ONLINE STUTTERING THERAPY

Insights into the Kassel Stuttering Therapy (KST)

New technical developments

From a face- to- face therapy (since 1996)
to a blended learning concept (since 2011)
to a telehealth version (since 2014)
to a stand alone therapy app (end of 2016)
KST: From a face to face therapy to a stand alone version in 20 years

status - timeline

1996 Foundation
1998 First Reimbursement from payors
2003 Software flunatic
2008 Reimbursement contracts with payors
2011 Online Therapy
2013 Grants from State Hessia
2016 Digital Therapy

# of participants (cumulative)

- 1996: 50
- 1999: 200
- 2002: 400
- 2004: 800
- 2007: 1,000
- 2009: 1,500
- 2011: 2,000
- 2013: 2,500
- 2016: 4,000
- 2017: 19,000
- 2018: 45,000

13.10.16 Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Organized in the Center for Communication Medicine

Competence for speech, language and voice disorder

Kasseler Stottertherapie
Therapy institute

PARLO Ltd.
Ltd. for research, education and development of online therapy

freach Ltd.
Ltd. for international online therapy

Digithep Ltd.
Ltd. for the development of the KST App easyspeech

13.10.16 Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
20 years of experience in disfluency treatment.

14 days of intensive treatment and structured follow-up care over the duration of 1 year

- Ultimate goal: Establishing long term speech fluency
- Continuous therapeutic assistance and control is provided throughout the whole process
- The treatment includes refresher weekends (4 weeks, and 10 months after intensive treatment) and 15 units online therapy
- Clients practice the acquired speech technique self-consistently in everyday life situations at home after intensive treatment
- Compliance contract between clients and medical insurances in order to use the training software regularly at home.
Institute for Research and Education in speech therapy since 2011

PARLO (www.parlo-institut.de) is:

- Committed to the advancement of evidence-based practice
- Oriented towards the WHO guidelines
- Supported by a research advisory board of renowned international researchers in the field of speech and language therapy
- Provider of services for therapy and research institutions as well as for medical engineering
- Developing the platform “freach” and the training software “flunatic” and “ASSIST” for speech based online therapy
- Developing online therapy moduls for speech pathology
- Forstering basic research and therapy research on stuttering issues
- Publishes numerous articles with named researchers with emphazise on neurological and therapeutical aspects
- Introducing an online academy with speeches of renowned experts most of the members of the Parlo advisory board
Pre-post therapy videos

Standarized speech reconstruction therapy
Compliance contracts with insurances
(Software is paid for if exercise time is proven by send in log files)

Computer assisted speech training

1. Gentle onset at the beginning of the syllable
2. Conscious feeling of the vibrations in the larynx
3. Even increase and decrease of the voice
4. Realising of pauses for breathing
Exercises in German and English in the training software „flunatic“

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<td>3. 2-Sek.-Weiche Stimmführung, einsilbiges Wörter, Vokale am Anfang (0/3)</td>
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<td>21. Freies Üben (0/1)</td>
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<td>23. Weicher Phraseneinsatz (0/1)</td>
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<td>24. 2 sec, Gentle Onset, Vokale (0/0)</td>
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<td>28. 2 sec, Gentle Onset, Compound Syllables (0/0)</td>
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<td>29. 1 sec, Linking Syllables, Sentences (0/0)</td>
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<tr>
<td>30. Linking Syllables, Sentences (0/0)</td>
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</table>
Subjective and objective data of stuttering

Objective dysfluencies in syllable percentages, subjective evaluation of stuttering and avoidance of speaking situations at different dates of measurement; self evaluation of stuttering (1 = no, 5 = severe stuttering), avoidance and disfluencies (% S), before and after treatment (N=78), 6 months (N=31), 1 year (N=68), 2 years (N=65) and 3 years later (N=50); mean over clients.

Data '1/2 year later' from (Euler/Wolff von Gudenberg 2000)
Results neuroimaging

Neuroimaging – brain activation in stutterers

before KST  after KST

left  at the front  right

K. Neumann- brain research stuttering, „Gehirn & Geist“
Data in JFD: KST – effectiveness and outcome

**Effectiveness Rating ('very good and quite good')**

- **Speech reconstruction**
  - KST: 80%
- **Non avoidance**: 68%
- **Breathing techniques**: 33%
- **Hypnosis**: 15%
- **Unspecific**: 14%

**Descriptive Values**

- **Effectiveness**
  - Speech reconstruction: 4.17
  - Non avoidance: 3.78
  - Breathing techniques: 2.58
  - Hypnosis: 1.76
  - Unspecific: 2.20

- **Satisfaction**
  - Speech reconstruction: 3.89
  - Non avoidance: 3.88
  - Breathing techniques: 1.75
  - Hypnosis: 2.12
  - Unspecific: 2.46

**Best Therapy with Proven Effectiveness**

KST in the virtual room with the platform „freach“

Teletherapy in the maintenance
Online therapy single and group therapy
Online therapy International
First experiences by single case studies in Kuwait, Columbia and Portugal
Outside transfer at a shopping mall at Kuwait city

Online treatment in a single person setting
Overview Concept

Phase 1: Motor Training
1 month
12 sessions = 32 hours

Phase 2: Overlearning
1 month
5 sessions = 5.5 hours

Phase 3: In-Vivo Training
2 months
8 sessions = 9.5 hours

Phase 4: Maintenance
4 months
4 sessions = 4.5 hours

Phase 5: Termination
2 months
2 sessions = 3.5 hours

Total:
10 months
31 sessions
55 hours

+ autonomous training
Comparison study: face to face vs. pure online therapy of groups

realisation of the treatment

treatment and evaluation study of the program

technical development of the treatment platform

Comparison study with a „non inferiority design“ funded by the biggest German insurance „Techniker Krankenkasse“

Project Duration: 24 month (October 2014 until October 2016)
Pure online treatment concept for groups includes also some individual treatment

**Phase 1:**
- **Motor Training**
- 1 month

**Phase 2:**
- **Overlearning**
- 1 month

**Phase 3:**
- **In-Vivo Training**
- 2 months

**Phase 4:**
- **Maintenance**
- 4 months

**Phase 5:**
- **Termination**
- 4 months

**Duration:** 1 year

Total:
- 25 h
- 13 h
- 2,5 h
- 9 h
- 4,5 h
- 12 h
- 2 h
- 11,5 h
- 2 h
- 7,5 h

= 36 h

**Total:**
- 53 h
Materials and methods: Study Design

**Pure Online Treatment**

- **Phase 1:**
  1 month
  intensive motor training

- **Phase 2:**
  1 month
  Overlearning

- **Phase 3:**
  2 months
  in outside transfer

- **Phase 4:**
  4 months
  maintenance

- **Phase 5:**
  4 months
  Termination

**Control group**

- 14 days of intensive therapy (face-to-face)
- 2 x online sessions
- 3 days follow-up meeting
- 14 x online sessions (every 2-3 weeks)
- final weekend

**Phase 2:** Overlearning

3 days follow-up meeting

**Phase 3:** in outside transfer

14 x online sessions (every 2-3 weeks)

**Phase 4:** maintenance

final weekend

**Phase 5:** Termination

Self-reliant accomplishment of speech exercises and transfer situations in everyday life

day-to-day practice with computer software *flunatic!*

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Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Treatment organisation of groups with the platform „freach“
The platform „freach“ for speech-based online therapy

- **clients**
- **therapist**
- **clients**

*Give and take away of the microphone*

*Projection surface for video, software „flunatic“ slides, notes, content of the therapy, etc.*

**gestures**
Education for clients in handling of the platform: Introducing the tools to organize sessions in „freach“

Therapist always can!
Clients with hand microphon or strg-key
Introducing the tools to organize sessions in „freach“

Important gestures and tools:

- gestures
- approval
- rejection
- speech bubble
- delete speech bubble
- Click „cup of coffee“, if absent

Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Results: Comparison of therapy elements in Face-to-face treatment and tele-treatment

Face to face treatment
Training with the biofeedback software “flunatic!”

Tele-treatment
Integration of the software in “freach”
Results: Comparison of therapy elements in face to face treatment and tele-treatment

Face to face treatment
Speech training with video analysis

Tele-treatment
Video recording module
Results: Comparison of therapy elements in Face – to - face treatment and tele-treatment

Face to face treatment
Discussions and role plays

Tele-treatment
Use of webcam

Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Results: Comparison of therapy elements in face to face treatment and tele-treatment

Face to face treatment
Talks in the group, exchange of experiences

Tele-treatment
Use of microphone, gestures and text fields to write on the board
Results: Comparison of therapy elements in Face – to - face treatment and tele-treatment

Face to face treatment
Telephone training

Tele-treatment
Via webcam or audio channel
Results: Comparison of therapy elements in Face- to - face treatment and tele-treatment

Face to face treatment
In-Vivo-Training

Tele-treatment
*limited*
Skype App, listen to recordings, audio channel via mobile phone

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Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Comparison pure online therapy versus Face- to- face treatment: Data collection

• **Objective speech data**
  – Conversation, Telephone call, Reading, (M1, M2)
  – Passive telephone call (M3, M4)

• **Subjective speech data**
  – OASES – questionnaire

• **Online-questionnaire evaluating tele-treatment**
Fig. 1: rate of stuttering (S%) for 60 participants of tele-treatment and 216 participants of face-to-face treatment, before therapy and 12 months after the intensive course (error margin 95% confidence interval).
Subjective data

Fig. 2 OASES –indices for 60 participants of tele-treatment and 216 participants of face to face treatment, before therapy and 12 months after the intensive course (error margin 95% confidence interval).

Dr. A. W. von Gudenberg – Insights into the Kassel Stuttering Therapy
Pure online group treatment for persons who stutter

Client´s and therapist´s advantages

• Time effective
  → no need to travel
  → no need to take time off work

• Cost effective
  → No costs for accommodation and food

• Independent of location
  → Treatment at client´s home

• Regular treatment sessions
  → Closer monitoring of the client´s progress
Going international since 2012: Online feasibility study in Brasil

Prof. Anelise Junqueira Bohnen
- IBF, Porte Allegre

Prof. Cristiane Moço Canhetti de Oliveira
Department of Speech-Language and Hearing Therapy UNESP, Sao Paulo
Presentation of the data at the international conference on telemedicine organized by the Parlo Institut and later in 2015 at IFA

April 7th – 10th, 2014, Hospital Alemão Oswaldo Cruz, São Paulo

Biomedical Signal Analysis Conference

Telemedicine: Diagnosis and Therapy
Speech Therapy | Tele-Neurology | Technical and Legal Challenges

April 7th-10th, 2014
Hospital Alemão Oswaldo Cruz, São Paulo

Registration and Call for Papers are open now:
www.biomedical-signals.com
Abstract.
The Kassel Stuttering Therapy (KST) is a computer-aided fluency-shaping one year intensive course for groups of people who stutter, which uses a biofeedback program (Flunatic) for learning a new speech pattern. Since 2014, the KST also offers a pure online version with a platform for speech therapy called Freach. The goal is to demonstrate the possibility of an international project, with the participation of Portugal, Brazil, Germany and Portuguese-speaking African countries. This approach allows treatment to populations that have extreme difficulties to find specialized stuttering clinics, and trains language therapists who intend to work with stuttering. Results from a feasibility study done in Brazil in a partnership are also discussed.
Evaluation Summary Report

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<tr>
<th>N.</th>
<th>Proposer name</th>
<th>Country</th>
<th>Total Cost</th>
<th>%</th>
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Abstract:
Freach is a disruptive IT software innovation to optimize online therapies of patients with speech disorders or psychological diseases. It is used for daily and intensive therapy sessions, providing not only a video conference tool for patients, therapists, and doctors but also automatic evaluations for speech- and psychotherapy (e.g., real-time analysis of voice curves and individual training sessions). The benefit are time savings for the patients (treatment from home), cost savings for the insurances and private payers (standardized group and individual training sessions) and treatment improvement (automated real-time analysis of speech). The scientifically proven facilitation of therapy for patients with speech disorders or psychological diseases is embedded into a globally scalable B2B business model and several international clinic chains are interested to use the system (e.g., Schwenk clinics as one of the largest German hospital chains). Furthermore, several listed Communication Technology Providers would like to offer the service in their portfolio since it has recently won several prices, like e.g. the ConHIT Medicine Management Prize 2015. The key objective of the innovation project is to extend the automated processes of the speech and psychotherapy based therapy software in more depth and to roll it out into European and global markets.

Total score: 13.49 (Threshold: 13)
KST web app–digital speech therapy for stuttering

- **Offline**
  - therapy via video chat
  - "anywhere"
  - face to face on site

- **Online**
  - therapy via video chat
  - "anywhere"
  - anytime
  - any language

- **Digital**
  - therapy via PC, tablet or phone

- **Proven**
  - effectiveness
  - accepted by patients
  - proven business model

- **Accepted**
  - by patients
KST web app – digital speech therapy for stuttering

“fighting stuttering and stammering – making digital therapy available for everyone anywhere and anytime.”
The situation

- 1 Mio. German speaking people stutter
- high variability in therapy with little effect
- effective hybrid therapy established, validated and reimbursed for 20 years
- online version running and proven effective
- digital remote therapy in development
- high efficiency
- full scalability and global availability
- global market > 20 Mio. people
- start in 2016 in DACH
- roll out in P, E, S market by 2018
Core of the app: ASSIST

**Automatic Speech analysis of a assistance system for a systematically Step-up of contextual and Interaction requirements in Stuttering Therapy**

**Videostory:** Everyday speaking situations can be trained by the help of a videostory.

**Provider of Feedback:** The user receives a direct feedback on the quality of the utterance.

**Voice curve:** The user receives a visual feedback on the gentle onsets and the syllable bindings.
Digital speech therapy for stuttering

- Curriculum
  - based on on-site group therapy and online therapy
  - speech analyses
  - speech training modules and reflections
  - real case situations

- Analytics
  - specific parameter
  - assessment algorithms
  - scientific evaluation

- Modular training
  - exercises and workouts
  - specific compilation according to status and individual progress

- Specific User interface (UX)
  - based of personas and individual motivation
  - specific compilation of real case video trainings
Market potential & outlook für speechbased therapy incl. indications of speech- and psychopathology

> Number of speech patients: 10% of the population
> Number of psychotherapy patients: 20% of the population

<table>
<thead>
<tr>
<th>Region</th>
<th>Population (Mil)</th>
<th>Ambulant Speech and Psychotherapy Patients (Mil)</th>
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<tbody>
<tr>
<td>Europe</td>
<td>740</td>
<td>222</td>
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<tr>
<td>Asia (excl. China)</td>
<td>4.216</td>
<td>1265</td>
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<td>Africa</td>
<td>1.072</td>
<td>321</td>
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<td>LATAM</td>
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<tr>
<td>USA</td>
<td>346</td>
<td>104</td>
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Source: Business Plan Horizon 2020: Portal system for the automatization of speech based therapy

Besides stuttering other disorders in:
- speech pathology
- psycho pathology

Multilingual online treatment global scaling
Perspectives of online activities for 2017

• Lidcombe online in German, comparison study German vrs. australian data
• CBT stand alone treatment in German integrated in the Kasseler Stuttering Therapy, comparison study German vrs. australian data
• Establishing of online conference on technical and therapeutical aspects of online therapy of stuttering
Thank you for listening!

Questions to: awvgudenberg@kasseler-stottertherapie.de