

S4 Table

Article title: Physiological reactions to acute stressors and subjective stress during daily life: A systematic review on ecological momentary assessment (EMA) studies

Authors: Jeannette Weber, Peter Angerer, Jennifer Apolinário-Hagen

Institute of Occupational-, Social- and Environmental Medicine, Centre for Health and Society, Medical Faculty, Heinrich-Heine-University Düsseldorf, Moorenstraße 5, 40225 Düsseldorf, Germany

S4 Table. Description of studies examining within-subject associations between acute stress and cardiovascular outcomes

Study	Study population and setting	Exposure variable (scale range ¹)	Sampling schedule per participant	Max. time lag between exposure and outcome	Results (direct association between exposure and outcome)
Balducci et al., 2021 (1)	61 workers in Italy; M _{age} =47.5 (SD=12, range 23-68), female: 43%	Severity of acute stressors at work (scale range: 1-7)	10 days; daily	Same day	<u>SBP</u> : No association (WS: b=0.34, SE=0.48, p>.05)
Bishop et al., 2003 (2)	92 police patrol officers at work in Singapore; M _{age} =26.85 (SD=5.15) female: 0%	Severity of acute stressors at work: job demands (scale range: 1-4)	1 day; every 30 minutes	10 minutes	Moderation effect of job control was included in the following models: <u>SBP</u> : No association (BS: b=-.29, SE=0.99, p>.05; WS: b=0.16, SE=0.16, p>.05) <u>DBP</u> : No association (BS: b=.10, SE=0.65, p>.05; WS: b=0.38, SE=0.31, p>.05) <u>HR</u> : No association (BS: b=-.06, SE=1.11, p>.05; WS: b=0.45, SE=0.31, p>.05). <u>Mean arterial pressure</u> : No association (BS: b=-.03, SE=0.69, p>.05; WS: b=0.33, SE=0.28, p>.05). <u>Pressure rate product</u> : No association (BS: b=-.04, SE=0.17, p>.05; WS: b=0.08, SE=0.05, p>.05).
Bowen et al., 2014 (3)	94 heterosexual couples (N=188) at workplace and in the evening at home with partner in the US;	Global subjective stress (scale range: 1-4)	1 day; every 30 minutes	concurrent	<u>SBP</u> : Positive association (p<.01) <u>DBP</u> : Positive association (p<.05)

	$M_{age}=29.6$ ($SD=8.6$), female: 50%				
Brondolo et al., 2003 (4)	104 participants in the US; $M_{age}=30$ ($SD=7.7$, range=18-46); female: 62%	Severity of acute stressors regarding social interactions (scale range: 1-5)	1 day; every 20 minutes	concurrent	<u>SBP</u> : Positive association (WS: $b=1.97$, $SE=0.96$, $p<.05$; BS: $b=7.76$, $SE=4.94$, $p>.05$), <u>DBP</u> : Positive association (WS: $b=2.28$, $SE=0.59$, $p<.001$; BS: $b=2.49$, $SE=2.86$, $p>.05$) <u>HR</u> : No association (WS: $b=1.67$, $SE=0.89$, $p>.05$; BS: $b=-6.76$, $SE=3.83$, $p>.05$)
Buckley et al., 2004 (5)	36 Vietnam veterans (19 with post-traumatic stress disorder (PTSD), 17 without PTSD) in the US; $M_{age}=51.1$ ($SD=3.3$) with PTSD; $M_{age}=53.4$ ($SD=3.1$) without PTSD; female: 0%	Global subjective stress (dichotomous scale: 0/1);	1 day; every 20 minutes	concurrent	Moderation effect of PTSD was included in the following models: <u>SBP</u> : No association (WS: $b=-2.99$, $SE=2.76$, $p>.05$) <u>DBP</u> : No association (WS: $b=-1.48$, $SE=1.88$, $p>.05$) <u>HR</u> : No association (WS: $b=-4.53$, $SE=2.55$, $p>.05$)
Carels et al., 2003 (6)	45 participants with congestive heart failure in the US; $M_{age}=66$ ($SD=11.7$); female: 39%	Severity of acute stressors at work: job demands (scale range: 1-5)	1 day; exposure: 2 times/hour outcome: continuously (aggregated per hour)	1 hour	<u>Frequency of premature ventricular contractions</u> : No association (WS: $b=1.1$, $SE=11.1$, $p=.92$) <u>Frequency of repetitive premature ventricular contractions</u> : No association (WS: $b=0.2$, $SE=7.3$, $p=.982$) <u>Tachycardia</u> : No association (WS: $b=1.6$, $SE=2.7$, $p=.544$)
Conley & Lehman, 2012 (7)	99 undergraduate students in the US; $M_{age}=21$; female: 70%	Occurrence of acute and anticipated stressors in education (dichotomous scale: 0 = no stressor occurred, 1 = stressor occurred);	4 days exposure: daily outcome: hourly	1 hour	<u>SBP</u> : Positive association with acute stressors (WS: $b=3.80$, $SE=1.21$, $p=.002$). No association with anticipated stressors (WS: $b=-0.53$, $SE=0.56$, $p=0.345$); <u>DBP</u> : No association with acute stressors (WS: $b=1.29$, $SE=1.14$, $p=.259$) or anticipated stressors (WS: $b=0.28$, $SE=0.50$, $p=.581$); <u>HR</u> : No association with acute academic stressors (WS: $b=2.32$, $SE=1.65$, $p=.163$) or anticipated academic stressor (WS: $b=-0.63$, $SE=0.68$, $p=.357$)
Dennis et al., 2016 (8)	219 participants with PTSD and without PTSD in the US; $M_{age}=30.32$	Global subjective stress (scale range: 0-4);	1 day; exposure: not reported; outcome: continuously	5 minutes	<u>HRV (low frequency domain)</u> : Negative association (WS: $b=-1.14$, $SE=0.37$, $p<.01$; BS: $b=0.44$, $SE=1.24$, $p>.10$) <u>HRV (High frequency domain)</u> : No association (WS: $b=-0.57$, $SE=0.31$, $p<.10$; BS: $b=1.06$, $SE=1.02$, $p>.10$) <u>HR</u> : No association (WS: $b=0.49$, $SE=0.30$, $p>.10$; BS: $b=-0.94$, $SE=1.01$,

(SD=5.42, range=18-39) with PTSD; $M_{age}=27.8$ (SD=5.47, range=18-39) without PTSD; female: 49% with PTSD; 53% without PTSD

$p>.10$)

Enkelmann et al., 2005 (9)	108 male police patrol officers at shift with patrol duties in Singapore; $M_{age}=26.9$ (SD=5.7); female: 0%	Severity of acute stressors in social interactions	1 day; every 30 minutes	10 minutes	<u>SBP/DBP</u> : No main effects reported
French, 2017 (10)	100 full-time workers in the US; $M_{age}=33.09$ (SD=9.09); female: 63%	Occurrence of acute stressors regarding work-family conflict (momentary conflict - dichotomous scale: 0/1; accumulated conflict - sum of conflicts)	3 days; 8 times/day	2 hours	<u>SBP</u> : No association with momentary ($\beta=-1.40$, $p=.09$) of daily accumulated ($\beta=0.18$, $p=.63$) work-to-family conflict and momentary family-to-work conflict ($\beta=-0.11$, $p=.88$), positive association with daily accumulated family-to-work conflict ($\beta=0.68$, $p<.01$) <u>DBP</u> : no association with momentary ($\beta=0.46$, $p=.05$) and daily accumulated ($\beta=-0.01$, $p=.98$) work-to-family conflict and momentary ($\beta=0.93$, $p=.15$) and daily accumulated ($\beta=0.24$, $p=.24$) family-to-work conflict <u>HR</u> : No association with momentary ($\beta=0.69$, $p=.47$) or daily accumulated ($\beta=-0.54$, $p=.26$) work-to-family conflict. Negative association with momentary ($\beta=-1.97$, $p=.03$) and daily accumulated ($\beta=-0.92$, $p<.01$) family-to-work conflict
Gaggioli, 2013 (11)	6 participants in Italy; $M_{age}=22$; female: 50%	Severity of acute stressors: overall, in current activity and regarding social interactions (scale range: -0 - 3); global subjective stress (scale range: 1- 10)	7 days; exposure: 5-6 times/day outcome: continuously	12 minutes	<u>HR</u> : HR measured between 4 to 0 minutes before, was positively correlated with severity of acute stressors ($r=0.173$, $p=.032$) and global subjective stress ($r=0.205$, $p=.004$). HR measured between 8 to 4 minutes before, was positively correlated with severity of acute stressors ($r=0.175$, $p=.031$) and global subjective stress ($r=0.176$, $p=0.014$). HR measured between 12 to 8 minutes before, was positively correlated global stress ($r=0.168$, $p=0.021$) but not with severity of acute stressors ($r=0.151$, $p=.066$). No significant correlation between HR and severity of acute stressors in current activity and social interactions.
Gallo et al., 2006 (12)	205 adolescents on school days in the US; Age Range 14-16; female: 50%	Severity of acute stressors regarding social interactions: conflicting social	2 days; every 30 minutes	10 minutes	Moderation effects of attachment were included in those models: <u>SBP</u> : No association with pleasant/unpleasant interactions ($b=0.23$, $SE=0.16$, $p>.10$) and conflicting interactions ($b=0.05$, $SE=0.19$, $p>.10$) <u>DBP</u> : Positive association with pleasant/unpleasant interaction ($b=0.24$, $SE=0.10$, $p<.05$). No direct association with conflicting interaction ($b=0.13$,

interactions and pleasant/unpleasant social interactions (scale range: 1-6)

SE=0.12, $p > .10$)
 HR: No association with pleasant/unpleasant interaction ($b=0.30$, SE=0.13, $p < .10$) or conflicting interaction ($b=-0.02$, SE=0.14, $p > .10$)

Hawkey et al., 2003 (13)	70 undergraduate students in the US; $M_{age}=19.2$ (SD=1.0); female: 50%	Severity of acute stressors in current activity (scale range: 1-5)	1 day; 9 times/day	concurrent	<u>SBP, DBP, mean ambulatory blood pressure, HR, pre-ejection period, respiratory sinus arrhythmia or stroke volume</u> : no association
Ilies et al., 2010 (14)	64 university employees in the US; $M_{age}=42.58$ (SD=9.44); female: 80%	Severity of acute stressors at work: job demands (scale range: 1-5)	10 days; 3 times/day (aggregated per day)	concurrent	<u>SBP</u> : Positive association (WS: $b=2.48$, $\beta=0.16$, $t=1.81$, $p < .05$)
Johnston et al., 2016 (15)	100 Nurses at working shifts in medical and surgical wards in Scotland; $M_{age}=36.4$; female: 93%	Severity of acute stressors at work – job demands, work effort (dichotomous rating scale: 0/1)	2 days; exposure: every 90 minutes outcome: continuously	concurrent	HR: Positive association with demands (WS: $\beta=0.84$, SE=0.11, $p < .05$; BS: $\beta=2.86$, SE=1.11, $p < .05$) and effort (WS: $\beta=0.86$, SE=0.14, $p < .05$; BS: $\beta=3.25$, SE=1.40, $p < .05$).
Kamarcik et al., 2002 (16)	340 older adults in the US; M_{age} = not reported; female: 51%	Severity of acute stressors at work: job demands and regarding social interactions (scale range: 1-4)	6 days; every 45 minutes	10 minutes	<u>SBP</u> : Positive association with job demands (WS: $b=0.18$, $p < .05$, BS: $b=0.15$, $p < .01$) and social interactions (WS: $b=0.41$, $p < .05$, BS: $b=0.04$, $p > .05$). <u>DBP</u> : Positive association with job demands (WS: $b=0.26$, $p < .0001$, BS: $b=0.12$, $p < .05$) and social interactions (WS: $b=0.17$, $p < .0001$, BS: $b=0.01$, $p > .05$).
Kamarcik et al., 2018 (17); Thomas et al., 2019 (18)	477 working midlife adults in the US; $M_{age}=42.7$ (SD=7.3, range=30-54); female: 52%	Occurrence of acute stressors at work: task strain - ratio between demands and control (dichotomous scale: 1 = high demands and low control, 0 = all other conditions) and regarding social	4 days; hourly	10 minutes	<u>SBP</u> : Positive association with task strain (WS: $b=0.67$, $p=.003$) and social interactions (WS: $b=0.47$, $p=.003$) <u>DBP</u> : Positive association with task strain (WS: $b=0.63$, $p < .001$). No association with social interactions (WS: $b=0.16$, $p=.16$)

		interactions (scale range: 1-6)			
Kamarc et al., 1998 (19)	120 full time workers as part of the Pittsburgh study in the US; M _{age} =35 (range=23-50); female: 53%	Severity of acute stressors at work: job demands (dichotomous rating scale: 0/1) and regarding social interactions (scale range: 1-4)	6 days; every 45 minutes	10 minutes	<u>SBP</u> : No association with job demands (WS: b=-0.29, p=.06) or social interactions <u>DBP</u> : No association with job demands or social interactions <u>HR</u> : No association with social interactions. Positive association with job demands (WS: b=0.50, p<.05).
Luecken et al., 2009 (20)	91 undergraduate students (loss group experienced childhood parental death, control group did not experience childhood parental death) in the US; age range=18-29; female: 63%	Occurrence of any acute stressors (dichotomous scale: 0/1)	1 day; every 30 minutes	30 minutes	<u>SBP</u> : Positive association (WS: b=1.8, t(2179)=3.2, p=.001) <u>DBP</u> : Positive association (WS: b=1.0, t(2247)=2.2, p=.031)
Lumley et al., 2014 (21)	40 female managers at work working in private or public sectors in Sweden; M _{age} =36.03 (SD=4.81); female: 100%	Global subjective stress (scale range: 1-6);	1 day; exposure: 3-14 times outcome: continuously	concurrent	<u>HR</u> : Positive association (WS: b=0.94, p.018)
Määttäen et al., 2021 (22)	44 students in Finland; M _{age} =25.0 (SD=5.4, range 20-47), female: 80%	Occurrence of any acute stressor (dichotomous scale)	3-5 days; exposure: every 45 minutes outcome: continuously	concurrent	<u>HRV – SDNN</u> : No association (WS: p=0.09-0.44)
Pieper et al., 2007	73 teachers at secondary schools in the	Occurrence of any acute stressor	4 days; exposure: hourly	Pieper et al. 2007: 1 hour; Pieper et al.	<u>Pieper et al., 2007 (23)</u> : <u>HR</u> : Positive association (b=2.75, SE=0.77, CI=1.98-3.52, z=3.55, p<.001)

(23)/ Pieper et al., 2010 (24)	Netherlands; M _{age} =24.4 (SD=3.5); female: 33%	(dichotomous scale: 0/1)	outcome: continuously	2010: 15 minutes, 1 hour, 2 hours	<u>RMSSD</u> : No association (b=-0.05, SE=0.03, p=.098) <u>Pieper et al., 2010 (24)</u> : <u>HR</u> : No association <u>RMSSD</u> : No association
Pollard et al., 2007 (25)	33 university employees in non-manual jobs at working days in UK; M _{age} =43.1 (SD=9.8); female: 100%	Global subjective stress (scale range: 1-7)	2 days; 6 times/day	1 hour	<u>SBP</u> : Positive association (WS: b=1.39, t=3.65, p<.001) <u>DBP</u> : Positive association (WS: b=0.88, t=2.93, p=.004) <u>HR</u> : Positive association (WS: b=0.98, t=2.69, p=.008)
Potter, 2019 (26)	26 adults being overweight in the US; M _{age} = 27.51 (SD=9.83); female: 56%	Global subjective stress (scale range: 0-4)	7 days; exposure: 6 times/day outcome: continuously	concurrent	<u>HR</u> : No association (b=2.31-2.46, SE=4.37-4.39, p=.57-.60)
Schilling et al., 2020 (27)	173 police workers in Switzerland; M _{age} = 37.64 (SD=9.80); female: 34%	Global subjective stress (scale range: 1-5)	2 days; exposure: 8 times/day outcome: continuously	concurrent	Moderation effect of cardiorespiratory fitness was included in the model: <u>HRV - RMSSD</u> : No association (WS: β=-0.02, SE=0.03, p=0.437)
Schmid & Thomas, 2020 (28)	101 school teachers in Germany; M _{age} = 42.87 (SD=11.46); female: 69%	Severity of acute stressors at work (scale range: 1- 7)	2 days; exposure: 6 times/day outcome: continuously	2 hours	<u>HRV - RMSSD</u> : No association (WS for emotional demands: b=0.00, SE=0.01, P=0.736; WS for time pressure: b=-0.02, SE=0.01, p=0.06)
Schwerd tfefer & Dick, 2019 (29)	43 male firefighters at work in Germany; M _{age} =32.7 (SD=6.9); female: 0%	Severity of acute stressors at work (dichotomous rating scale: 1 = baseline - 3 = high stressful emergency operations)	1 day; exposure: hourly outcome: continuously	1 hour	Moderation effects of resilience were included in those models: <u>HRV</u> : lnRMSSD was negatively associated with stressful emergency- operations (b=-0.23, SE=0.08, 95% CI=-0.39 - -0.08). lnSDNN tended to be negatively associated with stressful emergency operations (b=-0.12, SE=0.06, 95%CI = -0.24 - 0.00).
Shockle y et al., 2013 (30)	58 employees in the US; M _{age} =37.5; female: 90%	Occurrence of acute stressors regarding work- family conflict (dichotomous rating scale: 0/1)	10 days; exposure: daily outcome: 4 times/day	not reported (approximately 6 hours)	<u>SBP</u> : No association with work-family conflict (WS: β=0.02, SE=0.01, p>.05), work-to-family conflict (WS: β=0.01, SE=0.01, p>.05) or family-to-work conflict (WS: β=0.01, SE=0.01, p>.05) <u>DBP</u> : No association with work-family conflict (WS: β=0.00, SE=0.02, p>.05), work-to-family conflict (WS: β=-0.01, SE=0.01, p>.05) or family-to-work conflict (WS: β=0.00, SE=0.02, p>.05) <u>HR</u> : Positive association with work-family conflict (WS: β=0.04, SE=0.02, p<.05) and family-to-work conflict (WS: β=0.05, SE=0.02, p<.01). No

Simon et al., 2020 (31)	174 adults in the US; M _{age} = 31.23 (SD=6.49, range 18-46); female: 50%	Global subjective stress (dichotomous scale: 0/1)	5 days; exposure: every 30 minutes outcome: continuously	not reported (approximately < 30 minutes)	association with work-to-family conflict (WS: $\beta=0.02$, SE=0.02, p>.05) HR: Positive association (WS: b=.93, SE=.19, p<.001) HRV-HF: Negative association (WS: b=-.02, SE=.01, p=.024) HRV-RMSSD: Negative association (WS: b=-.02, SE=.01, p=.006)
Smith et al., 2007 (32)	80 patients with acute myocardial infarction in the US; M _{age} = 57 (SD=11); female: 35%	Global subjective stress (scale range: 1-4)	1 day; exposure: every 30 minutes outcome: continuously (aggregated per hour)	concurrent	<u>Number of ventricular premature beats</u> : Positive association (WS: b=0.74, 95% CI=0.50-0.99 p<.001)
Uchino et al., 2006 (33)	214 middle-aged and older married couples in the US (N=428); M _{age} =52.8 (SD=10.0); female: 50%	Occurrence of any acute stressor (dichotomous rating scale: 0/1)	1 day; every 45 minutes	concurrent	<u>SBP</u> : No association <u>DBP</u> : Positive association (WS: b=1.71, p<.01)
Wong & Kelloway, 2016 (34)	55 care workers at work in Canada; M _{age} =43 (SD=9, range=25-62); female: 93%	Severity of acute stressors regarding social interactions (scale range: 1 - 5*)	1 day; hourly	15 minutes	<u>SBP</u> : Negative association (WS: b=-1.59, SE=0.68, 95% CI=-2.93- -0.24, p<.05)
Wrzus et al., 2013 (35)	89 participants in Germany; M _{age} =42.4 (SD=19.0); female: 55%	Acute stressors: circumscribed acute stressors = 1 life domain affected; complex acute stressor > 1 life domain affected (dichotomous scale: 0/1)	2 days; exposure: 6 times/day outcome: continuously	2 hours	Moderation effects of age were included in those models: <u>RMSSD</u> : No direct association with circumscribed (WS: b=-0.06, p>.05) and complex acute stressors (WS: b=-0.20, p>.05).

Notes. Abbreviations: b= unstandardized regression coefficient, β = standardized regression coefficient, BS = between-subject effect, DBP = Diastolic blood pressure, HF = high frequency, HR = Heart rate, HRV = Heart rate variability, RMSSD = root mean square of the successive differences, SBP = Systolic blood pressure, SD = standard deviation, SDNN = standard deviation of NN intervals, SE = standard error, WS= Within-subject effect;¹ Higher values correspond to more stress. If higher values correspond to lower stress, those scale ranges will be marked by an asterisk; * higher values correspond to lower stress

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