# Social support and loneliness in college students: Effects on pulse pressure reactivity to acute stress

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*Abstract:* Socially supportive relationships at university may buffer against psychological stress in students, particularly in those experiencing loneliness. *Objectives*: To examine the relation of social support at university and loneliness with pulse pressure (PP) reactivity to acute psychological stress in a sample of first-year undergraduate students. *Study group*: Sixty-five female, adolescent, first-year university students. *Methods*: Pulse pressure (PP) was calculated as the arithmetic difference between systolic blood pressure and diastolic blood pressure, which were measured during a resting baseline and during a stressful reading task. The difference between baseline and reading task PP represents PP reactivity. The Social Support at University Scale (SSUS) was used to assess social support availability in university, and the Revised UCLA Loneliness Scale was used to assess loneliness. Hierarchical linear regression was used to examine main and interactive effects of SSUS and loneliness on PP change scores, and simple slopes were computed to assist in the interpretation of interaction effects. *Results*: Social support at university was associated with lower PP reactivity in students reporting medium (t = −2.03, p = .04) or high levels of loneliness (t = −2.93, p = .004), but not in those reporting low levels of loneliness (t = −0.20, p = .83). *Conclusions*: Psychosocial interventions designed to increase social support available at university, and targeted at students experiencing loneliness may buffer against the harmful effects of acute stressors in lonely first-year students.

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## INTRODUCTION

In the developed world, cardiovascular disease (CVD) is the leading cause of premature death, and low social support is one of its most established psychosocial risk factors (1). Loneliness, which is experienced when intimate and social needs are not met, has also been associated with CVD risk (2).

Although closely related, social support and loneliness are conceptually independent, persons with good access to social support may nonetheless feel lonely, whereas persons without such access may not. Both social support and loneliness may influence CVD risk via their influences on reactions to stress, including cardiovascular reactivity

to stress (CVR) (3-4). Adolescence is an important time to evaluate the associations between psychosocial variables and CVR for a number of reasons: the long-term development of CVD begins early in life (5); adolescence is the time when lifelong patterns of behavior (including those linked to one's psychological dispositions regarding stress) are established (6); and, as a period of transition, adolescence may be associated with considerable psychological stress.

The transition from school to university represents a stressful period for many adolescents, but social support resources may buffer against the negative effects of such stress (7). For first-year university students, the loneliness associated with adapting to a new social environment (8) and the mobilization of social support resources within this environment may be key issues. Indeed, students experiencing loneliness, resulting either from the transition to university or from other factors, may possibly benefit most from a socially supportive university environment.

Pulse pressure (PP) represents the divergence between systolic blood pressure (SBP) and diastolic blood pressure (DBP). In younger people, where SBP alone possesses less validity as a predictor of long-term disease risk, PP is a particularly useful measure (9). Changes in PP associated with psychological stress (i.e., PP reactivity) were associated with markers of carotid atherosclerosis including average intima-media thickness and focal plaque in a sample of 254 healthy women (10). In the same study, neither stress-induced SBP nor HR change scores were associated with markers of carotid atherosclerosis. The purpose of the present study was to examine the relation of social support at university and loneliness with PP reactivity to acute psychological stress in a sample of adolescent, female, first-year undergraduate students.

## METHODS

Participants were 65 female, first-year undergraduate students aged between 17 and 21 years (M = 17.96, SD = .82). Gender differences in CVR to social interactions have been documented (11;12). We chose an all-female sample because we were not interested in gender effects per se and because we wanted to employ a relatively homogenous sample with respect to PP and social support. Mean body mass index was 21.51 kg/m2 (SD = 2.95), and the sample included nine smokers. Exclusion criteria included the presence of chronic or acute illness and use of medications (including the oral contraceptive pill; OCP). The OCP can lead to increases in CVR (13). Course credit was given to participants for taking part. Participants provided informed consent and institutional ethical guidelines were strictly adhered to.

### Measures

*Cardiovascular measures.* The Dinamap Pro100 vital signs monitor (Critikon Corporation, Tampa, Florida) was used to measure SBP and DBP from the upper non-dominant arm using the oscillometric method. Measures were taken during a resting baseline, which included ten minutes of rest followed by three BP measurements taken at one-minute intervals. Measures were also taken at one-minute intervals during the stressor task, which lasted for six minutes. PP was computed as the arithmetic difference between SBP and DBP.

*Psychometric measures.* Items for all psychometric measures were rated on four-point scales. The Social Support at University Scale (SSUS) is a five-item scale assessing social support availability in university settings (see table 1) (14). The Revised UCLA Loneliness Scale (15) consists

*Table 1*: Social support at university scale items

| |
|---|
| 1. I have a good relationship with my supervisors/lecturers |
| 2. I am getting on well with my fellow students |
| 3. There is a pleasant atmosphere at university |
| 4. There is group cohesion at university |
| 5. There are often conflicts and arguments at university |

of 20 items assessing loneliness. Each scale has previously demonstrated sound psychometric properties (14-15).

**Procedure**
Participants were instructed to avoid caffeine, alcohol, smoking, and exercise during the two hours before laboratory attendance. Following the presentation of instructions by the experimenter, a computerized, automated procedure led the participants through the experiment. The participants browsed popular magazines during a ten-minute baseline period and then completed the stressor task, which involved reading three passages aloud into a microphone and in front of a video camera for six minutes. Lastly, participants completed the psychometric measures.

**Statistical analysis**
A paired $t$-test was used to examine the effectiveness of the reading task stressor in eliciting the stress response. Change scores for PP were computed as the arithmetic difference between baseline PP and reading task PP. Hierarchical linear regression was used to examine main and interactive effects of SSUS and loneliness on PP change scores. Baseline PP was entered in the first step, and mean-centered SSUS and loneliness scores as well as the SSUS*loneliness interaction term were entered in the second step. Mean-centered SSUS and loneliness scores were used in regression

analyses to reduce problems associated with multicollinearity (16). The interaction term SSUS*loneliness was computed as the product of mean-centered SSUS and loneliness scores. The Mod Graph software package (17) was used to graph significant interaction effects and to compute simple slopes to assist in the interpretation of interaction effects. SPSS software was used for all other analyses.

**RESULTS**
**Psychometric measures**
The internal consistency for the full 5-item SSUS was low (Cronbach's $\alpha$ = .45). However, excluding the fifth item of the scale resulted in a 4-item scale with an internal consistency of .69. The fifth item was unique in being reverse-scored, and was conceptually distinct in that it referred to the presence of negative social ties rather the presence of support per se. We therefore used the 4-item scale in all analyses. Internal consistency of the UCLA Loneliness Scale was good (Cronbach's $\alpha$ = .89). The association between SSUS scores and Loneliness was moderate (r = .24, p = .05).

**Social support and pulse pressure**
The reading task stressor resulted in significant increases in PP from baseline (t = -6.63, p < .001). We found a significant negative linear relationship between SSUS and task PP, such that social support at university appeared to buffer against PP
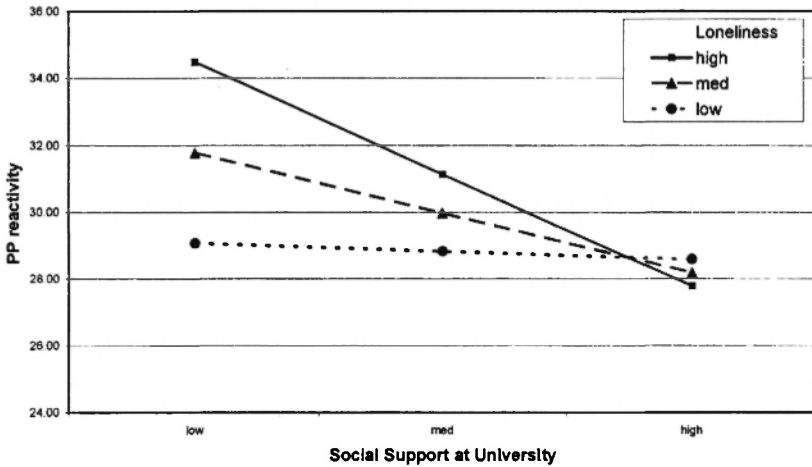
**Fig. 1:** Moderation of the effects of social support at university on pulse pressure reactivity by loneliness. SSUS scores were significantly associated with PP reactivity at high and medium levels of loneliness (*p*s < .05), but not at low levels of loneliness (*p* = .83).

reactivity to acute stress ($\beta$ = –.23, p < .001). No significant linear relation was found between loneliness and PP reactivity ($\beta$ = .14, p = .25).

The SSUS*Loneliness interaction term emerged as a significant predictor of PP reactivity ($\beta$ = –.24, p = .04). Follow-up analyses were conducted to examine the relation between SSUS and PP reactivity at high loneliness (mean score + 1 SD), medium loneliness (mean score), and low loneliness (mean score –1 SD; see figure 1). Simple slopes analyses showed that SSUS scores were significantly associated with PP reactivity in participants with high levels of loneliness (slope = –2.09, t = –2.93, p = .004), and in those with medium levels of loneliness (slope = –1.123, t = -2.03, p = .04). In participants with low levels of loneliness, however, no significant associations were found between SSUS scores and PP reactivity (slope = –0.15, t = -0.20, p = .83). When we repeated our analyses after excluding smokers and controlling for BMI (n = 56), we found the same pattern of

results. We also found the same pattern when we repeated our analyses using z-transformed, rather than mean-centered, scores to take account of the different scoring ranges of our measures.

**DISCUSSION**

Our data highlight the associations between social variables and PP reactivity to acute stress in a sample of adolescent females, emphasizing the importance of social resources in adolescent life. We found that the perceived availability of social support resources at university buffered against the negative physiological effects of acute stress in adolescent female students, but only those experiencing loneliness. Important to note is that the presence or absence of social support at university did not affect PP reactivity in adolescent female students who were not experiencing loneliness.

Lonely individuals tend to perceive stressors—that is stressful events—as more severe even if the stressors are objectively comparable in frequency and intensity (4).

As a result of their greater perceived stress, lonely individuals may be more at risk of ill health caused by harmful physiological reactions to stress. From our data, it appears that the availability of a variety of social support resources at university may be beneficial to lonely students in terms of reducing physiological reactivity to acute stressors.

The limitations of the present work include the small sample size and the absence of data on male students, or gender differences. The present data indicate that a follow-up study examining the interaction between SSUS scores and loneliness in male, first-year university students may be warranted.

Psychosocial interventions designed to increase social support available at university, and targeted at female students experiencing loneliness may buffer against the harmful effects of acute stress in these students.

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