

# Vulnerability, scar, or reciprocal risk? Temporal ordering of self-esteem and depressive symptoms over 25 years

**Matthew D. Johnson** University of Alberta, Canada  
[matt.johnson@ualberta.ca](mailto:matt.johnson@ualberta.ca)  
**Nancy L. Galambos** University of Alberta, Canada  
**Harvey J. Krahn** University of Alberta, Canada

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## Abstract

*Three models have been proposed to explain the temporal interrelation between self-esteem and symptoms of depression: vulnerability (self-esteem predicts future depressive symptoms), scar (depressive symptoms predict future self-esteem), and reciprocal risk (self-esteem and depressive symptoms predict each other in the future). This study tested these three models over 25 years in a sample of high school seniors surveyed six times from age 18 to 43 (n = 978). Autoregressive cross-lagged modeling revealed that self-esteem and symptoms of depression prospectively predicted each other at every measurement occasion. Additionally, the cross-lagged association from self-esteem to symptoms of depression and the corresponding link from depressive symptoms to future self-esteem were equally strong. These results provide support for the reciprocal risk model.*

## Keywords

Depressive symptoms, longitudinal, mental health, reciprocal risk, scar model, self-esteem, vulnerability model

## Introduction

Do symptoms of depression erode future perceptions of self-worth or does low self-esteem foretell later depressive symptoms? Or are they both risk factors for worsening mental health over time? Given recognition of depression as a major contributor to disease and disability around the world (World Federation for Mental Health, 2012) and the robust literature demonstrating significant associations between depression and low self-esteem (e.g. Galambos, Barker & Krahn, 2006; Lewinsohn, Hoberman & Rosenbaum, 1988), untangling the temporal ordering between these variables has emerged as a central focus for research. Three models have been proposed: vulnerability (self-esteem prospectively predicts depressive symptoms),

scar (depressive symptoms prospectively predict self-esteem), and reciprocal risk (self-esteem and depressive symptoms prospectively predict each other). A burgeoning body of longitudinal research has evaluated these models (Orth & Robins, 2013), but questions remain. Not only has each model received some support, but much of the evidence is based on data gathered over the span of a few years, despite the recognized need for examination over longer time spans such as decades (Orth, Robins & Roberts, 2008). The current work contributes to this literature by testing the three models in a sample of Canadian high school seniors surveyed six times from age 18 to 43 years.

## Vulnerability, scar, and reciprocal risk models

Theoretical perspectives on self-esteem and depression have long posited linkages between these constructs. Believing one's self to be of value and worth has been conceptualised as a fundamental human need (e.g. Rosenberg, 1979). Those with low self-esteem suffer a variety of psychological disturbances. Rosenberg and Owens (2001) highlight some characteristics of low self-esteem people that may render them particularly vulnerable to experiencing depression. Those with low self-esteem are hypervigilant for signs of rejection or inadequacy and are, in turn, more likely to internalise such information compared to those with high self-esteem. Unsurprisingly, people with low self-esteem lack self-confidence, ultimately reducing performance in a variety of domains and limiting their ability to enjoy success. Given these dynamics, those with low self-esteem are motivated to protect the little self-worth they possess and are more likely to avoid challenges that may facilitate the development of mastery and achievement of self-respect. A life driven by such tendencies may certainly lead to feelings of depression. Indeed, some theories of depression view negative self-beliefs as playing a causal role in the onset of clinical depression (e.g. Beck, 1967).

In line with these theoretical perspectives, the *vulnerability model* posits that low self-esteem serves as a risk factor for future depression. Poor perceptions of self-worth may increase the likelihood of depression via intrapersonal and interpersonal pathways. For example, self-esteem prospectively predicts the quality of social relations (Johnson & Galambos, 2014; Johnson, Galambos & Krahn, 2015; Marshall, Parker, Ciarrochi & Heaven, 2014) and low self-esteem can impair social ties (Murray, Bellavia, Rose & Griffin, 2003), which may ultimately put one at risk for symptoms of depression (Davila, Bradbury, Cohan & Tochluk, 1997). One intrapersonal mechanism has been found: the self-esteem to depression pathway was partially mediated by an increased tendency in those with low self-esteem to ruminate about negative facets of themselves, which predicted higher levels of depression (Kuster, Orth & Meier, 2012), as expected from prior theory (Rosenberg & Owens, 2001).

The *scar model*, in contrast, suggests that depression precedes self-esteem and other self-focused cognitions (e.g. Lewinsohn, Steinmetz, Larson & Franklin, 1981) by leaving 'scars' in one's life that erode self-esteem over time. The experience of depression may alter self-concept, but, again, depressive symptoms could operate through interpersonal and intrapersonal pathways. Symptoms of depression are intertwined with less adaptive close relationship functioning (Davila, Karney, Hall & Bradbury, 2003) decades in the future (Johnson, Galambos & Krahn, 2014) and self-esteem is shaped by interactions with close others (Mund, Finn, Hagemeyer, Zimmerman & Neyer, 2015). Likewise, the negative feelings inherent in depression may also shape the way individuals process and encode information, such that more negative interpretations of self-relevant information are retained, ultimately lowering self-esteem (Orth et al., 2008).

Of course, the vulnerability and scar models are not mutually exclusive, so a third reciprocal relations model has been proposed, whereby self-esteem and depressive symptoms exhibit bidirectional longitudinal associations over time (Orth & Robins, 2013). We label the third model a *reciprocal risk model* because it proposes that low self-esteem and higher levels of depressive symptoms both pose risks to future mental health (and each other) and that both scar and vulnerability processes could operate simultaneously. From our perspective, a reciprocal risk model assumes that neither self-esteem nor depressive symptoms hold temporal precedence for determining the course of mental health across the life span. Indeed, theories of depression and self-esteem acknowledge a poor sense of self-worth is closely intertwined with feelings of depression (for example, see Beck's (1983) conceptualisation of autonomous depression) and "each strengthens and reinforces the other" (Rosenberg & Owens, 2001, p. 410), supporting the possibility of a reciprocal risk dynamic between these constructs.

Turning to empirical work in this area, a substantial body of literature supports the vulnerability model. Drawing on a variety of large longitudinal datasets with diverse participants from around the world and employing sophisticated statistical methods to tease out effects, recent research found self-esteem precedes symptoms of depression from adolescence

to old age (Orth et al., 2008; Orth, Robins, Trzesniewski, Maes & Schmitt, 2009a; Orth, Robins & Widaman, 2012; Orth, Robins, Widaman & Conger, 2014; Rieger, Göllner, Trautwein & Roberts, 2016). The prospective link from self-esteem levels to future depression is robust, persisting when accounting for self-esteem instability and contingency on external factors (Sowislo, Orth & Meier, 2014), the occurrence of stressful events (Orth, Robins & Meier, 2009b), narcissism (Orth, Robins, Meier & Conger, 2016), and item overlap between measures of self-esteem and depression (Orth et al., 2009b).

Far less longitudinal evidence supports the scar model. Using data from 260 adults diagnosed with a severe mental illness who were participating in an intervention aimed at improving social functioning, baseline depression predicted lower levels of self-esteem four months later (mid-treatment), but there was no association between the constructs from mid-treatment to termination when the majority of gains in social functioning occurred (Shahar & Davidson, 2003). The nature of this sample calls into question the generalisability of the findings. In addition, research specifically investigating the scar model of depression in a community sample found no evidence that those with a history of depression differed from those who never experienced depression on a variety of cognitive measures, including self-esteem (Lewinsohn, et al., 1981).

Although much evidence aligns with the vulnerability model, support for the reciprocal risk model is impressive and relatively unacknowledged. A meta-analysis of longitudinal research with 77 samples found bidirectional linkages between self-esteem and depression (Sowislo & Orth, 2013): the path from self-esteem to future symptoms of depression was significant ( $\beta = -.16, p < .05$ ) as was the path between depressive symptoms and future self-esteem ( $\beta = -.08, p < .05$ ). Because, compared to the effect from depression to self-esteem, the effect was twice as large for self-esteem to depression, the authors concluded that the evidence best supported the vulnerability model rather than the reciprocal risk model. Additionally, the only study we could locate to test the interrelation between self-esteem and depressive symptoms over decades found reciprocal associations, with self-esteem and depressive symptoms at age 16 years predicting each other at

age 45 years (Steiger, Fend & Allemand, 2015); again, the self-esteem to depression effect ( $\beta = -.21, p < .001$ ) was significantly stronger than the depression to self-esteem path ( $\beta = -.12, p < .05$ ), although both paths were statistically significant. We believe that the results from the meta-analysis and the Steiger et al. (2015) study could be re-interpreted as support for the reciprocal risk model. In our view, casting aside the reciprocal risk model in favour of the vulnerability model implies that little risk is posed by depression for decreasing self-esteem; dismissal of the significant effect of depressive symptoms on self-esteem is not warranted by the evidence.

Finally, some studies have not supported any of the three models. For example, a longitudinal, population-based study found no association between self-esteem at age 16/17 years and the odds of experiencing major depression from age 18 to 31 years, controlling for baseline variables, including psychological distress; the effect of depression on later self-esteem was not examined (Colman et al., 2014). A recent longitudinal study of depression and self-esteem in a sample of older adults also found no cross-lagged associations between the constructs (Gana, Bailly, Saada, Broc & Alaphilippe, 2015). Overall, then, it is difficult to draw conclusions concerning the generalisability of the vulnerability, scar, and reciprocal risk models.

### **A lifespan developmental perspective**

We follow a lifespan developmental perspective, which assumes that (a) development across the life course is influenced by earlier behaviours; (b) different dimensions of development unfold together dynamically across time, making the patterning of interrelationships complex and important to examine; and (c) temporal sequencing of related phenomena is necessary to understand different pathways through life and to pinpoint the direction and determinants of change (e.g. Baltes, 1987; Baltes, Staudinger & Lindenberger, 1999; Lerner, Leonard, Fay & Issac, 2011). The lifespan perspective leads us to consider how self-esteem and depressive symptoms (two dimensions reflecting psychological well-being) are related to one another within and across time over as long a period of the life course as possible, and to explore possible shifts over time in the magnitude and direction of their interrelationship. The dynamic

nature of human development (Lerner et al., 2011) leads to the prediction that, at least across some points in the lifespan, depression and self-esteem will exhibit mutually influential reciprocal relations.

Furthermore, lifespan perspective proponents argue that studies with only two points in time cannot constitute an adequate test of the direction of effects and temporal sequencing of theoretically and empirically intertwined variables. Baltes and Nesselroade (1979, p. 34), for example, provided compelling arguments that “the study of developmental change generally ought to encompass more than two occasions of measurement....multiple occasions of measurement in longitudinal research permit the specification of change functions” (Baltes & Nesselroade, 1979, p. 34). In the current context, the lifespan perspective highlights the need for multiwave longitudinal research that captures and documents the potential complexities in the self-esteem-depression connection.

It is notable that many of the studies in Sowislo and Orth’s (2013) meta-analysis included assessments at only two points in time, and only one followed participants longer than a few years (13 years; Schafer, Wickrama, & Keith, 1998). But even that study examined only the effect of self-esteem to future depression and did not consider possible bidirectional associations between the constructs. The only other study spanning decades included assessment at two time points (Steiger et al., 2015), making the current research the only attempt to test the interrelation among self-esteem and depression with varying time intervals in a single sample spanning a good portion of the lifespan. Furthermore, Sowislo and Orth’s (2013) meta-analysis included fewer studies estimating the depression to self-esteem path ( $k = 42$ ), relative to those estimating the self-esteem to depression path ( $k = 77$ ). It may be premature to reject the reciprocal risk model when there are more studies testing only the vulnerability model, and it is imperative to consider how self-esteem and depressive symptoms are related to one another across varying intervals involving a larger swath of the lifespan than previously considered.

### The present study

This study further investigates the interrelation between self-esteem and depressive symptoms as

they unfold over decades using a sample of high school seniors surveyed into midlife. The intensive measurement during the transition to adulthood in our study (participants were surveyed five times from age 18 to 25 years) is similar to the time lags (ranging from one to three years between assessments) of most other studies in this area, but has an additional time of measurement at age 43 (an 18 year gap). Thus, we are able to examine whether the magnitude of the longitudinal associations between self-esteem and depression differs over varying time intervals, a question yet to be answered.

Given the stronger effect observed from self-esteem to depressive symptoms than vice versa in the studies documenting reciprocal relations (Sowislo & Orth, 2013; Steiger et al., 2015), we will empirically test the strength of the cross-lagged associations. We address our research questions using autoregressive cross-lagged modeling procedures. This is a particularly potent analytic approach, as the three most likely confounds are controlled in the model: they are prior levels of each construct; within-wave correlations between the constructs; and shared method variance due to reliance on self-report data. We also include baseline (assessed at age 18 years) control variables that have exhibited associations with self-esteem or depressive symptoms, namely: self-rated health (Orth et al., 2012); parental education (Galambos et al., 2006); final year grades (Steiger, Allemand, Robins & Fend, 2014); social support (Marshall et al., 2014); and disagreement with parents (Galambos et al., 2006; Johnson & Galambos, 2014).

Finally, we consider gender as a potential moderator of the association between self-esteem and depression. Across most of the lifespan and around the world, major depression and depressive symptoms are more prevalent in women than in men (Galambos, Leadbeater & Barker, 2004; Raj, Zitko, Jones, Lynch & Araya, 2013). Prior work with the data used in the present research found men had higher self-esteem and fewer symptoms of depression than women at age 18 years, but the gap narrowed by age

25 years (Galambos et al., 2006). Some evidence suggests that gender moderates associations between depression and its correlates. For example,

unemployment and media use are more strongly related to depressive symptoms in young men than in young women (Mossakowski, 2009; Primack, Swanier, Georgiopoulos, Land & Fine, 2009). In contrast, the depression-self-esteem association does not appear to differ for women and men (e.g. Orth et al., 2008; Steiger et al., 2015). Nevertheless, given the reported gender differences in levels of self-esteem and depression and their correlates, we examine the potential moderating influence of gender on the vulnerability, scar, and reciprocal risk models.

## Method

### Procedures

In spring of 1985, 983 Grade 12 students (age 18 years) completed questionnaires in class in the first wave of this 25-year longitudinal study. Six high schools representing working-class and middle-class neighborhoods in a large western Canadian city were sampled. The baseline sample (47% female, 80% born in Canada, 15% non-White, and 26% with at least one

university-educated parent) was representative of western Canadian urban youth born in 1967 (the birth year of our sample) on race, immigration status, and parents' education (McVey & Kalbach, 1995). Follow-up questionnaires were mailed in 1986 (age 19 years;  $n = 665$ ), 1987 (age 20 years;  $n = 547$ ), 1989 (age 22 years;  $n = 503$ ), and 1992 (age 25 years;  $n = 404$ ) only to previous wave respondents. In each of these mail surveys, data collection involved a slightly modified version of Dillman's (1978) "total design method," with up to five contact attempts made for some participants. In 2010, telephone and web surveys targeted all baseline participants (age 43 years;  $n = 405$ ; 41% response after 25 years). Half (51%) had participated in all previous waves. Participants were also surveyed in 1999, but data are not included here given the absence of full self-esteem and depressive symptoms measures in that wave. Table 1 contains descriptive information for the sample at age 43 years.

**Table 1. Description of sample demographics at age 43 years ( $n = 405$ )**

Variable	%
Female	52.6
White	88.8
Relationship Status	
Married	70.1
Cohabiting	6.2
Divorced or Separated	10.4
Never Married	13.1
Number of Children	
0	22.1
1	13.9
2	42.7
3	16.6
4+	4.7
Education	
High School or Less	15.6
Some Technical School or University	13.6
Technical School Diploma or Associate's Degree	33.8
Bachelor's Degree	24.7
Graduate Degree	12.3
Employed	92.1

**Missing data**

As expected, the amount of missing data was substantial over the course of this longitudinal study (see table 1 for a variable-level report of missing data at each measurement occasion). We chose to maximise power and generalisability by including every participant who reported self-esteem or depressive symptoms at any time point ( $n = 978$ ) and by employing full-information maximum likelihood estimation (FIML) to handle missing values. FIML assumes the data are missing at random (MAR), meaning the pattern of missingness is not related to the constructs under investigation (depressive symptoms and self-esteem), but is predicted by other so-called auxiliary variables (see Allison, 2002). We first tested the MAR assumption by conducting a series of  $t$ -tests comparing continuing and non-continuing participants at each wave of measurement (ages 19, 20, 22, 25, and 43 years) on prior levels of depressive symptoms and self-esteem measured at

baseline (age 18 years). Controlling for family-wise error, there were no significant differences between continuing and non-continuing participants at any wave of measurement. Next we computed a series of logistic regressions to identify auxiliary variables that predicted the pattern of missingness. Male status, parents without a university education, and immigrant status predicted greater odds of attrition. These analyses provide evidence that these data meet the MAR assumption and support the use of FIML to estimate missing values. As a robustness check, we computed our models with listwise deletion to ensure the results obtained using FIML aligned with the results obtained from those who did not drop out of the study. The pattern of results was consistent between the two approaches.

**Measures**

Means, standard deviations, and Cronbach's  $\alpha$  coefficients are presented in table 2.

**Table 2. Descriptive statistics for study variables**

	Age in years at time of survey					
	1985	1986	1987	1989	1992	2010
	18	19	20	22	25	43
<b>Depressive symptoms</b>						
<i>Mean</i>	2.74	2.73	2.71	2.56	2.46	2.14
<i>SD</i>	.67	.64	.65	.62	.66	.66
<i>Cronbach's <math>\alpha</math></i>	.68	.68	.71	.69	.73	.72
<i>% Missing</i>	2.2	32.4	44.1	48.8	58.8	58.9
<b>Self-Esteem</b>						
<i>Mean</i>	3.79	3.78	3.86	3.95	3.98	4.32
<i>SD</i>	.70	.69	.69	.70	.72	.64
<i>Cronbach's <math>\alpha</math></i>	.73	.74	.77	.77	.78	.80
<i>% Missing</i>	0.70	32.4	44.1	48.5	58.8	58.8
<b>Control variables</b>						
<b>Disagreements with parents</b>						
<i>Mean</i>	2.11					
<i>SD</i>	.71					
<b>Self-Reported health</b>						
<i>Mean</i>	3.91					
<i>SD</i>	1.21					
<b>Parent's education</b>						
<i>% No degree</i>	72.30					
<i>% 1 with degree</i>	17.20					
<i>% 2 with degree</i>	10.40					
<b>School grades</b>						
<i>Mean</i>	3.30					
<i>SD</i>	.87					
<b>Social support</b>						
<i>Mean</i>	2.66					
<i>SD</i>	.64					

Note: Range for all variables is 1 – 5, except social support which ranges from 1 – 4 and parent's education ranges from 0 – 2.

### **Depressive symptoms**

Four items from the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) measured depressive symptoms at ages 18, 19, 20, 22, 25, and 43 years. They asked how often in the past few months respondents 'felt depressed', 'felt lonely', 'talked less than usual' and 'felt like people were unfriendly'. Mean scores were calculated on a scale from 1 = *never* to 5 = *almost always*. Evidence for the validity of this shortened scale was previously

provided (Galambos et al., 2006), but we also examined correlations between these items and nineteen of the original twenty CES-D items in the National Longitudinal Study of Adolescent Health (Harris et al., 2009). The shortened scale used in the present study correlated with the almost complete CES-D at .84, providing additional evidence that our measure serves as a reasonable proxy for the full CES-D.

### Self-esteem

Five items from the Rosenberg Self-Esteem Scale (Rosenberg, 1989) measured self-esteem at ages 18, 19, 20, 22, 25, and 43 years. Participants reported their level of agreement with each statement: 'On the whole, I am satisfied with myself', 'At times I think I am no good at all (reverse coded)', 'I feel that I have a number of good qualities', 'I certainly feel useless at times (reverse coded)', and 'All in all, I am inclined to feel that I am a failure (reverse coded)'. Responses ranged from 1 = *strongly disagree* to 5 = *strongly agree* and mean scores were calculated. Using data from 1,629 undergraduate students, we examined validity by computing correlations between our five-item measure and the full 10-item Rosenberg Self-Esteem Scale. Our scale correlated with the full measure at .96, strongly supporting its validity.

### Control variables

Age 18 years assessments of disagreements with parents, self-rated health, parental education, school grades, and social support were included as control variables. Disagreements with parents were assessed with the mean of 10 items that correspond to potential sources of conflict between parents and adolescents. Participants were asked, 'In the past few months, how often have you had disagreements with your parent or guardian about...'. Items included, 'School (including homework)', 'Your choice of friends', and 'Dating', and were rated on a scale from 1 = *Never* to 5 = *Almost always* ( $M = 2.11$ ,  $SD = .71$ ,  $\alpha = .83$ ). To measure self-rated health, we asked 'In the past few months, how healthy have you felt physically?' Responses were 1 = *Not very healthy*, 2 = *Somewhat healthy*, and 3 = *Very healthy* ( $M = 2.45$ ,  $SD = .60$ ). Parental education referred to the number of parents with a university degree: 0 = *No parents with a university degree*, 1 = *One parent with a university degree*, and 2 = *Two parents with a university degree* ( $M = .38$ ,  $SD = .67$ ). School grades were assessed by asking about participants' final grades, on average, in the past school year. Responses were 1 = *Mainly Fs (under 50%)*, 2 = *Mainly Ds (50% to 59%)*, 3 = *Mainly Cs (60% to 69%)*, 4 = *Mainly Bs (70% to 79%)*, and 5 = *Mainly As (80% or above)*; ( $M = 3.30$ ,  $SD = .87$ ). Social support was measured by asking: 'When you have problems, how much can you rely on each of the following people for help?' Respondents then

provided a rating for the following people: 'Mother', 'Father', 'Other family members', 'Friends', 'Teachers' and 'Others'. Mean scores were computed; response categories were 0 = *No such person or not at all*, 1 = *A little*, 2 = *Somewhat*, 3 = *Very Much* ( $M = 2.66$ ,  $SD = .64$ ,  $\alpha = .62$ ).

### Analytic Plan

The interrelation between depressive symptoms and self-esteem was examined through the use of autoregressive cross-lagged modeling procedures in Mplus 7.11 (Muthén & Muthén, 2012). This approach allows for an empirical comparison of the vulnerability, scar, and reciprocal risk conceptualisations in the literature by computing a series of nested models to determine the most appropriate way to represent their interrelations over time. These nested models are depicted in figure 1. First, a baseline model was computed that included only the autoregressive paths and the within wave covariances between the variables. Two models tested the longitudinal unidirectional cross-lagged associations: the vulnerability model (self-esteem predicting depressive symptoms) and the scar model (depressive symptoms predicting self-esteem). A final model, corresponding to the reciprocal risk model, included the bidirectional cross-lagged linkages. The chi-square difference test ( $\chi^2_{diff}$ ) was used to compare nested models. Degrees of freedom are the same for each unidirectional model, so the one with the smaller chi-square value was considered the better fitting model.

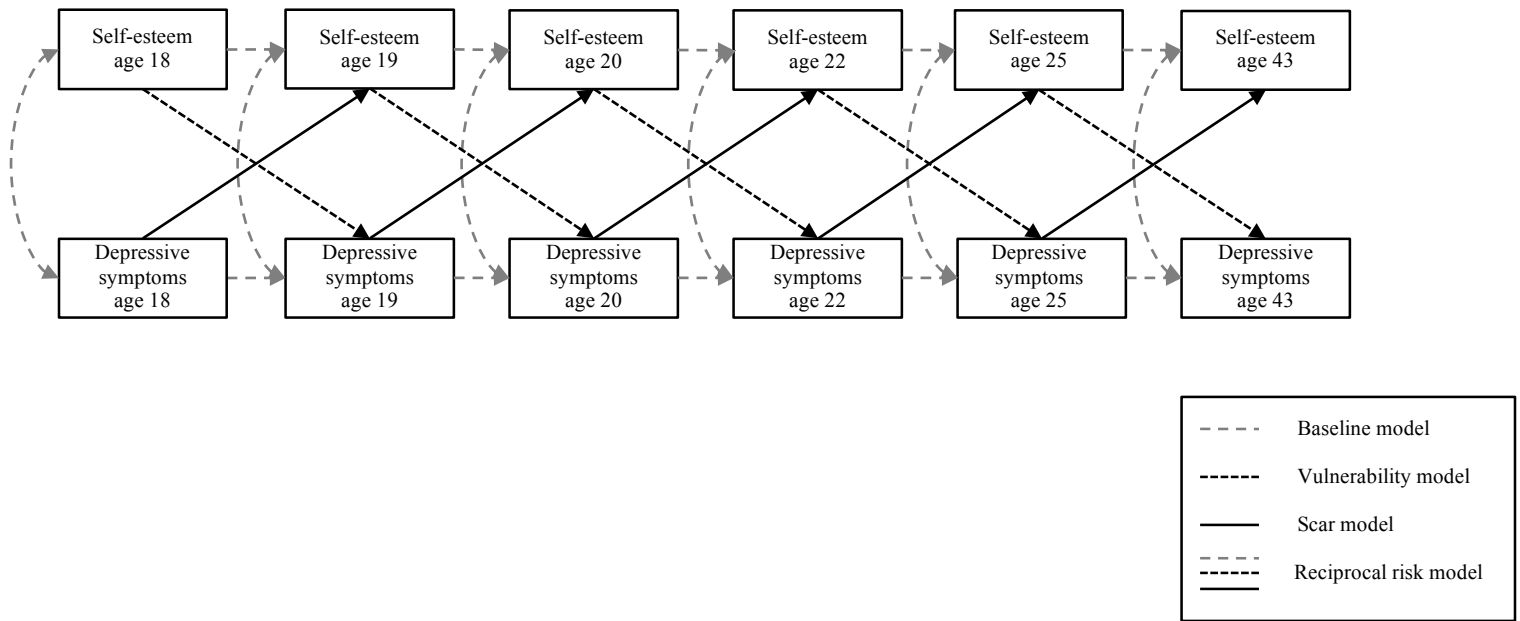
During these initial model comparisons, model fit was poor, so we consulted the modification indices and residuals to diagnose model misspecification. We found that depressive symptoms and self-esteem needed to be regressed on all prior assessments of the construct (e.g., self-esteem at age 43 years was regressed on self-esteem at ages 25, 22, 20, 19, and 18 years), not just the immediately preceding assessment. Such an approach implies one's sense of self-worth and feelings of depression are the result of those constructs at all prior occasions of measurement in this study, not only the temporally adjacent time of measurement. Such a specification is conceptually sound because developmental status at any point represents the accumulation of experiences and continuities in behavior across earlier parts of the



life course, and additional autoregressive paths are often needed to reflect these connections (Little, 2013). With these additional regression paths

included, the fit was admissible and we included these paths in all subsequent analyses.

**Figure 1. Depiction of nested model comparisons testing the baseline, vulnerability, scar, and reciprocal risk models**



After selecting the best fitting model, equality constraints were placed on corresponding cross-lagged paths and a chi-square difference test was computed to determine whether the strength of the associations from self-esteem to depressive symptoms were significantly stronger than those from depressive symptoms to self-esteem. Next, a multiple group analysis was used to test the potential moderating effect of gender on the associations between depressive symptoms and self-esteem. Equality constraints between men and women were placed on corresponding cross-lagged paths and a chi-square difference test was conducted. Finally, control variables were added and final models computed. Overall model fit was evaluated with the chi-square test ( $\chi^2$ ), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and standardised root mean square residual (SRMR). A non-significant chi-square, values greater than .95 for CFI and TLI, and values smaller than .06 and .08 for RMSEA and SRMR suggest good model fit

(Hu & Bentler, 1999).

## Results

### Autoregressive cross-lagged model comparisons

Model fit results from each autoregressive cross-lagged model (baseline, unidirectional, and bidirectional) are shown in table 2. According to chi-square difference tests, the bidirectional or reciprocal risk model (in bold) proved the best fit to the data, signifying depressive symptoms and self-esteem reciprocally influenced each other over time. Next, the application of the equality constraints to corresponding cross-lagged parameter estimates did not worsen the model fit, signifying self-esteem and depressive symptoms exhibited an equally strong effect on each other over time. We retained these more parsimonious models with the cross-lagged equality constraints for all subsequent analyses. With the most appropriate temporal ordering identified, we next tested the potential moderating influence of gender.

**Table 3. Model fit indices for the longitudinal associations between depressive symptoms and self-esteem (n = 978)**

<i>Model</i>	$\chi^2(df)$	RMSEA (90% CI)	CFI	TLI	SRMR	Model Comparison: $\chi^2_{diff}(df_{diff})$
Baseline	115.654 (30)	.054 (.044, .065)	.966	.927	.104	
Depress to self-esteem	63.188 (25)	.040 (.028, .052)	.985	.961	.061	Baseline: $\chi^2_{diff}(5) = 52.466, p < .001$
Self-esteem to depress	67.265 (25)	.042 (.030, .054)	.983	.957	.053	Baseline: $\chi^2_{diff}(5) = 49.389, p < .001$
<b>Bidirectional</b>	<b>32.333 (20)</b>	<b>.025 (.005, .040)</b>	<b>.995</b>	<b>.984</b>	<b>.027</b>	Depress to Self-esteem: $\chi^2_{diff}(5) = 30.855, p < .001$

Note: Depress = depressive symptoms. Bolded models have the best fit. Baseline models only include autoregressive paths and within-wave covariances.

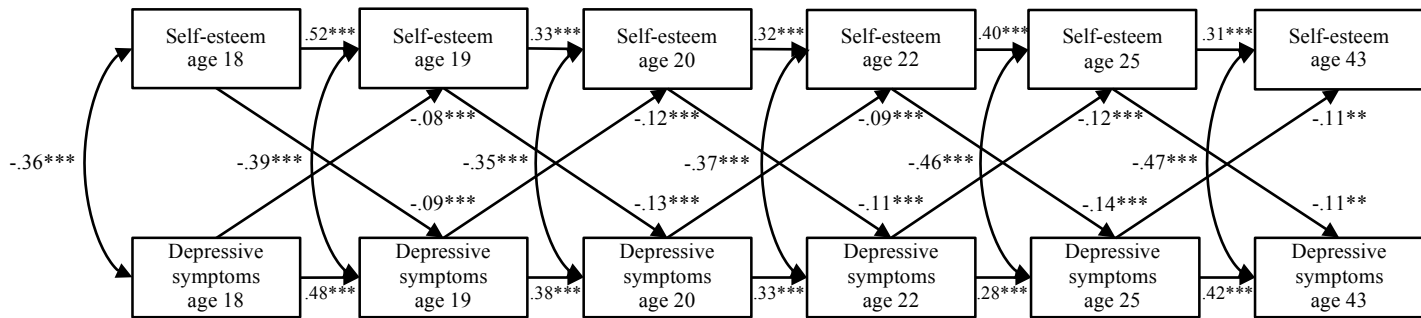
### Test of moderation by gender

The multiple group (gender) autoregressive cross-lagged models fit the data well:  $\chi^2(40) = 66.199$ ; RMSEA = .037 (C.I. = .020, .052); CFI = .990; TLI = .967; SRMR = .035. The application of equality constraints to the cross-lagged paths did not significantly worsen model fit ( $\chi^2_{diff}(10) = 15.959, p = .101$ ), indicating that gender did not moderate the longitudinal associations between symptoms of depression and self-esteem. Thus, we combined men and women in a single model and proceeded to our final analysis, incorporating the control variables (including gender).

### Final autoregressive cross-lagged model results

The final autoregressive cross-lagged model proved a good fit to the data (see figure 1). Self-esteem and symptoms of depression at age 18 years were regressed on all control variables (which were also assessed at that age). Being male, reporting better health, experiencing fewer conflicts with parents, earning better grades, and having access to more social support predicted fewer depressive symptoms and higher levels of self-esteem at age 18 years. Additionally, having more highly educated parents was linked with higher age 18 years self-esteem, but was not associated with depressive symptoms.

**Figure 2. Standardised autoregressive cross-lagged models depicting bidirectional associations between self-esteem and depressive symptoms in relation to age (n = 978)**



Note: Corresponding cross-lagged parameters are constrained equal. Age 18 years assessment of each construct was regressed on gender, disagreements with parents, self-rated health, parental education, school grades, and social support. Self-esteem and depressive symptoms were regressed on all prior assessments of each respective construct. Model fit indices:  $\chi^2(85) = 99.839$ ; RMSEA = .013 (C.I. = .000, .023); CFI = .995; TLI = .992; SRMR = .036.

Turning to the main findings, self-esteem prospectively predicted fewer symptoms of depression at every measurement occasion and symptoms of depression foretold lower self-esteem at each measurement occasion, as well, in support of the reciprocal risk model. Additionally, the effect from self-esteem to depression was equally strong as that from depressive symptoms to self-esteem; some of the corresponding parameter estimates differ slightly in figure 1 because standardised coefficients are presented, but the unstandardised estimates are equivalent.

### Discussion

Motivated by the need to examine the interrelation between self-esteem and depressive symptoms using longitudinal data with multiple assessments of both constructs across a large segment of the life span, we tested three conceptual models differing in the temporal ordering of self-esteem and depressive symptoms (vulnerability, scar, and reciprocal risk) in a sample of high school seniors surveyed over a quarter century. Counter to much prior research, we failed to find support for the vulnerability model. Our analyses demonstrated a longitudinal bidirectional relationship between self-

esteem and depression, with no differences in the strength of the cross-lagged associations between these constructs. Indeed, as life unfolds from adolescence to midlife, sense of self-worth and depressive symptomatology mutually contribute to each other, reaffirming healthy functioning for some and representing a risk of future problems for others.

Aligning with a lifespan developmental perspective (e.g. Baltes, 1987; Lerner et al., 2011), these findings support our proposition of reciprocal risk, that neither self-esteem nor depressive symptoms hold primacy for determining the course of mental health across the lifespan. One's sense of self-worth and feelings of depression are deeply intertwined in human psychology (e.g. Beck, 1983) and it is likely that the processes by which they become so connected begin early in childhood and adolescence. That is, risks at multiple levels (genetic, personal/individual, parental/family) that are present in childhood are connected to adult depression via pathways that involve internalizing (e.g. low self-esteem, anxiety) and externalising (substance abuse, conduct disorders) problems (Clark, Rodgers, Caldwell, Power & Stansfeld, 2007; Kendler, Gardner & Prescott, 2002, 2006). As an example, lower family socioeconomic status (SES) in childhood is linked with

depression in middle adulthood, but indirectly through children's adjustment problems, young adult depression, and lower SES (e.g. income, occupational status) in adulthood (Elovainio et al., 2012; Gilman, Kawachi, Fitzmaurice & Buka, 2002). Such findings suggest that the associations between self-esteem and depression are set in motion early on by a multiplicity of interacting factors, and they may continue to reinforce each other throughout life. At the same time, diversity in experiences and across transitions at any point in the lifespan may change the course of development of either construct (see e.g. Lerner et al., 2011).

These findings also have direct implications for practitioners working with those suffering from symptoms of depression and/or struggling with a poor self-concept. The bidirectional cross-lagged associations observed in this study indicate that interventions to alleviate either low self-esteem or depressive symptoms may produce gains in both domains. Although either construct can be a target for interventions, treatment protocols for depression are well-articulated (e.g. Power, 2013) with demonstrated efficacy (Ekers, Richards & Gilbody, 2008), and self-esteem has been shown to improve during the course of treatment for depression (Wegener et al., 2015). In contrast, there is little literature on the clinical treatment of low self-esteem (e.g. Hall & Tarrier, 2003). Consequently, it may be more prudent for clinicians to focus on symptoms of depression until similarly effective clinical tools are developed focusing on low self-esteem. Prior work supporting the vulnerability model suggested clinicians boost self-esteem to alleviate symptoms of depression (e.g. Orth et al., 2009b), but this is easier said than done in the absence of a proven treatment protocol.

Two recent studies highlight the difficulty with trying to boost self-esteem, particularly among those with low self-esteem already. First, children who received more frequent praise about who they are as a person rather than in response to their behaviours tended to internalise failures and experience feelings of shame, especially among those with lower self-esteem (Brummelman et al., 2014). Second, giving inflated praise ('that is an incredibly beautiful drawing!') to children with low self-esteem resulted in those children avoiding challenges because they

feared failure, thus depriving these children natural opportunities to overcome adversity and build their own sense of self-worth (Brummelman, Thomaes, de Castro, Overbeek & Bushman, 2014). These studies underscore the danger of well-meaning efforts that might perpetuate the very problem they were meant to help and point to a clear need for more investigation into best practices for the clinical treatment of low self-esteem.

### Limitations and future directions

This study has limitations that must be considered. First, shortened scales were used to measure depressive symptoms and self-esteem. These shortened measures correlated highly with the full-length scales from which they were drawn (see measures section), however, and the mean levels of each construct exhibited the same pattern over time as documented in prior longitudinal research. Specifically, self-esteem increased (e.g. Orth et al., 2012) and symptoms of depression declined (Elovainio et al., 2012; Sutin et al., 2013) from age 18 to 43 years (see table 1), increasing confidence in the validity of our measures. Nevertheless, investigation of reciprocal risks employing full-length scales administered over decades would provide a useful addition to this literature. A second limitation is that many studies examining the interrelation between self-esteem and depressive symptoms analysed these constructs as latent variables to account for measurement error. We lacked the statistical power to model these data similarly. Once measurement error has been controlled through the use of structural equation modeling, associations between constructs tend to become stronger (e.g. Little, 2013), and so the reciprocal associations observed in this study might be magnified if we had been able to model latent variables. Third, our studies used data from one age cohort in one western Canadian city. Future research in different age groups over varying time spans and diverse geographical areas may indicate to what extent these findings are generalisable. Fourth, our data were best suited to examining the longitudinal interrelation between self-esteem and depressive symptoms, but prior work has documented within-time reciprocal associations between these constructs (e.g. Owens, 1994). While we accounted for within-time covariation between

the constructs, such an approach overlooks potentially meaningful directional relationships between self-esteem at a given point in time. Daily diary studies would be invaluable to shed further light on the interrelation between self-worth and feelings of depression as they unfold on a daily basis.

## Conclusion

Untangling the temporal ordering of depressive symptoms and self-esteem has garnered intense interest, but this issue remains unsettled. Drawing on

data gathered over 25 years, this study contributes additional evidence in support of a reciprocal risk conceptualisation: self-esteem and depression exhibit bidirectional longitudinal associations over a quarter of a century. Low self-esteem and symptoms of depression both represent risks for future mental health and interpersonal problems, and careful intervention able to alleviate distress in either may produce benefits that cascade into many life domains.

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