Stress and Internalizing Symptoms in Adolescents: Analyzing Physiological Regulation as a Moderator

Caroline Davey, Kassandra Ramos, Allie Spiekerman, Sarah K. Borowski,
Ashley M. Groh, & Amanda J. Rose
Department of Psychological Sciences, University of Missouri, Columbia, Missouri, USA

ASH Scholars
Close Relationships

Introduction

- Stress has negative effects on adolescent adjustment.
  - Stress in adolescence can cause adverse effects, and the more negative life experiences in adolescence, the higher levels of internalizing symptoms, such as depression and anxiety (Kim et al., 2003).
  - The experience of stress is a critical risk factor for the development of other psychological symptoms during adolescence" (Kim et al. 2003).
- It is important to consider what factors might exacerbate and/or ameliorate the negative effects of stress on adolescents on adjustment.
  - For example, past research has found that there is a stronger relationship between stress and negative adjustment among adolescents that co-ruminate (i.e., talk about problems in a repetitive, negatively-focused manner) with friends; (Bastin et al., 2015).
- Adolescents' physiological regulation might be one factor that affects how they cope with stress and the subsequent effects of stress on their well-being.
- The current study considers respiratory sinus arrhythmia (RSA) and skin conductance levels (SCL) as two measures of autonomic physiological regulation.
- Respiratory sinus arrhythmia (RSA) refers to fluctuations over the respiration cycle and indexed parasympathetic control of heart rate (Hinnant, et al., 2013).
  - Higher levels of RSA measured during resting conditions reflect higher levels of emotional self-regulation (Beauchaine, 2001).
- Skin conductance level (SCL) is the electrodermal activity of the sweat glands innervated by the sympathetic nervous system as a response to stress (El-Sheikh, et al., 2007).
  - Higher levels of SCL during resting conditions reflect greater behavioral inhibition and have been linked to greater internalizing symptoms (Beauchaine, 2001).
- This study aims to examine stress and adjustment in adolescents with physiological regulation as a moderating factor.

Hypotheses

Is stress a predictor of internalizing symptoms?
H1: Stress will be related to greater internalizing symptoms.
How does physiological regulation (i.e., RSA and SCL) affect the relationship between stress and internalizing symptoms?
H2: The relation between stress and internalizing symptoms will be ***weaker*** among adolescents with higher levels of resting RSA.
H3: The relation between stress and internalizing symptoms will be ***stronger*** among adolescents with higher levels of resting SCL.
Are there gender differences in the relations among stress, internalizing symptoms, and physiological regulation?
H4: Boys with higher SCL will have less self inhibitory control and consequently more internalizing symptoms in response to stress.
H5:Girls with higher SCL will have greater vulnerability to stress and consequently more internalizing symptoms.
H6: Greater RSA will be related to reduced internalizing symptoms and stress in both boys and girls.

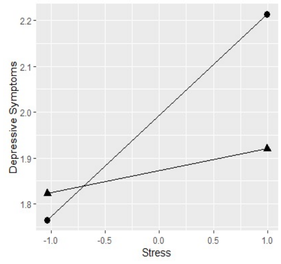
Method

- Participants were adolescents (62 boys, 118 girls) in the 8th, 9th, and 10th grades.
- ***Physiological Assessment:***
  - To assess RSA, participants wore heart rate monitors and respiratory belts and Mindware HRV software was used to compute RSA.
  - To assess SCL, participants wore gel electrodes on their ring and pointer fingers and Mindware EDA software was used to compute SCL.
  - Physiological responses were measured while the adolescents sat quietly for a 3-minute period.
- ***Stress:*** participants' stress levels were measured using the Perceived Stress Scale (Cohen et al., 1983).
- ***Internalizing symptoms:*** participants answered questions about depressive symptoms using the Center for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977).

Results

Regression with Stress, RSA, and Gender Predicting Internalizing Symptoms

	b	*p*-value	R^2
Stress	0.44	0.0002	
Physiological Reg (RSA)	-0.195	0.16	0.17***
Gender	0.095	0.192	
Stress X RSA	-0.2706	0.04069	
Gender X RSA	0.2037	0.15325	
Stress X Gender	-0.0862	0.46283	
Stress X RSA X Gender	0.1849	0.17948	

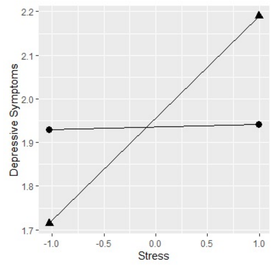


Simple Slopes

	b	*p*-value
Low RSA	0.22	<2e-16***
High RSA	0.05	0.41

Regression with Stress, SCL, and Gender Predicting Internalizing Symptoms

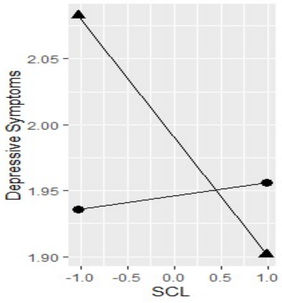
	b	*p*-value	R^2
Stress	0.4024	0.0006	
SCL	0.0326	0.78742	0.23***
Gender	0.0685	0.32888	
Stress X SCL	-0.3352	0.01039	
Gender X SCL	-0.2641	0.02886	
SCL X Gender	-0.0540	0.63813	
Stress X SCL X Gender	-0.1642	0.20630	



Simple Slopes

	b	*p*-value
Low SCL	0.01	0.92
High SCL	0.23	<2e-16

Regression with Gender Differences, SCL, and Depressive Symptoms



	b	*p*-value
Boys	0.01	0.77874
Girls	-0.09	0.0007

Key: *p <.05; **p < .01; ***p < .001

Discussion

- Stress was related to higher levels of internalizing symptoms.
- Physiological regulation (RSA; SCL) was not found to be a significant predictor of internalizing symptoms.
- However, when youth had low levels of resting RSA, there was a positive association between stress and depression; at high levels of resting RSA, there was no association between stress and depression.
  - This supports our hypothesis that physiological regulation would ameliorate the link between stress and negative adjustment.
  - Given that higher levels of RSA are thought to reflect better emotional self-regulation (e.g., Beauchaine, 2001), adolescents with lower levels of resting RSA may have difficulties coping with stressors, resulting in greater depressive symptoms.
- Further, there was a stronger link between stress and negative adjustment for adolescents with greater SCL.
  - Adolescents with higher SCL may have higher trait levels of behavioral inhibition and could be more reactive to stressors
- Unexpectedly, higher levels of SCL related to lower levels of depressive symptoms for girls. No other gender differences were found.
- It will be important for future research to use a longitudinal design to examine the interrelations among stress, physiological regulation, and internalizing symptoms over time.

References

Carver, C.S. You want to measure coping but your protocol' too long: Consider the brief cope. *Int. J. Behav. Med.* 4, 92 (1997). https://doi-org.proxy.mul.missouri.edu/10.1207/s15327558ijbm0401_6
Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24*(4), 385-396. Retrieved March 30, 2021, from http://www.jstor.org/stable/2136404
Dumont, M., & Provost, M. A. (1999). Resilience in adolescents: Protective role of social support, coping strategies, self-esteem, and social activities on experience of stress and depression. *Journal of Youth and Adolescence*, *28*(3), 343–363. https://doi-org.proxy.mul.missouri.edu/10.1023/A:1021637011732
El-Sheikh, M., Keller, P.S. & Erath, S.A. Marital Conflict and Risk for Child Maladjustment over Time: Skin Conductance Level Reactivity as a Vulnerability Factor. *J Abnorm Child Psychol* 35, 715–727 (2007). https://doi.org/10.1007/s10802-007-9127-2
Hinnant, J. B., & El-Sheikh, M. (2013). Codevelopment of externalizing and internalizing symptoms in middle to late childhood: sex, baseline respiratory sinus arrhythmia, and respiratory sinus arrhythmia reactivity as predictors. Development and psychopathology, 25(2), 419–436. https://doi.org/10.1017/S0954579412001150
Kim, K. J., Conger, R. D., Elder, G. H., & Lorenz, F. O. (2003). Reciprocal influences between stressful life events and adolescent internalizing and externalizing problems. *Child Development, 74*, 127–143. doi:10.1111/1467-8624.00525.
Lantagne, A., Peterson, R.L., Kirkwood, M.W., Gerry Taylor, H., Stancin, T., Yeates, K.O., Wade, S.L. (2018). Featured Article: Interpersonal Stressors and Resources as Predictors of Adolescent Adjustment Following Traumatic Brain Injury. Journal of Pediatric Psychology, Volume 43, Issue 7, August 2018, Pages 703–712, https://doi.org/10.1093/jpepsy/jsy020
Radloff, L. S. (1977). The CES-D scale: A self report depression scale for research in the general population. *Applied Psychological Measurements,* 1, 385-401.
Rose, A.J. (2002), Co–Rumination in the Friendships of Girls and Boys. Child Development, 73: 1830-1843. https://doi.org/10.1111/1467-8624.00509
Rose, A.J., Glick, G.C., Smith, R.L. et al. Co-Rumination Exacerbates Stress Generation among Adolescents with Depressive Symptoms. J Abnorm Child Psychol 45, 985–995 (2016). https://doi.org/10.1007/s10802-016-0205-1
Tu, K. M., Erath, S. A., Pettit, G. S., & El-Sheikh, M. (2014). Physiological reactivity moderates the association between parental directing and young adolescent friendship adjustment. *Developmental Psychology*, *50*(12), 2644–2653. https://doi-org.proxy.mul.missouri.edu/10.1037/a0038263

Acknowledgements

We would like to thank the adolescents who participated in the Friendship Project. We would also like to thank the staff of the Peer Relations Lab, which is administered by the University of Missouri's Department of Psychological Sciences. Funding for this study was provided by the MU Arts, Social Sciences, and Humanities (ASH) Scholars Program.