

Biomonitoring bei Arbeitnehmern mit stressassoziierten Beschwerden

Alexander Pilger

Institut für Arbeitsmedizin

Global burden of Disease Study 2010

Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010

Lancet 2012; 380: 2163–96

Theo Vos, Abraham D Flaxman, Mohsen Naghavi, Rafael Lozano, Catherine Michaud, Majid Ezzati, Kenji Shibuya, Joshua A Salomon, Safa Abdalla, Victor Aboyans, Jerry Abraham, Ilana Ackerman, Rakesh Aggarwal, Stephanie Y Ahn, Mohammed K Ali, Mohammad A AlMazroa, Miriam Alvarado, H Ross Anderson, Laurie M Anderson, Kathryn G Andrews, Charles Atkinson, Larry M Baddour, Adil N Bahadur, Suzanne Barker-Collins, Lope H Barrero, David H Bartels, Maria-Gloria Basáñez, Amanda Baxter, Michelle L Bell, Emelia J Benjamin, Derrick Bennett, Eduardo Bernabé, Kavi Bhalla, Bishal Bhandari, Boris Bikbov, Araf Bin Abdulhak, Gretchen Birbeck, James A Black, Hannah Blencowe, Jed D Blore, Fiona Blyth, Ian Bolliger, Audrey Bonaventure, Soufiane Boufous, Rupert Bourne, Michel Boussinesq, Fawaz Brathwaite, Carol Brayne, Lisa Bridgett, Simon Brooker, Peter Brooks, Traalach S Brugha, Claire Bryant-Hancock, Chiara Bucello, Rachele Buchbinder, Geoffrey Buckle, Christine M Budke, Michael Burch, Peter Burney, Roy Burstein, Bianca Calabria, Benjamin Campbell, Charles E Carter, Hélène Carabin, Jonathan Carapetis, Loreto Carmona, Claudia Cella, Fiona Charlson, Honglei Chen, Andrew Tai-Ann Cheng, David Chou, Sumeet S Chugh, Luc E Coffeng, Steven D Colan, Samantha Colquhoun, K Ellicott Colson, John Condon, Myles D Connor, Leslie T Cooper, Matthew Corriere, Monica Cortinovis, Karen Courville de Vaccaro, William Couser, Benjamin C Cowie, Michael H Criqui, Marita Cross, Kaustubh C Dabhadkar, Manu Dahiya, Nabila Dahodwala, James Damsere-Derry, Goodarz Danaei, Adrian Davis, Diego De Leo, Louisa Degenhardt, Robert Dellavalle, Allyne Delossantos, Julie Denenberg, Sarah Derrett, Don C Des Jarlais, Samath D Dharmaratne, Mukesh Dherani, Cesar Diaz-Torne, Helen Dolk, E Ray Dorsey, Tim Driscoll, Herbert Duber, Beth Ebel, Karen Edmond, Alexis Elbaz, Suad Eltahir Ali, Holly Erskine, Patricia J Erwin, Patricia Espindola, Stalin E Ewaigbokhan, Farshad Farzadfar, Valery Feigin, David T Felson, Alize Ferrari, Cleusa P Ferri, Eric M Fèvre, Mariel M Finucane, Seth Flaxman, Louise Flood, Kyle Foreman, Mohammad H Forouzanfar, Francis Gerry R Fowkes, Richard Franklin, Marlene Fransen, Michael K Freeman, Belinda J Gabbé, Sherine E Gabriel, Emmanuela Gakidou, Hammad A Ganatra, Bianca Garcia, Flavio Gaspari, Richard F Gillum, Gerhard Gmel, Richard Gosselin, Rebecca Grainger, Justina Groeger, Francis Guillemin, David Gunnell, Ramyani Gupta, Juanita Haagsma, Holly Hagan, Yara A Halasa, Wayne Hall, Diana Haring, Josep Maria Haro, James E Harrison, Rasmus Havmoeller, Roderick J Hay, Hideki Higashi, Catherine Hill, Bruno Hoen, Howard Hoffman, Peter J Hotez, Damian Hoy, John J Huang, Sydney E Ibeanusi, Kathryn H Jacobsen, Spencer L James, Deborah Jarvis, Rashmi Jasrasaria, Sudha Jayaraman, Nicole Johns, Just B Jonas, Ganesan Karthikeyan, Nicholas Kassebaum, Norito Kawakami, Andre Keren, Jon-Paul Khoo, Charles H King, Lisa Marie Knowlton, Olive Kobusingye, Adofo Koranteng, Rita Krishnamurthi, Ratilal Lalloo, Laura L Laslett, Tim Lathlean, Janet L Leasher, Yong Yi Lee, James Leigh, Stephen S Lim, Elizabeth Limb, John Kent Lin, Michael Lipnick, Steven E Lipshultz, Wei Liu, Maria Loane, Summer Lockett Ohno, Ronan Lyons, Jixiang Ma, Jacqueline Mabweijano, Michael F MacIntyre, Reza Malekzadeh, Leslie Mallinger, Sivabalan Manivannan, Wagner Marcenes, Lyn March, David J Margolis, Guy B Marks, Robin Marks, Akira Matsumori, Richard Matzopoulos, Bongani M Mayosi, John H McNulty, Mary M McDermott, Neil McGill, John McGrath, Maria Elena Medina-Mora, Michele Meltzer, Ziad A Memish, George A Mensah, Tony R Merriman, Ana-Claire Meyer, Valeria Miglioli, Matthew Miller, Ted R Miller, Philip B Mitchell, Ana Olga Mocumbi, Terrie E Moffitt, Ali A Mokdad, Lorenzo Monasta, Marcella Montico, Maziar Moradi-Lakeh, Andrew Moran, Lidia Morawska, Rintaro Mori, Michele E Murdoch, Michael K Mwaniki, Kevin Naidoo, M Nathan Nair, Luigi Naldi, K M Venkat Narayan, Paul K Nelson, Robert G Nelson, Michael C Nevitt, Charles R Newton, Sandra Nolte, Paul Norman, Rosana Norman, Martin O'Donnell, Simon O'Hanlon, Casey Olives, Saad B Omer, Katrina Ortblad, Richard Osborne, Doruk Ozgediz, Andrew Page, Bishnu Pahari, Jeyaraj Durai Pandian, Andrea Panozo Rivero, Scott B Patten, Neil Pearce, Rogelio Perez Padilla, Fernando Perez-Ruiz, Norberto Perico, Konrad Pesudovs, David Phillips, Michael R Phillips, Kelsey Pierce, Sébastien Pion, Guilherme V Polanczyk, Suzanne Polinder, C Arden Pope III, Svetlana Popova, Esteban Porrini, Farshad Pourmalek, Martin Prince, Rachel L Pullan, Kapa D Ramaiah, Dharani Ranganathan, Homie Razavi, Mathilda Regan, Jürgen T Rehm, David B Rein, Guiseppe Remuzzi, Kathryn Richardson, Frederick P Rivara, Thomas Roberts, Carolyn Robinson, Felipe Rodriguez De Leon, Luca Ronfani, Robin Room, Lisa C Rosenfeld, Lesley Rushton, Ralph L Sacco, Sukanta Saha, Uchechukwu Sampson, Lidia Sanchez-Riera, Ella Sanman, David C Schwebel, James Graham Scott, Maria Segui-Gomez, Saeid Shahrzad, Donald S Shepard, Hwasin Shin, Rupak Shivakoti, Donald Silberberg, David Singh, Gitanjali M Singh, Jasvinder A Singh, Jessica Singleton, David A Sleet, Karen Sliwa, Emma Smith, Jennifer L Smith, Nicolas J C Stapelberg, Andrew Steer, Timothy Steiner, Wilma A Stolk, Lars Jacob Stovner, Christopher Sudfeld, Sana Syed, Giorgio Tamburlini, Mohammad Tavakkoli, Hugh R Taylor, Jennifer A Taylor, William J Taylor, Bernadette Thomas, W Murray Thomson, George D Thurston, Imad M Tleyjeh, Marcello Tonelli, Jeffrey A Towbin, Thomas Truelsen, Miltiadis K Tsimbaris, Clotilde Ubeda, Eduardo A Undurraga, Marieke J van der Werf, Jim van Os, Monica S Vavilala, N Venketasubramanian, Mengru Wang, Wenzhi Wang, Kerianne Watt, David J Weatherall, Martin A Weinstock, Robert Weintraub, Marc G Weisskopf, Myrna Weissman, Richard A White, Harvey Whiteford, Steven T Wiersma, James D Wilkinson, Hywel C Williams, Sean R M Williams, Emma Witt, Frederick Wolfe, Anthony D Woolf, Sarah Wulf, Pon-Hsiu Yeh, Anita K M Zaidi, Zhi-Jie Zheng, David Zonies, Alan D Lopez, Christopher J L Murray†

Theo Vos

1465 x zitiert (bis 20.09.2016)

Years lived with disability

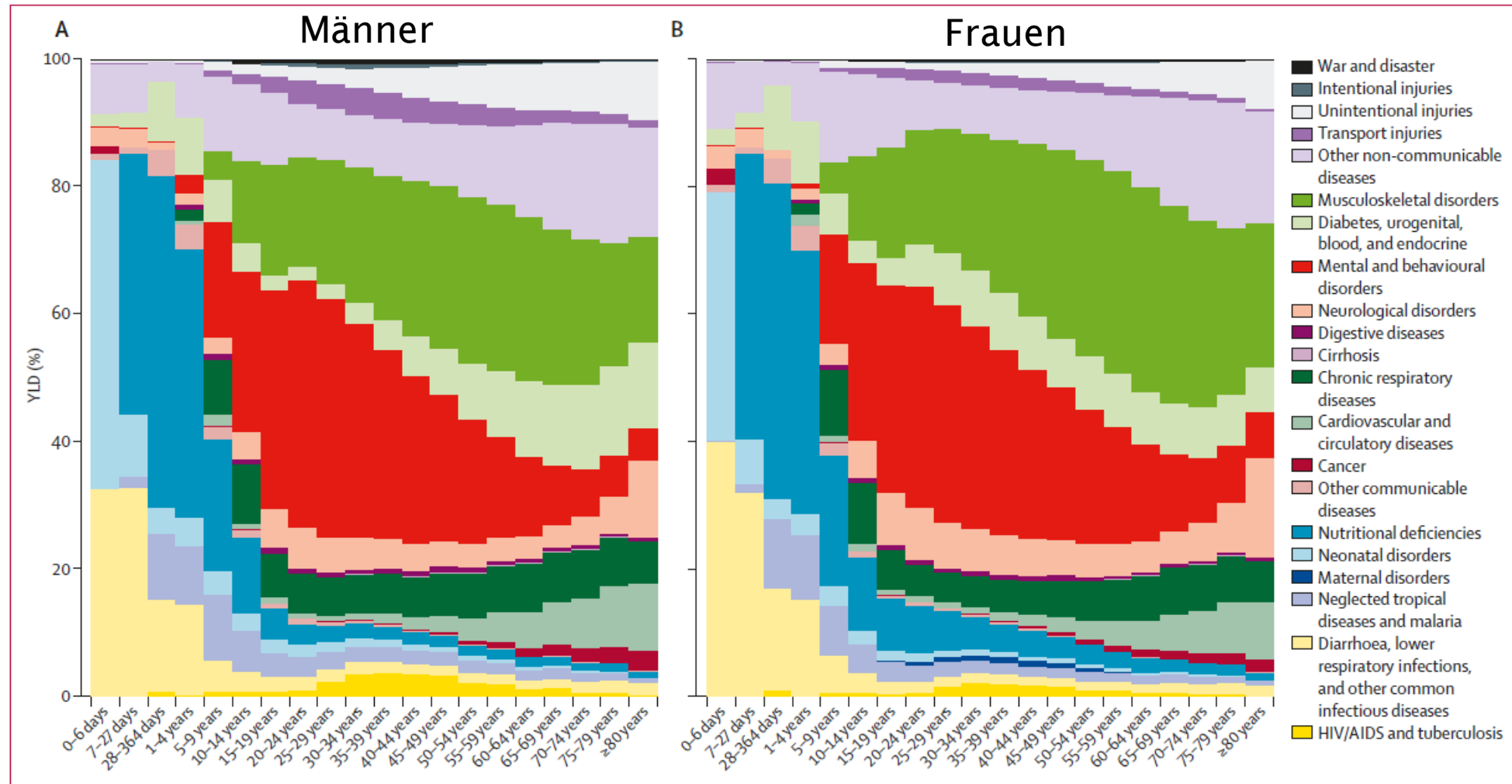
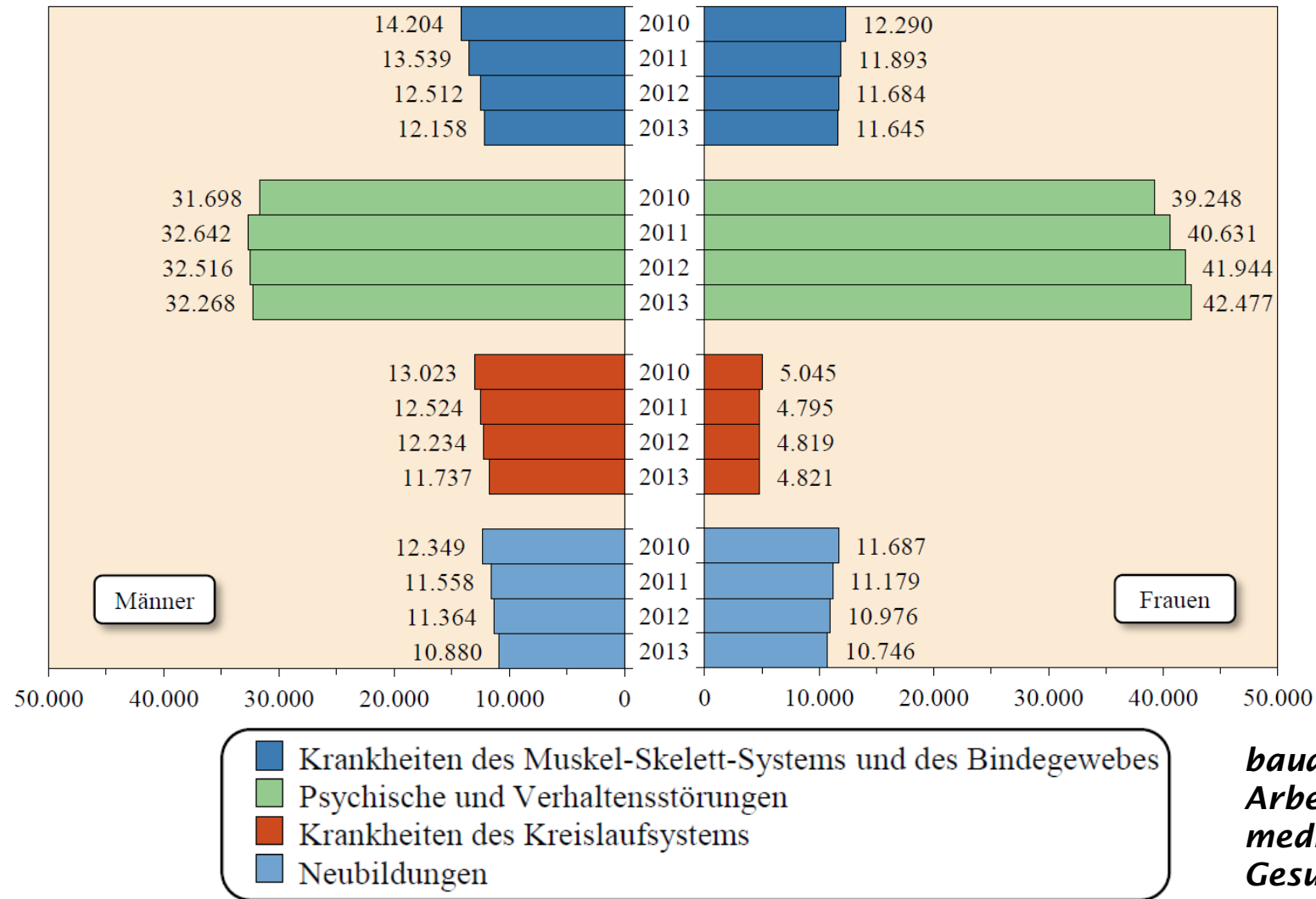


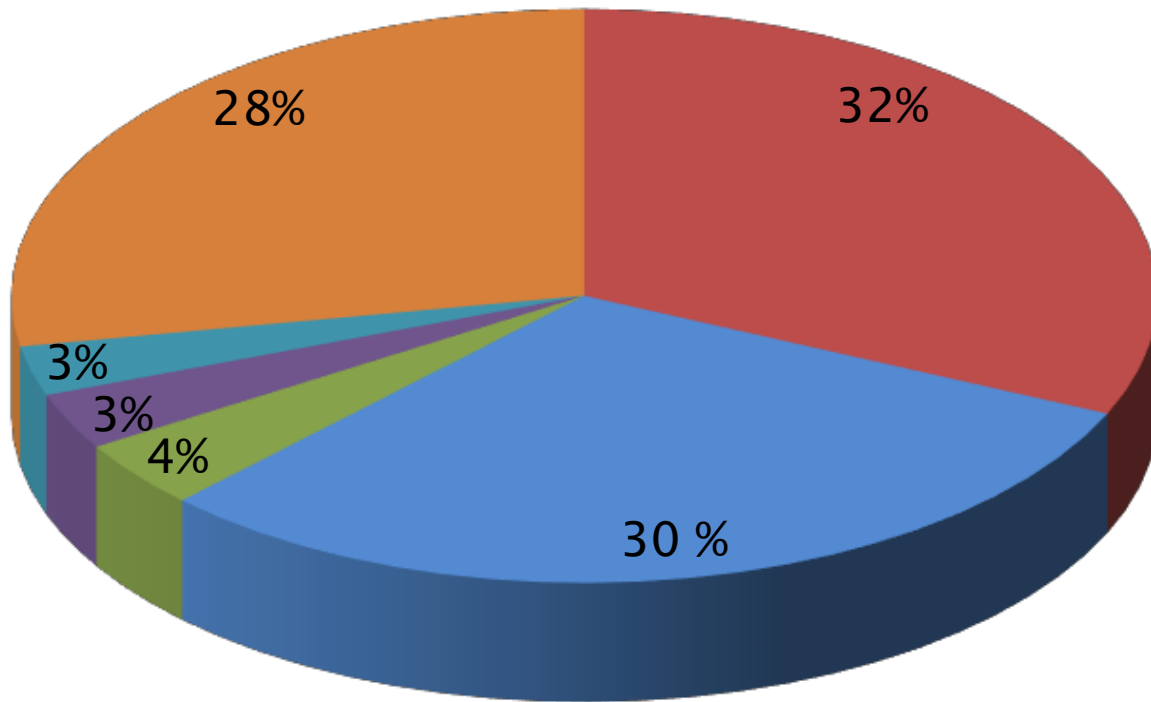
Figure 2: Percentage of years lived with disability (YLDs) in 2010, by cause and age

Rentenzugänge wegen verminderter Erwerbsfähigkeit (D)



baua – Bundesanstalt für Arbeitsschutz und Arbeitsmedizin: Sicherheit und Gesundheit bei der Arbeit 2013

Invaliditätsneuzuerkennungen – Österreich 2010



- Psychische Krankheiten (9.093 Fälle)
- Krankheiten des Muskel-Skelett-Systems
- Krankheiten des Nervensystems
- Krankheiten des Atmungssystems
- Ischämische Herzkrankheiten
- Sonstige Krankheiten

N = 28.649

Online-Psychosoziales Screening

<http://service.hera.co.at/psychoscreen>

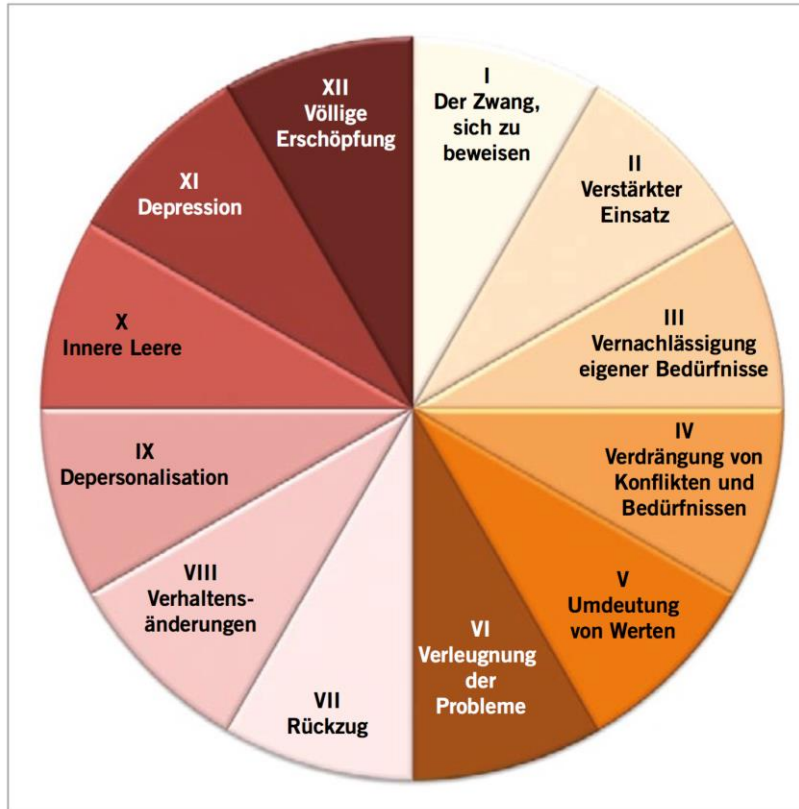


Abb. 1: 12-Phasen-Modell von Herbert Freudenberger und Gail North (1992). Die 12 Phasen sind verkürzt dargestellt; nähere Erläuterungen siehe Text (Quelle: Coaching, Empirische Sozialforschung und Gender-Research, 2013)

Fig. 1: 12-phase model of Herbert Freudenberger and Gail North (1992). The 12 phases are depicted in the abbreviated form; see text for more details (Source: Coaching, Empirical Social Research and Gender Research, 2013)

Ponocny E, Winker R. 12-Phasen-Burnout-Screening – Entwicklung, Implementierung und erste testtheoretische Analysen eines Burnout-Screenings. ASU 2014; 49: 927-935

Psychosoziales Screening

- Lebensstil (Ref.: 40 – 59)
- Bewegungsverhalten (Ref.: 40 – 59)
- Ernährungsverhalten (Ref.: 40 – 59)
- Sozialkontakte / Entspannung (Ref.: 40 – 59)
- Gesundheitsvorsorge (Ref.: 40 – 59)
- Stress (unauffällig < 60, leicht auff. 60 – 70, auffällig 70 – 80, sehr auffällig > 80)
- Angst (unauffällig < 7, leicht auffällig 8 – 11, auffällig 12 – 14, sehr auffällig 15 – 21)
- Depression (unauffällig < 7, leicht auffällig 8 – 11, auffällig 12 – 14, sehr auffällig 15 – 21)
- Sonstige Belastungen (2 Punkte pro starker Bel., 1 Punkt pro geringer Bel.)
- Alkoholkonsum (unauffällig, auffällig, riskant)



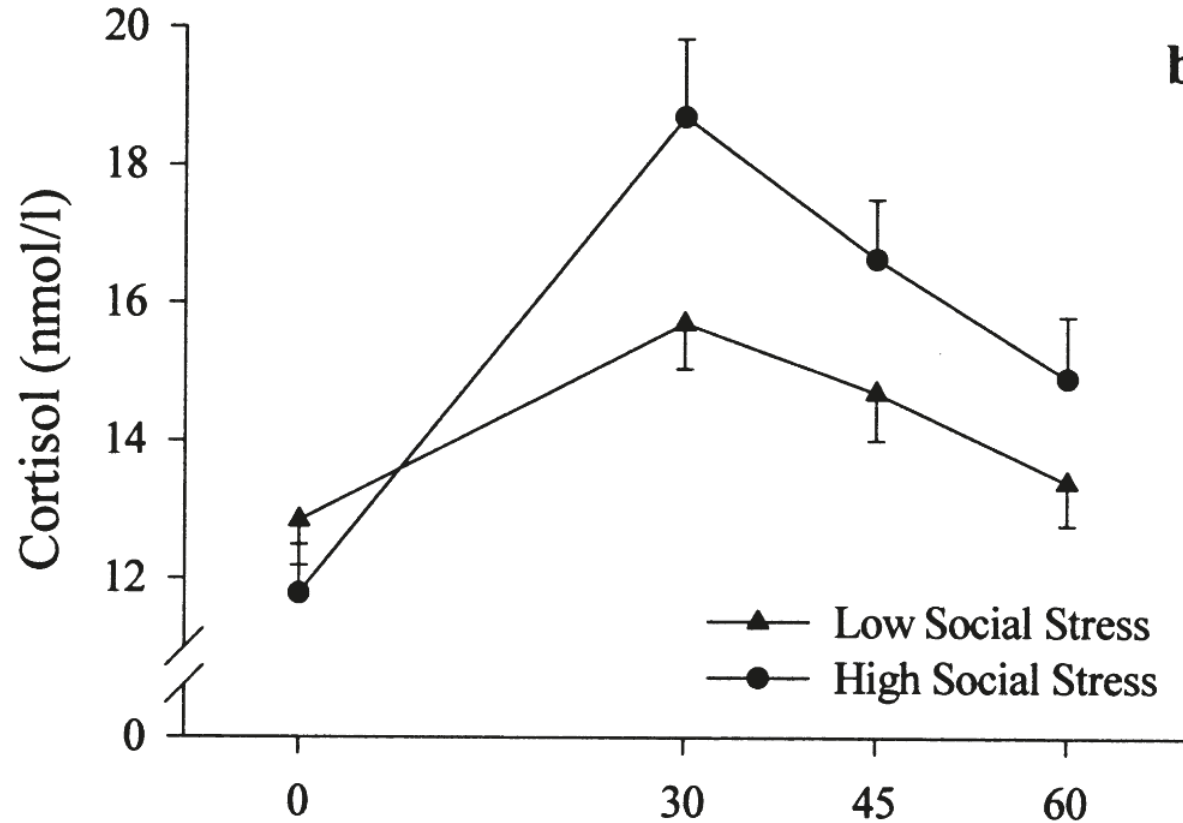
Untersuchung an Orchestermmitgliedern

Levels of cortisol, CRP, MPO, folic acid, Hcy, PON-1 activity, MDA and SAM ratings on the day of rehearsal and on the day of premiere.

Variable	Rehearsal		Premiere		n	p-Value
	Mean (SD)	Median (range)	Mean (SD)	Median (range)		
<i>Biological markers</i>						
Cortisol T1 (µg/dl)	.54 (.21)	.51 (.17–1.23)	.67 (.24)	.67 (.17–1.22)	44	.001 ^b
T2 (µg/dl)	.60 (.22)	.59 (.19–1.26)	.62 (.22)	.62 (.17–1.22)	46	.592 ^b
T3 (µg/dl)	.27 (.15)	.24 (.08–.79)	.39 (.20)	.38 (.08–.95)	45	<.001 ^b
T4 (µg/dl)	.20 (.14)	.16 (.05–.92)	.23 (.15)	.18 (.03–.63)	47	.169 ^b
T5 (µg/dl)	.19 (.19)	.13 (.02–1.00)	.20 (.12)	.17 (.02–.52)	47	.040 ^{a,†}
AUC (µg h/dl)	3.28 (1.09)	3.06 (1.74–6.47)	3.93 (1.32)	3.93 (1.76–6.28)	41	<.001 ^b
CRP (mg/dl)	.11 (.12)	.06 (.02–.51)	.12 (.15)	.06 (.02–.98)	48	.813 ^b
IL-6 (pg/ml)	2.98 (.60)	3.00 (1.78–4.74)	3.78 (.61)	3.84 (2.66–5.56)	48	.001 ^b
MPO (ng/ml)	124.5 (41.5)	125.3 (28.8–258.3)	149.3 (44.6)	146.4 (62.5–255.6)	48	<.001 ^b
Folic acid (nmol/l)	16.6 (6.0)	16.3 (6.1–31.2)	17.3 (7.0)	15.8 (8.9–41.0)	48	.138 ^b
Hcy (µmol/l)	11.0 (3.0)	10.6 (4.9–20.3)	11.5 (2.9)	10.7 (5.8–21.6)	48	.027 ^{b,†}
PON-1 activity (U/ml)	13.3 (2.3)	13.5 (9.4–19.1)	13.5 (2.4)	13.5 (9.0–21.0)	48	.219 ^b
MDA (µmol/l)	.15 (.02)	.15 (.10–19)	.15 (.02)	.15 (.12–.20)	48	.288 ^b

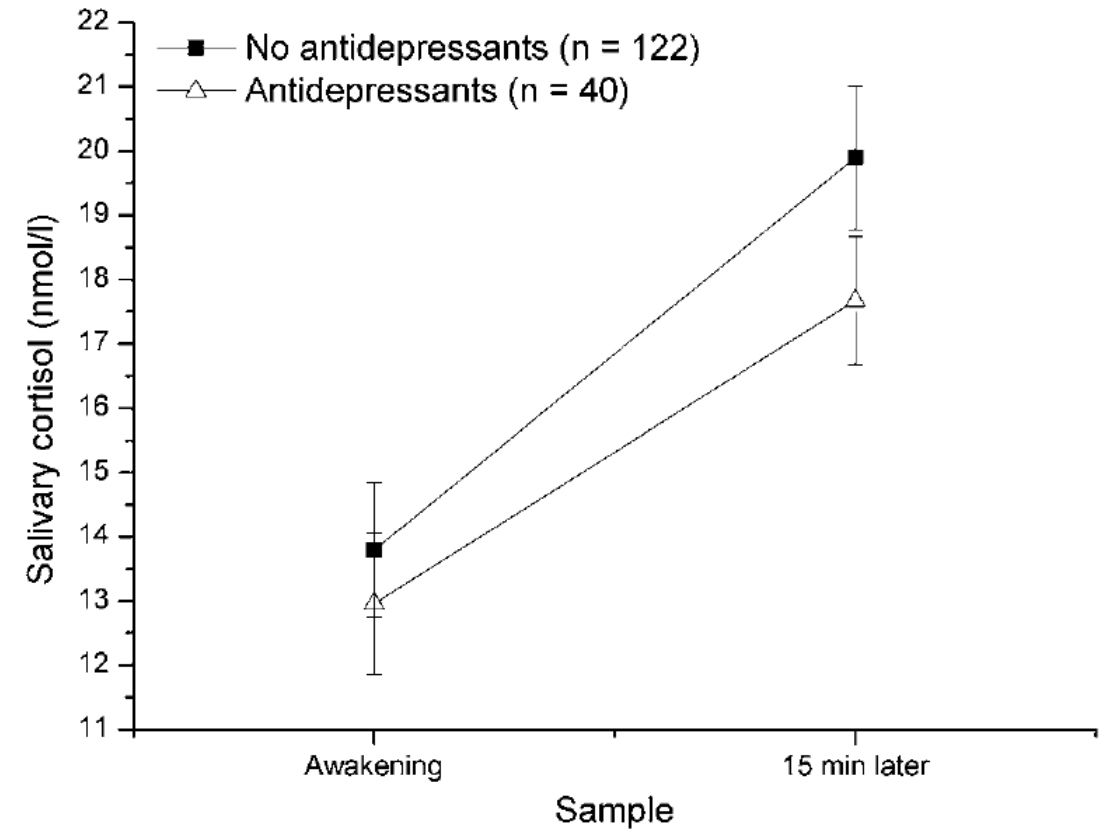
Pilger et al. (2014) Brain, Behavior, and Immunity 37:23-29

Zusammenhang zwischen Stress und Cortisol



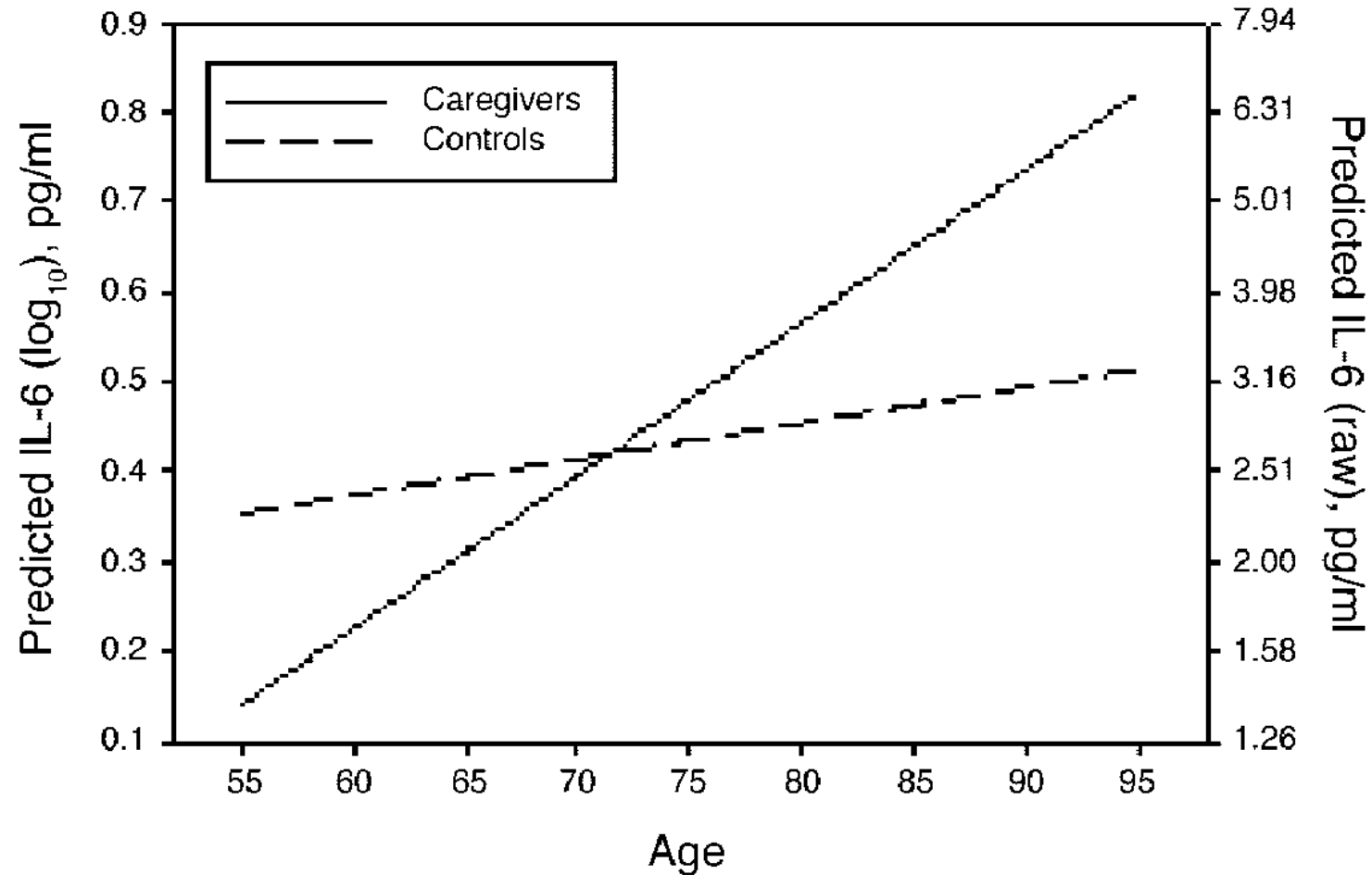
Wüst et al. (2000) *Psychoneuroendocrinology* 25:707-720

b



Sjörs et al. (2012) *BMJ Open* 2:e001091.
doi:10.1136/bmjopen-2012-001091

Chronischer Stress und IL-6



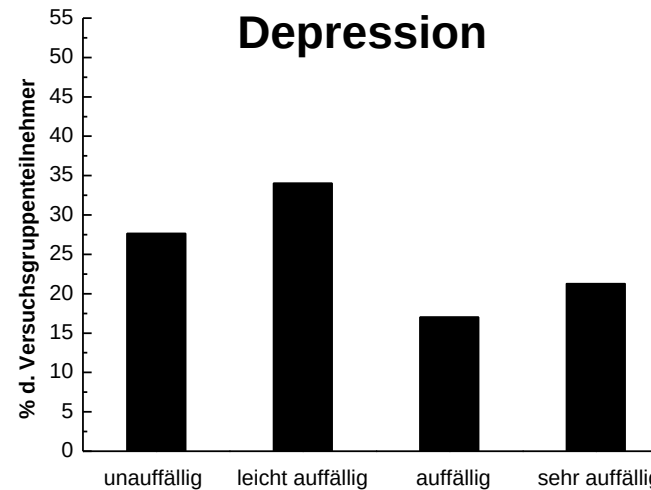
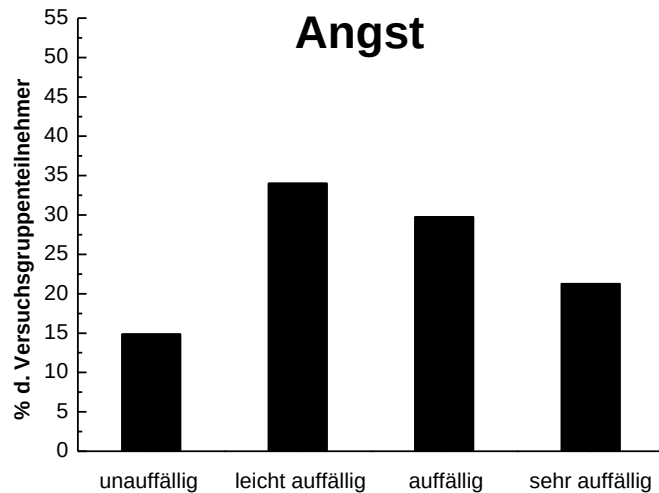
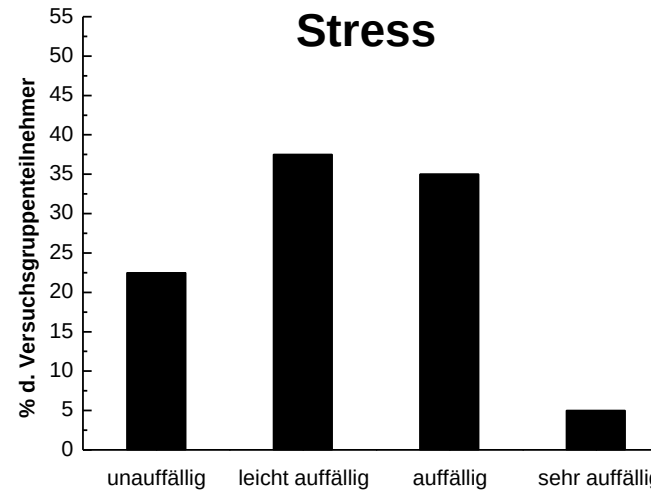
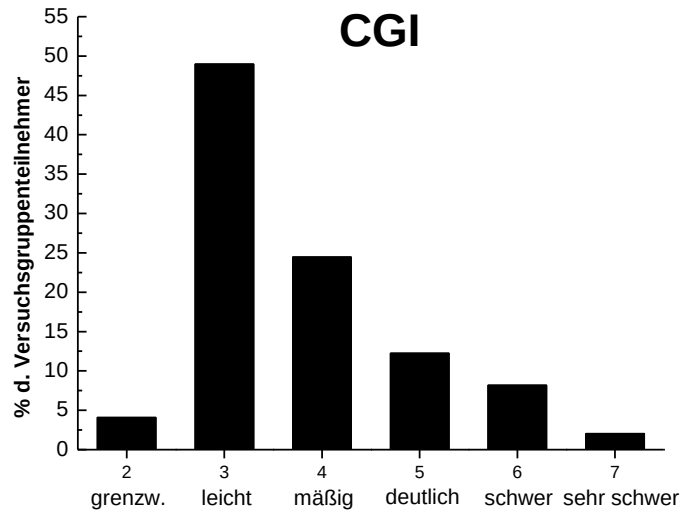
Kiecolt-Glaser et al. (2003) Chronic stress and age-related increases in the proinflammatory cytokine IL-6. PNAS 100:9090-9095.

Untersuchungsgruppen

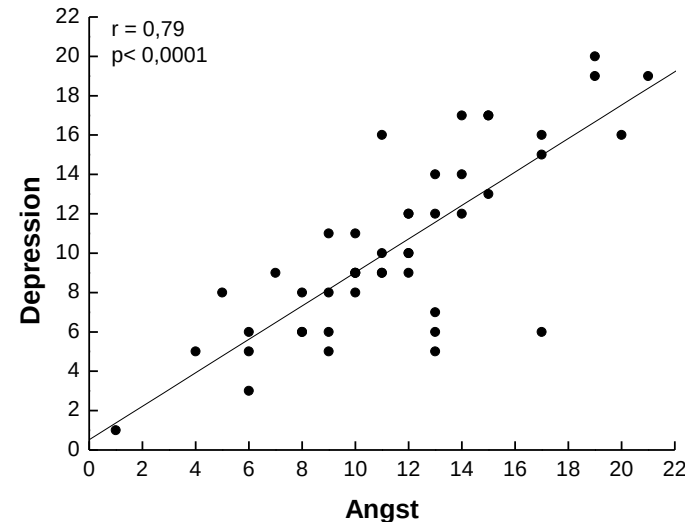
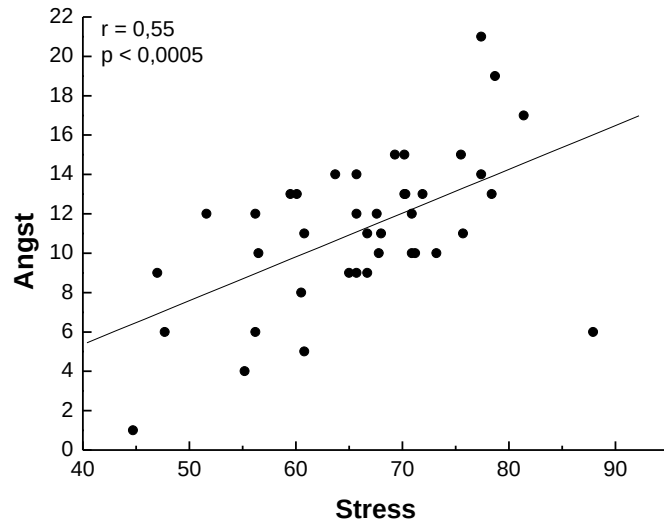
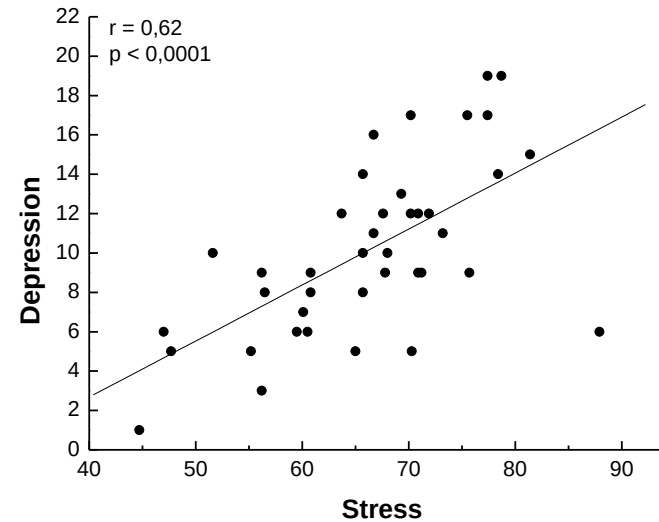
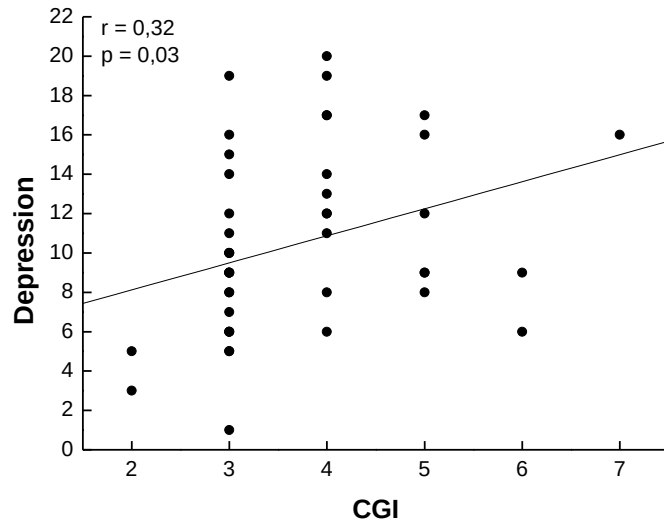
		Mittelwert $\pm$ SD	Bereich	n	%
V e r s u c h s g r u p p e	Alter	44,7 $\pm$ 10,5	[19 - 71]		
	BMI (kg/m ²)	27,4 $\pm$ 5,5*	[19,6 - 43,8]		
	Geschlecht				
	m			13	24
	f			41	76
	Rauchen				
K o n t r o l l i g r u p p e	ja			15	28
	nein			39	72
	Alter	41,3 $\pm$ 13,4	[21 - 74]		
	BMI (kg/m ²)	24,1 $\pm$ 3,7	[18,6 - 34,5]		
	Geschlecht				
	m			8	22
	f			28	78
	Rauchen				
	ja			4	11
	nein			32	89

*p = 0,002 (t-Test)

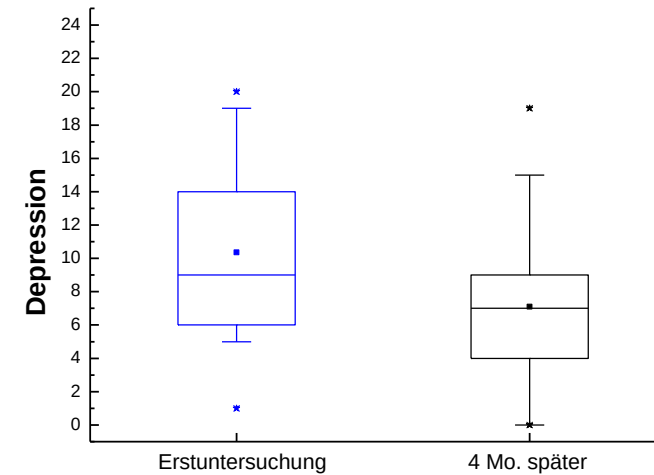
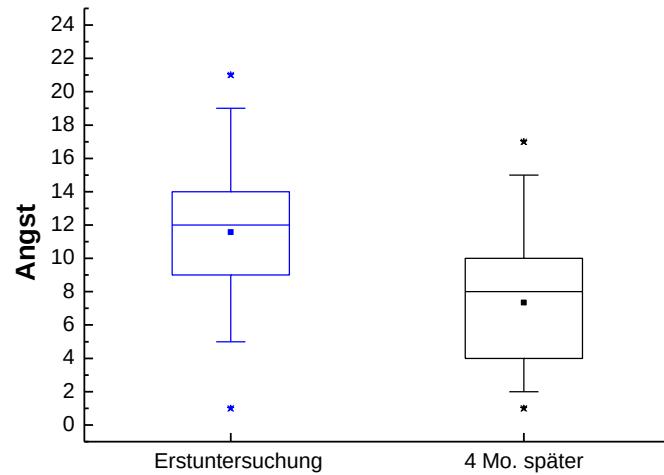
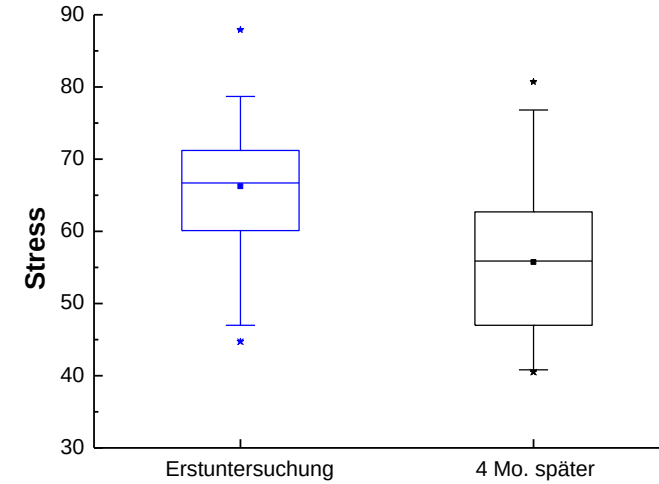
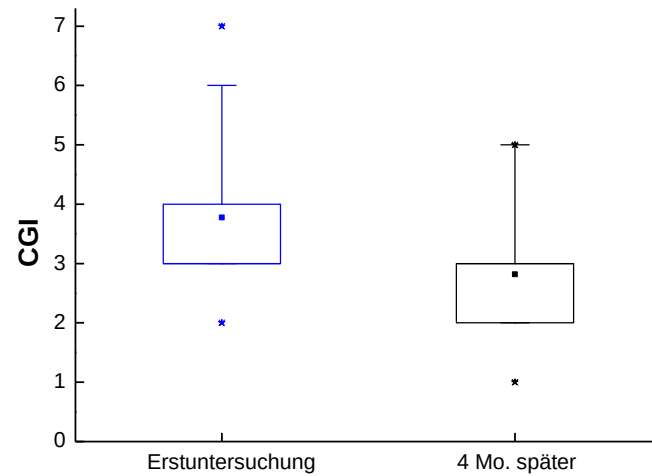
Psychosoziales Screening: Erstuntersuchung



CGI, Stress, Angst, Depression: Zusammenhänge

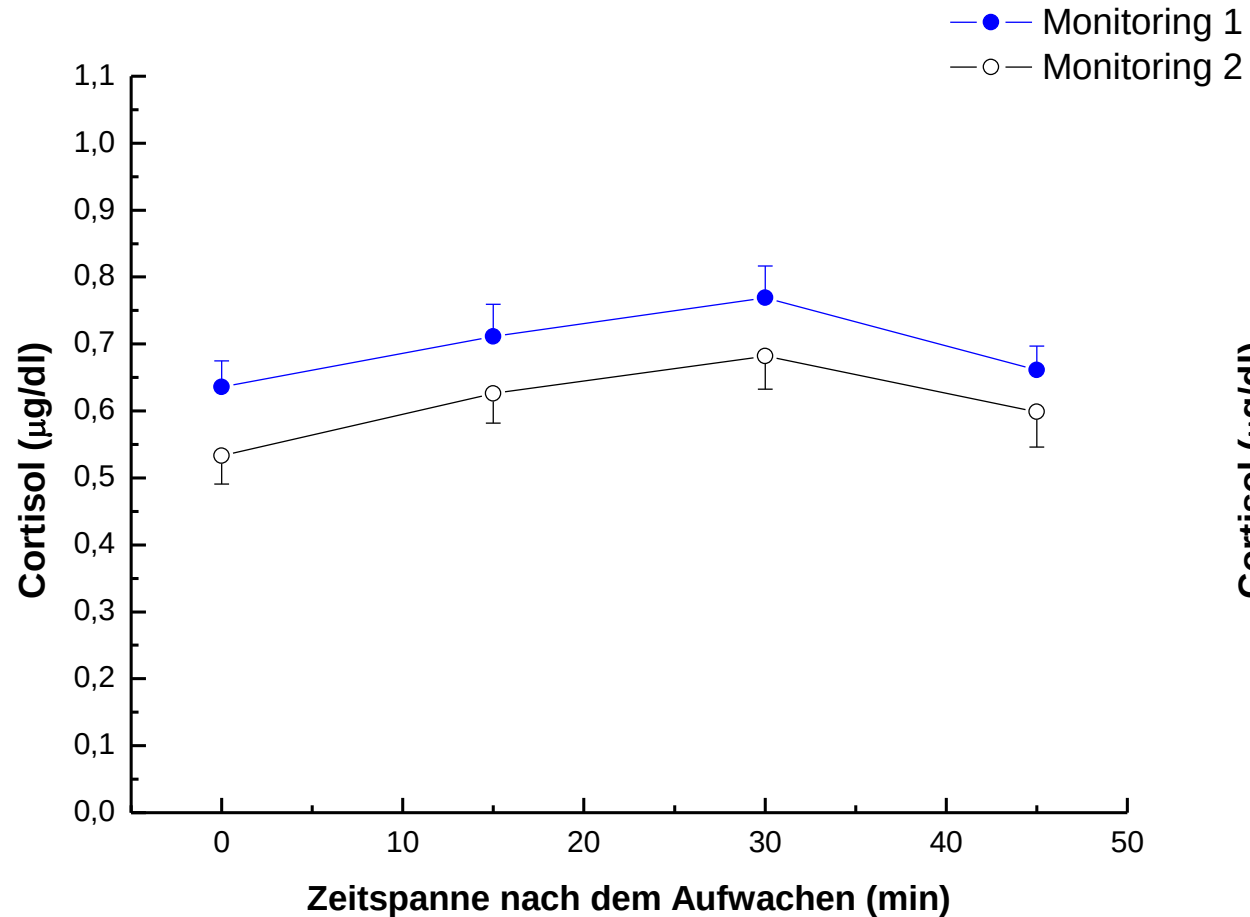


CGI, Stress, Angst, Depression: Interventionseffekte

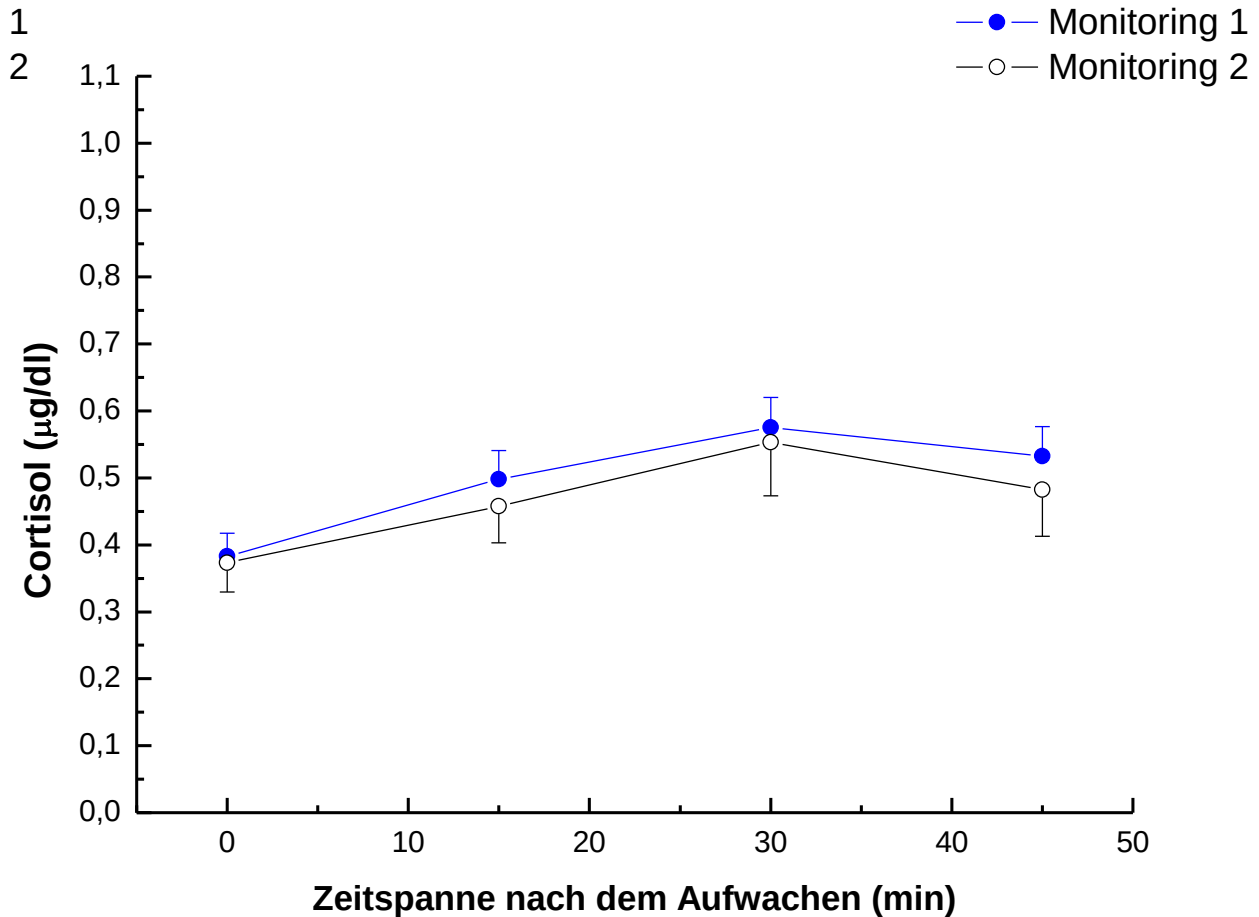


Cortisol-Response nach dem Aufwachen

Versuchsgruppe

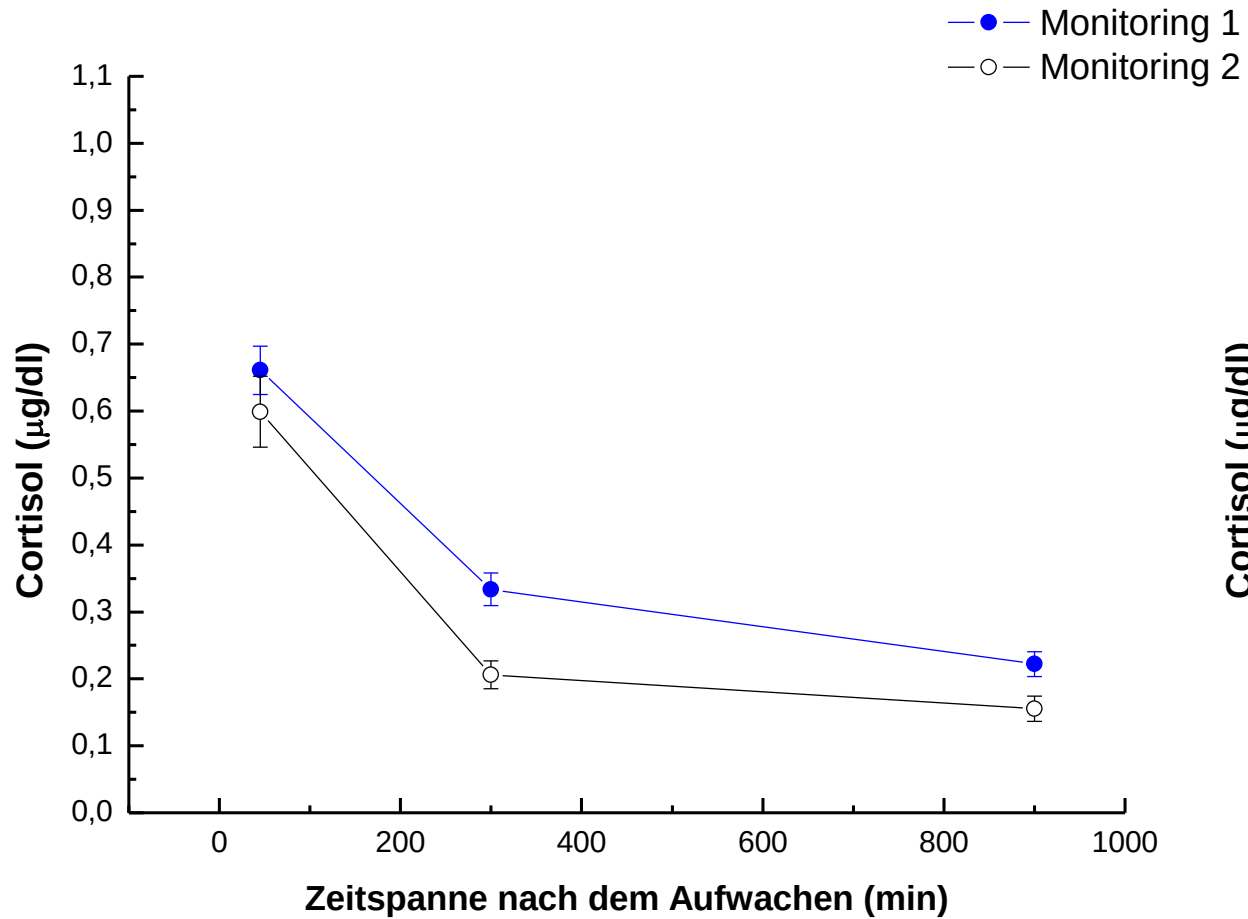


Kontrollgruppe

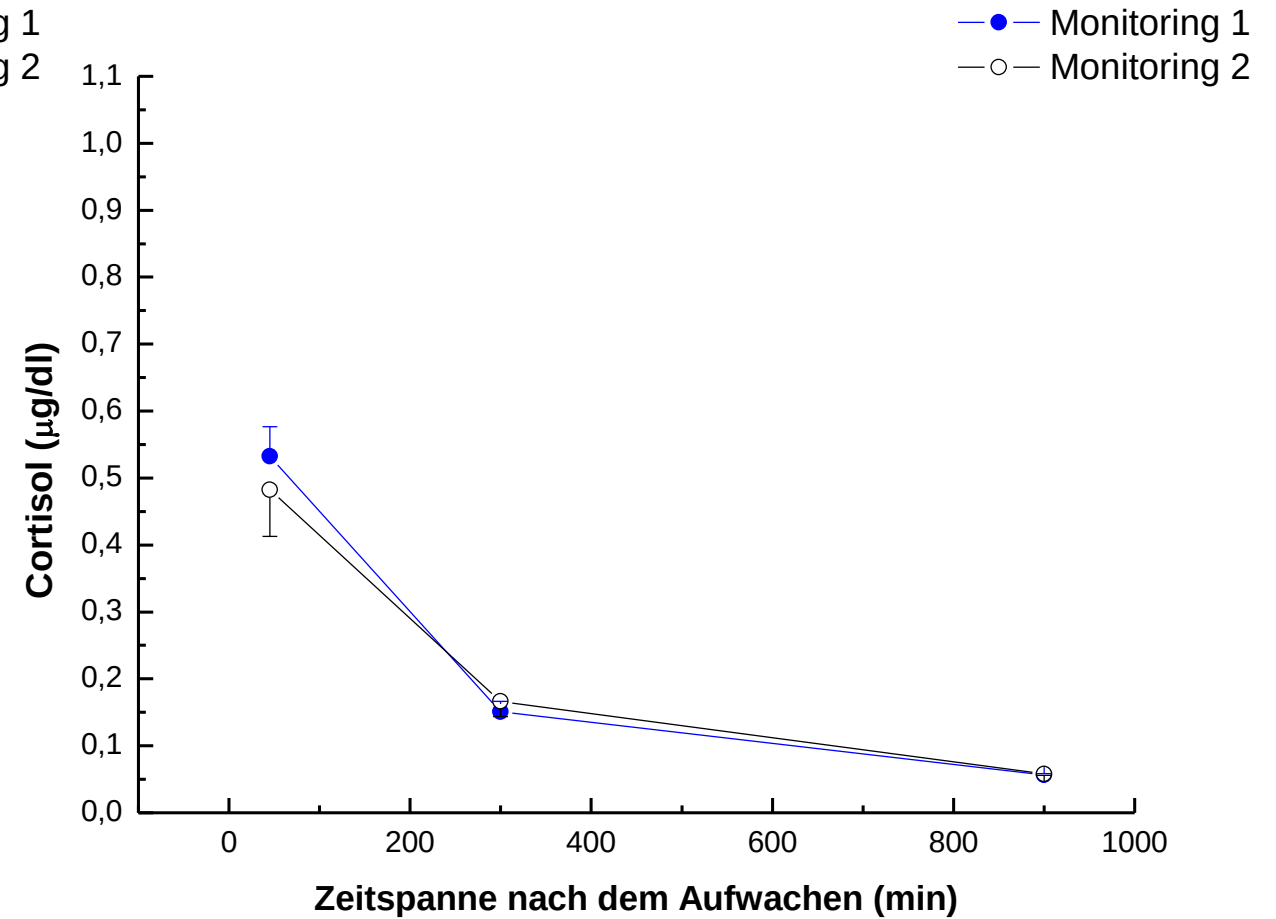


Cortisol-Tagesverlauf

Versuchsgruppe

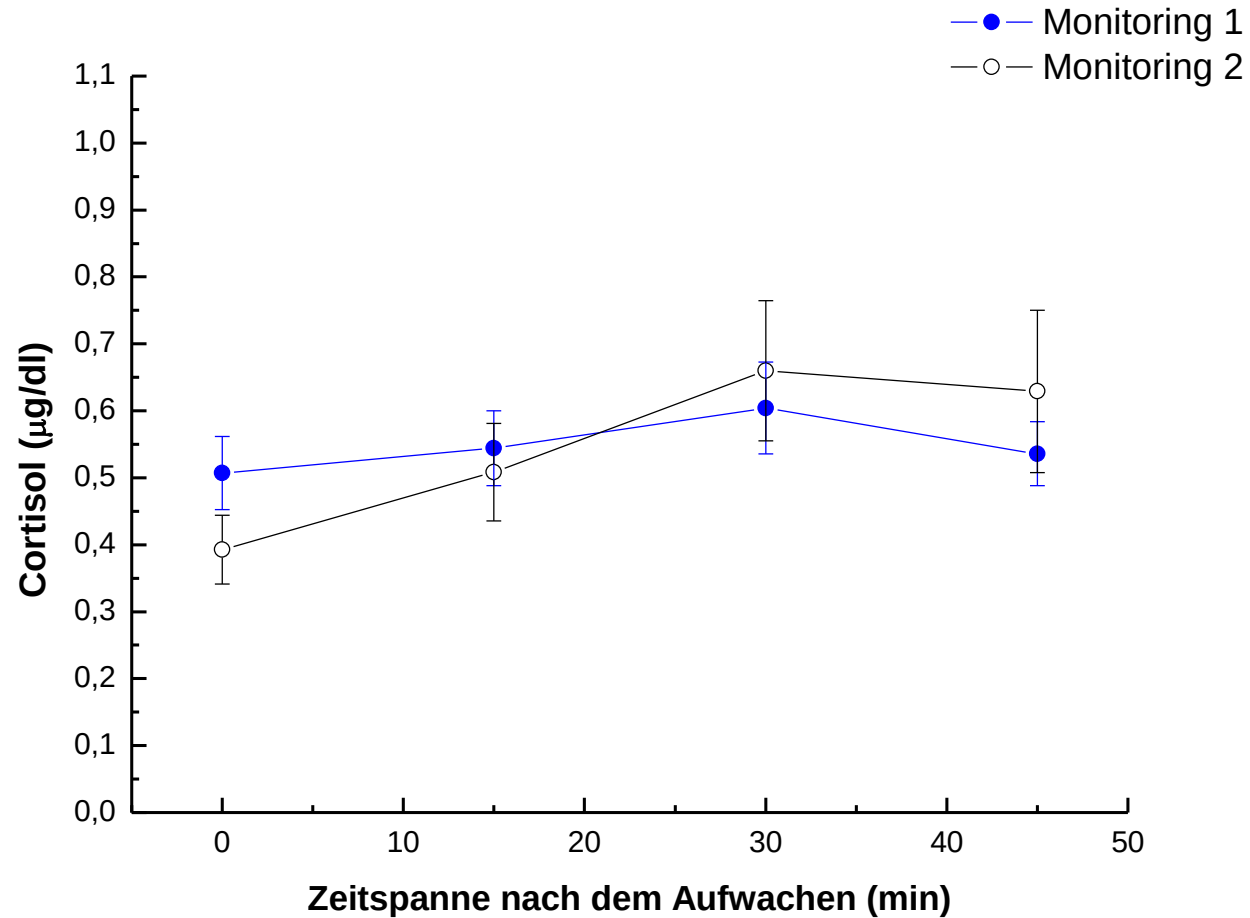


Kontrollgruppe

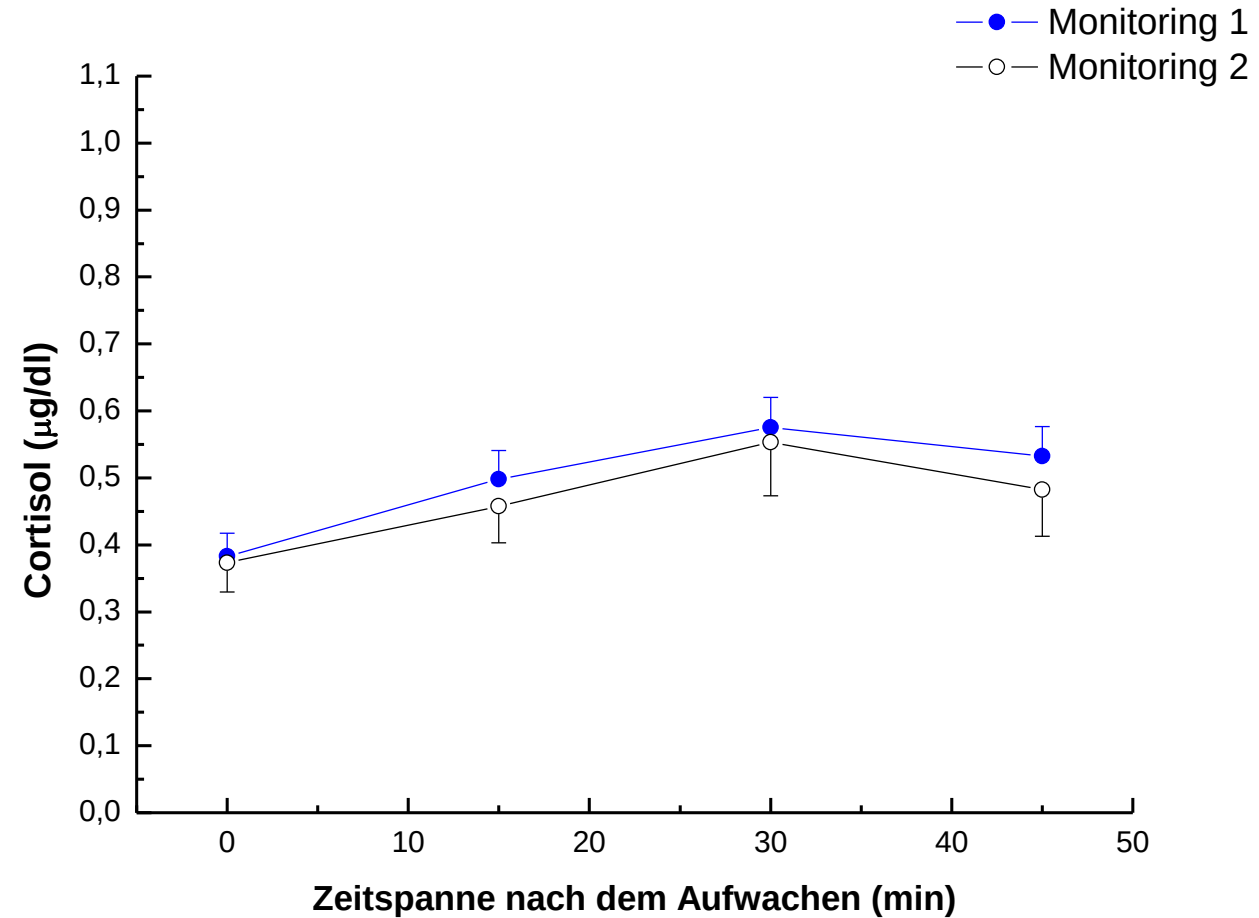


Cortisol-Response bei Patienten ohne Medikation

Versuchsgruppe ohne Medikation (n = 10)

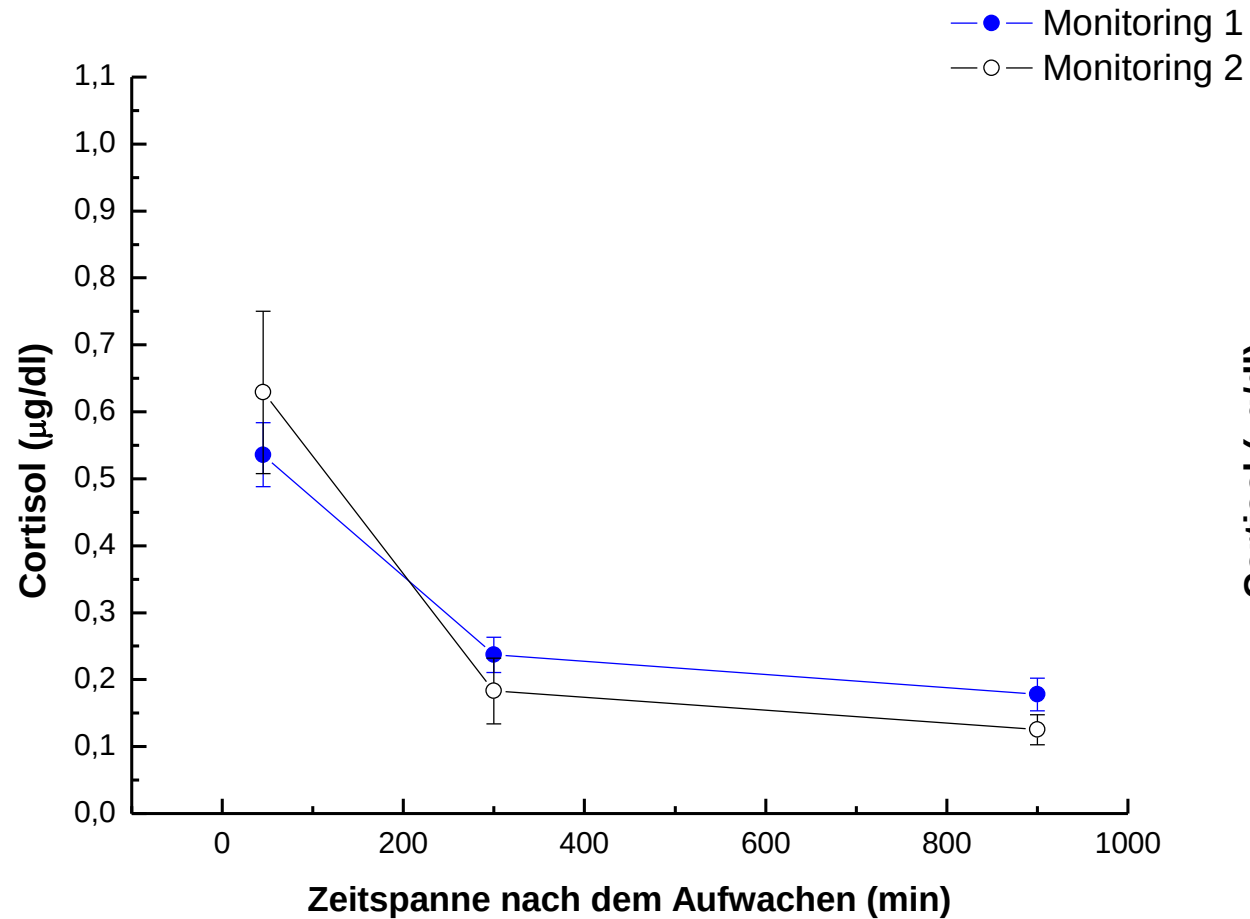


Kontrollgruppe

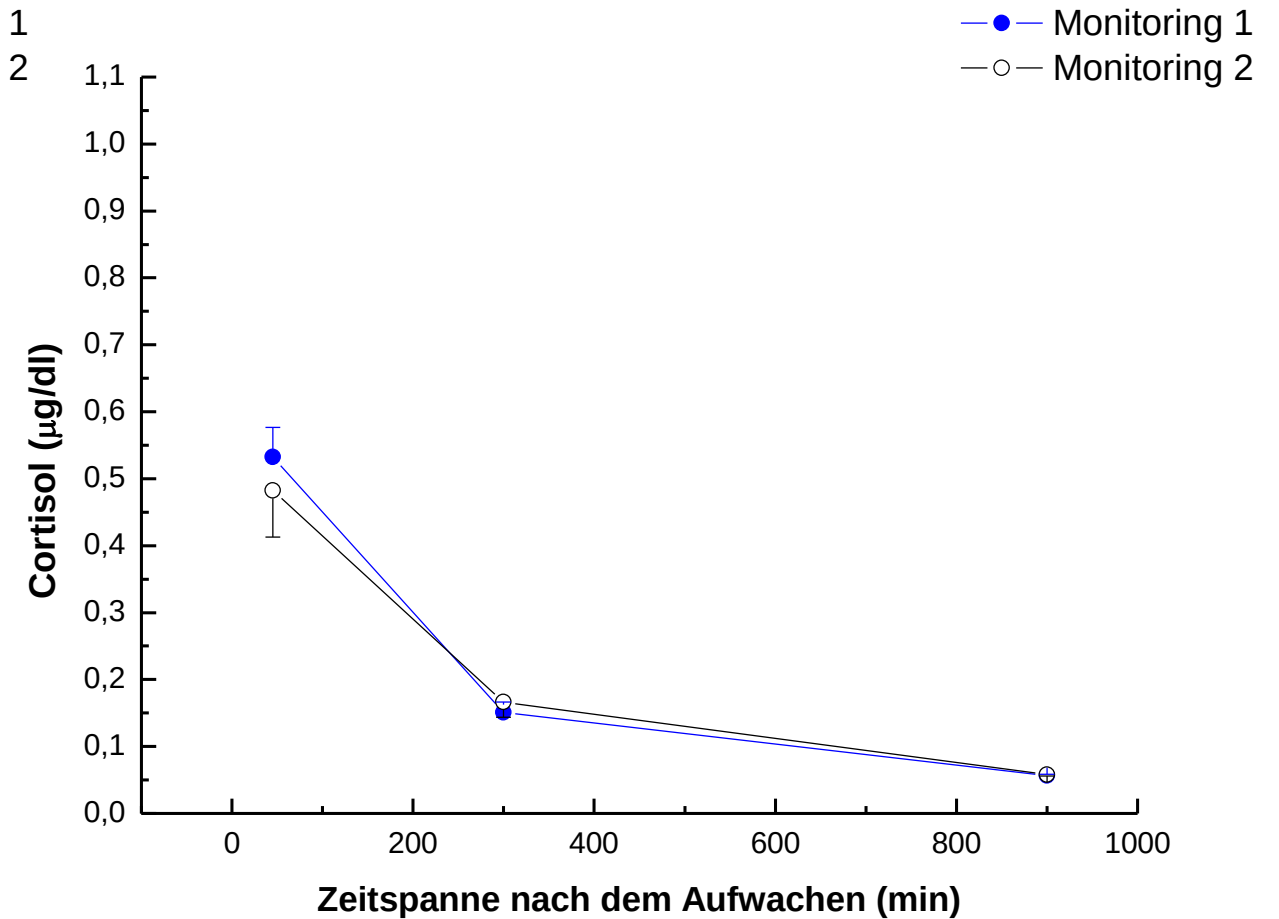


Cortisol bei Patienten ohne Medikation

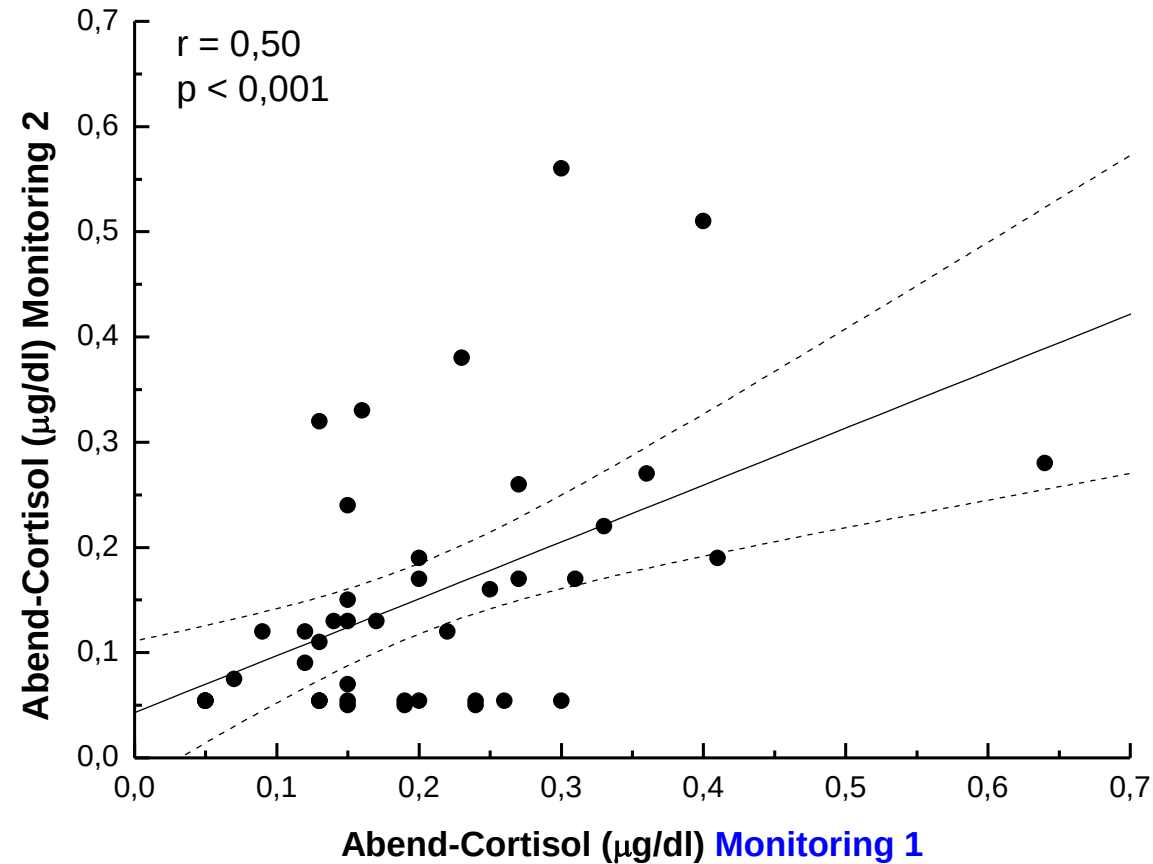
Versuchsgruppe ohne Medikation (n = 10)



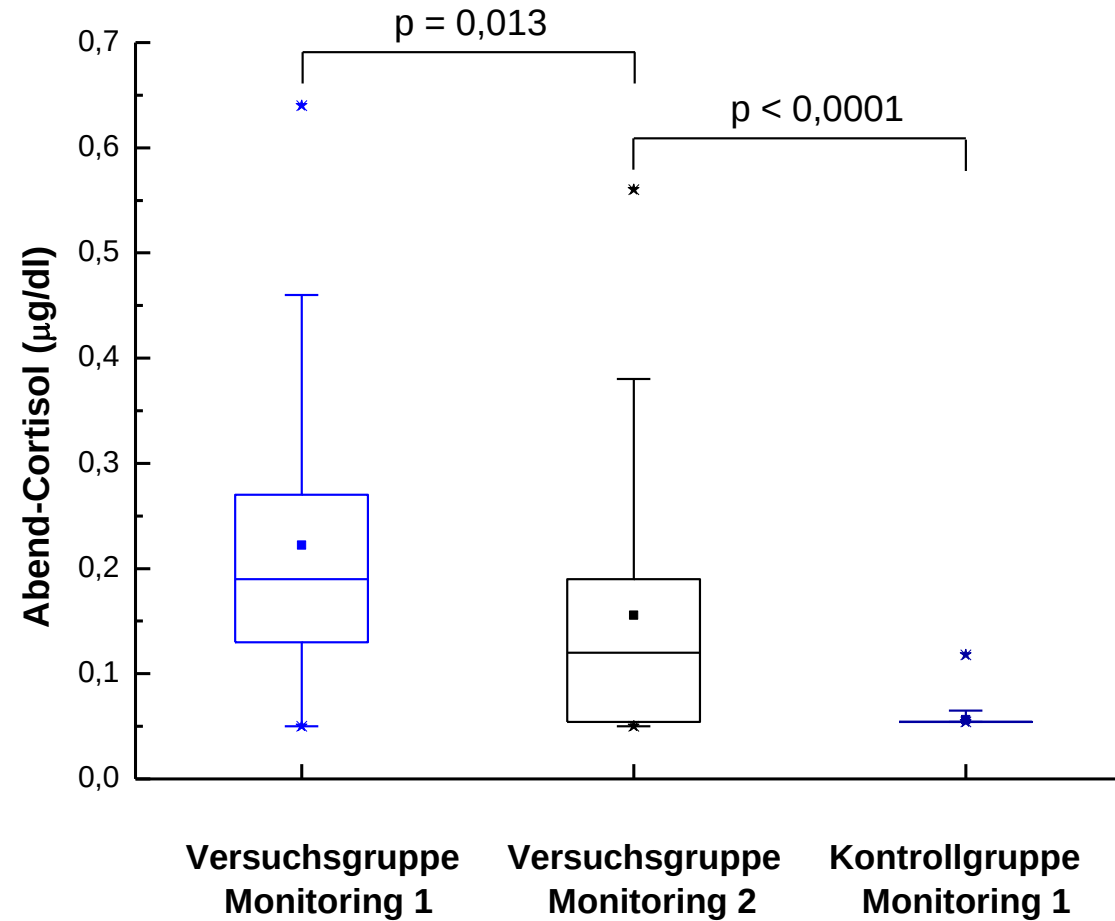
Kontrollgruppe



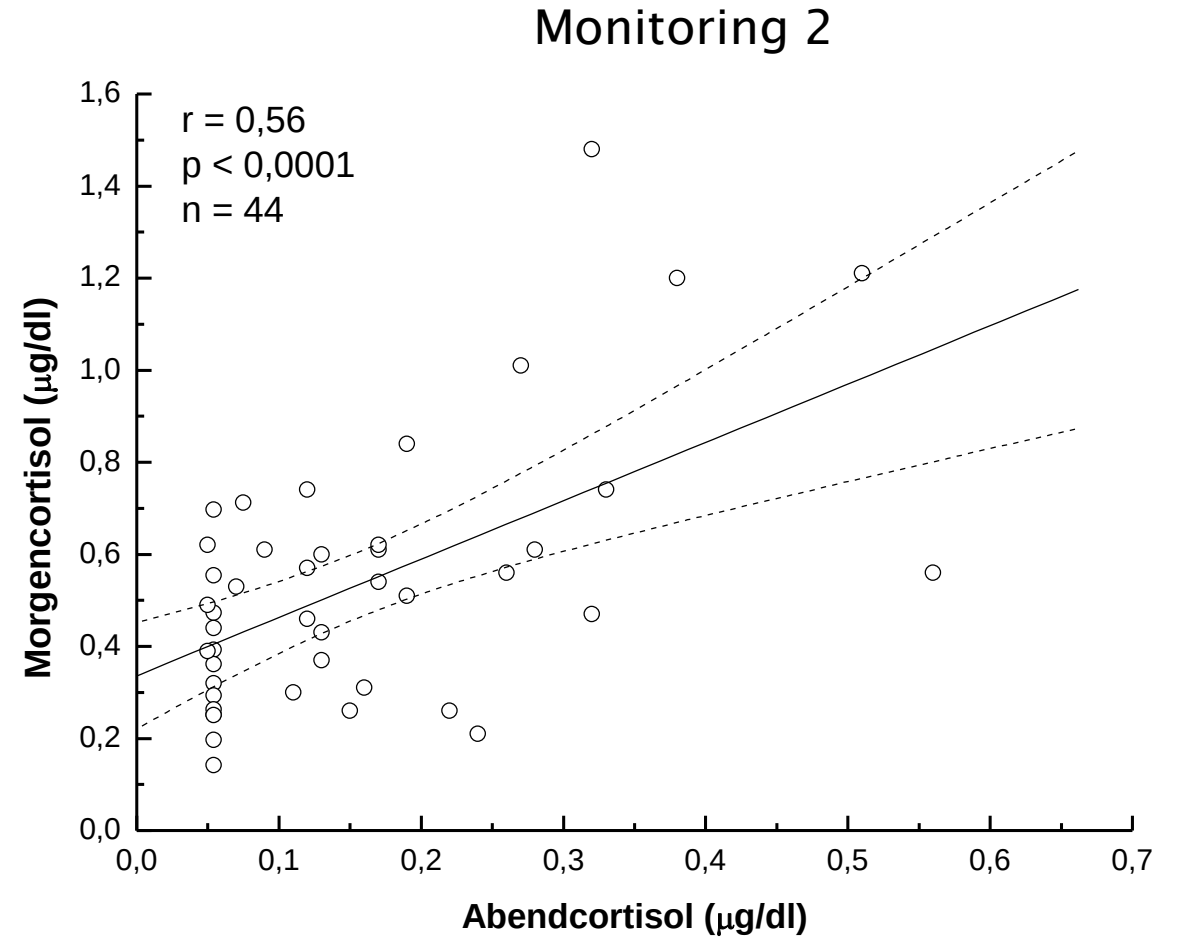
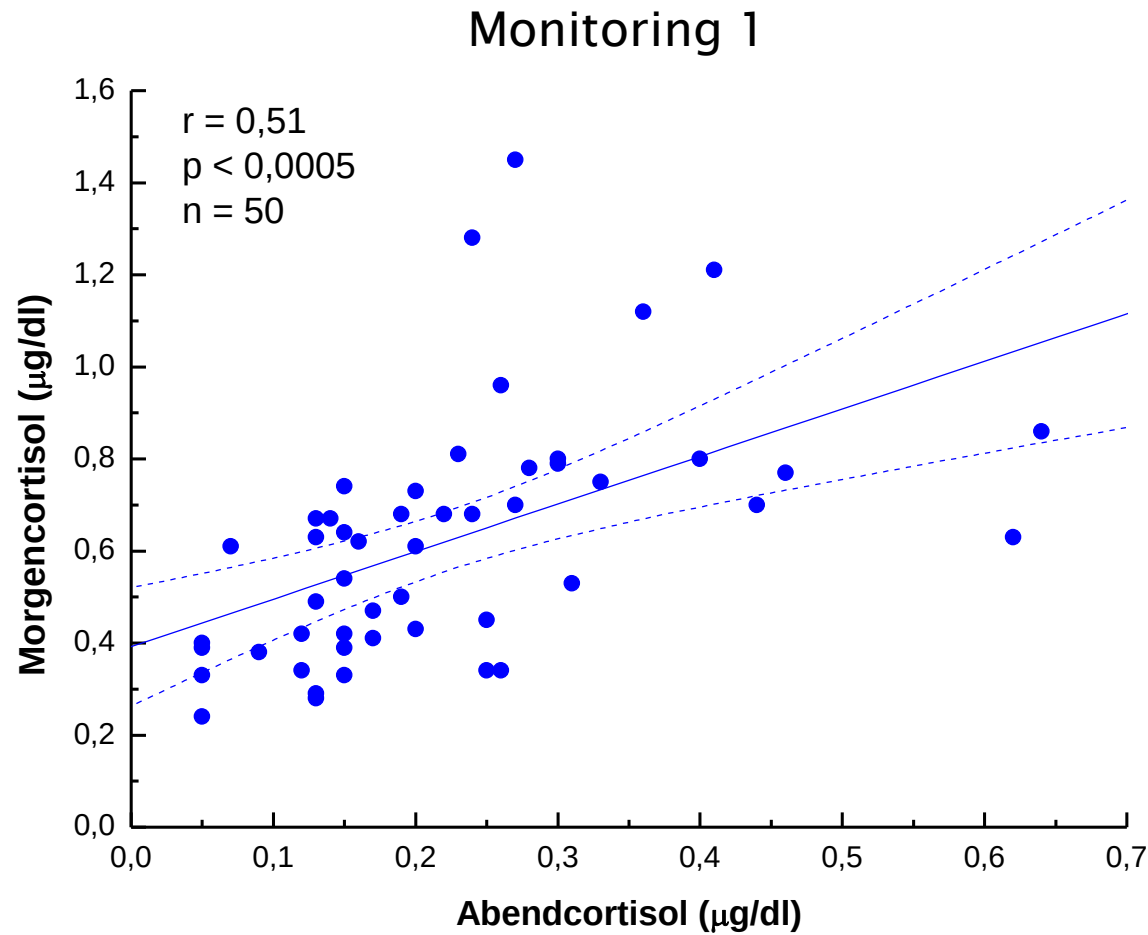
Abend-Cortisolwerte vor und nach Intervention



Abend-Cortisol

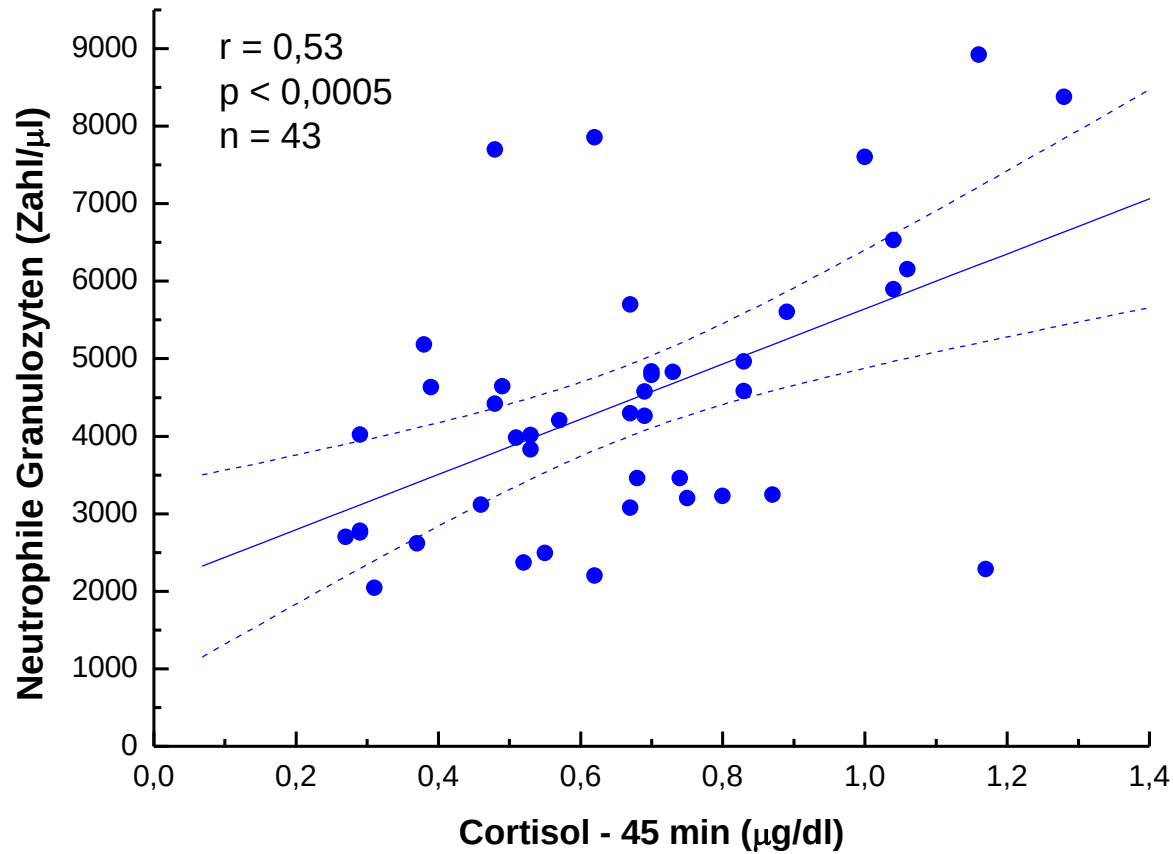


Zusammenhang zwischen Morgen- und Abend-Cortisolwerten

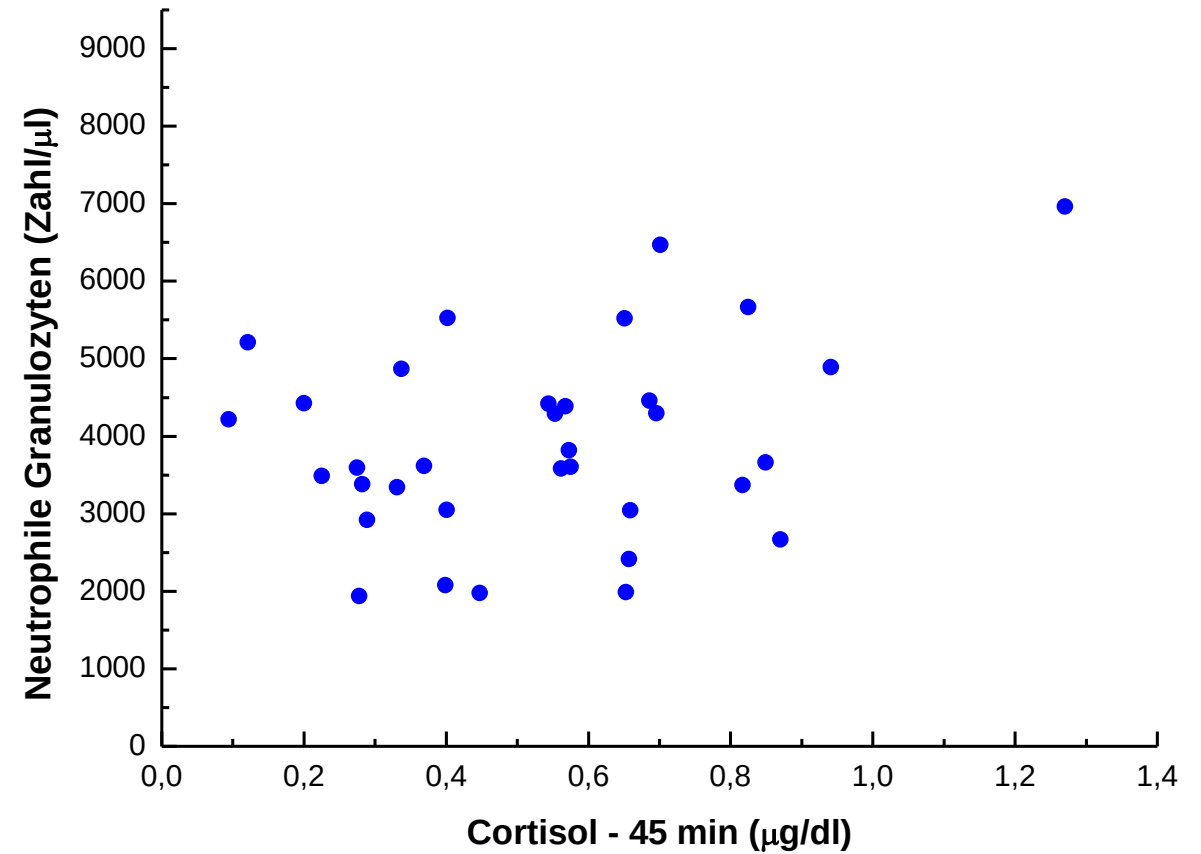


Cortisol und neutrophile Granulozyten

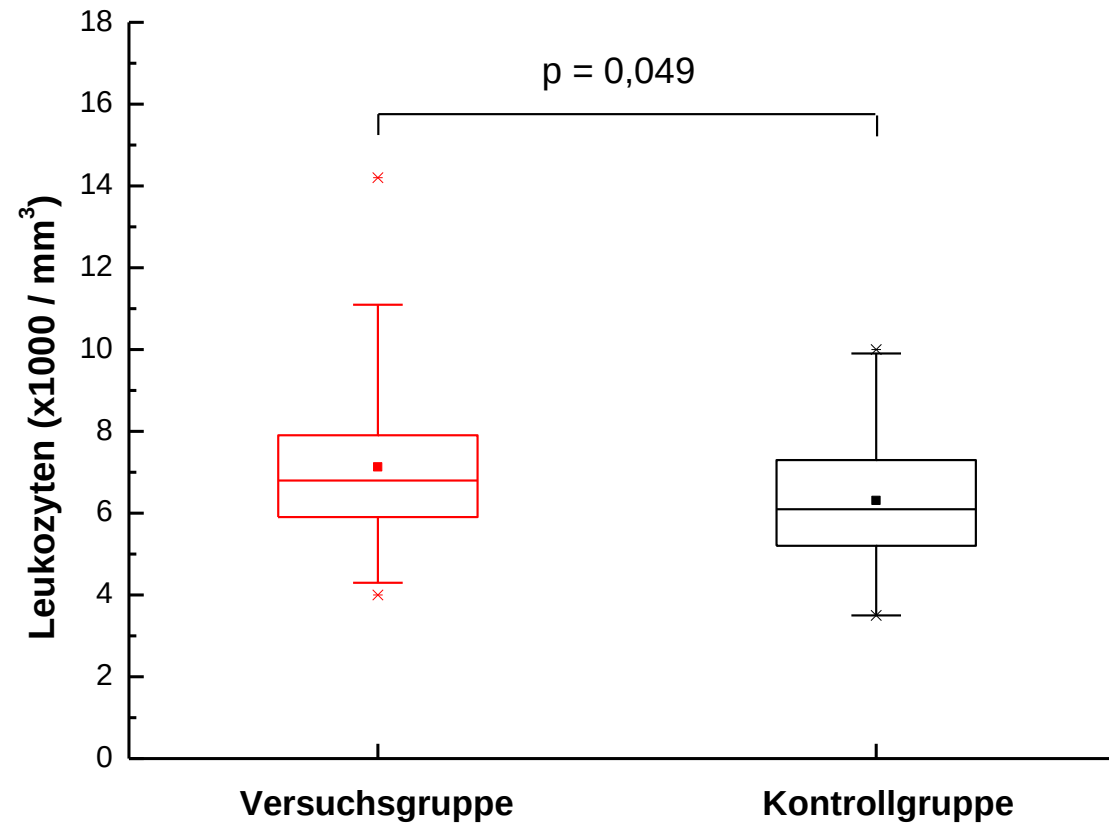
Versuchsgruppe



Kontrollgruppe

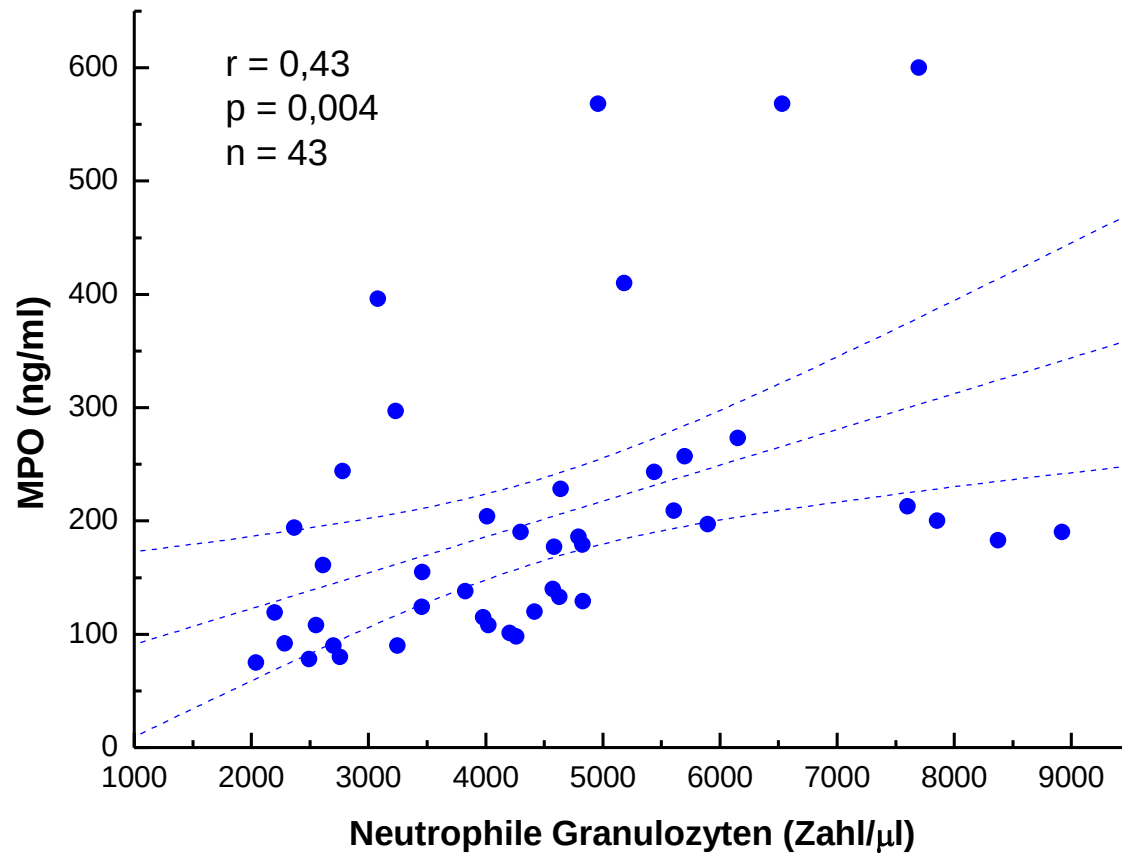


Leukozyten

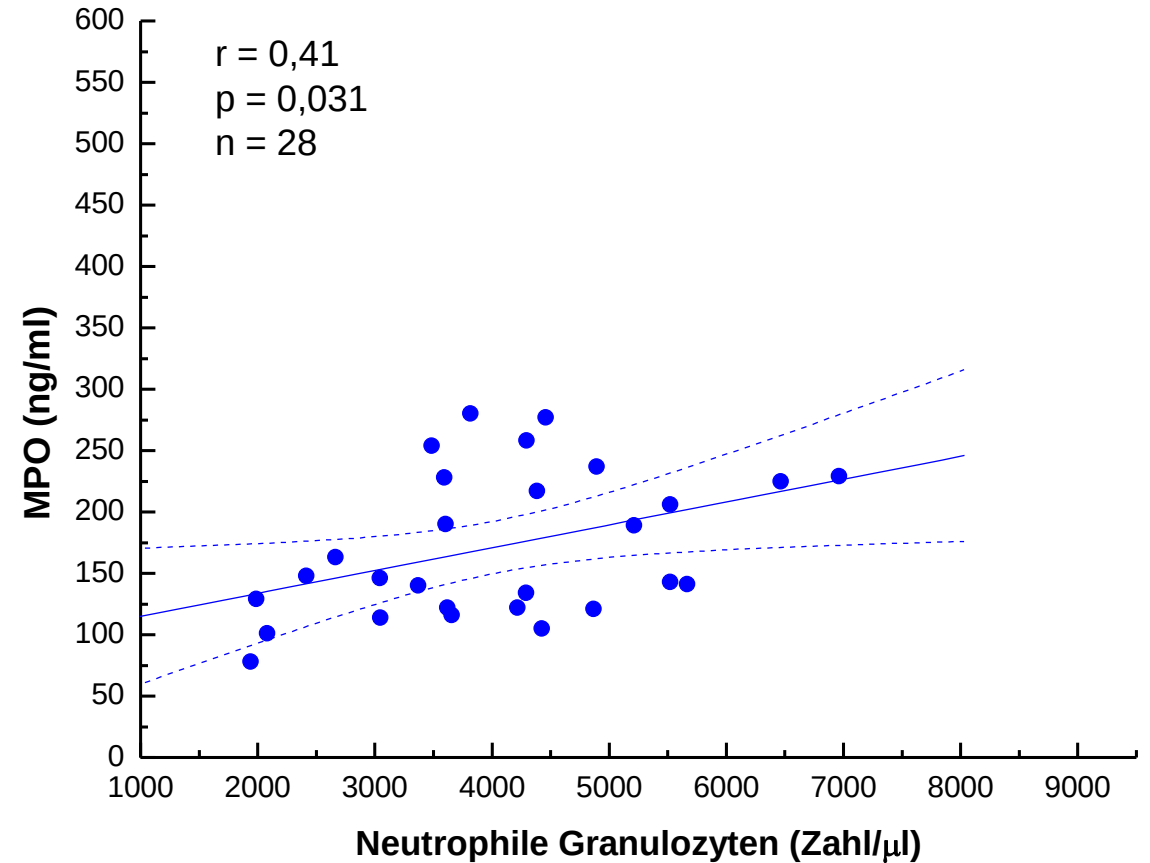


Neutrophile Granulozyten und MPO-Konzentration

Versuchsgruppe



Kontrollgruppe



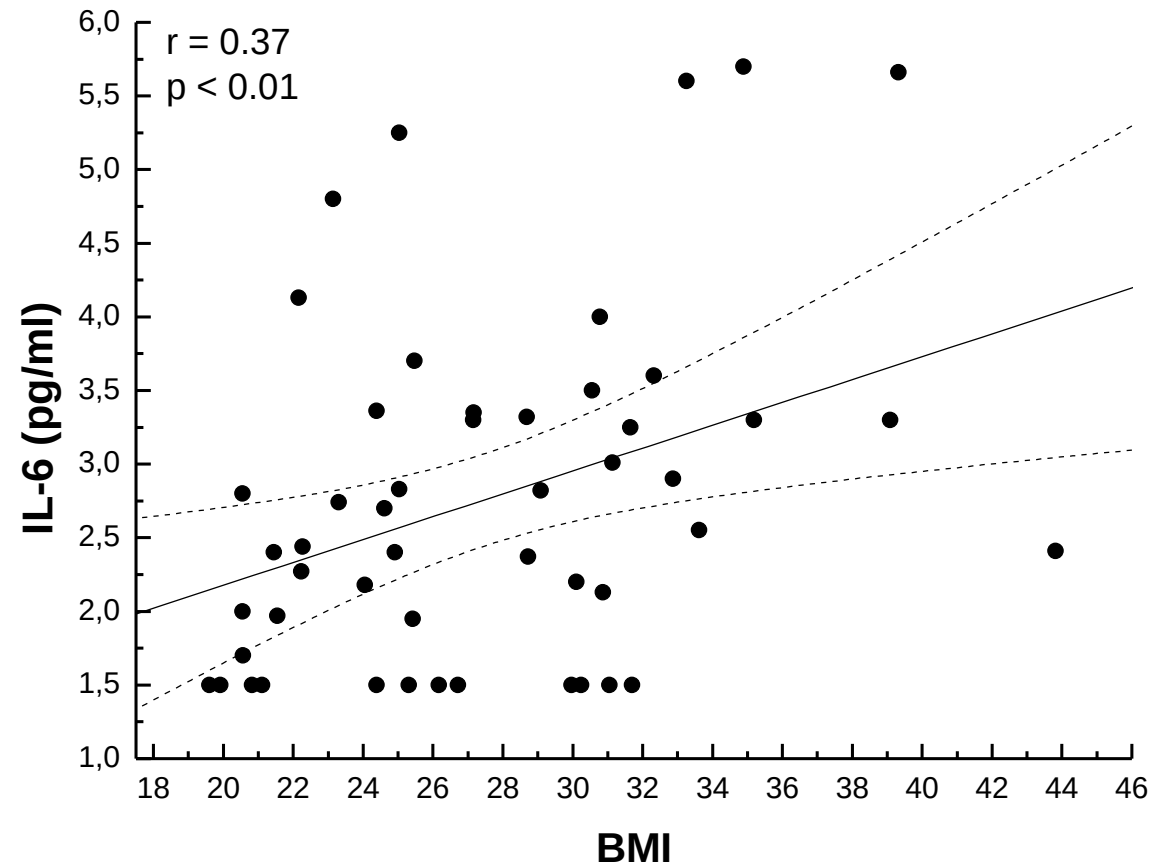
Interleukin-6, Homocystein und Myeloperoxidase

		Param.	Versuchsgruppe	Kontrollgruppe
M o n i t o r i n g	1	IL-6 (pg/ml)	2,81 ± 1,36 (n = 53)	2,20 ± 1,14 (n = 33)
		Hcy (μmol/l)	12,0 ± 3,6 (n = 53)	11,7 ± 2,2 (n = 33)
		MPO (ng/ml)	199 ± 126 (n = 52)	172 ± 59 (n = 28)
	2	IL-6 (pg/ml)	2,69 ± 1,55 (n = 44)	2,23 ± 0,89 (n = 23)
		Hcy (μmol/l)	12,2 ± 3,8 (n = 42)	12,5 ± 4,0 (n = 21)
		MPO (ng/ml)	176 ± 97 (n = 44)	156 ± 75 (n = 18)



t-Test: p = 0,035

Body Mass Index und Interleukin-6



Zusammenhang zwischen BMI und IL-6

	Correlation coefficients, <i>r</i>					
	MS group			Control group (BMI = 26,5 ± 0,6)		
	Log visfatin	Log IL-6	Log Hs-CRP	Log visfatin	Log IL-6	Log Hs-CRP
BMI, kg/m ²	−0.108	0.26	0.42*	−0.14	0.51**	0.43**
Weight, kg	−0.043	0.34*	0.4*	0.02	0.55**	0.32*
WC, cm	−0.08	0.61**	0.36*	−0.86	0.63**	0.5**
Waist/Hip	0.132	0.31**	−0.02*	−0.16	0.44**	0.44**
SBP, mm Hg	0.06	0.12	0.02	0.09	0.19	0.25
DBP, mm Hg	−0.04	0.19	0.12	−0.16	0.129	0.19

* $P < 0.05$; ** $P < 0.001$

BMI body mass index, *DBP* diastolic blood pressure, *SBP* systolic blood pressure, *Hs-CRP* high-sensitivity C-reactive protein, *WC* waist circumference

Hosseinzadeh-Attar et al. (2016) J Endocrinol Invest 39:917-922

Schlußfolgerungen

- Cortisol ist ein geeigneter Biomarker bei stressassoziierten Erkrankungen
- Abend- und Morgen-Cortisolwerte hängen zusammen
- Die Cortisolausschüttung bei Patienten mit stressbedingten Beschwerden ist beeinflussbar
- Interventionserfolge: CGI, Stress, Angst, Depression
- Die Ergebnisse deuten auf Zusammenhänge zwischen Stress und dem Immunsystem

Folie Titel und Inhalt