

## Subjective and physiological reactivity to flight in people with fear of flying

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## Synchrony during flight

Synchronous change in subjective and physiological reactivity during flight as an indicator of treatment outcome for aviophobia: a longitudinal study with 3-year follow-up

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## SUPPLEMENTAL MATERIAL

Multiple hierarchical regression analyses were used to test the hypothesis that a higher amount of synchronous change is associated with better treatment outcome. Separate analyses were performed for video-, simulator- and flight-exposure. Predictor variables were the SUD, HR, RSA and PEP changes from first- to second- exposure. The products of the SUD change scores with the physiological change scores were added to the regression models in the second step of the regression analyses. Significance of a two-way interaction in this second step of the regression model would be an indication that synchronous change was related to treatment outcome. For example, a significant interaction between changes in SUD and changes in HR would indicate that synchrony between these two components was associated with treatment outcome. Short-term outcome was operationalized as the flight anxiety score taken directly after the second exposure flight. Long-term outcome was operationalized as the flight anxiety score three years after treatment, and number of flights taken in this three-year period. To compensate for individual baseline differences in the flight anxiety outcome variables these anxiety scores were regressed on the flight anxiety score taken during diagnostic assessment. Throughout all regression analyses we first computed saved standardized residuals by regression of second exposure reactivity scores on first exposure reactivity scores, and subsequently used them as independent variables in the final regression analyses. This way it was not necessary to control for baseline values in an additional first step in the hierarchical regression analysis; this procedure reduced the number of predictor variables while reaching similar results.

Contrary to this hypothesis, the results revealed no significant interaction effect in any condition for none of the three paired variables (SUD/HR, SUD/RSA and SUD/PEP). Main effects for changes in SUD and HR emerged during the flight exposure, and a main effect for changes in HR emerged during the simulator exposure, both for short-term outcome. Participants with less diminution in HR over simulated flights reported less decrease in flight anxiety from beginning to end of therapy than participants with more diminution of HR over the simulated flights. Participants who reported less decrease in distress over real flights reported less decrease in flight anxiety from beginning to end of therapy than participants who reported a larger decrease in distress over real flights, and participants with less diminution in HR over real flights reported less decrease in flight anxiety from beginning to end of therapy than participants with more diminution of HR over both real flights.

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**Table 1a.** Regression analyses of short-term treatment outcome (flight anxiety) on changes over video-exposure in subjective distress (SUD) and changes over video-exposure in physiological measures (HR, RSA and PEP) and their interaction.

	В	SE	t	р	Zero-order correlations
Step 1					
Constant	052	.123	421	.676	-
SUD changes	045	.147	307	.760	.095
HR changes	.163	.143	1.143	.258	.114
RSA changes	.214	.152	1.404	.166	.160
PEP changes	055	.131	421	.675	085
Step 2					
Constant	133	.143	931	.356	-
SUD changes	036	.147	242	.810	.095
HR changes	.161	.144	1.123	.267	.114
RSA changes	.184	.154	1.196	.237	.160
PEP changes	053	.142	374	.710	085
Interaction SUD-HR	140	.132	-1.063	.292	167
Interaction SUD-RSA	.199	.139	1.429	.159	.195
Interaction SUD-PEP	175	.154	-1.135	.261	028

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

**Table 1b.** Regression analyses of short-term treatment outcome (flight anxiety) on changes over simulator-exposure in subjective distress (SUD) and changes over simulator-exposure in physiological measures (HR, RSA and PEP) and their interaction.

	В	SE	t	р	Zero-order correlations
Step 1					
Constant	137	.135	-1.1017	.318	-
SUD changes	176	.131	-1.345	.189	005
HR changes	.745	.149	4.985	< .001	.645
RSA changes	.029	.150	.194	.847	118
PEP changes	.158	.109	1.443	.160	.107
Step 2					
Constant	169	.164	-1.035	.311	-
SUD changes	229	.186	-1.235	.228	005
HR changes	.705	.166	4.245	< .001	.645
RSA changes	027	.172	156	.877	118
PEP changes	.175	.126	1.388	.177	.107
Interaction SUD-HR	059	.179	328	.746	101
Interaction SUD-RSA	139	.146	957	.348	124
Interaction SUD-PEP	028	.177	158	.876	126

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

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**Table 1c.** Regression analyses of short-term treatment outcome (flight anxiety) on changes over flights in subjective distress (SUD) and changes over flights in physiological measures (HR, RSA and PEP) and their interaction.

	SI				
	В	SE	t	р	Zero-order correlations
Step 1					
Constant	.10	.144	.070	.944	-
SUD changes	.423	.157	2.699	.011	.303
HR changes	.476	.169	2.813	.008	.309
RSA changes	.252	.153	1.646	.108	035
PEP changes	.059	.158	.375	.710	074
Step 2					
Constant	074	.158	469	.642	-
SUD changes	.571	.220	2.597	.014	.303
HR changes	.422	.171	2.460	.019	.309
RSA changes	.252	.163	1.546	.132	035
PEP changes	006	.170	033	.974	074
Interaction SUD-HR	361	.203	-1.777	.085	162
Interaction SUD-RSA	083	.173	482	.633	029
Interaction SUD-PEP	.004	.213	.017	.987	164

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

**Table 2a.** Regression analyses of long-term treatment outcome (flight anxiety) on changes over video-exposure in subjective distress (SUD) and changes over video-exposure in physiological measures (HR, RSA and PEP) and their interaction.

	VAFAS Long-term						
	В	SE	t	р	Zero-order correlations		
Step 1							
Constant	083	.121	685	.496	-		
SUD changes	.020	.133	.147	.884	.039		
HR changes	.043	.141	.303	.763	.092		
RSA changes	019	.158	119	.906	060		
PEP changes	077	.123	628	.533	108		
Step 2							
Constant	122	.134	912	.366	-		
SUD changes	048	.146	330	.742	.039		
HR changes	.029	.152	.192	.848	.092		
RSA changes	117	.167	701	.486	060		
PEP changes	084	.129	648	.520	108		
Interaction SUD-HR	089	.179	500	.619	.040		
Interaction SUD-RSA	299	.176	-1.695	.096	200		
Interaction SUD-PEP	046	.132	350	.728	098		

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

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**Table 2b.** Regression analyses of long-term treatment outcome (flight anxiety) on changes over simulator-exposure in subjective distress (SUD) and changes over simulator-exposure in physiological measures (HR, RSA and PEP) and their interaction.

	В	SE	t	р	Zero-order correlations
Step 1					
Constant	.129	.166	.775	.445	-
SUD changes	.285	.212	1.346	.189	.222
HR changes	445	.196	-2.276	.031	240
RSA changes	129	.226	571	.572	.041
PEP changes	335	.149	-2.255	.032	275
Step 2					
Constant	.034	.197	.171	.866	-
SUD changes	.043	.329	.129	.898	.222
HR changes	467	.302	-1.543	.136	240
RSA changes	209	.310	673	.507	.041
PEP changes	283	.172	-1.648	.112	275
Interaction SUD-HR	.032	.521	.062	.951	.331
Interaction SUD-RSA	276	.520	531	.600	274
Interaction SUD-PEP	.154	.340	.452	.655	100

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

**Table 2c.** Regression analyses of long-term treatment outcome (flight anxiety) on changes over flights in subjective distress (SUD) and changes over flights in physiological measures (HR, RSA and PEP) and their interaction.

	VAFAS Long-term						
	В	SE	t	р	Zero-order correlations		
Step 1							
Constant	039	.163	237	.814	-		
SUD changes	.024	.152	.158	.876	.036		
HR changes	.068	.185	.369	.715	.119		
RSA changes	.003	.193	.017	.987	025		
PEP changes	122	.177	691	.495	164		
Step 2							
Constant	089	.174	509	.615	-		
SUD changes	.098	.201	.487	.631	.036		
HR changes	.032	.193	.164	.871	.119		
RSA changes	008	.243	033	.974	025		
PEP changes	175	.189	928	.362	164		
Interaction SUD-HR	292	.254	-1.149	.261	105		
Interaction SUD-RSA	063	.241	263	.795	009		
Interaction SUD-PEP	148	.167	884	.385	076		

VAFAS = Visual Analogue Flight Anxiety, SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

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**Table 3a.** Regression analyses of long-term treatment outcome (number of flights taken within three years after treatment) on changes over video-exposure in subjective distress (SUD) and changes over video-exposure in physiological measures (HR, RSA and PEP) and their interaction.

	В	SE	t	р	Zero-order correlations
Step 1					
Constant	.052	.128	.408	.685	-
SUD changes	146	.151	966	.338	256
HR changes	097	.154	628	.533	119
RSA changes	214	.155	-1.384	.172	244
PEP changes	.008	.126	.061	.952	.056
Step 2					
Constant	.079	.148	.533	.597	-
SUD changes	133	.154	864	.392	256
HR changes	143	.162	887	.379	119
RSA changes	200	.158	-1.266	.212	244
PEP changes	.044	.134	.328	.744	.056
Interaction SUD-HR	132	.155	857	.396	124
Interaction SUD-RSA	.057	.139	.411	.683	.078
Interaction SUD-PEP	.027	.145	.189	.851	.068

SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period.

**Table 3b.** Regression analyses of long-term treatment outcome (number of flights taken within three years after treatment) on changes over simulator-exposure in subjective distress (SUD) and changes over simulator-exposure in physiological measures (HR, RSA and PEP) and their interaction

	Number of Flights					
	В	SE	t	р	Zero-order correlations	
Step 1						
Constant	.181	.202	.900	.377	-	
SUD changes	.053	.204	.259	.798	001	
HR changes	.052	.201	.258	.798	.062	
RSA changes	.187	.210	.892	.380	.093	
PEP changes	234	.159	-1.471	.153	255	
Step 2						
Constant	.250	.257	.973	.341	-	
SUD changes	.037	.286	.129	.899	001	
HR changes	.028	.220	.126	.901	.062	
RSA changes	.256	.253	1.010	.323	.093	
PEP changes	298	.191	-1.565	.131	255	
Interaction SUD-HR	086	.297	289	.775	.105	
Interaction SUD-RSA	004	.234	018	.985	118	
Interaction SUD-PEP	270	.287	940	.357	099	

 $\mbox{SUD} = \mbox{Subjective Units of Distress, HR} = \mbox{Heart Rate, RSA} = \mbox{Respiratory Sinus Arrhythmia, PEP} = \mbox{Pre-Ejection Period}$ 

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**Table 3c.** Regression analyses of long-term treatment outcome (number of flights taken within three years after treatment) on changes over flights in subjective distress (SUD) and changes over flights in physiological measures (HR, RSA and PEP) and their interaction

	Number of Flights						
	В	SE	t	р	Zero-order correlations		
Step 1							
Constant	091	.204	444	.661	-		
SUD changes	022	.195	113	.911	018		
HR changes	252	.242	-1.042	.306	076		
RSA changes	136	.230	592	.559	044		
PEP changes	283	.211	-1.340	.191	191		
Step 2							
Constant	071	.208	342	.735	-		
SUD changes	238	.265	900	.736	018		
HR changes	217	.245	885	.384	076		
RSA changes	179	.240	746	.462	044		
PEP changes	253	.215	-1.181	.248	191		
Interaction SUD-HR	547	.402	-1.362	.185	087		
Interaction SUD-RSA	126	.237	532	.599	104		
Interaction SUD-PEP	476	.264	-1.799	.084	168		

SUD = Subjective Units of Distress, HR = Heart Rate, RSA = Respiratory Sinus Arrhythmia, PEP = Pre-Ejection Period

