Impact case study form

- The Impact case study form consists of two sections. In Section A, provide basic information about the applicant, the unit of assessment, the title of the case study, the period when the research on which the case study is based was conducted, and information about the submitting institution's staff who are (or have been) involved in the research. The information regarding the underpinning research does not need to be linked to current staff, nor does it need to be linked to the evaluation period (2020-2024) or to the outputs submitted in the previous section.
- Section B has 5 main parts:
    - Brief summary of the impact (max. 100 words): briefly state the specific societal impact described in the case study;
    - The research on which the impact is based (max. 500 words): provide the key research findings or insights that underpin the societal impact and details of what research has been conducted, when and by whom;
    - References to the research (max. 6 references): provide references to the key outputs from the research described in the previous section;
    - Details of the societal impact (max 750 words): using supporting evidence, explain how the research has clearly supported or substantially contributed to the declared societal impact, and also the nature and extent of the societal impact, including a description of the societal impact on specific institutions or target groups, including a description of the evidence to support the societal impact;
    - Up-to-date contacts to sources supporting the societal impact (max. ten references): provide contacts of those external sources (i.e. sources outside the submitting institution) that have supported the specific claims made in the case study.
- The last part of the form is 'other contextual data', which applicants may fill in if relevant in the context of the application (this information is supplementary and optional; it is not included in the limit of five pages).

Section A
The fields in this section are compulsory.

Applicant: Department of Psychology Faculty of Arts, University of Trnava		
Unit of assessment: Social Sciences – 19. Psychology		
Title of case study: The utilization of dichotic listening as a diagnostic tool for psychological assessment		
Type of the impact: medical (diagnostic tools)		
Time period when the underpinning research was conducted: 2006-2020		
Details about the personnel conducting the underpinning research from the submitting unit:		
Name/Names:	**Roles (e.g. work position):**	**Period of employment at the submitting institution:**
prof. PhDr. Marián Špajdel, PhD.	Head of the Department of Psychology	2006-present
Details about the personnel from the submitting institution who have contributed to the impact:		
Name/Names:	**Roles (e.g. work position):**	**Period of employment at the submitting institution:**
prof. PhDr. Marián Špajdel, PhD	Head of the Department of Psychology	2006-present
Period when the declared impact occurred: 2020-2024		
Section B		

1. Brief summary of the impact (max. 100 words)

We have created a comprehensive methodology of dichotic listening, which serves to detect brain damage, the degree of auditory function impairment and determine the laterality of auditory processing. Such a tool has not been available in Slovak or Czech psychological diagnostics until now. Our methodology has proven to be beneficial for clinical practice, primarily in psychological, neuropsychological and speech therapy diagnostics, where it enables early recognition of damage

or brain diseases and therefore the possibility of early treatment and rehabilitation, thereby significantly contributing to the improvement of clinical diagnostics and also subsequent clinical procedures in these areas. In the case study, we describe specific applications in clinical practice and also the experiences of users with our methodology.

2. Research on which the impact is based (max. 500 words)

The dichotic listening paradigm is a non-invasive methodology for investigating the nature of lateralized auditory information processing in the brain. Performance deficits in dichotic listening tasks are observed across a wide range of neurological conditions and structural brain disorders, including lesions in the temporal and frontal lobes, damage to the posterior corpus callosum, and subcortical regions such as the thalamus and basal ganglia. Additionally, impaired dichotic listening performance has been reported in patients with aphasia, epilepsy, traumatic brain injury, and other neurological conditions. Importantly, dichotic listening can reveal auditory dysfunction even in the absence of overt structural brain lesions.

Internationally, the practical application of dichotic listening has been predominantly limited to verbal stimuli (e.g., syllables, words), whereas the use of non-verbal stimuli (e.g., environmental sounds, tones) remains relatively rare. In Slovakia, research applications of dichotic listening have previously relied on experimental versions using verbal stimuli, while the use of non-verbal stimuli and clinical applications of dichotic listening in psychological diagnostics were entirely absent.

To address this gap, we developed a comprehensive dichotic listening methodology incorporating both verbal and non-verbal stimuli (Špajdel & Jariabková, 2008), including tone sequences, environmental sounds, syllables, and words. Validation of this method in a normative population demonstrated good test-retest reliability across all task variants (Špajdel & Jariabková, 2008), establishing its potential for broader diagnostic use. Furthermore, we demonstrated a significant correlation between dichotic listening performance and brain activity measured via event-related potentials (Špajdel, 2016), confirming the method's validity for assessing auditory-perceptual laterality.

Our methodology was further tested in clinical populations with brain damage, including ischemic lesions and traumatic brain injury (Špajdel, 2020). The results showed that dichotic listening reliably differentiates individuals with brain damage from neurologically intact populations, even several months post-lesion. Moreover, the method effectively distinguishes between left- and right-hemisphere lesions (Špajdel, 2020). Our findings confirm that dichotic listening tasks incorporating both verbal and non-verbal stimuli are not only sensitive to temporal lobe damage but also reflect impairments in broader cortical and subcortical structures (Špajdel, 2020).

Additionally, we identified critical periods of functional hemispheric asymmetry changes for verbal and non-verbal tasks between the ages of 10 and 18 years (Špajdel, 2016). Our dichotic listening methodology has been applied in research on auditory-perceptual laterality in both typically developing children and children with developmental speech and language disorders, such as

dyslexia (Špajdel, Jariabková, & Krajmer, 2009), acquired aphasia with epilepsy, temporal lobe epilepsy, and selective attention deficits.

The key findings and applications of our work have been comprehensively summarized in the scientific monograph *Dichotic Listening in Psychological Diagnostics* (Špajdel, 2020), which serves as a guide for the practical clinical implementation of the method in psychological assessment. This monograph elucidates the principles of dichotic listening, methods for quantitative and qualitative evaluation, and fundamental approaches to clinical interpretation. It also includes illustrative graphs and case studies.

Our dichotic listening methodology has proven to be an effective psychological screening tool for suspected brain damage. The inclusion of various verbal and non-verbal tasks allows for comparative analysis and differentiation based on the nature of auditory stimuli (e.g., non-semantic stimuli such as tone sequences and syllables vs. meaningful stimuli such as environmental sounds and words), thereby facilitating a more comprehensive diagnostic interpretation. We also created percentile standards for children and adults aged 9 to 50 years to use our method for clinical purposes (Špajdel, 2020).

3. References to the research (max. 6 references)

1. Špajdel, M. (2020). Dichotická stimulácia v psychologickej diagnostike. Trnava, Filozofická fakulta Trnavskej univerzity, 92 s., ISBN 978-80-568-0268-7.
2. Špajdel, M. (2017). Brain asymmetry for verbal stimuli in relation to dichotic listening performance, verbal and nonverbal intellectual abilities. Activitas Nervosa Superior Rediviva, 59 (1), p. 33-37.
3. Špajdel, M., Jariabková, K. (2008). Metodika dichotickej stimulácie: neverbálne a verbálne úlohy. Československá psychologie, roč. 52, č.2, s. 167-171. PDF
4. Špajdel, M. (2016). Medzipohlavné rozdiely v kognícii a funkčnej asymetrii mozgových hemisfér. Trnava, Filozofická fakulta Trnavskej univerzity, 132 s., ISBN: 978-80-8082-956-8.
5. Špajdel, M., Jariabková, K., Krajmer, P. (2009). Verbal auditory processing in boys with specific reading disability. Activitas Nervosa Superior Rediviva, 51 (3-4), p. 156-158. PDF

4. Details of the impact (max. 750 words)

We have developed a comprehensive dichotic listening method that integrates both non-verbal and verbal stimuli. Such a tool has not previously been available in psychological diagnostics in Slovakia or Czech Republic. Our method provides professionals with critical data for detecting brain damage, assessing auditory function impairments, and determining the laterality of auditory processing. Following rigorous validation and reliability testing, the method has been established as a practical tool for clinical diagnostics, significantly supported by our monograph *Dichotic Listening in Psychological Diagnostics* (Špajdel, 2020), which serves as a reference guide for implementing the method in clinical practice.

For practitioners (psychologists, speech therapists, special education professionals, etc.), our methodology is available free of charge. The set includes dichotic stimuli, scoring sheets, and an electronic version of the manual.

Dissemination to the Professional Community

To introduce the methodology to the professional community, we conducted lectures and published research:

1. Key Contribution to Societal Impact
    - Three full-day lectures on dichotic listening within postgraduate courses for clinical psychologists in healthcare settings in the Czech Republic (Špajdel, M.: *Cognition and Functional Hemispheric Asymmetry*. Invited lectures, 3×8 hours, as part of the certified postgraduate course *Practical Clinical Neuropsychology of Adults for Clinical Psychologists in Healthcare*, Prague, January 2018, March 2018, March 2019. Institute for Postgraduate Medical Education, Czech Republic).
2. Invited Lectures at Professional Events
    - Špajdel, M.: *Functional Hemispheric Asymmetry in Brain Damage: Dichotic Listening Methodology*. *Civilization Diseases III.*, Faculty of Health and Social Work, Trnava University, and Faculty Hospital in Trnava, Trnava, November 8, 2017.
    - Špajdel, M., Jariabková, K.: *Dichotic Listening Method in Neuropsychological Diagnostics*. *Psychological Diagnostics Brno*, October 22-23, 2015, Faculty of Social Studies, Masaryk University, Brno.
3. Scientific and Professional Publications
    - Špajdel, M., Jariabková, K.: *Dichotic Listening Method in Neuropsychological Diagnostics*. TESTFÓRUM, No. 7, pp. 14–19, 2016 (a specialized publication for clinical psychologists).

Implementation in Clinical Practice (2020–2024)

Since 2020, our dichotic listening method has been systematically integrated into several psychological and medical institutions across Slovakia and the Czech Republic, becoming a screening tool in psychological diagnostics. The methodology is applicable to both neurologically healthy individuals and patients with various types of brain injuries.

Its impact is evident in multiple areas of clinical practice, primarily among psychologists and speech therapists (Document 1; Document 2; Document 3), but it is also utilized by special education professionals. Communication with users via email has revealed that practitioners appreciate the method's ease of administration, as it can be conducted in standard psychological and speech therapy clinics using stereo headphones connected to widely available devices (MP3 players, smartphones, or laptops). The method enables efficient and rapid assessment of auditory laterality and auditory discrimination impairments (Document 1; Document 2). Users also recognize its high

diagnostic sensitivity in detecting auditory deficits (Document 1; Document 3). Beyond diagnostics, the method is applied in rehabilitation for memory and speech disorders, as well as in multisensory stimulation programs (Document 1).

Systematic Use in Epilepsy Center (Prague, Czech Republic)

Since 2020, our method has been systematically employed at the Epilepsy Center at the Department of Neurology in Motol University Hospital in Prague (The hospital of 2nd Faculty of Medicine Charles University in Prague, Czech Republic) for neuropsychological assessments of epilepsy patients undergoing pre-surgical evaluations for epilepsy surgery. The method is particularly beneficial in diagnosing auditory discrimination deficits and evaluating cognitive function following surgical interventions in both temporal and extratemporal brain regions, as well as in monitoring neuropsychological rehabilitation outcomes (Document 3). One of the primary advantages, recognized by clinicians at epilepsy center, is the methodology's non-invasive nature compared to the Wada test, which involves the injection of a barbiturate to selectively sedate one hemisphere. Additionally, unlike traditional language function tests, which predominantly assess speech production, dichotic listening evaluates the perception of verbal and non-verbal auditory stimuli, providing a broader and more sensitive measure of auditory processing. This approach allows for assessments across various stages of neurological conditions, including preoperative evaluations, postoperative monitoring, and tracking of disease progression (Document 3). Furthermore, clinical experience suggests that the methodology provides critical insights into the extent and nature of auditory processing impairments, even in patients who exhibit no apparent speech perception deficits during standard neuropsychological assessments (Document 3).

Conclusion

Our dichotic listening method has proven to be a valuable tool in clinical practice, particularly in psychological and neuropsychological diagnostics, where it facilitates the early detection of brain disorders, enabling timely intervention and rehabilitation. As a result, it significantly enhances the quality of clinical diagnostics and subsequent therapeutic procedures in these fields.

5. Sources to support the impact (max. ten references)

1. Document No. 1 – Report (email) from PhDr. Mgr. Kamila Finkesová (clinical speech therapist and psychologist), Private Speech Therapy Practice Pohoda s.r.o., Prostějov, Czech Republic.
2. Document No. 2 – Report (email) from PhDr. Lenka Klepáčková (clinical psychologist and psychotherapist), Private Practice of Clinical Psychology and Psychotherapy, Hostinné, Czech Republic.
3. Document No. 3 – Report (email) from PhDr. Alena Javůrková, PhD. (clinical psychologist, neuropsychologist), Epilepsy Center, Neurology Clinic at Motol University Hospital, 2nd Faculty of Medicine, Charles University, Prague, Czech Republic.

Other contextual data Fields in this part are additional and optional. This information is provided in a separate form and is not included in the five-page limit.
Name(s) of funder(s):
Global Research Identifier of funder(s) (https://www.grid.ac/):
Name(s) of funding programme(s):
Grant number(s):
Amount of grant (in EUR):
ORCID for each named researcher, where available: Marián Špajdel https://orcid.org/0000-0002-5995-3741
Name(s) of formal partner(s):
Countries where the impact occurred: