates, each type of relationship risk (experienced between Wave I and Wave III) was related to either depression or general health at Wave III, with the strongest effects seen for exposure to intimate partner violence. In addition, a cumulative relationship risk index examining the extent to which youth experienced high levels of multiple relationship risk factors revealed that each additional adverse relationship experience increased the odds of reporting worse mental and general health at Wave III, with increases occurring in an additive manner.
Conclusion: Multiple types of adverse relationship experiences predicted increases in poorer general health and depressive symptoms from adolescence to early adulthood. Consistent with a cumulative risk hypothesis, the more types of adverse relationship a youth experienced, the worse were their young adult health outcomes.
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Human beings are social beings; social relationships play a central role in our lives. From infancy onward, we depend on others to help meet basic needs of sustenance, shelter, and protection; to provide instrumental and emotional support; to serve as sources of companionship, comfort, and pleasure; and to serve as partners in child-bearing and child-rearing. Developing and maintaining positive social relationships are among the most important developmental tasks of infancy, childhood, and adolescence [1]. Not surprisingly, variations in social relationship experiences have been related to individual differences in emotional and physical health [2–4]. Social relationships are thought to affect health via multiple pathways, including direct impacts

on negative and positive affect; changes in perceptions of and responses to stressors; impacts on stress-sensitive biological systems; and changes in health behaviors [5,6].

Much of the previous research on social relationships and health has focused on the positive side of social relationships—the stress-buffering and health-promoting role of strong social supports and integration within large social networks [3,5]. However, theoretical models have also proposed direct negative effects of adverse social experiences on health [5–7]. Taking a "cumulative relationship risk" approach, we argue that cumulative exposure to multiple adverse relationship experiences may be particularly deleterious for health. We also argue that certain types of adverse relationship experiences are most likely to be related to poor health—those that are directly threatening to the social or physical self [8]. In this study, we focus on high perceived loneliness, low parental support, instability in romantic relationships, violence in intimate relationships, and loss by death of important relationship figures. Before elaborating our hypotheses, we briefly discuss existing research on each of these relationship risks and emotional and physical health.

Loneliness

Loneliness, or the perceived absence of supportive social relationships, has recently emerged as a key variable predicting health [9]. Loneliness has been linked to depression, nausea, headaches, eating disturbances [9,10], sleep disturbances [11], and poorer immune and cardiovascular functioning [9,12]. In addition, loneliness has been found to activate biological stress processes [13] and contribute to poorer health practices [14], providing several mechanisms by which loneliness may influence emotional and physical health outcomes.

Low Parental Support

In addition to providing for basic material and physical needs, parents play a central role in regulating the affect, behavior, and physiology of their children [4]. The presence of a sensitive caregiver can buffer physiological responses to stressful events [4,15], whereas the absence of warm and sensitive parenting, and exposure to parental anger or conflict are associated with physiological dysregulation [16,17]. In theoretical models of the family environment and health, such as the "Risky Families Model" [7], low levels of parental support are hypothesized to be a major causal contributor to emotional and physical health problems in adulthood.

Romantic Relationship Instability

Recent theory and research has pointed to relationship instability as a contributor to negative outcomes in adolescents. For example, frequent changes in parent figures have been related to emotional, behavioral, and physical health problems [18,19]. There has been less research on the effects of instability in adolescent romantic relationships on health, although studies have linked adolescent romantic break ups to increased depressive symptoms [20]. Whether romantic relationship instability in adolescence and early adulthood predicts physical health outcomes has not to our knowledge been examined.

Intimate Partner Violence

Intimate partner violence (IPV) is defined as physical, sexual, and perceived emotional abuse within a romantic rela-

tionship [21]. IPV has been associated with depression and post-traumatic stress disorder [22,23], and a wide range of physical health conditions including chronic pain, arthritis, severe headaches; gastrointestinal disorders; and cardiovascular problems [24–26]. Some of these effects are mediated by the chronic stress and fear associated with IPV. Given that IPV threatens both the physical and the social self, we expect it to be a strong predictor of ill health.

Loss/Bereavement

A large body of evidence has linked the experience of loss or bereavement with emotional, behavioral, and physical health problems [27–29]. Increased rates of major depression have been found among adolescents who were exposed to a friend's suicide [27] or the death of a parent [28]. Bereaved children also experience greater somatic symptoms such as gastrointestinal problems, stomachaches, and headaches [30]. Bereavement has been linked to short-term dysregulation of neuroendocrine and immune systems, but limited evidence exists on the long-term physical health consequences of childhood or adolescent bereavement [31–33].

Cumulative Relationship Risk

Although each of the relationship risks described earlier in the text have been individually related to health in separate studies, we hypothesize that an accumulation of these risks will be particularly deleterious for mental and physical health. Rather than being singly determined, adverse outcomes are thought to be best predicted by the number of risk factors present [34,35]. We will examine whether youth exposed to multiple relationship risks are at higher risk for negative emotional and health outcomes in young adulthood, controlling for baseline health and demographic and health behavior covariates.

Methods

Procedures and participants

The data for present study have been obtained from the first three waves of the National Longitudinal Study of Adolescent Health (Add Health), which measures adolescents' social, economic, psychological, and physical well-being and contextual data on family, neighborhood, community, school, friendships, and romantic relationships. Add Health is a nationally representative, probability-based longitudinal survey of adolescents in grades 7–12 in the United States during the 1994-95 school year [36]. It used a multistage, stratified, school-based clustered sampling design, with 80 schools selected with probability proportional to size [36].

Wave I (1994–95) included 20,745 adolescents (ages, 11–20 years) and their parents. All adolescents in grade 7 through 11 in Wave I (but not those in grade 12) were targeted about 1 year later for the Wave II interview (n = 14,738). Wave III took place between 2000 and 2001 (ages, 18–27 years; n = 15,197), targeting all respondents from Wave I. Our final analytical sample (n = 10,149) included respondents who participated in all three waves, were in grades 7–11 at Wave I, and had valid sampling weights. Approval was obtained from the Northwestern University Institutional Review Board to conduct secondary analyses of the Add Health data.

Measures

Health outcomes

Our dependent variables were measures of self-reported general health and mental health (depressive symptoms) at Wave III. General health was assessed from the question, "In general, how is your health?" (response choices included excellent = 1; very good = 2; good = 3; fair = 4; poor = 5). A depressive symptoms scale was created by taking the mean of the following items from the Center for Epidemiological Studies Depression Scale [37]: felt blue; bothered by things that do not usually bother you; frequent crying; felt depressed, had trouble keeping mind on things; did not enjoy life; did not feel just as good as other people; felt disliked by people; felt sad; and felt too tired to do things (never/ rarely; sometimes; a lot of the time; most/all of the time; α = .79).

Adverse interpersonal relationship experiences

Adverse relationship experiences were measured at Waves I and II, and in the case of the romantic relationship history and loss variables, retrospectively at Wave III.

Loneliness/perceived social acceptance. Loneliness was measured on a 4-point scale reflecting how often respondents reported feeling lonely (never or rarely; sometimes; a lot of the time; most or all of the time), averaged across Waves I and II. Perceived social acceptance was measured by averaging responses, on a 5-point scale from strongly disagree to strongly agree, across Waves I and II to: "Do you feel socially accepted?" and "Do you feel loved and wanted?" Loneliness and acceptance measures were examined separately because they were only moderately correlated (r = −.37).

Parental support. A parental support scale was created by averaging responses (on a 5-point scale, with five indicating high support) to the following questions in Waves I and II: "how close do you feel with your mom/dad; how much does your mom/dad care about you; is your mom/dad warm and loving towards you; when you do something wrong, does your mom/dad talk with you to understand; are you satisfied with your communication with mom/dad; are you satisfied with your relationship with mom/dad." Scales were created separately for mothers and fathers in each wave (mother: WI α = .84, WII α = .83; father: WI α = .88, WII α = .87) and then averaged across waves.

Romantic relationship instability. In Wave III, participants were asked to provide a list of romantic relationships experienced since 1995. Detailed relationship questions, including onset and offset dates, were asked for relationships that were sexual, rated by Add Health as important, or part of the Add Health couples sample. We calculated the number of romantic relationships transitions after the age of 16 years that each respondent reported between Waves I and III. A dummy variable indicated those with "0" transitions because they had not yet initiated romantic relationships.

Intimate partner violence. IVP is a binary measure of ever having experienced violent actions from an important romantic partner as reported in the detailed relationships section of Wave III. Four questions on frequency of violent acts were asked of the participants about their two most important romantic relationships: (1) partner threatened, pushed or shoved, or thrown something at you; (2) partner slapped, hit, or kicked you; (3) partner insisted on or made you have sexual relations with him/her; and (4) had an injury, such as sprain, bruise, or cut, because of a fight with partner. The criteria used by Add Health to determine the two most important relationships include marriage and cohabitation status, relationship length, presence of children or pregnancy, and whether the relationship was current.

Loss. This binary variable indicates whether the participant experienced the loss of one or more of significant relationship figures between Waves I and III. This measure focused on the death of people who are most important in the life of the respondent: biological parents, residential parents, friends, and partners or spouses.

Cumulative relationship risk index. We created a count variable that indicated how many relationship risks the participant had experienced. Being in the highest quartile of loneliness and/or the lowest quartile of accepted/loved added one to the count, as did being in the lowest quartile on the perceived parental support measure, the highest quartile for romantic relationship instability, ever having experienced IPV, or ever having experienced the loss of one or more close loved ones. Scores ranged from 0 to 5. From these, we created dummy variables reflecting having experienced 0, 1, 2, 3, and 4 or more relationship risks.

Demographic and health covariates

Basic demographic data were measured, including age, gender, race-ethnicity, parental marital status and education, participants' marital/relationship status, and race/ethnicity (Table 1). Parental education served as a proxy for socioeconomic status, because of high levels of missing data on income, and was created using the higher level of mother's or father's education. Pre-existing physical and mental conditions were measured at Wave I, including self-reported general health, asthma, heart problems, physical limitations, body mass index, depressive symptoms, low birth weight, and an index of nonspecific somatic symptoms (e.g., headaches, aches, pains, soreness). Health behaviors at Wave II, including frequency of physical exercise in the past week, whether the youth smoked cigarettes in the past month, frequency of fast food consumption in the past week, and whether the youth binge drank (had five drinks or more in row) in the past year, were included as covariates and/or potential mediators.

Analytic plan

All continuous predictors were standardized before analyses. We first examined bivariate associations between health outcomes and relationship risk variables. We then used ordinary least squares regression for the continuous depressive symptoms outcome, and ordered logistic regression for the five-level general health outcome, to examine whether each of the individual relationship risk variables contributed to health

Table 1
Weighted descriptive statistics for poor health, depressive symptoms, relationship risk variables, and covariates

Predictor Variable	Full sample (n = 10,828)			Male (n = 4,791)			Female (n = 5,358)		
	Mean or %	SD	High risk[a,b]	Mean or %	SD	High risk	Mean or %	SD	High risk
Relationship risk									
Perceived loneliness	.425	.554	22.8%	.350	.484	18.5%	.500	.612	27.3%
Perceived social acceptance	4.227	.549	19.6%	4.273	.516	17.3%	4.180	.580	22.0%
Perceived parental support	4.322	.559	24.1%	4.388	.484	19.4%	4.256	.625	29.0%
Romantic relationship instability (Number of transitions/year)	.358	.429	29.5%	.362	.429	30.0%	.354	.429	29.1%
Ever experienced intimate partner violence	.317	.463	31.7%	.283	.432	28.3%	.350	.489	35.0%
Ever experienced loss of a loved one	.083	.275	8.3%	.075	.254	7.5%	.091	.296	9.1%
Outcome variables WIII									
General health (higher score reflects worse health)	2.011	.886		1.928	.817		2.096	.907	
Average depressive symptoms	.507	.449		.457	.396		.557	.497	
Wave I health and demographic controls									
Baseline general health	2.133	.889		2.036	.858		2.191	.934	
Baseline average depressive symptoms	.568	.390		.519	.338		.617	.436	
Baseline body mass index	22.228	4.497		22.407	4.368		22.042	4.625	
Baseline age	14.93	1.542		15.02	1.526		14.85	1.550	
Baseline symptom count	7.310	6.478		6.656	5.428		7.972	7.418	
Baseline physical limitations	2.3%	.148		2.1%	.138		2.5%	.159	
Baseline asthma	2.3%	.148		.2%	.047		.5%	.072	
Baseline cardiac abnormality	.1%	.034		.1%	.029		.1%	.039	
Race/ethnicity									
Non-Hispanic White	67.7%	.466		67.2%	.453		68.2%	.478	
Non-Hispanic Black	15.1%	.357		14.7%	.341		15.6%	.373	
Hispanic	11.9%	.323		12.2%	.316		11.6%	.329	
Non-Hispanic Asian/Pacific Islander	3.7%	.187		4.1%	.191		3.2%	.182	
Non-Hispanic Native American	.8%	.089		.9%	.093		.6%	.079	
Non-Hispanic Other	.8%	.089		.9%	.091		.7%	.086	
Baseline family structure									
Two biological parents	57.2%	.493		57.4%	.477		57.0%	.509	
Two parents (1 biological)	16.5%	.370		16.5%	.359		16.4%	.380	
Single mother	19.5%	.395		18.7%	.376		20.4%	.414	
Single father	2.9%	.168		3.5%	.178		2.3%	.156	
Other family structure	3.9%	.192		3.8%	.186		3.9%	.199	
Baseline parent education									
Less than high school	13.7%	.343		13.5%	.330		14.0%	.356	
High school or GED	30.0%	.457		29.6%	.441		30.4%	.472	
Some college	20.4%	.401		19.5%	.382		21.3%	.420	
College	22.9%	.419		24.2%	.414		21.6%	.423	
More than college	11.0%	.312		10.9%	.301		11.2%	.323	
Marital status									
Married	13.6%	.341		9.8%	.287		17.4%	.390	
Remarried	.3%	.051		.1%	.036		.4%	.064	
Divorced	1.6%	.123		1.3%	.107		1.9%	.139	
Cohabitating	15.4%	.360		14.0%	.335		16.8%	.384	
Widowed	.02%	.014		0%	.000		.04%	.020	
Single	69.5%	.495		75.0%	.418		63.8%	.493	
Wave II Health Behavior Controls									
Frequency of physical exercise in last week	4.949	2.537		5.402	2.443		4.490	2.546	
Days ate at fast food restaurant in past week	2.145	1.759		2.239	1.728		2.049	1.781	
Smoked cigarettes in the past 30 days	32.5%	.467		31.6%	.449		33.3%	.484	
Binge drank in the past year (5 or more drinks in a row)	27.9%	.447		30.1%	.443		25.7%	.449	

[a] High risk cut points were: ≥5 for loneliness, <4 for social acceptance, ≤4 for perceived parental support, and 1 (ever having experienced) for loneliness and loss.
[b] High risk cut points do not result in exact quartiles for the continuous variables due to large numbers of participants falling at the quartile-dividing scores.

outcomes at Wave III, controlling for baseline health and de-mographic covariates. Next, we tested whether cumulative relationship risk was more predictive than the individual risk variables by adding the cumulative relationship risk dummy variables. For all models, we tested interactions between the relationship risk variables and gender, to examine whether effects were similar for males and females, and tested whether the relationship risk effects remained after including Wave II

health behaviors. Item-level missing data were replaced with the mean of other items in a scale/measure. Missing scale-level continuous data were handled by replacement with the population mean and inclusion of missing data dummy variables [38]. For Wave I categorical health controls, missing values were assigned the modal value. List-wise deletion was used for missing data on outcome variables and for age, race, and other demographic variables. Analyses were weighted

Table 2
Intercorrelation table of poor health, depressive symptoms and relationship risk main independent variables ($n = 10,010$)

Variable	1	2	3	4	5	6	7	8
General health[a]	1							
Depressive symptoms	.260***	1						
Loneliness	.139***	.265***	1					
Social acceptance	−.181***	−.210***	−.361***	1				
Parental support	−.144***	−.182***	−.293***	.491***	1			
Romantic relationship instability	.017	−.029	−.032*	.016	−.007	1		
Ever experienced relationship violence	.106***	.160***	.068***	−.073***	−.120***	.135***	1	
Ever experienced loss	.033*	.037**	.038**	−.026	−.031*	−.015	.012	1

[a] Higher scores indicate worse health.
* $p < .05$, ** $p < .01$, *** $p < .001$. Intercorrelations used Bonferonni adjusted significance levels.

using Add Health longitudinal sampling weights, which adjust for complex sample design, selection, and nonresponse [39].

Results

Descriptive statistics

On average, participants rated their health to be very good and had relatively low levels of depressive symptoms (Table 1). Despite experiencing relatively low levels of risk on each variable (see means/proportions in Table 1), less than one-third of respondents (29%) scored zero on our risk index. A slightly larger proportion (34%) experienced one relationship risk, 24% encountered two risks, 10% encountered three risks, and only 3% were in the four or more risk category. As illustrated in Table 1, females were exposed, on average, to a slightly larger number of relationship risks than males (1.34 vs. 1.10 risks, respectively, $t = -9.13$, $p < .001$). Chi-squared tests of independence showed that females were significantly more likely to fall in the high-risk category for all the relationship risk variables except romantic relationship instability.

Correlations among relationship risk variables and health outcomes

Poor health and depressive symptoms were significantly positively correlated (Table 2). In addition, poor health was significantly positively correlated with loneliness, intimate partner violence, and loss, and negatively correlated with feeling accepted or loved and perceived parental support. Depressive symptoms were significantly positively correlated with loneliness, romantic relationship violence, and loss, and negatively correlated with feeling accepted or loved, and perceived parental support.

Multivariate associations between relationship risks and health outcomes

Table 3 shows results from multivariate models examining the effect of each relationship risk variable on general health and depressive symptoms while controlling for the other relationship risk variables, baseline health and demographic covariates. Each of the relationship risk predictors made a unique contribution to predicting at least one of the two health outcomes (all $p < .05$, except loss, $p < .10$).

General health. Loneliness was not significantly associated with self-reported general health, but a one standard deviation (SD) increase in feeling accepted and/or loved was associated with a 12% reduction in the odds of reporting worse health. A one SD increase in perceived parental support was associated with a 9% reduction in the odds of reporting poorer health. For each additional romantic relationship transition after age 16, there was a 6% increase in odds of reporting poorer health. Experiencing IPV was associated with a 38% increase in odds of reporting poorer health. Having lost a loved one was associated with 19% greater odds of reporting poorer health, but was only marginally significant ($p < .09$).

Depressive symptoms. A one SD increase in loneliness was associated with a .062 SD increase, and a one SD increase in feeling accepted/loved was associated with a .058 SD decrease in depressive symptoms. A one SD increase in perceived parental support was associated with .05 SD lower depressive symptoms. Ever having experienced IPV was associated with a .26 SD increase in depressive symptoms.

Cumulative relationship risk index. In the final two models we examined the potential cumulative effects of experiencing multiple relationship risks on general health and depressive symptoms (Table 4). As compared with no relationship risks, the odds ratios (OR) predicting poorer health increased linearly for each added relationship risk: one relationship risk, OR = 1.31; two relationship risks, OR = 1.67; three relationship risks, OR = 1.90; four or more relationship risks, OR = 2.20 (all $p < .001$). Participants in the highest group had more than twice the odds of reporting poorer health than those in the no risk group ($p < .001$; Figure 1). We also observed an increasing linear trend in effect sizes across the cumulative relationship risk groups when predicting depressive symptoms (Figure 1). As compared with youth with no relationships risks, youth with one relationship risk had a .07 SD increase in depressive symptoms, and youth with two, three, and four or more relationship risks had depressive symptom increases of .28 SD, .42 SD, and .44 SD, respectively (all $p < .001$).

In addition to baseline health and demographic covariates, all the models included Wave II health behavior measures (exercise, smoking, diet, and binge drinking). Although smoking was a significant predictor of general health, the relationship risk coefficients were not substantially reduced by the addition of the health behavior variables, suggesting that the impact of relationship risks on changes in health from Wave I to Wave III are not accounted for by variations in these particular health behaviors.

In a final set of models (not shown), we added interactions between the relationship risk variables and gender. Although there were significant main effects of gender, with males reporting better

Table 3
Ordered Logit predicting poor health and OLS Regressions predicting depressive symptoms at wave III from cumulative relationship risk independent variables and controls

Predictor Variable	General health[a] (n = 9,850)			Depressive symptoms (n = 9,798)		
	Odds ratio	t	p	a	t	p
Relationship risk						
Loneliness	1.046	1.25	.215	.062	3.46	.001
Social acceptance	.883	−3.94	.000	−.058	−4.04	.000
Parental support	.913	−2.94	.004	−.052	−3.80	.000
Romantic relationship instability	1.062	2.21	.029	−.007	−.55	.585
Ever experienced relationshipv violence	1.382	6.09	.000	.261	9.27	.000
Ever experienced loss	1.194	1.71	.089	.069	1.52	.131
Wave I health and demographic controls						
Self-rated health (very good)						
Excellent	.481	−11.31	.000	−.036	−1.18	.240
Good	1.683	8.13	.000	.018	.55	.586
Fair	3.159	10.34	.000	.059	.97	.332
Poor	8.589	3.53	.001	−.059	−.33	.745
Depressive symptoms	1.044	1.26	.210	.190	9.25	.000
Physical limitation	1.105	.64	.526	−.086	−1.00	.317
Symptom count	1.010	2.04	.044	.010	3.91	.000
Baseline cardiac abnormality	1.900	.91	.362	.176	.48	.629
Baseline asthma	4.780	3.10	.002	.154	.82	.451
Body mass index[b] (2nd quartile)						
BMI 1st quartile	1.118	1.74	.084	.068	1.99	.049
BMI 3rd quartile	1.145	1.83	.070	.069	2.02	.045
BMI 4th quartile	1.691	6.72	.000	.068	1.92	.058
Gender (male = 1)	.837	−3.02	.003	−.194	−7.84	.000
Parental education[b] (high school)						
Less than high school	1.013	.12	.901	.062	1.69	.094
Some college	.995	−.07	.946	.030	.84	.403
College	.917	−1.08	.281	.027	.78	.437
More than college	.765	−2.77	.007	−.061	−1.56	.121
Race/ethnicity (Non-Hispanic White)						
Non-Hispanic Black	.932	−.91	.364	.064	1.43	.155
Hispanic	.962	−.54	.591	.104	2.36	.020
Non-Hispanic Asian/Pacific Islander	1.378	2.39	.018	.131	2.01	.047
Non-Hispanic Native American	.737	−1.50	.135	−.107	−.79	.433
Non-Hispanic Other	.985	−.05	.958	.096	.94	.348
Wave II health behavior controls						
Physical exercise	.986	−1.20	.231	.009	1.87	.064
Current smoking	1.182	2.77	.006	.031	1.08	.281
Fast food consumption	.997	−.18	.856	−.011	−1.61	.110
Binge drinking	1.031	.53	.600	−.006	−.20	.842
Constant[c]	—	—	—	−.173	−1.16	.250
Cut 1[d]	−.819	−2.86	.005	—	—	—
Cut 2	1.222	4.32	.000	—	—	—
Cut 3	3.432	12.12	.000	—	—	—
Cut 4	6.056	16.62	.000	—	—	—

Also controlling for age, WI family structure (two parents, both biological; two parents, one biological; single mother, single father, other); WIII marital status (married, remarried, divorced, widowed, cohabitating); WIII single parenthood, and WIII number of births.
[a] Higher scores indicate worse health.
[b] Missing data were coded as a separate category.
[c] Intercept for ordinary least squares regression predicting depressive symptoms.
[d] Estimated cut points for ordered regression model for general health.

general health and lower depressive symptoms (Tables 3 and 4), there were only two significant interactions between gender and relationship risk exposure in predicting these outcomes. Parental support had a lower impact on the general health of males, whereas loneliness had a significantly stronger impact on the depressive symptoms of males. Thus, although males were exposed to fewer relationship risks than females, the risks they did encounter generally related to health in similar ways.

Discussion

This study provides evidence that multiple types of adverse relationship experiences, encountered during the adolescent years, are associated with worse self-reported mental and general health in adulthood, controlling for baseline health status, demographic covariates, and health behaviors. Results varied by outcome of interest: although relationship transitions and loss were related to general health but not depressive symptoms, loneliness predicted depression but not general health. The remaining variables (low acceptance, low perceived parental support, and IPV) significantly predicted both outcomes. The effect sizes for most of the relationship risk variables were small, except for IPV, which had the largest effect sizes for both outcomes. It is perhaps not surprising that IPV, which carries the dual threat of social and physical harm, would show the largest effects [24]. Although there were main

Table 4
Ordered Logit predicting poor health and OLS Regressions predicting depressive symptoms at wave III from cumulative relationship risk index variables and controls

Predictor Variables	General health[a] (n = 9,850)			Depressive symptoms (n = 9,798)		
	Odds ratio	t	p	a	t	p
Relationship risk						
One relationship risk	1.309	4.07	.000	.068	2.17	.032
Two relationship risks	1.673	6.78	.000	.281	7.79	.000
Three relationship risks	1.895	6.76	.000	.416	8.34	.000
Four or more relationship risks	2.197	4.83	.000	.437	4.47	.000
Wave I health and demographic controls						
Self-rated health (very good)						
Excellent	.469	−11.77	.000	−.049	−1.60	.112
Good	.170	8.11	.000	.023	.70	.485
Fair	3.192	10.63	.000	.069	1.17	.244
Poor	9.578	3.65	.001	.009	.05	.963
Depressive symptoms	1.080	2.66	.009	.221	11.86	.000
Physical limitation	1.079	.50	.621	−.095	−1.08	.282
Symptom count	1.009	1.96	.052	.010	3.88	.000
Baseline cardiac abnormality	2.096	1.04	.299	.188	.50	.165
Baseline asthma	4.998	3.23	.002	.187	.98	.328
Body mass index[b] (2nd quartile)						
BMI 1st quartile	1.112	1.68	.095	.062	1.79	.076
BMI 3rd quartile	1.127	1.73	.085	.059	1.76	.080
BMI 4th quartile	1.673	6.63	.000	.066	1.87	.063
Gender (male = 1)	.833	−3.06	.003	.198	−7.99	.000
Parental education[b] (high school)						
Less than high school	1.022	.22	.828	.069	1.92	.057
Some college	.998	−.03	.975	.028	.80	.423
College	.927	−.93	.352	.029	.83	.410
More than college	.764	−2.76	.007	−.070	−1.79	.076
Race/ethnicity (Non-Hispanic White)						
Non-Hispanic Black	.908	−1.24	.217	.070	1.59	.114
Hispanic	.961	−.55	.581	.113	2.57	.011
Non-Hispanic Asian/Pacific Islander	1.406	2.49	.014	.141	2.15	.034
Non-Hispanic Native American	.747	−1.47	.144	−.092	−.68	.498
Non-Hispanic Other	.985	−.05	.959	.112	1.09	.277
Wave II health behavior controls						
Physical exercise	.982	−1.51	.132	.007	1.52	.130
Current smoking	1.194	2.93	.004	.039	1.40	.164
Fast food consumption	.997	−.24	.813	−.011	−1.53	.129
Binge drinking	1.032	.55	.584	−.009	−.32	.749
Constant[c]	—	—	—	−.204	−1.33	.187
Cut 1[d]	−.666	−2.29	.024	—	—	—
Cut 2	1.369	4.76	.000	—	—	—
Cut 3	3.573	12.46	.000	—	—	—
Cut 4	6.194	16.79	.000	—	—	—

Also controlling for age, WI family structure (two parents, both biological; two parents, one biological; single mother, single father, other); WIII marital status (married, remarried, divorced, widowed, cohabitating); WIII single parenthood, and WIII number of births.

[a] Higher scores indicate worse health.
[b] Missing data were coded as a separate category.
[c] Intercept for ordinary least squares regression predicting depressive symptoms.
[d] Estimated cut points for ordered regression model for general health.

effects of gender on our health outcomes, there was little evidence that associations between relationship risks and health outcomes were moderated by gender.
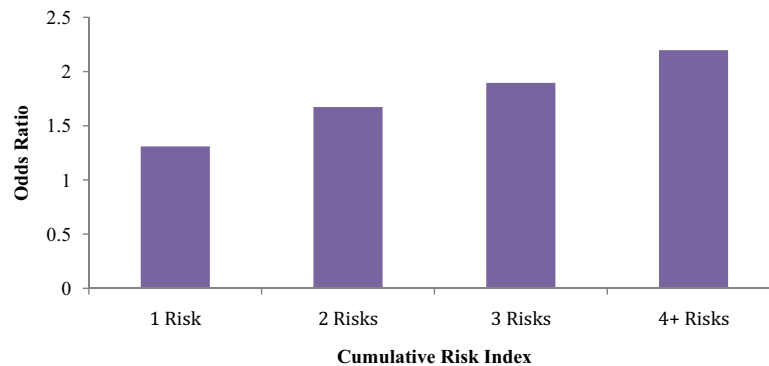
Our cumulative risk results underscore the more substantial health effects of experiencing multiple adverse relationship experiences. A relatively linear increase in poor health was observed, with each additional risk predicting an incremental worsening of outcomes for both general health and depression. Although statistically significant, the average effect size for the effect of just one relationship risk on health was small, particularly for depression. However, by two, three, and four relationship risks, effect sizes reached a clinically relevant level. At four risks, the odds of moving to one step worse health status (e.g., from very good to good, or from good to fair) between Wave I and Wave III more than doubled, and the increase in depressive symptoms approached half SD (e.g.,

the equivalent of moving from experiencing two to three symptoms sometimes to experiencing at least six symptoms sometimes).

Although we favor the interpretation that relationship risks contribute causally to later poor health, an alternative explanation could be that individuals with poor health are more likely to encounter relationship risks, or that a third variable contributes to relationship risks and poor health. However, by using prospective longitudinal data, controlling for confounds, and using a change model controlling for baseline levels of our health outcomes, we strongly reduce the likelihood that stable individual differences, genetic factors, or pre-existing health conditions account for our results.

In terms of potential mechanisms, the health behaviors that we examined (exercise, smoking, diet, binge drinking) did not play a large role in explaining the effect of relationship risks of

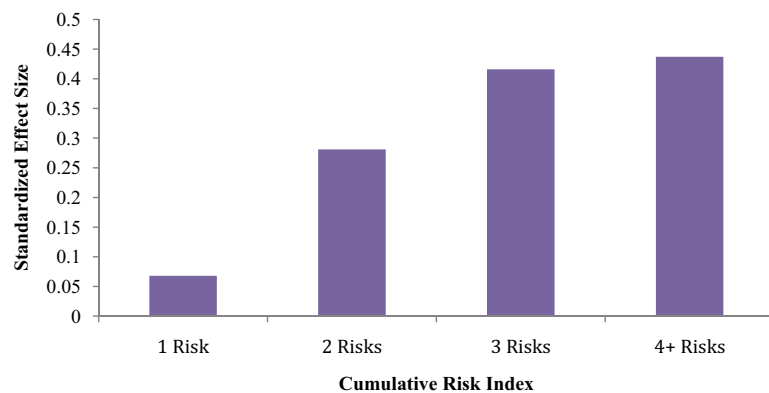(A) General Health

(B) Depression

Figure 1. Associations between level of cumulative relationship risk exposure and (A) self-reported general health and (B) self-reported depressive symptoms in young adulthood, controlling for baseline health and demographic and health behavior covariates.

our health outcomes. Another hypothesis to be tested in future research is the possibility that adverse relationship experiences result in activation of biological stress systems, which in turn have negative health implications [7]. Our "relationship risks" include the presence of actively adverse relationship experiences (e.g., exposure to violence), as well as the perceived absence of necessary positive relationship experiences (e.g., loneliness, low parental support); both types of experience have been linked to stress physiology in past research [7,13].

Conclusion

This study has some limitations, the largest of which is reliance on self-reported data for measuring both relationship risks and health outcomes. Nonetheless, it is the first study to examine multiple adverse relationship experiences simultaneously, allowing a test of their cumulative/joint effect on health. Most large-scale studies of social relationships and health have focused on positive features of social relationships, such as social support and social network size, and the stress buffering properties of social relationships, despite considerable research and theory [5,6] suggesting that negative social experiences may play an equally important role. Future analyses and theoretical models need to consider how multiple positive and negative features of our social relationships jointly determine health trajectories.

Next steps should also include direct measurements, in longitudinal studies, of the biological stress pathways by which adverse social experiences may affect health.

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