

REPLICATION DATA SET FOR:

Cohen, S., Janicki-Deverts, D., Turner, R.B., & Doyle, W.J. (in press). Does hugging provide stress-buffering social support? A study of susceptibility to upper respiratory infection and illness. *Psychological Science*.

MANUSCRIPT ABSTRACT

Perceived social support has been hypothesized to protect against the pathogenic effects of stress. How such protection might be conferred, however, is not well understood. In 406 healthy adults, we examined the roles of perceived social support and received hugs in buffering against interpersonal stress-induced susceptibility to infectious disease. Perceived support was assessed by questionnaire, and daily interpersonal conflict and receipt of hugs by telephone interviews on 14 consecutive evenings. Subsequently, participants were exposed to a virus that causes a common cold, and monitored in quarantine to assess infection and illness signs. Perceived support protected against the rise in infection risk associated with increasing frequency of conflict. A similar stress-buffering effect emerged for hugging, which explained 32% of the attenuating effect of support. Among infected participants, greater perceived support and more frequent hugs each predicted less severe illness signs. These data suggest that hugging may act as an effective means of conveying support.

SUMMARY OF PARENT STUDIES:

The data reported on in this manuscript were derived from participants in two viral challenge studies: The Pittsburgh Mind Body Center Cold Study (PMBC) and the Pittsburgh Cold Study 3 (PCS3). Common variables across the two studies were aggregated prior to analysis, with similar but not identical measures (e.g., extraversion assessed with Goldberg's adjectives in one study and with items from the International Personality Item Pool in the other) being made equivalent by creating z-scores (see publication for additional details). Descriptions of the two parent studies are provided below.

The Pittsburgh Mind-Body Center (PMBC) Study was a prospective viral challenge study conducted from 2000-2004 among healthy volunteers ages 21-55 (mean age 37.3; SD 8.8). This study included detailed daily interviews with participants over 14 consecutive days to assess social interactions (number of interactions, with whom they were interacting, etc.), mood, and health behaviors. PMBC also included in-depth measurement of various aspects of marital relationships, including relationship satisfaction, spousal social support, marital commitment, and spousal self-disclosure. In addition (as part of the broader Mind-Body Center Project) numerous other psychological and behavioral variables were assessed including personal attributes, social factors, socioeconomic status, and health practices. Biological

assessments before viral challenge included epinephrine, norepinephrine, cortisol, and stimulated cytokine production. Post-challenge measures, in addition to standard virology, included local (nasal secretions) cytokines (interleukin [IL]-1 β , IL-6, IL-8, IL-10, IFN- α , and TNF- α).

Participants were 95 men and 98 women who responded to advertisements and were judged to be in good health. Of these, the first 38 to be enrolled in the study were exposed to influenza A/Texas/36/91; all subsequent participants (n = 155) were exposed to rhinovirus (RV) 39. To maximize the rate of infection, only volunteers with viral-specific antibody titers ≤ 4 were deemed eligible for participation in the study. Prior to enrollment, volunteers completed a telephone screening, and screened participants were followed up with an in-person health evaluation by a study physician to further assess eligibility. After completing baseline psychosocial and biological assessments, participants were administered nasal drops containing the challenge virus, followed in quarantine for either 5 (for RV39) or 6 (for influenza) days, and monitored for development of infection and objective signs of illness (see viral challenge timeline below). Approximately 28 days after virus exposure, blood was collected for serological testing. Participants were considered to have a cold if they both were infected with the challenge virus and met illness criteria. All individuals who completed the study received \$800 for their participation.

Pittsburgh Cold Study 3 (PCS3) was a prospective viral challenge study with data collected from 2007-2011 among healthy volunteers ages 18-55 (mean 30.1; SD 10.9). This study extended work on the role of childhood environment in common cold susceptibility by including additional retrospective measures of childhood and adolescent experience, such as parental social participation, parental bonding, family structure and relationships, neighborhood physical and social environments, and childhood physical health. Numerous other social, psychological and behavioral measures were administered during the pre-challenge baseline period as well, including assessments of current social relationships, personal attributes, stressful life events, personality characteristics, and health practices. PCS3 also included detailed daily interviews (14 days) with participants to assess health behaviors, mood, and daily social interactions. One of the novel features of PCS3 is that it introduced several additional biological assessments prior to viral challenge, including markers of biological aging (e.g., telomere length in lymphocytes, oxidative stress), cardiovascular and cortisol reactivity to acute laboratory stress, and cytokine and glucocorticoid and adrenergic receptor genotypes. Post-challenge measures, in addition to standard virology, included local (nasal secretions) cytokines (interleukin [IL]-1 β , IL-6, IL-8, IL-10, IFN- α , and TNF- α).

Participants were 123 men and 90 women from the Pittsburgh, Pennsylvania metropolitan area who responded to newspaper advertisements and were judged to be in good health after a medical examination. Prior to enrollment, volunteers completed a telephone screening interview followed by an in-person physical health evaluation conducted by a study physician. To maximize the rate of infection, only eligible volunteers with viral-specific antibody titers ≤ 4 were

included in the study. After completing baseline psychosocial questionnaires and biological assessments (e.g., biological aging markers, saliva cortisol), participants were administered nasal drops containing rhinovirus 39 (RV39). They were then followed in quarantine for 5 days and monitored for development of infection and objective signs of illness (see viral challenge timeline below). Approximately 28 days after virus exposure, blood was collected for serological testing. Participants were considered to have a cold if they were both infected with the challenge virus and met illness criteria. All individuals who completed the study received \$1,000 for their participation, plus an additional \$60 if they provided hair samples for cortisol analysis.

REPLICATION DATA SET

The replication data set is provided as an annotated SPSS data file (.SAV), and contains all variables necessary to conduct the analyses reported on in the associated publication. Data are represented by 57 variables, which are described in detail in the code book that appears on the following pages. The code book provides a descriptive label for each variable, as well as value labels for categorical and dichotomous variables (when necessary). Missing data are represented by empty cells.

The data set includes both input variables and variables that were created from the input data. The latter are indicated with an asterisk (*). Information on the algorithms used for creating computed variables is provided in the associated manuscript.

Included alongside the data set is an SPSS syntax file (.sps) that includes code for all analyses reported in the manuscript's results section.

Questions regarding this document or the data to which they refer may be sent to:

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VARIABLES INCLUDED IN REPLICATION DATA SET

VARIABLE NAME	VARIABLE LABEL	VALUE LABELS
subj_id	subject ID	
study.id	Cold Study ID	
age	age at screening	
sex	sex	0=male, 1=female
race.white	race/ethnicity: white, caucasian	0=all others, 1=white
educ.4cat	4-category education variable	1=high school or less 2=some college 3=2 years college + degree 4=bachelor's degree or higher
educ.hscl	educational attainment: high school or less	
educ.lt2yr	educational attainment: lt 2 yrs college	
educ.assoc	educational attainment: ge 2 yrs college + assoc. degree	
virus	challenge virus	0=RV39, 1=influenza
pre_ab_ge4	Pre-challenge Ab ≥ 4	0=Ab < 4, 1=Ab ≥ 4
bodymass	Body Mass Index	
season	Season of trial	1=winter 2=spring 3=summer 4=fall
winter	Season of trial: winter (Dec-Jan-Feb)	
spring	Season of trial: spring (Mar-Apr-May)	
summer	Season of trial: summer (Jun-Jul-Aug)	
fall	Season of trial: fall (Sep-Oct-Nov)	
sni.hcr.married	SNI - high contact role: married/marriage like relationship	0=not married 1=married/marital-like relationship
post.infected	Meets criteria for infection?	0=no, 1=yes
post.objcold	Meets objective criteria for cold?	0=no, 1=yes
di.totcomplete	DI: Total completed interviews	
di.hugdays	Total Days with Hug	
Pcthug*	% Days with Hug	
Cpcthug*	% Days with Hug - mean-centered	
pcthug_mdn*	% Days with Hug - median-split	
Pcthugsoc*	% Social interaction days with hug	
Cpcthugsoc*	% Social interaction days with hug - mean-centered	
di.tendays	Total Days with Tension	
Pctten*	% Days with Tension	
Cpctten*	% Days with Tension - mean-centered	

VARIABLE NAME	VARIABLE LABEL	VALUE LABELS
Pcttensoc*	% Social interaction days with tension	
Cpcttensoc*	% Social interaction days with tension - mean-centered	
Pcthugten*	% Tension days with hug	
Pcthugnoten*	% Non-tension days with hug	
di.socdays	DI: Total days with social activity	
Pctsocdays*	% Days with any social activity	
di.totsoc_avg	DI: Avg # social activities per day	
isel12tot	ISEL: Total Interpersonal Support	
cisel12tot*	ISEL: Total Interpersonal Support - mean-centered	
isel12tot_mdn*	ISEL: Total Interpersonal Support - median split	
post.mucwt_tot	Total Adjusted Post-challenge Mucus Weight (g)	
log_post.mucwt_tot	Total Adjusted Post-challenge Mucus Weight (g) - log ₁₀	
post.nasclr_avg	Avg Adjusted Post-challenge Nasal Clearance Time (min)	
log_post.nasclr_avg	Avg Adj Post-challenge Nasal Clearance Time (min) - log ₁₀	
cpctten_cpcthug*	Centered tension X centered hugs interaction	
cpctten_cisel12tot*	Centered tension X centered social support interaction	
cpcthug_cpctten_virus*	Centered tension X centered hugs X virus interaction	
cisel12tot_cpctten_virus*	Centered tension X centered social support X virus interaction	
Zgb5.extrscr*	Zscore: Extraversion	
zgb5.emotscr*	Zscore: Emotional stability (inverse neuroticism)	
Zgb5.agrbscr*	Zscore: Agreeableness	
tenxisel1†	Predicted probability: Infection	
hicisel12tot‡		
locisel12tot‡		
tenxhug1†	Predicted probability: Infection	
hicpcthug‡		
locpcthug‡		

*Computed variable

†Derived from regression equation

‡Variables created for plotting interactions at high and low (i.e., +/- 1 standard deviation) values. See Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions* (pp. 9-27). Sage Publications.