Twin Research and Human Genetics (2024), **27**, 163–168
doi:10.1017/thg.2024.21

CAMBRIDGE UNIVERSITY PRESS

Article

Genetic and Environmental Influences on Perceived Stress in South Korean Twins

Gwanwoo Jo and Yoon-Mi Hur

Kookmin Twin Research Institute, Kookmin University, Seoul, South Korea

Abstract

Researchers have proposed that culture significantly influences perceived stress (PS). To date, however, twin studies on PS have been conducted mostly in western, individualistic cultures, which demonstrate that PS due to controllable (personal) life events is more heritable than PS due to uncontrollable (network) life events. This study aimed to investigate genetic and environmental influences on PS in South Korean twins. South Korea practices a dominant collectivist culture. In total, 1372 twin individuals (mean age = 22.4 ± 2.5 years) completed an online survey on PS, which consisted of the scales, Friendship, Academic Stress, Future Career, Family Conflicts, and Family Financial Difficulties (FFD). Friendship, Academic Stress, and Future Career can be considered PS due to personal life events, and Family Conflict and FFD, PS due to network life events. The general sex-limitation model-fitting analysis revealed the absence of qualitative or quantitative sex differences in genetic and environmental influences. Specifically, additive genetic influences were predominant for Friendship (63%), Academic Stress (67%), and Future Career (57%) for both sexes, with the remaining variance attributable to nonshared environmental influences. In contrast, shared environmental influences were largest for Family Conflict (47% for both genders) and FFD (64% for males, 63% for females) with no significant genetic effects. Despite known cultural differences in the means and variances of PS, South Korean twins exhibited significant genetic effects in PS due to personal life events and large shared environmental effects in PS due to network life events, which is similar to western samples.

Keywords: Perceived stress; Twin study; Genetics; Environmental influences; Culture; Stressful life events

(Received 26 March 2024; accepted 3 April 2024; First Published online 3 May 2024)

Perceived stress (PS) is defined as the feelings or thoughts of individuals about the amount of stress to which they are exposed over a given time period (Cohen et al., 1983). PS broadly involves frequencies of exposure to stressful events and appraisal of and ability to cope with such stressful events (Cohen et al., 1983). Individuals greatly differ in the perception and adaptation to aversive and stressful stimuli (Ebner & Singewald, 2017). Previous research demonstrates that PS is significantly associated with personality traits, such that extraversion, conscientiousness, and agreeableness were negatively related to PS, but neuroticism was positively related to PS (Ebstrup et al., 2011). PS is also a significant predictor of physical health (Baum & Posluszny, 1999), mental health (Bjørndal et al., 2023; Kendler & Gardner, 2010), work–life conflict (Bell et al., 2012), and wellbeing (Bolger et al., 1989).

Many researchers have pointed to gender differences in terms of level of stress and responses to stressful life events (Graves et al., 2021; Kendler et al., 2001). Young adult women tended to report higher levels of stress than their male counterparts (Graves et al., 2021). Furthermore, men and women varied in PS by category. Kendler et al. (2001) illustrated that women reported more interpersonal, while men more legal and work-related stressful life events, and that women were more sensitive to stress due to social relationships, while men were more sensitive to stress due to loss of wealth and social status. Although the results were mixed, men were frequently engaged in problem-focused coping strategies, whereas women typically utilized emotion-focused coping strategies (Eaton & Bradley, 2008; Tamres et al., 2002).

Cultural psychologists have proposed that culture significantly influences one's perception of stressful situations (Lee et al., 2023). North Americans, who mainly belong to individualistic cultures, tend to perceive themselves as independent from others and prioritize independent goals and values, such as personal accomplishments, when evaluating situations. Conversely, East Asians, who belong to collectivistic cultures, tend to view themselves as embedded in relationships with others and prioritize interdependent values and goals, such as social harmony, when evaluating situations (Lee et al., 2023). In support of this perspective, Hashimoto et al. (2012) found that Japanese undergraduates perceived stressful interpersonal situations as more frequent, which was associated with increased psychological distress, compared with American undergraduates. Lee et al. (2023) extended the study of Hashimoto et al. (2012) to include stressful noninterpersonal situations. The results revealed that European Canadian undergraduates perceived stressful noninterpersonal situations as more frequent compared

Corresponding author: Yoon-Mi Hur; Email: ymhur@kookmin.ac.kr
Cite this article: Jo G and Hur Y-M. (2024) Genetic and Environmental Influences on Perceived Stress in South Korean Twins. *Twin Research and Human Genetics* **27**: 163–168, https://doi.org/10.1017/thg.2024.21

with Japanese undergraduates. Alternatively, the Japanese undergraduates perceived stressful interpersonal situations as more frequent than did the European Canadian ones. Moreover, Lee et al. demonstrated that the European Canadian undergraduates perceived more psychological distress when envisioning themselves experiencing stressful noninterpersonal situations over interpersonal ones. Meanwhile, the Japanese undergraduates perceived more psychological distress when imagining themselves in interpersonal situations instead of noninterpersonal ones.

Prior twin studies have demonstrated genetic influences on PS. Federenko et al. (2006) assessed PS, stress susceptibility, and six perceived chronic stress scales in German adult twins and found that heritability ranged from 5% to 45%, whereas shared environmental influences ranged from 0% to 22%. However, caution must be exercised in interpreting the results due to the small sample size (total $N = 180$ pairs). Another small experimental twin study on young adult American twins showed that heritability of PS was 44% with the remaining variance attributable to nonshared environmental influences (Bogdan & Pizzagalli, 2009). Similarly, in a relatively large sample of Australian adolescent and young adult twins, Rietschel et al. (2014) found that genetic and nonshared environmental influences on PS were 52% and 48% respectively.

According to the theory of gene–environment (GE) correlation (Plomin et al., 1977), individuals play an active role in selecting and creating their environments. In support of GE correlation, twin studies have demonstrated that controllable events, in which the individual plays an active role, are substantially more heritable than uncontrollable events, in which the individual exerts little influence (Bemmels et al., 2008; Bolinskey et al., 2004; Colodro-Conde et al., 2018; Saudino et al., 1997). Using twins and adoptive siblings, Bemmels et al. (2008) found that additive genetic effects were the largest contributor to dependent, controllable life events (45%), whereas nonshared environmental effects were the largest contributor to uncontrollable, independent life events (57%). Shared environmental effects were the largest (71%) in the variance of familial life events (shared by members of a family). Bolinskey et al. (2004) administered the stressful life events exposure scale (SLEs) to a large sample of American adult twins ($N = 3938$ pairs). The authors estimated genetic and environmental influences by category (personal vs. network events) and gender. Parameter estimates were similar across genders in the total SLEs. Specifically, genetic effects explained approximately 25% of variance in the total SLEs, while shared environmental effects accounted for only 10%–13% of variance. Nonshared environmental effects ranged from 61% to 65%. In personal events (i.e., events that directly occur to the individual), genetic effects were greater than shared environmental effects, and both effects were nearly the same across men and women (genetic estimates: 29% vs. 28%; shared environmental estimates: 9% for both). In network events (i.e., events that occur to a person within one's social network, which, thus, indirectly affects the individual), shared environmental effects (26% for both genders) were greater than genetic effects (9% for men, 21% for women).

One of the limitations of twin studies of PS is that nearly all studies have recruited American or European twins raised in societies with individualistic cultures. To the best of our knowledge, no studies have examined genetic and environmental influences on PS in twins raised in collectivistic cultures. Given cultural differences in PS, exploring genetic and environmental influences on PS in East Asians is important to generalize the findings of twin studies to those in collectivistic societies. The present study aimed to examine genetic and environmental influences on PS in late adolescents and young adults in South Korea. Using sex-limitation variance component model-fitting analysis, we examined whether or not genetic and environmental effects on PS vary by gender and category.

Materials and Methods

Sample

The sample included 1372 twins who responded to an online survey conducted by the Korea Twin Research Institute (KTRI) in 2022–2023. The ages of the twins ranged from 16 to 27 years (mean ± SD = 22.4 ± 2.5 years). The survey link was uploaded to online communities in various universities and websites of the KTRI and twin clubs in South Korea. A gift coupon was sent to twins who completed the survey. The sample consisted of 286 (142 complete pairs and 2 cotwin missing individuals) monozygotic male (MZM), 91 (45 complete pairs and 1 cotwin missing individual) dizygotic male (DZM), 518 (258 complete pairs and 2 cotwin missing individuals) monozygotic female (MZF), 227 (113 complete pairs and 1 cotwin missing individual) dizygotic female (DZF), and 250 (125 complete pairs) opposite-sex dizygotic (OSDZ) twins. Women outnumbered men (63% vs. 37%) in the sample, partially because military service is mandatory for South Korean young adult men. Moreover, women tend to respond to online surveys more frequently than males (Wu et al., 2022).

The study determined the zygosity of twins using four questions on physical similarity: frequency of confusion about twins by family members, friends, or relatives; and self-perception of zygosity, adopted from the zygosity questionnaire developed by Ooki et al. (1993). MZ twins exceeded DZ twins (59% vs. 41%), which likely reflected the twin birth rates in South Korea in the 1990s and early 2000s (Hur, 2021).

Measure

We used the Life Stress Scale (LSS; Chon, 1998) to assess PS across the past 6 months. Originally, the LSS included 20 items for measuring stress levels of late adolescents and young adults across categories. We performed factor analysis and extracted five factors, namely, Friendship (five items), Family Conflicts (four items), Family Financial Difficulty (FFD; two items), Future Career (two items), and Academic stress (six items). We excluded one item ('I had conflicts with my lover'), because it did not substantially load on any of the five factors. Items were rated using a 4-point Likert-type scale ranging from 0 = *not at all true* to 3 = *certainly true*. The score for each scale was computed by summing the responses. We also summed the scores across the 19 items to produce the total score for PS. The internal consistency reliabilities (Cronbach's alpha) of the five scales ranged from .74 for FFD to .89 for Future Career (Table 1). Cronbach's alpha of the total scale reached .92.

Statistical Analysis

Using the raw data option in Mx (Neale et al., 2003), we computed the maximum likelihood correlations for the five zygosity groups of twins and performed the general sex-limitation model-fitting analysis (Neale & Cardon, 1992) to determine additive genetic, shared environmental, and nonshared environmental influences on PS. Specifically, we modeled the phenotypic variance for each PS scale and the total PS scale as a function of an additive genetic variance component (A), a shared environmental variance component (C), and nonshared environmental variance component, including measurement error (E). Twin correlations for A

Table 1. Items of the Perceived Stress Scale

Scale	Item	Alpha
Friendship	I have no friends to open up to.	.87
	I am disappointed in my friends and find it difficult to maintain friendships.	
	Because of discord with friends, interpersonal relationships are difficult.	
	It is difficult to understand other friends based on my way of thinking and values.	
	I am ignored or misunderstood by others.	
Academic	There was too much homework to do.	.83
	Grades do not improve as much as I try.	
	Class time is uninteresting and boring.	
	The subject I am learning is too difficult.	
	There is no conversation with the teacher (professor) and no opportunity to have a human relationship.	
	I don't like the major field I'm currently in.	
Future career	I wander because I cannot decide on a career path after graduation.	.89
	I'm worried because I don't know the aptitude needed for my career after graduation.	
Family conflicts	There is conflict between siblings in our family.	.86
	There is conflict with parents due to their excessive interference.	
	My parents don't have a good relationship	
	The entire family atmosphere is dark due to family issues.	
Family financial difficulties	The family's economic situation worsened.	.74
	Due to lack of pocket money, my actions were greatly restricted.	

were 1.0 and 0.5 for MZ and same-sex DZ twins respectively. For OSDZ twins, however, we allowed the correlation for A to vary between 0 and .5 with the assumption that genes for PS may be qualitatively different between men and women. To test this qualitative sex difference in genes for PS, we set the additive genetic correlation for OSDZ twins to .5 and examined the resultant model-fit statistics. Twin correlations for C were 1.0 for MZ and same-sex DZ twins. For OSDZ twins, we allowed the correlation for C to vary between 0 and 1.0 with the assumption that shared environmental effects for PS may be qualitatively different between men and women. To test for this qualitative sex difference in shared environmental influences on PS, we set the shared environmental correlation for OSDZ twins to 1.0, and examined the resultant model-fit statistics. Because we cannot test qualitative sex difference in genetic and shared environmental effects simultaneously, we tested them separately. Twins were not correlated for E. For correlational and model-fitting analyses, the study considered age as a covariate to control for its main effect. Additionally, we allowed the A, C, and E components to differ between men and women (Am ≠ Af, Cm ≠ Cf, and Em ≠ Ef) with the assumption that the magnitudes of additive genetic and shared and nonshared environmental influences on PS may quantitatively differ between the two genders. To test for this quantitative sex difference in the A, C and E components, we constrained the three variance components to be equal across men and women and examined the resultant model-fit statistics.

The raw data option in Mx calculates twice the negative log likelihood (−2LL) of the data. As the difference in −2LL is chi-square distributed with degrees of freedom equal to the difference in the degrees of freedom, we used the log likelihood ratio test to evaluate the significance of the constraint when two models were nested. A nonsignificant change in chi-square between the full and constrained models indicates that the reduction in parameter is acceptable, while a significant change indicates that the parameter should be retained in the model. When two models were not nested, we utilized Akaike information criterion (AIC; Akaike, 1987) to evaluate the models. AIC quantifies the information content of a model in terms of the joint criterion of fit and parsimony (Akaike, 1987). Thus, the smaller the AIC, the better the fit of the model to the data.

Results

Descriptive Statistics

Supplementary Table 1 presents the means and standard deviations of all PS scales. Except for Academic Stress and Future Career, the means were significantly higher for women than for men. However, the differences were small (Cohen's $d < .30$). Variances were also significantly higher for women for Friendship, Future Career, and FFD. Means were significantly higher in MZ than in DZ twins in a few scales. Again, however, the differences were small (Cohen's $d < .30$). Variance differences between MZ and DZ twins were significant For Friendship and Family Conflicts. In general, the correlations of the PS scales with age were nonsignificant ($r \leq .05$) except for Academic Stress ($r = -.12$).

Twin Correlations

Figure 1 depicts the correlations for the PS scales for the five zygosity groups of twins, and Table 2 shows the correlations and their 95% confidence intervals. For all scales, correlations for MZ twins were greater than those for DZ twins, which points to genetic influences on PS. However, correlations in FFD for DZ twins were very similar to those for MZ twins, which points to the importance of shared environmental influences. In general, correlations for OSDZ twins were not substantially lower than those for DZM or DZF twins, which indicates little evidence of the presence of sex-specific genes for PS. There were a number of hints of nonadditive genetic influences on Future Career for men, Friendship for women, and the total PS for men, because the correlations for DZ twins were much lower than half of those for MZ twins in these scales. But, because the estimates of dominance effects were not significant, only the additive genetic effects were reported.

Model-Fitting Analysis

Supplementary Table 2 shows the results of model-fitting analysis. For all PS scales, AIC values were lower for the ACE than those for the ADE models. Thus, we selected ACE as the full model for all scales. Sex-specific genetic and environmental effects were not significant in any of the PS scales, because dropping sex-specific genes or shared environmental effects did not worsen the fit of the full models. Additionally, the difference in the magnitudes of A, C and E between men and women obtained statistical significance only in FFD, indicating that overall, genetic and environmental influences are similar across sexes. Table 3 presents the estimates of variance of the PS scales and their 95% confidence intervals (CIs) in

https://doi.org/10.1017/thg.2024.21 Published online by Cambridge University Press

Table 2. Maximum likelihood twin correlations (95% CI) for Perceived Stress scales

	Friendship	Academic stress	Future career	Family conflict	Family financial difficulty	Total stress
MZM	.65 (.54, .74)	.68 (.58, .76)	.67 (.57, .75)	.77 (.69, .83)	.67 (.57, .75)	.81 (.74, .86)
DZM	.46 (.19, .66)	.40 (.13, .61)	.15 (-.14, .42)	.42 (.15, .63)	.62 (.41, .77)	.38 (.11, .60)
MZF	.69 (.62, .75)	.67 (.59, .73)	.52 (.43, .60)	.75 (.69, .80)	.65 (.58, .72)	.79 (.74, .83)
DZF	.18 (.00, .35)	.47 (.31, .60)	.35 (.18, .51)	.55 (.40, .66)	.62 (.49, .72)	.48 (.33, .61)
OSDZ	.32 (.16, .47)	.39 (.23, .53)	.32 (.16, .47)	.53 (.39, .64)	.52 (.38, .64)	.50 (.36, .62)

Note: MZM, monozygotic male; DZM, dizygotic male; MZF, monozygotic female; DZF, dizygotic female; OSDZ, opposite-sex dizygotic twins; CI, confidence interval.

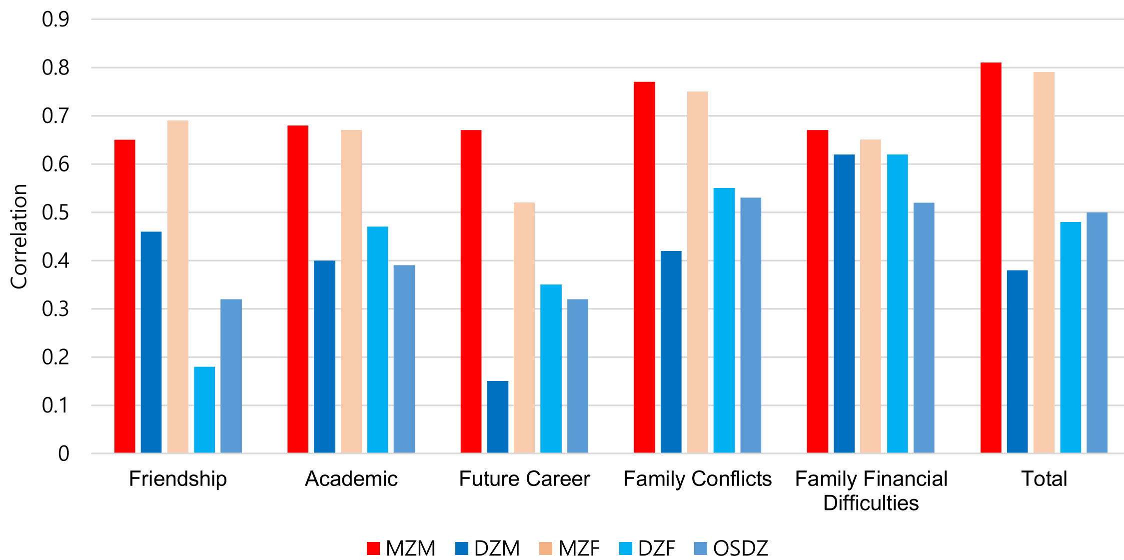

Figure 1. Maximum likelihood twin correlations for the Perceive Stress scales.
Note: MZM, monozygotic male twins; DZM, dizygotic male twins; MZF, monozygotic female twins; DZF, dizygotic female twins; OSDZ, opposite-sex dizygotic twins

the best-fitting models. For Friendship, Academic Stress, and Future Career, shared environmental influences were nonsignificant but additive genetic influences ranged from 57% (95% CI [51%, 62%]) for Future Career to 67% (95% CI [62%, 71%]) for Academic Stress. For Family Conflict, additive genetic and shared and nonshared environmental influences were all significant. However, among them, shared environmental influence was the largest (47%; 95% CI [30%, 60%]). Environmental influences entirely explained individual differences in FFD with shared environmental influence being much stronger than nonshared environmental influences for both gender groups. Although there were significant gender effects in the unstandardized variance components in FFD, the standardized variances of shared (men: 64%, women: 63%) and nonshared (men: 36%, women: 37%) environmental effects were nearly the same. For the Total PS scale, the variance components of additive genetic and shared environmental influences were similar (39% and 38%) in males and females. Nonshared environmental influences, including measurement error, accounted for 23% of variance for both gender groups.

Discussion

Using late adolescent and young adult twins in South Korea, the present study investigated the influences of genetics and environment on PS. In general, the magnitudes of additive genetic and shared environmental and nonshared environmental influences were nearly the same for men and women without sex-specific genetic or environmental effects in any of the PS scales. Additive genetic and shared environmental influences nearly equally explained the variance of the total PS in men and women. However, when the total PS scale was classified into five categories, shared environmental influences were predominant for Family Conflict and FFD, while additive genetic influences were substantial for Friendship, Academic Stress, and Future Career. These results indicate that classifying PS into categories is important for determining the origin of individual differences.

To categorize the scales into personal event versus network event stress (Kendler et al., 1993), the Friendship, Academic Stress and Future Career scales belong to the former group, while Family Conflict and FFD belong to the latter group. Our findings corroborate prior studies based on western samples (e.g., Bolinskey et al., 2004) in that genetic factors largely influenced PS due to personal life events, while shared environmental factors were predominant for PS due to network life events. One would argue that the respondent's behavior likely largely contributed to stress given that the Family Conflict scale represents stress due to family relationships. However, the scale used in our study mainly measures conflicts among siblings and parents, excessive interference from parents, and the general family atmosphere, which are likely experienced by the members of one's family but relatively less influenced by the behavior of the respondent (Table 1). Thus, although the effects of genetics were significant, the effects of

https://doi.org/10.1017/thg.2024.21 Published online by Cambridge University Press

Table 3. Parameter estimates in the best-fitting general sex-limitation model for various Perceived Stress (PS) scales.

Scale		A	C	E
Friendship	M = F	.63 (.58, .68)	–	.37 (.32, .42)
Academic	M = F	.67 (.62, .71)	–	.33 (.29, .38)
Future career	M = F	.57 (.51, .62)	–	.43 (.38, .49)
Family conflict	M = F	.26 (.11, .43)	.47 (.30, .60)	.27 (.23, .32)
Family financial difficulty	M	–	.64 (.55, .71)	.36 (.29, .45)
	F	–	.63 (.57, .69)	.37 (.31, .43)
Total	M = F	.39 (.24, .57)	.38 (.20, .52)	.23 (.20, .27)

Note: A, additive genetic effects; C, shared environmental effects; E, nonshared environmental effects, including measurement error; M, male; F, female; –, fixed to zero.

shared environmental influences were larger than those of genetics in the Family Conflict scale.

In collectivistic cultures, individuals tend to prioritize interpersonal relationships over personal accomplishments. Thus, the means and variances of PS and proportions of genetic and environmental influences on PS may differ between collectivistic and individualistic cultures. Although we were not able to compare differences in PS between the two cultures directly, our findings that PS due to personal events were largely influenced by genetic factors, whereas PS due to network events were largely influenced by shared environmental factors were similar to those found for samples from western, individualistic societies. In future twin studies, simultaneously collecting samples from collectivistic and individualistic cultures and directly comparing the means, variances, and proportions of genetic and environmental influences on PS would be interesting.

The current findings should be interpreted with caution due to several limitations. First, the means and variances of some of the PS scales significantly differed between MZ and DZ twins. Although these differences violate the assumptions of the classical twin method, the magnitudes of the differences were small. Thus, these differences may mainly reflect sampling errors associated with a relatively small sample. Second, we determined the zygosity of twins using the questionnaire method instead of DNA analysis. Odintsova et al. (2018) indicated that the misclassification of zygosity can influence the estimates of genetic and environmental influences. Notably, however, our study excluded twins whose zygosity was ambiguous ($n = 8$ pairs) to increase the validity of the zygosity diagnosis. Finally, although twins were recruited nationwide, the majority were primarily university students. This sample characteristic limits the generalizability of the findings to the general population in South Korea.

In conclusion, we found that genetic and environmental influences on PS were similar between men and women in South Korea. Furthermore, the study provided evidence that genetic influences are substantial for PS due to personal events (i.e., Friendship, Academic Stress, and Future Career), while shared environmental influences were predominant for PS due to network events (Family Conflicts, FFD). These findings replicated the results of studies that recruited western twin samples.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/thg.2024.21.

Acknowledgments. We are grateful for the twins for their participation.

Financial support. This study was supported by National Research Foundation of Korea (NRF2011371B00047).

References

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika*, *52*, 317–332. https://doi.org/10.1007/BF02294359

Baum, A. & Posluszny, D. M. (1999). Health psychology: Mapping biobehavioral contributions to health and illness. *Annual Review of Psychology*, *50*, 137–163. https://doi.org/10.1146/annurev.psych.50.1.137

Bell, A. S., Rajendran, D., & Theiler, S. (2012). Job stress, wellbeing, work-life balance and work-life conflict among Australian academics. *Electronic Journal of Applied Psychology*, *8*, 25–37. https://doi.org/10.7790/ejap.v8i1.320

Bemmels, H. R., Burt, S. A., Legrand, L. N., Lacono, W. G., & McGue, M. (2008). The heritability of life events: An adolescent twin and adoption study. *Twin Research and Human Genetics*. *11*, 257–265. https://doi.org/10.1375/twin.11.3.257

Bjørndal, L. D., Kendler, K. S., Reichborn-Kjennerud, T., & Ystrom, E. (2023). Stressful life events increase the risk of major depressive episodes: A population-based twin study. *Psychological Medicine*, *53*, 5194–5202. https://doi.org/10.1017/S0033291722002227

Bogdan, R., & Pizzagalli, D. A. (2009). The heritability of hedonic capacity and perceived stress: A twin study evaluation of candidate depressive phenotypes. *Psychological Medicine*, *39*, 211–218. https://doi.org/10.1017/S0033291708003619

Bolger, N., DeLongis, A., Kessler, R. C., & Schilling, E. A. (1989). Effects of daily stress on negative mood. *Journal of Personality and Social Psychology*, *57*, 808–818. https://doi.org/10.1037/0022-3514.57.5.808

Bolinskey, P. K., Neale, M. C., Jacobson, K. C., Prescott, C. A., & Kendler, K. S. (2004). Sources of individual differences in stressful life event exposure in male and female twins. *Twin Research*. *7*, 33–38. https://doi.org/10.1375/136905204607414 26

Chon, K. K. (1998). Development of the life stress scale for college students. *Journal of Rehabilitation Science*, *14*, 15–37.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 385–396. https://doi.org/10.2307/2136404

Colodro-Conde, L., Couvy-Duchesne, B., Zhu, G., Coventry, W. L., Byrne, E. M., Gordon, S., Wright, M. J., Montgomery, G. W., Madden, P. A. F.; Major Depressive Disorder Working Group of the Psychiatric Genomics Consortium; Ripke, S., Eaves, L. J., Heath, A. C., Wray, N. R., Medland, S. E., Martin, N. G. (2018). A direct test of the diathesis–stress model for depression. *Molecular Psychiatry*, *23*, 1590–1596. https://doi.org/10.1038/mp.2017.130

Eaton, R. J., & Bradley, G. (2008). The role of gender and negative affectivity in stressor appraisal and coping selection. *International Journal of Stress Management*, *15*, 94–115. https://doi.org/10.1037/1072-5245.15.1.94

Ebner, K., & Singewald, N. (2017). Individual differences in stress susceptibility and stress inhibitory mechanisms. *Current Opinion in Behavioral Sciences*, *14*, 54–64. https://doi.org/10.1016/j.cobeha.2016.11.016

Ebstrup, J. F., Eplov, L. F., Pisinger, C., & Jørgensen, T. (2011). Association between the five factor personality traits and perceived stress: Is the effect mediated by general self-efficacy? *Anxiety, Stress & Coping*, *24*, 407–419. https://doi.org/10.1080/10615806.2010.

Federenko, I. S., Scholotz, W., Kirschbaum, C., Bartels, M., Hellhammer, D. H. & Wust, S. (2006). The heritability of perceived stress. *Psychological Medicine*, *36*, 375–385. https://doi.org/10.1017/S0033291705006616

Graves, B. S., Hall, M. E., Dias-Karch, C., Haischer, M. H., & Apter, C. (2021) Gender differences in perceived stress and coping among college students. *PLoS ONE*, *16*, e0255634. https://doi.org/10.1371/journal.pone.0255634

Hashimoto, T., Mojaverian, T., & Kim, H. S. (2012). Culture, interpersonal stress, and psychological distress. *Journal of Cross-Cultural Psychology*, *43*, 527–532. https://doi.org/10.1177/0022022112438396

Hur, Y.-M. (2021). Changes in multiple birth rates and parental demographic factors in South Korea during the last four decades: 1981–2019. *Twin Research and Human Genetics*, *24*, 163–167. https://doi.org/10.1017/thg.2021.23

Kendler, K. S., & Gardner, C. O. (2010). Dependent stressful life events and prior depressive episodes in the prediction of major depression. *Archives of General Psychiatry*, *67*, 1120–1127. https://doi.org/10.1001/archgenpsychiatry.2010.136

Kendler, K. S., Meale, M., Kesstressr, R., Heath, A., & Eaves, L. (1993). A twin study of recent life events and difficulties. *Archives of General Psychiatry*, *50*, 789–796. https://doi.org/10.1001/archpsyc.1993.01820220041005

Kendler, K. S., Thornton, L. M., & Prescott, C. A. (2001). Gender differences in the rates of exposure to stressful life events and sensitivity to their depressonic effects. *American Journal of Psychiatry*, *158*, 587–593. https://doi.org/10.1176/appi.ajp.158.4.587

Lee, H., Masuda, T., Ishii, K., Yasuda, Y., & Ohtsubo, Y. (2023). Cultural differences in the perception of daily stress between European Canadian and Japanese undergraduate students. *Personality and Social Psychology Bulletin*, *49*, 571–584. https://doi.org/10.1177/01461672211070360

Neale, M. C., & Cardon, R. L. (1992). *Methodology for genetic studies of twins and families*. Kluwer Academic Publishers.

Neale, M. C., Boker, S. M., & Xie, G. (2003). *Mx: Statistical modeling* (6th ed.). Department of Psychiatry, Virginia Commonwealth University.

Odintsova, V. V., Willemsen, G., Dolan, C. V., Hottenga, J., Martin, N. G., Slagboom, P. E., Ordoñana, J. R., & Boomsma, D. I. (2018). Establishing a twin register: An invaluable resource for (behavior) genetic, epidemiological, biomarker, and 'omics' studies. *Twin Research and Human Genetics*, *21*, 239–252. https://doi.org/10.1017/thg.2018.23

Ooki, S., Yamada, K., & Asaka, A. (1993). Zygosity diagnosis of twins by questionnaire for twins' mothers. *Acta Geneticae Medicae et Gemellologiae*, *42*, 17–22. https://doi.org/10.1017/s0515283600042244

Plomin, R., DeFries, J. C., & Loehlin, J. C. (1977). Genotype- environment interaction and correlation in the analysis of human behavior. *Psychological Bulletin*, *84*, 309–322. https://doi.org/10.1037/0033-2909.84.2.309

Rietschel, L., Zhu, G., Kirschbaum, C., Strohmaier, J., Wust, S., Rietschel, M., & Martin, N. G. (2014). Perceived stress has genetic influences distinct from neuroticism and depression. *Behavior Genetics*, *44*, 639–645. https://doi.org/10.1007/s10519-013-9636-4

Saudino, K. J., Pedersen, N. L., Lichtenstein, P., McClearn, G. E., & Plomin, R. (1997). Can personality explain genetic influences on life events? *Journal of Personality and Social Psychology*, *72*, 196–206. https://doi.org/10.1037/0022-3514.72.1.196

Tamres, L. K., Janicki, D., & Helgeson, V. S. (2002). Sex differences in coping behavior: a meta-analytic review and an examination of relative coping. *Personality and Social Psychology Review*, *6*, 2–30. https://doi.org/10.1207/S15327957PSPR0601_1

Wu, M.-J., Zhao, K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, *7*, 100206. https://doi.org/10.1016/j.chbr.2022.100206