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1. Version log

Version	Date	Released by	Nature of Change
1.0	27.02.2018	Prof. Helmstaedter (Bonn)	

2. Definition and acronyms

Acronyms	Definitions
ERN	European Reference Network
RedCap	a secure web application for building and managing online surveys and databases
eCRF	Electronic case report form

3. Introduction

Behavioral and cognitive comorbidities in epilepsy are very common. In conjunction with data from imaging, electrophysiology, pathology and genetics, neuropsychological findings serve as an indicator for different epilepsy subtypes and syndromes. As part of the pilot ERN E-epilepsy a neuropsychological toolbox E-Neuropsych which aimed at the harmonization of neuropsychological practice across Europe has been developed.

As part of EpiCARE, the web based platform E-Neuropsych needs to be extended and adapted to answer a broader range of questions concerning the diagnosis and treatment of rare and complex epilepsies. Therefore, the work package aimed to:

- D5.1 establish an expert neuropsychology working group
- D5.2 report on new toolbox implementation

The expert neuropsychology working group is trying to establish a short core test battery for the assessment of all age groups, following a modular and question-guided neuropsychological approach. The hereby collected data could be used to define cognitive and behavioral aspects of rare and complex pathologies.

Implementing the advanced E-Neuropsychology toolbox is the major aim of this work package. Since EpiCARE focusses on the treatment of rare and complex epilepsies the current neuropsychological test battery needs to be adjusted in multiple ways. We especially need to discuss the assessment of children, adolescents and their development.

One challenge is the assessment of very young children and patients with intellectual disabilities. In addition, changes will have to be made regarding the data to be entered and how they will be stored. This is especially important for emerging research questions regarding the neuropsychological contribution to the diagnosis and treatment of rare and complex epilepsies.

4. Activities carried out and results

Activities carried out

In the beginning of year one, we formed a group of pediatric and adult neuropsychologists who do routine clinical work and have experience in scientific work. Therefore, we contacted five neuropsychologists and held monthly web based meetings to discuss the needed changes for E-Neuropsych and the setup of a neuropsychological registry across centers.

As a starting point, we created a survey to gather data on the tests being used in the respective neuropsychological unit. Together with data collected in a survey from 2014 (Vogt et al., 2017) these results are being used to adapt the existing E-Neuropsych toolbox to the requirements of EpiCARE.

Minor changes have already been carried out on the website regarding the storage of data and the evaluation of data. An outsourced IT programmer is currently working on the reorganization of test modules, compatibility with RedCap and Microsoft Excel and the structure of the eCRF.

Results

Within the first year, an expert group consisting of seven neuropsychologists from five European reference centers has been initiated. In monthly meetings, the group revised the existing E-Neuropsych website in terms of its purpose, the core test battery, the nature of the data and the required clinical information.

The group consists of the following neuropsychologists:

- Christoph Helmstaedter (UH Bonn)
- Alena Javurkova (FN Motol)
- Navah Kadish (UH Kiel)
- Einar Heminghyt (UH Oslo)
- Agathe Laurent (Centre Hospitalier Universitaire de Lyon)
- Delphine Breuillard (Hopital Enfant Malade, Necker, Paris)
- Julia Taube (UH Bonn)

The E-Neuropsych toolbox, which was originally created as part of the ERN pilot E-PILEPSY offered an evidence based core test battery, consisting of tests widely available across the EU. Unfortunately, the web based software has not been used by many centers in the past. As a result, the web based tool is going to be transformed into a registry containing a common sense regarding the cognitive domains to be assessed, but offering the possibility for each center to choose their own tests. Therefore, we conducted a second survey regarding neuropsychological practice. The idea is to gather a collection of assessment tools which will be incorporated into the toolbox. The results of the survey are displayed in **table 1**.

Table 1. Tests to be included in E-Neuropsych registry

IQ
MWT-B (vocabulary test) WAIS/WAIS short form WAIS-IV WISC/WISC short form WISC-IV/V K-ABC (Kaufman Assessment Battery for Children) WPPSI-III/WPPSI IV (Wechsler preschool and primary school scale of intelligence) Ravens' Progressive Matrices NEMI2 (Nouvelle Echelle Métrique de l'Intelligence) PEP-3 (Psychoeducational Profile) WASI (Wechsler Abbreviated Scale of Intelligence) BAYLEY SON-R (Snijders-Oomen Nicht-verbale Intelligenztest) WNV (Wechsler Nonverbal Scale of Ability)
babies/toddlers/children/ adolescents
BSID (Bayley Scale of Infant Development): Adaptive Behavior, Cognitive, Language, Motor, Social-Emotional development VABS (Vineland Adaptive Behavior Scale)
Development
VABS/VABS-II KOPKIJ (Kognitive Probleme bei Kindern und Jugendlichen) KOPKI 4-6 Bayley-III

Brunet Lezine Revised Development Inventory
Short-term/Working Memory
Digits&Corsi (WAIS,WISC) NeuroCog FX: 2-back-test/Digits Sequential thinking (KABC II/K-ABC I) DTC ROCFT (Rey-Osterreith Complex Figure Test) WNV Block Tapping
Long-term Memory
RAVLT/VLMT/CVLT/CAVLT/BVMT-R ROCFT DCS-R(DCS-II); NeuroCog FX: verbal; figural memory Benton test (recognition) WISC information ("Allgemeinwissen") Child Memory Scale NEPSY-II KABC II DTC WMS-III Stories
Attention and Executive Functions
EpiTrack/ EpiTrack Junior cIT SZ/AB TMT A/B d2 letter cancellation NeuroCog FX reaction times (simple choice, Go/NoGo, inv. Go/NoGo) 2-back test TAP reaction times Go/NoGo WISC symbol search, subtests of processing speed NEPSY-II Tea-Ch (Test of Everyday Attention of Children) Anitest D-KEFS (Delis–Kaplan Executive Function System) KABC-II(Kaufman Assessment Battery for Children) DTC Stroop WCST (Wisconsin Card Sorting Task) Tower of London cancellation tasks BRIEF WPPSI
Language
phonemic/semantic word fluency (RWT) TOKEN-test/(short) BNT SLRT-II (Salzburger Lese und Rechtschreibtest) NeuroCog FX phonematic fluency WAIS/WISC vocabulary and similarities WASI WPPSI-III vocabulary+similarity+comprehension+picture naming+receptive vocabulary BPVT+WPPSI naming; oral language NEPSY II KABC II Wechsler Scales PELEA pragmatics of language EVAC DEN48 ELO

<p>EDA written language EVALO2-6 Cognisciences Alouette D-KEFS phon + sem word fluency CWIT (Stroop) PPVT-IV (Peabody Picture Vocabulary Test) SETK (Sprach Entwicklungstest für 3-5 jährige) ELFRA (Elternfragebogen für die Früherkennung von Risikokindern)</p>
Visuo-spatial
<p>LPS-7; Chapuis mazes; WAIS/WISC block design; DCS-R copy; WPPSI IV; NEPSY II; Cancellation tasks; Benton; KABC II; DTC 36; Rey Osterieith Complex Figure Test; VMI (Developmental Test of Visual Motor Integration); MVPT-3 (Motor Free Visual Perception Test); ROCFT: copy</p>
Motoric
<p>Purdue Pegboard Luria Manual Sequencing Task Fingertapping NEPSY II DTC NP Mot or DF Mot (motor scale-Vaivre-Douret) HRNB Grooved Pegboard (5x5) (Halstead-Reitan Battery) K-ABC hand movement</p>
Mood & Personality / Behavior
<p>BDI SCL FPZ CBCL (Child Behavior Checklist - Elternfragebogen) DIKJ (Depressionsinventar für Kinder und Jugendliche) KOPKIJ RDMAS MDIC Conners SNAP ADIR Social Communication Questionnaire CHAT/M-CHAT (checklist for autism in toddlers) BREIF BRIEF P CSBS dDP ESEJE (social and emotional evaluation in coung children) GAD-7 (General Anxiety Disorder) NDDI-E (Neurological Disorders Depression Inventory for Epilepsy) VFE (Verhaltensfragebogen für Entwicklungsstörungen) (engl DBC); FSK((Fragebogen zur sozialen Kommunikation) (engl SCQ) DISYPS (Diagnostik System für psychische Störungen) VBV-EL/VBV-ER SEN SRS MBAS (Marbuger Beurteilungsskala zum Asperger Syndrom)</p>
Quality of Life
<p>QOLIE-10 KINDL KIDSCREEN DISABKIDS</p>
Dementia
<p>MMSE SIDAM MCI Screen</p>

Each center will have the possibility to select their preferred tests for each cognitive domain. To be able to compare the data across centers standardized scores are entered and categorized. The relevant cognitive domains (ie, attention, verbal memory and figural memory) are rated on a five-tiered scale (0=severe impairment, ie, at least two test scores >2 SDs below the mean of the normative sample; 1=impairment, that is, at least two test scores >1 SD below the mean of the normative sample; 2=borderline, that is, at least one test score >1 SD below the mean of the normative sample; 3=unimpaired, that is, no test scores >1 SDs below the mean of the normative sample; 4=above average, at least two test scores >1 SD above the mean score of the normative sample) based on the underlying psychometric test results (Grote et al.,2015). This way we ensure that each center can still choose their preferred tests but we will also be able to collect comparable data across centers. These data can be merged and help answer questions regarding the diagnosis, disease dynamics and therapeutic outcome for the benefit of individuals with rare and complex epilepsies across Europe. **Figure 1** shows a first visualization of the registry. Completing the form should not take longer than 10 – 15 minutes per patient. In addition, the tool provides you with the possibility to directly create and print a patient report.

Figure 1 Visualization of planned registry

However, the final scope of the registry and the details of the structure of the clinical patient information need to be further determined. The proposed changes will be incorporated into the existing E-Neuropsych website by a programmer and the website should be launched in 2018. Pending technical question regard the server on which the web based tool E-Neuropsych resides, the compatibility with Microsoft Excel and RedCap or other databases.

5 Conclusions

With the transformed version of E-Neuropsych we are offering a very well applicable tool for neuropsychologists across Europe. It also allows us to collect comparable data to examine differential diagnostic and prognostic criteria for different disease conditions in epilepsy from the beginning of the disease and along its natural course. Since the neuropsychological assessment should follow a modular and question-guided approach it can also be used for outcome and quality control of different treatment options. Since the establishment of a core test battery, which all reference centres can agree on, does not seem feasible now, the registry with a minimal consent on the domains to be assessed and the use of standardized scores is a suitable tool for EpiCARE.

6 Bibliography / References

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