# Radiofrequency for emotional stress

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# Overview

- Theoretical background
- Methods and procedures
- Hypotheses
- Results
- Discussion & Conclusion




Picture: bilder4ever.eu

# Pulsed Radiofrequency Therapy

- **TcPRF** has been used for decades in **chronic pain** patients
- Some studies indicate positive effects of **transdermal TcPRF** on **inflammation processes**
- Some individuals even report an **improvement of mood** and **energy**
- This is in accordance to actual **stress research**



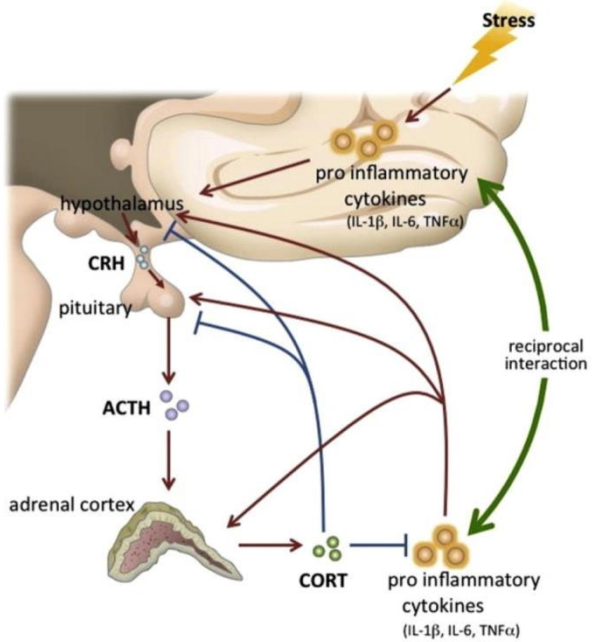
(Balogh, 2004; Byrd & Mackey, 2008; Chua, Vissers & Sluijter, 2011; Djuric, 2014; Gallagher, 2006; Teixeira & Sluijter, 2009, 2013)

# Mechanisms behind TcPRF

TcPRF may have an anti-inflammatorical effect on cellular level

and contribute to a healthy homeostasis,

both physical and mental and may help to repair the damages caused by stress.



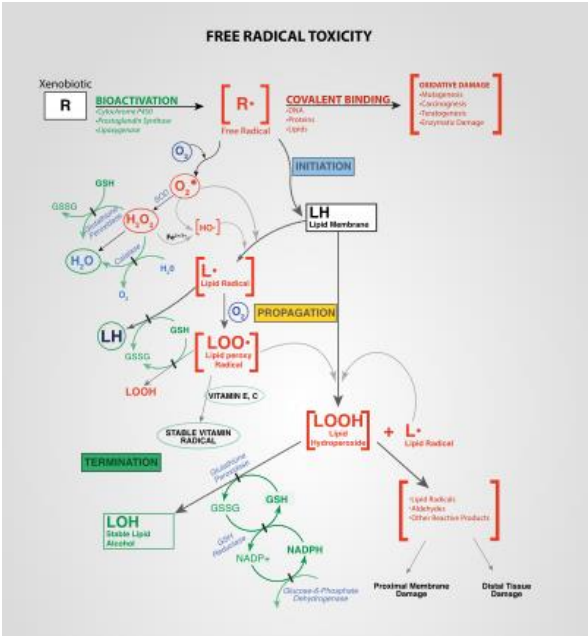



(Maier & Watkins,1998; Salim, 2014; Teixeira & Sluijter, 2009)

# Stress and inflammation

Emotional stress may affect psychology
as well as in the immune system,
based on bi-directional brain-to-immune communication (1).
The brain is particularly vulnerable to oxidative stress
because of its high oxygen consumption (1).

The causal relationship is not fully determined (2)






(1) Maier et al., (1998)., (2) Salim (2014), graphic: wikipedia

# Stress, Inflammation and Heart

It is well known that inflammation processes Have an effect on the autonomous system.

Stress is activating the **sympathetic system**.

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VOL. 49, NO. 1, 32–41
http://dx.doi.org/10.1080/07853890.2016.1226512

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

**Heart rate, heart rate variability and inflammatory biomarkers among young and healthy adults**

Stefanie Aeschbacher[a,b], Tobias Schoen[b,c], Laura Dörig[a,b], Rahel Kreuzmann[a,b], Charlotte Neuhauser[b], Arno Schmidt-Trucksäss[d], Nicole M. Probst-Hensch[e,f], Martin Risch[g,h], Lorenz Risch[g,i,j] and David Conen[a,b]

**CONCLUSION:** In this large cohort of young and healthy adults, inflammatory parameters were strongly associated with increased HR and decreased HRV, suggesting an important interaction between inflammatory pathways and the autonomic nervous system.

# Psychiatric disorders associated with inflammation

**Depression**
**Anxiety**
**Schizophrenia**
**Bipolar disorder,**
**Fibromyalgia**

**… and maybe even more**




***Salim, S. (2014);*** **Kivimäki, M. et al. (2014); Hänsel, A. et al. (2016), Groven et al. (2017)**

# Key issue of the study...

Is there an effect of TcPRF

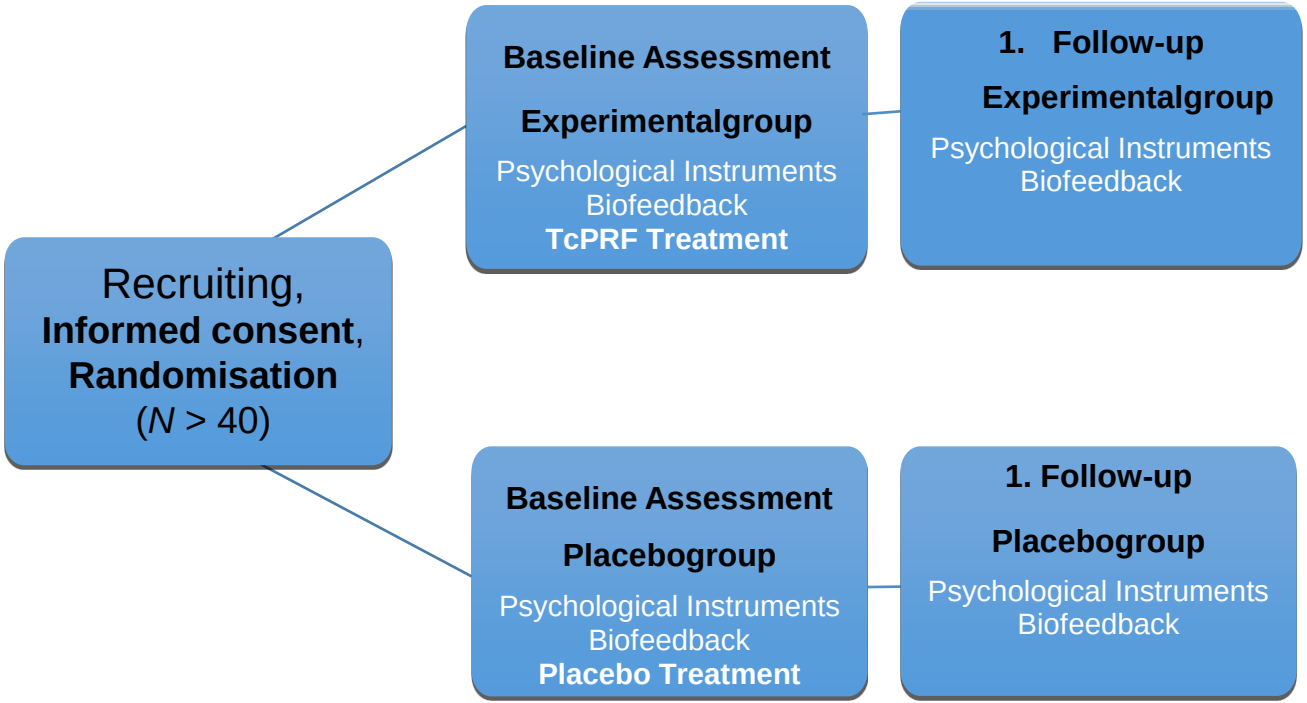
on patients well- being and mood?

We decided to go for a **double blind study** design with a **control group** (placebo vs. treatment) and **two measurement times**.

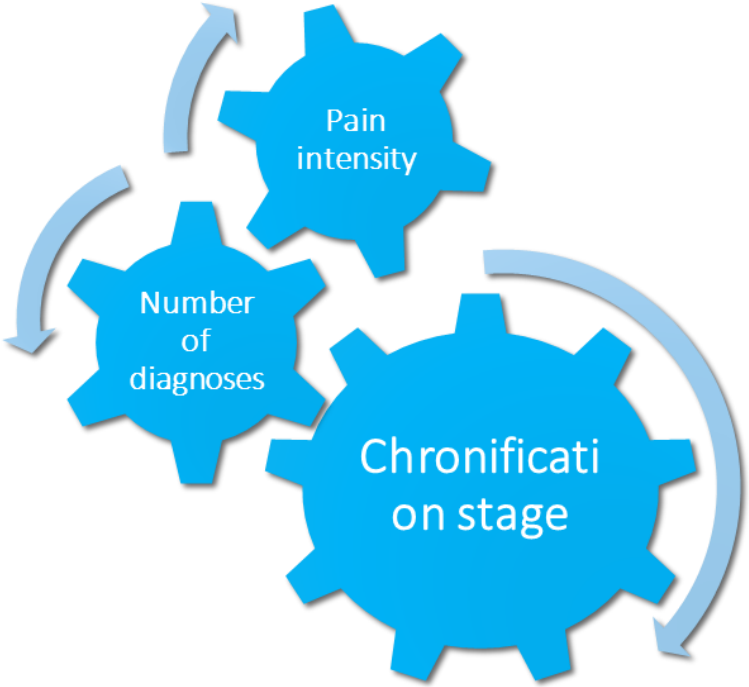
# TcPRF - Application in our study …


Device Settings: 5.11 Hz, Pulse Width 2,89 ms, ca. 70 V, 0,4 Ohm, Duration 25 min.

# Procedere


Recruiting,
**Informed consent**,
**Randomisation**
(*N* > 40)
**Baseline Assessment**
**Experimentalgroup**
Psychological Instruments
Biofeedback
**TcPRF Treatment**
**1. Follow-up**
**Experimentalgroup**
Psychological Instruments
Biofeedback
**Baseline Assessment**
**Placebogroup**
Psychological Instruments
Biofeedback
**Placebo Treatment**
**1. Follow-up**
**Placebogroup**
Psychological Instruments
Biofeedback

# Assessment of pain and stress



No explicit assessment of pain localisation or specification of pain problems! We only asked for pain level at the actual moment of assessment.

# Chronification stages

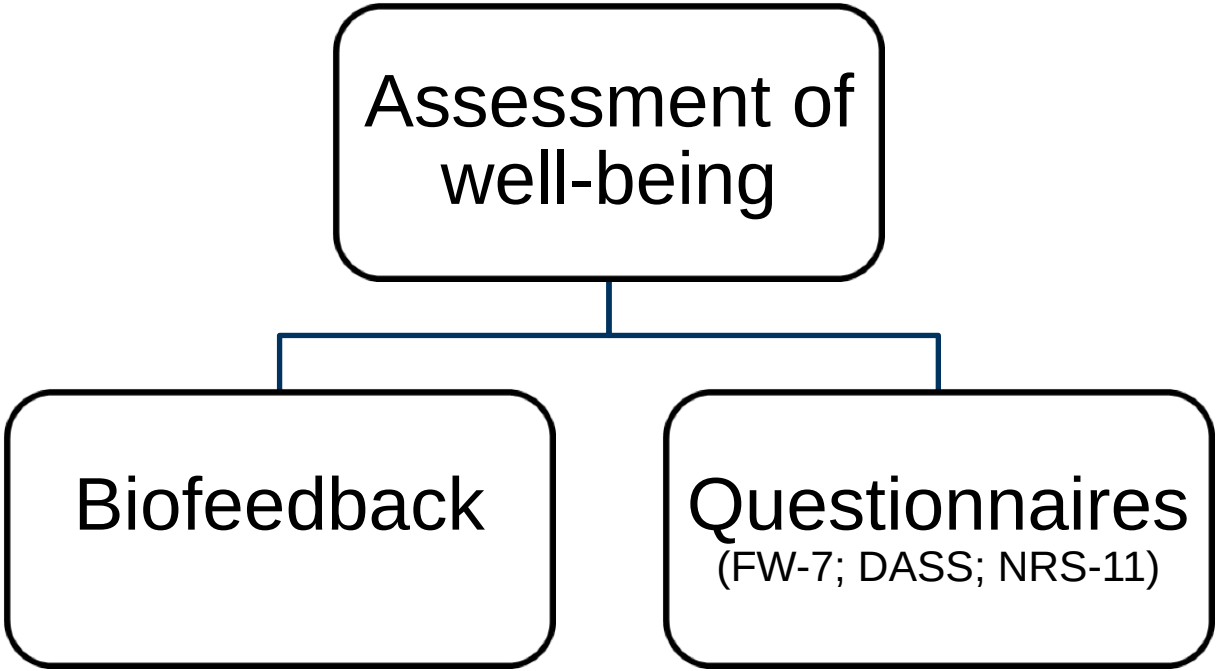
Chronification does not rely entirely on time based criteria.

Increasing importance of related factors, e. g. Number of pain places, strength of impairment, medical conditions.

Stadium model according to Gerbershagen (1996)

- Chronification stage I: slight cronification
- Chronification stage II: few painless episodes
- Chronification stage III: persistent pain

Allows to cover different to the pain impairment related aspects!


Assessment of well-being
Biofeedback
Questionnaires
(FW-7; DASS; NRS-11)

# Depression Anxiety Stress Scale (DASS)

- Edited version of the German translation encloses **21 questions** to assess general well-being
- Self report inventory encloses the three scales **depression, fear** and **stress** with seven Items each
- **Economic** and **reliable** screening method for patients with (chronic) pain
- Depressive symptoms and chronic pain disturbances are often **closely interweaved**
- -> Suffering pressure as well as impairment of the affected individual often lead to overassessment of depressive symptoms



(Banks & Kerns, 1996; Ehlert, 2003, Nilges & Rief, 2010)

# Numeric Rating Scale for Pain (NRS-11)

Linear measuring instrument to gather the **pain strength** on a **11-stage scale**

Gradations from ***0 = no pain***, up to the other pain extreme,

***10 = the strongest pain that is conceivable***

Good **reliability** and **validity** not only concerning acute pain - but also chronic pain

NRS-11 is **sensitive to changes** of the percieved pain intensity



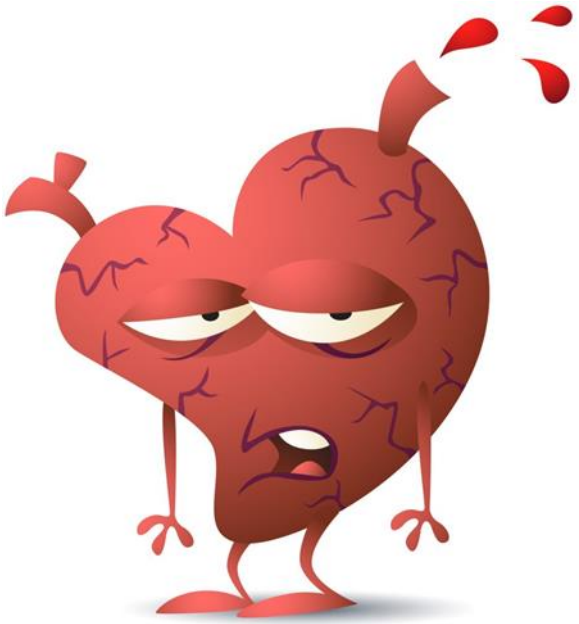
(Farrar, Young, LaMoreaux, Werth & Poole, 2001; Downie, Leatham, Rhind, Wright, Branco & Anderson, 1978)

# Marburg questionnaire on *habitual well-being* (FW-7)

- **Original version** by Herda, Scharfenstein and Basler (1998)
- Grasps **not only** the momentary **feeling** – but also ***habitual well-being*** (the last 7 days)
- Seven positive statements; Answers on 4-stage Likert scale
- Sensitivity of the one-dimensional scale to changes in well-being
- Evaluation by the sum scale (cut-off value)

# ... how to messure stress?

Stress has an effect on the cardiovascular system,
by increasing sympathical activity.



# Heart Rate Variability

Heart rate variability can be measured via various methods.
An established and reliable method is the
calculation of RR- differences:
SDNN (standard deviation of normal-to-normal)


In our study we used this parameter
to assess the stresslevel of our patients

# Heart Rate Variability (SDNN)

A higher variability (SDNN) is indicating
An increase of vagal activity,
while stress and illness
are associated with a decrease of SDNN.

SDNN: Standard deviation
of the IBI of normal sinus beats (ms).



McCraty R. (2015)

# Biofeedback

A perfect way to assess SDNN

live in different situations.

Biofeedback is used in daily pactice

Devices are well proven in practice

and reliable.

# Assessment of the heart rate variability

**Relaxation**

**Stress**


**Positive mood**

# SDNN in Relaxation

# SDNN during stress sequence (Stroop-Test)

# SDNN during funny movie

# Inclusion and Exclusion Criteria

**Inclusion:**
- age 18 – 65
- chronic pain patients (> 3 months)

**Exclusion:**
- severe medical issues, such as cancer or comparable
- severe mental disorders such as severe depression or schizophrenia
- patients with cardial conditions, pacemakers, beta- blockers
- Women who are pregnant or breast-feeding

Picture: gtreilly.com

# Hypotheses

We hypothesized a stressreduction in the treatment group due to the anti- inflammatory effects of TcPRF- Treatment:

- Increase of SDNN (Biofeedback)

- Decrease of stress, depression, anxiety (questionnaires)

- improvement of pain (NRS)


http://yogscast.wikia.com/wiki/File:Improvement.jpg

# Statistical evaluation

Mann Whitney U- Test for differences

Brunner model  (post-hoc tests)

Method for non-parametric variance analyzes

of longitudinal data (*R*)

(Main effects: Group, Measurement time

& and related interactions)



(Noguchi, Gel, Brunner & Konietschke, 2012, picture: landeszeitung-rlp.de)

# Results

**Table 1: Age, Chronification, Diagnoses, Gender**

| | Total (n= 42) | | TcPRF (n=23) | | Placebo (n=19) | |
|---|---|---|---|---|---|---|
| n | **M** | **sd** | **M** | **sd** | **M** | **sd** |
| Age (18-65) | **44.8** | 12.5 | **44.6** | 14.1 | **45.0** | 10.6 |
| Chronification status (1-3) | **2.5** | 0.7 | **2.4** | 0.7 | **2.5** | 0.6 |
| N Diagnoses | **5.3** | 2.6 | **5.6** | 2.6 | **5.0** | 2.6 |
| Gender: female | 70% | | 74% | | 63% | |

**No significant differences between the groups**

# Results

**Table 2: Psychological Assessment / Pain intensity**

| | TcPRF T1 (n=23) | Placebo T1 (n=19) | TcPRF T2 (n=23) | Placebo T2 (n=19) |
|---|---|---|---|---|
| n | **M (sd)** | **M (sd)** | **M (sd)** | **M (sd)** |
| DASS Depression Cut off: >10 | 6.6 (5.4) | 7.6 (5.6) | 6.1 (4.9) | 6.6 (4.7) |
| DASS Anxiety Cut off: >6 | 4.7 (4.6) | 6.5 (4.9) | 3.8 (3.8) | 6.0 (5.0) |
| DASS Stress Cut off: >10 | 5.1 (2.2) | 5.1 (2.0) | 7.5 (3.9) | 8.8 (5.5) |
| FW-7 Cut off: < 17 | 26.8 (8.3) | 23.5 (8.5) | 25.5 (7.9) | 25.2 (7.9) |
| NRS (0--10) | 5.1 (2.1) | 5.1 (2.2) | 4.6 (2.3) | 4.5 (1.7) |

**No significances between Treatment and Placebo group**

# Results

**Table 3: SDNN**

| | TcPRF T1 (n=23) | Placebo T1 (n=19) | TcPRF T2 (n=23) | Placebo T2 (n=19) |
|---|---|---|---|---|
| | **M (sd)** | **M (sd)** | **M (sd)** | **M (sd)** |
| SDNN 'Relax. | 46.9 (21.1) | 45.4 (27.4) | 48.0 (25.4) | 39.3 (18.1) |
| SDNN Stress | 32.9 (20.5)* | 38.6 (30.1)* | 40.2 (25.4)* | 30.3 (16.2)* |
| SDNN Movie | 46.6 (22.7) | 45.8 (32.8) | 43.3 (17.3) | 38.1 (25.3) |

*** Differences between goups are significant at p > .029.**
**(Man Whitney U- Test of differences between T1 and T2)**

# Results

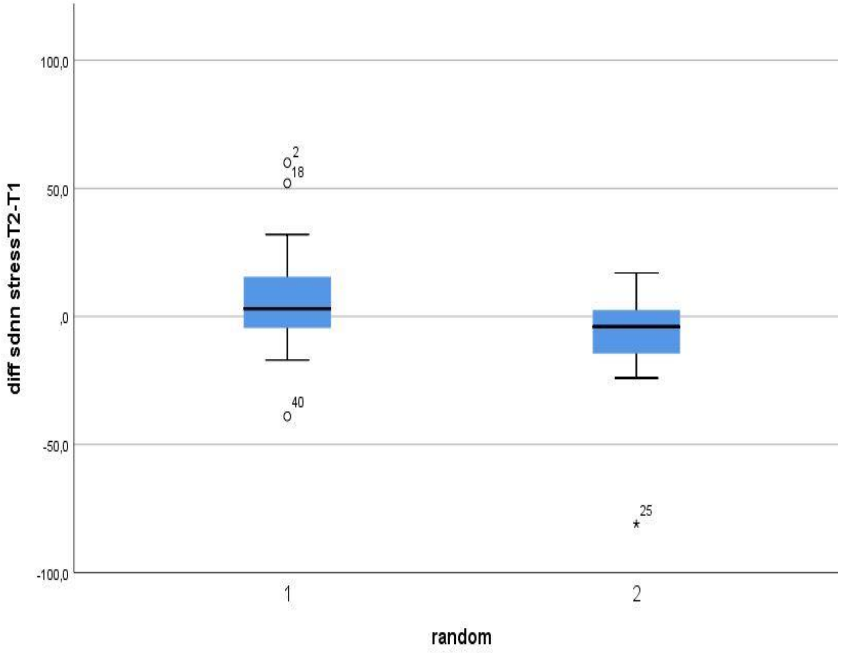
There were **no effects** of the treatment **on the psychological parameters** (depression, anxiety, stress and well-being, DASS / FW7).

There was **no effect** of the treatment **on pain** (NRS).

# Conclusion

It seems, that TcPRF- Treatment has had a **positive effect** on the ability of our patients to cope with the **stress-condition**.

The treatment group shows an increase of parasympathical activity and a higher SDNN while the placebo- Group seems to be more stressed at follow- up.




$p < .29$

# Limitations

- **Sample size** (*N* = 42)
- Correlations **do not show in all statistical procedures** (Brunner- Model)
- Selectivity of the sample population
- Diversity of treatments next to TcPRF
- Lack of clarity concerning TCPRF parameters

At the moment, we still are collecting follow up- data and will continue the analyses of our data.

And we want to express our deepest gratitide for supporting us to our whole team,

especially to Menno, Sluijter, Suzan Celik and En- Chul Chang.

Thank you !!

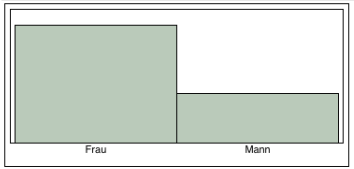
# Discussion

# Results

**No significant differences between Treatment- and Placebo Group in Gender, Age and duration of illness**

**Verteilungen random=A**

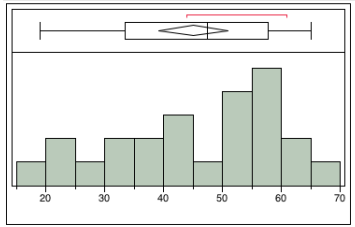
**geschlecht**




**Häufigkeiten**

| Klasse | Häufigkeiten | Wahrsch. |
|---|---|---|
| Frau | 17 | 0.70833 |
| Mann | 7 | 0.29167 |
| Summe | 24 | 1.00000 |
| Anzahl fehlender Werte | | 0 |
| 2 Klassen | | |

**alter**



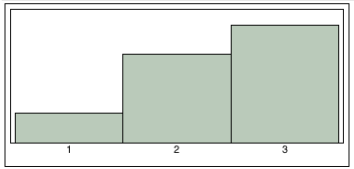

**Quantile**

| | | |
|---|---|---|
| 100.0 % | Maximum | 65 |
| 99.5 % | | 65 |
| 97.5 % | | 65 |
| 90.0 % | | 61 |
| 75.0 % | Quartil | 57.75 |
| 50.0 % | Median | 47.5 |
| 25.0 % | Quartil | 33.5 |
| 10.0 % | | 20.5 |
| 2.5 % | | 19 |
| 0.5 % | | 19 |
| 0.0 % | Minimum | 19 |

**Momente**

| | |
|---|---|
| Mittelwert | 45.083333 |
| Std.-Abw. | 14.021464 |
| Std.-Fehler Mittelwert | 2.8621193 |
| 95% KI oben Mittelwert | 51.004078 |
| 95% KI unten Mittelwert | 39.162588 |
| N | 24 |

**chronifizierung**

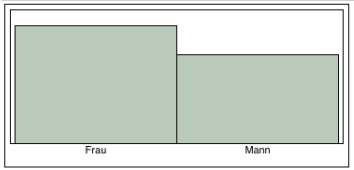



**Häufigkeiten**

| Klasse | Häufigkeiten | Wahrsch. |
|---|---|---|
| 1 | 3 | 0.12500 |
| 2 | 9 | 0.37500 |
| 3 | 12 | 0.50000 |
| Summe | 24 | 1.00000 |
| Anzahl fehlender Werte | | 0 |
| 3 Klassen | | |

**Verteilungen random=B**

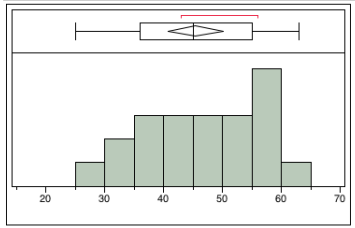
**geschlecht**




**Häufigkeiten**

| Klasse | Häufigkeiten | Wahrsch. |
|---|---|---|
| Frau | 12 | 0.57143 |
| Mann | 9 | 0.42857 |
| Summe | 21 | 1.00000 |
| Anzahl fehlender Werte | | 0 |
| 2 Klassen | | |

**alter**



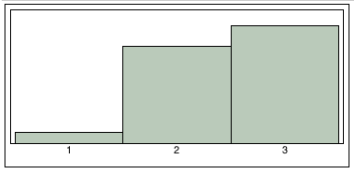

**Quantile**

| | | |
|---|---|---|
| 100.0 % | Maximum | 63 |
| 99.5 % | | 63 |
| 97.5 % | | 63 |
| 90.0 % | | 58.8 |
| 75.0 % | Quartil | 55 |
| 50.0 % | Median | 45 |
| 25.0 % | Quartil | 36 |
| 10.0 % | | 30.6 |
| 2.5 % | | 25 |
| 0.5 % | | 25 |
| 0.0 % | Minimum | 25 |

**Momente**

| | |
|---|---|
| Mittelwert | 45.428571 |
| Std.-Abw. | 10.419076 |
| Std.-Fehler Mittelwert | 2.2736288 |
| 95% KI oben Mittelwert | 50.171278 |
| 95% KI unten Mittelwert | 40.685865 |
| N | 21 |

**chronifizierung**




**Häufigkeiten**

| Klasse | Häufigkeiten | Wahrsch. |
|---|---|---|
| 1 | 1 | 0.04762 |
| 2 | 9 | 0.42857 |
| 3 | 11 | 0.52381 |
| Summe | 21 | 1.00000 |
| Anzahl fehlender Werte | | 0 |
| 3 Klassen | | |