










Supplementary information to:

Original article:

**LOW SELF-REPORTED STRESS DESPITE IMMUNE-
PHYSIOLOGICAL CHANGES IN PARAMEDICS DURING RESCUE
OPERATIONS**

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SUPPLEMENTARY INFORMATION

Detailed description of the self-report questionnaires:

1. *Stress from rescue service specific stressors* was measured with the 19-item “Stress during rescue service mission Scale” (SIRE)¹ on a 5-point rating scale (1 = *very little* to 5 = *very high*). The scale consists of six subscales named *competence* (4 items), *violence* (3 items), *not self-inflicted external factors* (4 items), *emergency operation* (3 items), *migration* (2 items), and *unpredictable missions* (3 items). Seven items were added to the scale belonging to the subscales *interruptions* (3 items), *colleagues* (2 items), *alteration* (1 item) and *material* (1 item). The whole scale consists of 26 items. An example item is “My perceived stress during rescue service missions with patients, who penetrate my personal safe area, is ... “. Coefficient alpha for the whole scale was .82 and it ranged between .41 and .81 for the subscales. The SIRE was only filled in by the paramedics.

2. *Mental Stress* was assessed with the 8-item Irritation Scale² on a 7-point rating scale (1 = *not at all* to 7 = *almost totally true*). The scale consists of the two dimensions *emotional irritation* (5 items, e.g., “I get grumpy when others approach me.”) and *cognitive irritation* (3 items, e.g., “Even at home I often think of my problems at work.”). Coefficient alpha for the whole scale was .80 and the subscales were .83 (*emotional irritation*) and .86 (*cognitive irritation*).

3. *Subjective strain* was assessed with the German version³ of the Perceived Stress Questionnaire (PSQ)⁴ on a 4-point rating scale (1 = *hardly never* to 4 = *mostly*). The questionnaire consists of 20 items – four subscales with 5 items each. The subscales are named *tension* (e.g., “You feel tense”), *demands* (e.g., “You have too many things to do”), *joy* (e.g., “You are full of energy”), and *worries* (e.g., “You feel frustrated”). The coefficient alpha were .90 for the whole scale, .81 (*tension*), .76 (*demands*), .80 (*joy*) and .77 (*worries*).

4. *Chronic stress* was assessed with the Trier Inventory of Chronic Stress (TICS)⁵. The inventory consists of 57 items that are grouped into nine subscales named *work overload* (8 items), *social overload* (6 items), *pressure to perform* (9 items), *work discontent* (8 items), *excessive demands at work* (6 items), *lack of social recognition* (4 items), *social tensions* (6 items), *social isolation* (6 items) and *chronic worrying* (4 items). An example item is “I have too many tasks to perform”. The chronic stress was measured on a 5-point rating scale (0 = *never* to 4 = *very often*). The coefficient alpha of the whole scale was .93 and it ranged between .77 and .90 for the subscales.

5. *Detachment* was measured with the 16-item Recovery Experience Questionnaire⁶ on a 5-point rating scale (1 = *I do not agree at all* to 5 = *I totally agree*). The questionnaire consists of four subscales named *psychological detachment* (e.g., “During time after work I forget about

¹ Hagemann V, Holtz M. Entwicklung eines web-basierten Fragebogens zur Messung von "Stress im Rettungsdienst - SIRE". *Wirtschaftspsychologie*. 2016;18(1):78-90.

² Mohr G, Rigotti T, Müller A. Instrumente der Arbeits- und Organisationspsychologie. Irritation - ein Instrument zur Erfassung psychischer Beanspruchung im Arbeitskontext. Skalen- und Itemparameter aus 15 Studien. *Z Arb & Organisationspsychol A&O*. 2005;49:44-8.

³ Fliege H, Rose M, Arck P, Levenstein S, Klapp B. Validation of the "Perceived Stress Questionnaire" (PSQ) in a German sample. *Diagnostica*. 2001;47:142-52.

⁴ Levenstein S, Pranter C, Varvo V, Scribano ML, Berto E, Luzi C, et al. Development of the Perceived Stress Questionnaire: a new tool for psychosomatic research. *J Psychosom Res*. 1993;37:19-32.

⁵ Schulz P, Schlotz W, Becker P. Trierer Inventar zum chronischen Stress: TICS. Göttingen: Hogrefe, 2004.

⁶ Sonnentag S, Fritz C. The Recovery Experience Questionnaire: development and validation of a measure for assessing recuperation and unwinding from work. *J Occup Health Psychol*. 2007;12:204-21.

work”), *relaxation* (e.g., “During time after work I do relaxing things”), *mastery* (e.g., “During time after work I do things that challenge me”) and *control* (e.g., “During time after work I decide my own schedule”). Each subscale includes 4 items. Coefficient alpha for the whole scale was .80. For the subscales coefficient alpha were .91 (*psychological detachment*), .89 (*relaxation*), .93 (*mastery*) and .90 (*control*).

6. *Coping Strategies* were measured with 28 items on a 4-point rating scale (1 = *not at all* to 4 = *to a great extent*) based on the German Brief⁷ COPE (Coping Orientation to Problems Experienced)⁸. There are 13 subscales with 2 items (*acceptance, denial, positive reframing, behavioural disengagement, substance use, self-distraction, use of emotional support, humour, active coping, venting, planning, self-blame, religion*) and the subscale *use of instrumental support* that includes 4 items. To specify the subscale *use of instrumental support* we divided between professional advice, private advice and advices from colleagues, so that we had in total 30 items. An example item is “I’ve been making jokes about it.”. The coefficient alpha for the whole scale was .73 and it ranged between .31 and .92.

7. *Burnout risk* was measured with the German version⁹ of the Maslach Burnout Inventory (MBI)¹⁰. The two subscales *emotional exhaustion* (EE, e.g., “Working with people all day is really a strain for me”) and *depersonalisation* (DE, e.g., “I don’t really care much about what happens to some patients”) were used. These subscales consist of 14 items (9 for EE and 5 for DE) and were measured on a 6-point rating scale (1 = *not at all* to 6 = *very often*). The coefficient alpha was .81. For the subscale EE the coefficient alpha was .82 and for the subscale DE it was .74. An example item is “I feel used up at the end of the workday”.

8. *Positive and Negative Affect* were measured with a German version¹¹ of the Positive and Negative Affect Schedule (PANAS)¹² with 9 items for *positive affect* and 7 items for *negative affect*. The 5-point rating scale ranged from 1 (*not at all*) to 5 (*totally true*) and examples of the adjectives, which had to be rated, are interested or upset. The coefficient alpha were .76 for *positive affect* and .79 for *negative affect*.

9. *Work-related flow experience* was assessed with the 13-item Work-Related Flow Inventory (WOLF)¹³ on a 7-point rating scale (1 = *never* to 7 = *always*). The inventory consists of three subscales named *absorption* (e.g., “I get carried away by my work”), *work enjoyment* (e.g., “My work gives me a good feeling”) and *intrinsic work motivation* (e.g. “I work because I enjoy it”). The coefficient alpha for the whole scale was .91. For the subscale *absorption* (4 items) the coefficient alpha was .81, for *work enjoyment* (4 items) the coefficient alpha was .92 and for *intrinsic work motivation* (5 items) the coefficient alpha was .85.

⁷ Knoll N, Rieckmann N, Schwarzer R. Coping as a mediator between personality and stress outcomes: A longitudinal study with cataract surgery patients. *Eur J Pers.* 2005;19:229-47.

⁸ Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: A theoretically based approach. *J Pers Soc Psychol.* 1989;56:267-83.

⁹ Büssing A, Perrar K-M. Die Messung von Burnout. Untersuchung einer deutschen Fassung des Maslach Burnout Inventory (MBI-D). *Diagnostica.* 1992;38: 328-53.

¹⁰ Maslach C, Jackson SE. The measurement of experienced burnout. *J Organiz Behav.* 1981;2:99-113.

¹¹ Krohne HW, Egloff B, Kohlmann C-W, Tausch A. Untersuchungen mit einer deutschen Version der "Positive and negative Affect Schedule" (PANAS). *Diagnostica.* 1996;42:139-56.

¹² Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *J Pers Soc Psychol.* 1988;54: 1063-70.

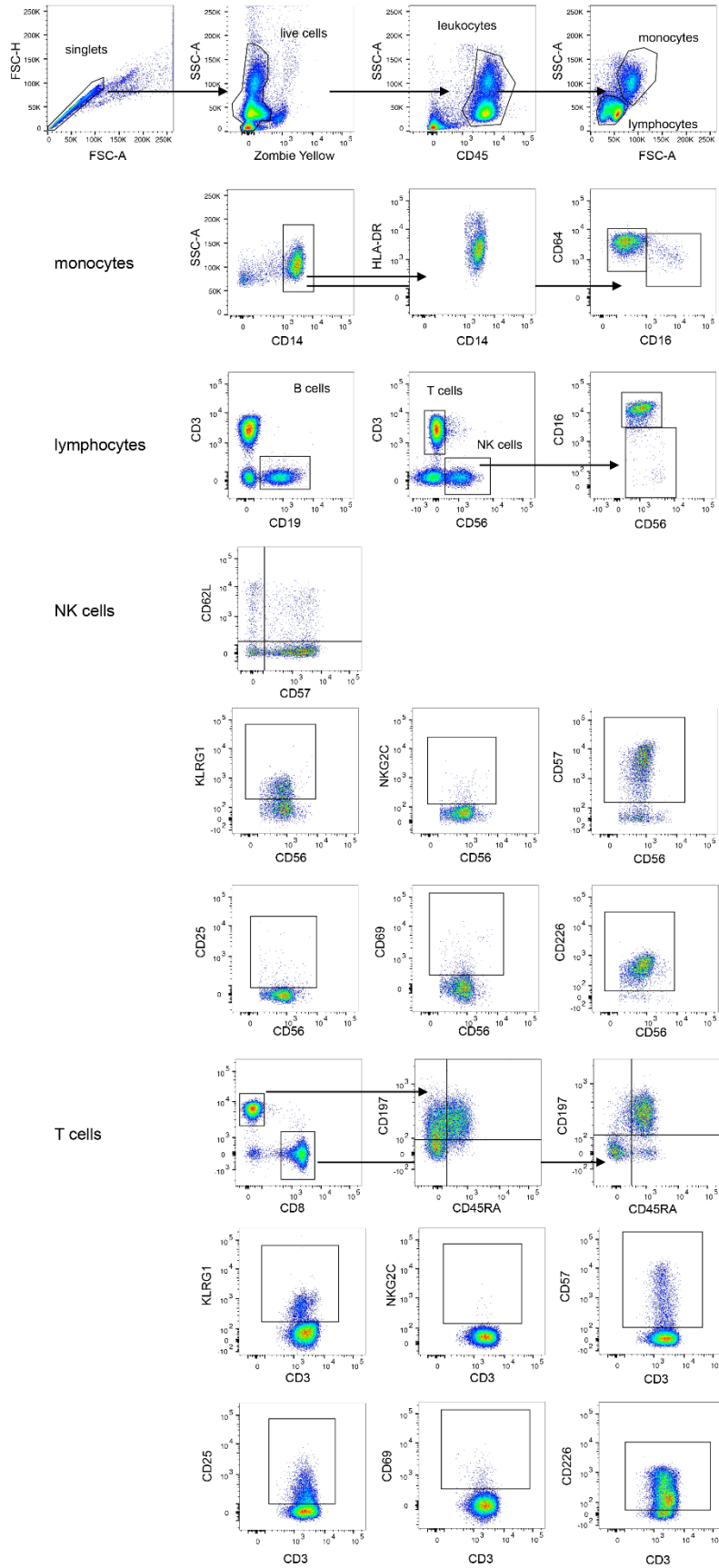
¹³ Bakker AB. The work-related flow inventory: Construction and initial validation of the WOLF. *J Vocat Behav.* 2008;72:400-14.

Supplementary Table 1: Scales, number of items and coefficient alpha

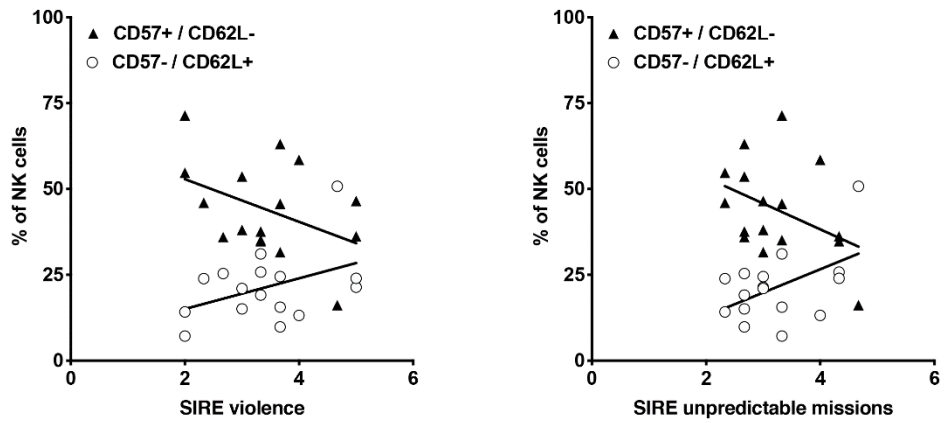
Scale	Items	Coefficient Alpha
SIRE	26	.82
competence	4	.58
violence	3	.81
not self-inflicted external factors	4	.81
emergency operation	3	.47
migration	2	.41
unpredictable missions	3	.68
interruptions	3	.54
colleagues	2	.46
alteration	1	
material	1	
Irritation Scale	8	.80
emotional irritation	5	.83
cognitive irritation	3	.86
PSQ	20	.90
tension	5	.81
demands	5	.76
joy	5	.80
worries	5	.77
TICS	57	.93
work overload	8	.90
social overload	6	.87
pressure to perform	9	.78
work discontent	8	.77
excessive demands at work	6	.79
lack of social recognition	4	.84
social tensions	6	.85
social isolation	6	.77
chronic worrying	4	.87
Recovery Experience Questionnaire	16	.80
psychological detachment	4	.91
relaxation	4	.89
mastery	4	.93
control	4	.90
COPE	30	.73
acceptance	2	.88
use of instrumental support	4	.61
denial	2	.63
positive reframing	2	.77
behavioural disengagement	2	.31
substance use	2	.92
self-distraction	2	.38
use of emotional support	2	.62
humour	2	.60
active coping	2	.37
venting	2	.55
planning	2	.51
self-blame	2	.83
religion	2	.33
MBI (two subscales)	14	.81
emotional exhaustion	9	.82
depersonalisation	5	.74
PANAS		
positive affect	9	.76
negative affect	7	.79
WOLF	13	.91
absorption	4	.81
work enjoyment	4	.92
intrinsic work motivation	5	.85

Supplementary Table 2: Tables of antibodies used for flow cytometry

panel	antigen	clone	fluorochrome	company	dilution 1/x
absolute cell count	CD19	HIB19	BV421	BD Horizon™	100
	CD3	UCHT1	BV510	BD Horizon™	100
	CD66b	G10F5	BB515	BD Horizon™	100
	CD56	B159	PerCP-Cy5.5	BD Pharmingen™	100
	CD14	MφP9	PE	BD Pharmingen™	100
	CD45	HI30	AF700	BD Pharmingen™	100
(1) general overview of lymphocytes / monocytes	CD19	HIB19	BV421	BD Horizon™	200
	CD3	UCHT1	BV510	BD Horizon™	400
	live / dead		zombie Yellow	Biolegend	1000
	CD16	3G8	FITC	BD Pharmingen™	200
	HLA-DR	G46-6	PerCP-Cy5.5	BD Horizon™	100
	CD14	MφP9	PE	BD Pharmingen™	500
	CD64	10.1	PE-Cy7	BD Pharmingen™	200
	CD56	B159	APC	BD Pharmingen™	50
	CD45	HI30	AF700	BD Pharmingen™	500
(2) memory and homing markers of NK cells and T cells	KLRG1	2F1	BV421	BD Horizon™	400
	CD3	UCHT1	BV510	BD Horizon™	400
	live / dead		zombie Yellow	Biolegend	1000
	CD8	RPA-T8	FITC	BD Pharmingen™	200
	CD28	CD28.2	PerCP-Cy5.5	BD Pharmingen™	100
	CD57	NK-1	PE	BD Pharmingen™	800
	CD56	B159	PE-CF594	BD Pharmingen™	100
	CD62L	DREG-56	PE-Cy7	BD Horizon™	200
	CD197	150503	AF647	BD Pharmingen™	50
	CD4	RPA-T4	APC-H7	BD Pharmingen™	100
	CD45RA	HI100	AF700	BD Pharmingen™	400
(3) activation and memory markers of NK cells and T cells	KLRG1	2F1	BV421	BD Horizon™	400
	CD3	UCHT1	BV510	BD Horizon™	400
	live / dead		zombie Yellow	Biolegend	1000
	NKG2C	134591	AF488	R&D Systems	100
	CD56	B159	PerCP-Cy5.5	BD Pharmingen™	50
	CD57	NK-1	PE	BD Pharmingen™	800
	CD25	M-A251	PE-Cy7	BD Pharmingen™	50
	DNAM-1	DX11	AF647	BD Pharmingen™	100
	CD69	FN50	APC-H7	BD Pharmingen™	100



Supplementary Figure 1: Gating strategy used for FACS analysis



Supplementary Figure 2: Correlation of paramedics NK cell subsets with the SIRE subscales “violence” and “unpredictable missions”