Anti Fear of Flying Seminar of Austrian: Physiological Recordings and Ratings

M. Trimmel, Medical University of Vienna, Austria
R. Wolfger, Austrian Airlines, Vienna, Austria
M. Burger, Medical University of Vienna, Austria

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Motivation of Study

Investigating physiological and psychological aspects (habituation, responses to specific aspects of flying, modulation by amount of fear) of people with flight anxiety during an anti fear of flying seminar by:

• Analysing autonomous arousal (HR, HRV)
• Oxygen saturation (SpO2)
• Stress (salivary cortisol)
• Perception of situation: Fear, aspects of control, physiological sensations, mood
Procedure of Seminar

1st day: Information about anxiety and aviation with clinical psychologist and professional pilot (headquarter Austrian).

2nd day: Confrontation – exposure in vitro exposure flight by simulator training, relaxation training, cognitive restructuring, training of coping skills, visit air-traffic control (at airport Schwechat, technical base).

3rd day: Technical and aerodynamic info, visit of an aircraft in the hangar of the airport, relaxation training in the airplane, briefing and explanation of pilots and crew for the flight, scheduled commercial flight in Europe (London, Oct. 2004, n=14; Amsterdam, Mar 2005, n=13; London, Mai 2005, n=8) out and in.
Behavioral and Cognitive Group Treatment for Fear of Flying

(Van Gerwen, L., Dysart, R., Rondos, J., & Wolfger, R., 2006)

Concept behind Anti Fear of Flight Seminar:

- Training program in group-setting
- Training by clinical psychologist and professional pilot
- Information of relevant psychological factors involved in fear and anxiety, cognitive model of panic and anxiety
- Information about aerodynamics
- Information about traffic control and meteorological aspects
- Relaxation exercises and breathing exercises
- Coping skills: Learning skills for handling phobic problems,
- Systematic de-sensation (visit airplane, simulator, real flights)
- Building of personal fear hierarchies and acceptance of fear
Design, Subjects and Procedure

- 3 X 55 ANOVA design of Group (Control, Anxious, Highly Anxious) X Conditions (repeated factor)
- 24 Participants of anti fear of flying seminar
- 9 Control persons
- Procedure:
  - ECG recordings during all days of seminar (Controls only during flights)
  - SpO2: Spot measures 2-5 times per day
  - Cortisol: On the flights out during descend
  - Ratings of flight anxiety (pre- and post seminar)
  - Ratings of moods etc. on each day at specific epochs
Recordings and Equipment

Holter ECG - MK3 TOM for ECG recordings

Medilog simple view software for visualisation and analyzing of signals (ECG, HR, Respiration).

Finger- pulse- oxyometer (clip) for oxygen saturation and pulse.

Cortisol salvia sampling to determine the level of stress.
Measures (Variables)

Ratings

• **Flight Anxiety Situations (FAS) questionnaire (Van Gerwen et al., 1999)**
  - Anticipatory Flight Anxiety Scale
  - In-Flight Anxiety Scale
  - Generalized Anxiety Scale

• **Flight Anxiety Modality (FAM) questionnaire (Van Gerwen et al., 1999)**
  - Somatic Modality
  - Cognitive Modality
  - Panic-score
  - Number of Panic-items rated

• **State-Trait-Inventory (Spielberger et al., 1970)**
  - State anxiety
  - Trait anxiety

• **Fear and Mood:**
  - physiological sensation (Cronbach alpha = .82)
  - diffuse fear (Cronbach alpha = .74)
  - cognitive fear (Cronbach alpha = .77)
  - unconfidence joyless. (Cronbach alpha = .90).
Measures (Variables)

Physiological variables

- Mean heart rate (HR)
  - Intervals of 5 min
  - Only blocks with 5 successive valid PQRST-appearance were analysed

- Heart rate variability (HRV) calculated from N-N intervals (4 kHz)
  - pNN50 (percent of successive N-N interval >50 msec)
  - LF% (percent of power in the range of 0.04 Hz – 0.15 Hz of total power)
  - HF% (percent of power in the range of 0.15 Hz – 0.40 Hz of total power)
  - Log LF/HF

- Oxygen Saturation (SpO2)
  - From the fingerpulses by a clip

- Salivary cortisol
# Overview of the procedure for 3 seminars
(Seminar1: AMS, Seminar2: AMS, Seminar3: LON)

<table>
<thead>
<tr>
<th>Pre-seminar</th>
<th>Day 1 Theory</th>
<th>Day 2 Simulator</th>
<th>Day 3 Crew Real flights</th>
<th>Post seminar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>--------------</td>
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</tr>
<tr>
<td>n = 9</td>
<td>Moods: 3t, SpO2: 3t, Cortisol HR, HRV: t8-20</td>
<td>Moods: 2t, SpO2: 2t, Cortisol HR, HRV: t1-7</td>
<td>Mood+Fear: 6t, SpO2: 5t, Cortisol HR, HRV: 24t</td>
<td>R A T I N G S</td>
</tr>
<tr>
<td>Anxious</td>
<td>Mood+Fear: 6t, SpO2: 5t, Cortisol HR, HRV: 21-55</td>
<td>Mood+Fear: 3t, SpO2: 3t, Cortisol HR, HRV: t8-20</td>
<td>Mood+Fear: 6t, SpO2: 5t, Cortisol HR, HRV: t21-55</td>
<td>R A T I N G S</td>
</tr>
<tr>
<td>n = 15</td>
<td>Mood+Fear: 2t, SpO2: 2t, Cortisol HR, HRV: t1-7</td>
<td>Mood+Fear: 3t, SpO2: 3t, Cortisol HR, HRV: t8-20</td>
<td>Mood+Fear: 6t, SpO2: 5t, Cortisol HR, HRV: t21-55</td>
<td>R A T I N G S</td>
</tr>
<tr>
<td>Very</td>
<td>Moods: 2t, SpO2: 2t, Cortisol HR, HRV: t1-7</td>
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</tr>
</tbody>
</table>
Subjects in Groups

<table>
<thead>
<tr>
<th></th>
<th>Controls</th>
<th>Anxious</th>
<th>Highly Anxious</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>9</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Fem.</td>
<td>4</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Age</td>
<td>32.4 ± 11.4</td>
<td>43.2 ± 10.9</td>
<td>36.8 ± 14.2</td>
</tr>
<tr>
<td>BMI</td>
<td>22.8 ± 1.4</td>
<td>24.96 ± 3.96</td>
<td>23.98 ± 4.4</td>
</tr>
</tbody>
</table>

Grouping of anxious Ss into “Anxious” and “Highly Anxious”
FAS score general >31 and
FAS total >47

No group difference (all p’s > .10) regarding
✓ number of flights taken
✓ fear level during the last flight
✓ Interventions against fear
✓ Demographic variables
Mean HR (bpm)

Day 1 theory
Day 2 flight-simulator
Day 3 real flight

3 h 6 h 12 h

Controls (n=9) Anxious (n=15) Highly Anxious (n=9)
Summarized results of ANOVAs for mean HR and HRV measures of real flights

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Condition</th>
<th>Group x Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F(2, 30)$</td>
<td>$F(23, 690)$</td>
<td>$F(46, 690)$</td>
</tr>
<tr>
<td>Mean HR</td>
<td>4.26*</td>
<td>36.63***</td>
<td>2.24***</td>
</tr>
<tr>
<td>pNN50</td>
<td>0.72</td>
<td>2.19**</td>
<td>1.64**</td>
</tr>
<tr>
<td>Log LF/Hf</td>
<td>1.20</td>
<td>1.61*</td>
<td>1.75**</td>
</tr>
<tr>
<td>HF%</td>
<td>1.28</td>
<td>1.78*</td>
<td>1.22</td>
</tr>
<tr>
<td>LF%</td>
<td>5.33*</td>
<td>2.32***</td>
<td>1.84***</td>
</tr>
</tbody>
</table>

Note: * $p < .05$, ** $p < .01$, *** $p < .001$
pNN50 +/- 95% CI

Gruppe
Controls
Highly Anxious
Gruppe
Anxious

Flight out
Shop
Flight in
Log LF/HF +/- 95% CI

Controls
Highly Anxious
Anxious

Flight out
Shop
Flight in
Salivary Cortisol Concentration during flight out of Vienna +/- 95% CI
Saturation of Oxygen during real flights
+/- 95% CI

Controls
Anxious
Highly Anxious

Take off 1
Take off 2

D3 Lounge, D3 nach Start, D3 Sinkflug, D3 nach Start R, D3 Sinkflug R

SPO2%
Moods: Physiological Sensation

Diagram showing physiological sensation levels for different groups (Controls, Anxious, Highly Anxious) across seating, flight, and descend phases. The graph indicates decreasing sensation levels over time with higher variability for the Anxious group.
Moods: Cognitive Fear

- Controls
- Anxious
- Highly Anxious

Out
In

Seating  Flight  Descend  Seating  Flight  Descend
Moods: Diffuse fear

![Graph showing mood changes during seating, flight, and descent for controls, anxious, and highly anxious groups.](image-url)
Moods: Unconfident, Joyless

Controls
Anxious
Highly Anxious

Unconfident, Joyless

Seating
Descend
Flight
Seating
Descend
Flight

Out
In
State-Trait-Anxiety pre-post Seminar

![Graphs showing State Anxiety and Trait Anxiety scores pre and post seminar.](image-url)
Flight Anxiety Modality (FAM) Questionnaire Pre-Post-Seminar

PRE-Seminar

POST-Seminar

Somatic

Cognitive

Panic

Number Pnaic

Highly Anxious

Anxious
Flight Anxiety Situations Questionnaire (FAS) Pre-Post-Seminar

- Anxiety Levels:
  - Inflight
  - Anticipatory
  - General

Scores FAS

Inflight
Anticipatory
General

Pre-seminar
Post-seminar

Highly Anxious
Anxious
Discussion

• Fear of flying is associated with higher HR
  • 15 bpm during 2nd flight
  • 20 bpm after 2nd flight
• Maximal HR appear during boarding (also in Controls where they displayed the same HR as Anxious)
• HR during start is associated with fear
  • Highly anxious show a remarkable acceleration of HR contrary to other groups
• HRV (pNN50) indicate a high sympathetic activity in Controls at boarding which disappears during flight.
  • After 2nd flight a relaxation response appear in Controls only.
• HF (parasympathetic impact) was most prominent in Controls – after start) and had in general the lowest influence in High Anxious.
Discussion

• Autonomic balance (LF/HF) indicate
  • a relative high sympathetic load during boarding in Controls
  • A rise of load during flight in High Anxious
• Cortisol indicated high stress in Anxious and High Anxious -- at least in the first flight.
• SpO2 indicate that oxygen saturation may be modulated by flight anxiety.
• Ratings of moods indicate a systematic decrease during flights and by flights.
• Comparing pre-post FAS and FAM there is clear evidence that participants of anti fear of flying seminar displayed a remarkable change in fear.
Thanks

• For your attention
ANOVA for LF/HF of 1st and 2nd day of seminar
Aktueller Effekt: F(16, 352)=2,2124, p=,00481
Means +/- 95% CI
ANOVA for mean HF% during 1st and 2nd seminar day, +/- 95% CI

Aktueller Effekt: $F(16, 352)=1.8380, p=0.02532$