Mobile Eye-Tracking as a Research Method to Explore the D/Deaf Experience at Arts and Cultural Venues

Vanessa Cumper(✉), Caroline Scarles, Hongbo (Daisy) Liu, and Albert Kimbu

University of Surrey, Guildford GU2 7XH, England
{v.cumper,c.scarles,hongbo.liu,a.kimbu}@surrey.ac.uk

Abstract. D/deaf activists have consistently lamented their exclusion from the decision-making process by service providers. Accessibility is only effective when designed with contributions from those affected by the perceived or known barrier. This paper redresses the historic absence of the D/deaf paradigm, and recenters the focus to the individual's perspective of accessibility requirements by developing a conceptual framework, constructed through the review of empirical and theoretical literature. The conceptual dimensions presented are from the D/deaf person's perspective as valued through shared power and ownership. The aim of this conceptual paper is to explore how D/deaf-centric research can be applied and qualitatively measured through the combination of self-report, observation and Mobile eye tracking (MET).

Keywords: D/deaf access · Mobile eye-tracking · Arts and culture

1 Introduction

People who are D/deaf continue to be a marginalised group. The accepted definition for D/deaf where the use of capital 'D' is used to describe someone who identifies as culturally Deaf, their first language is signed, not spoken, lowercase 'd' identifies everyone else who is living with a hearing impairment [1]. Despite the recognised opportunity to improve competitiveness and economic value of creating an accessible and inclusive tourism industry, accessibility remains a low priority [2–4]. The latest estimates [5] state that 1 in 6 people worldwide, have some form of hearing loss [6]. Previous research has focused on assumed communication barriers [7], without consulting their 'dehumanised subjects' [1], rendering D/deaf perceptions inconsequential, [8] this conceptual paper argues, there are substantive reasons to co-create solutions. Research conducted within an authentic setting of an art gallery presents an opportunity to fully understand how people who are D/deaf can participate in leisure, recreation, and cultural life [1]. D/deaf epistemology should be central to any research which pertains to an accessibility solution. A D/deaf-centric investigation challenges societal barriers, rendering D/deaf disabled or D/deaf problematic irrelevant, to develop an egalitarian relationship [1, 9].

This paper argues the advantage of the application of qualitative methodology of self-report in conjunction with Mobile Eye-Tracking (MET) data, accredits the D/deaf

B. Ferrer-Rosell et al. (Eds.): ENTER 2023, SPBE, pp. 94–98, 2023.
https://doi.org/10.1007/978-3-031-25752-0_10

perspective centrally within the research, empowering reciprocal communication. The Tobii 2 mobile eye-tracking (MET) hardware, video-records the temporal and spatial eye-movements, through the integrated forward and rear facing cameras. The collected data identifies points of interest, through the recognition of objects, location, and duration of the gaze. The concept of power and control is assigned to the wearer of MET, as data is gathered through their gaze, and instant playback enables accurate self-report dialogue of experience from their perspective [10]. Previous research which has relied on quantitative eye-tracking measurements [10, 11] is deficient in meaning without the clarity of the D/deaf perspective. Eye-tracking data collection is becoming more ubiquitous in the marketing, gaming, and medical industries. However, it has been neglected in the tourism industry in relation to a co-design approach to provide D/deaf accessible experiences. Building on review of existing literature, a conceptual framework of D/deaf centralism is constructed, with important future research directions indicated.

2 Deaf Experience

People who are D/deaf have been categorised by society as a non-contributing group according to D/deaf activists [1, 9, 12–15] asserting, society lacks the comprehension of D/deaf as a unique linguistic group. The frequency of stigmatization occurs within the audition and oral social parameters thus, obstructing access. Intensified by traditional exhibition curation expressly reliant on the principles of artistic merit, chronology, and taxonomy, in preference to the centrality of accessibility in the visitor experience [16]. The corresponding societal bias dictates the body as disabled, contrary to the preference of the body as different [9, 14]. Recognising D/deaf body as different legitimately implies how people who are D/deaf experience the world, and the indifference society has to their diversity, unique communication, and situatedness [1, 9, 14, 16]. Fixations on individual words and difficulty articulating their experience regarding known and perceived barriers, is by definition a barrier for people who are D/deaf. The importance of eliciting personal biographies from participants corroborates the complex influences of the various dimensions of identity, understanding and recognition[16]. Previous research has indicated ethnographic film making, observations and interviews are effective methods of data collection of D/deaf narratives [9, 14, 16]. Although these methods have been favored in social anthropology, psychology, and other disciplines the barriers discussed earlier remain unsurmountable, utilising traditional qualitative methods[9, 13, 15, 16]. Although previous research papers have discussed the overarching principle of visual acuity of people who are D/deaf, there is a deficit of comparative studies of gaze patterns or areas of interest for this group within tourism [17].

3 MET as Method

Recent research has indicated people who are D/deaf exhibit remarkably different gaze patterns in comparison to hearing people [17]. Through the deployment of MET the researcher can observe participants' decoding and comprehension, to formulate strategies to reduce perceived barriers, in accessing and engaging in tourism experiences[18]. The eye tracking software, iMotions in this instance, generates pictorial evidence of gaze

patterns and heatmaps. Gaze patterns consist of saccades and fixations. Fixations are the momentary pauses on an area that either consciously or unconsciously are found interesting [19, 20]. The saccades are the rapid eye movements between each fixation lasting a few seconds. Specific dependent variables of data will be collected with analysis of the correlations between fixations, matched by the analytical software to the photographs of the visual stimuli [20]. A group of fixations collectively create an area of interest (AOI). Participant interviews will reveal their conscious and unconscious AOI [18, 21, 22]. The salience of an AOI is calculated by the algorithm of the analytical software, iMotions, based on the duration before fixation on a AOI and the commonality or proportion of participants who fixate on an AOI. If the first fixation to AOI is brief, the salience is more relative in terms of participant interest and engagement [18]. Capturing meaningful qualitative data through MET provide clear indicators of participant engagement, relevant narratives and motivations with art and culture and the actualisation of intangible and tangible barriers are realized [19, 20], therefore, providing data to construct an impactful accessible solution [12, 18, 21, 22].

4 Conceptual Framework

The review of empirical literature has highlighted the absence of the D/deaf narrative when designing accessible experiences[2–4, 8, 16]. The traditional museum curation of object assemblage disregards the visitor perspective, incidentally, facilitating an inaccessible exhibition [23]. However, the proposed conceptual framework propounds a D/deaf-centric (Fig. 1) co-design paradigm [24]. Direct dialogue, moderates' opportunities to transform inaccessible experiences, into accessible experiences for a diverse population [12, 16]. The proposed experimental design places the participant in an authentic gallery environment with genuine artefacts for the purpose of the replication of natural behaviour [23, 24]. Meaning is applied through the careful consideration of observations in conjunction with MET, preceding and informing the semi-structured interviews. The qualitative instruments provide a unique opportunity to gain valuable insight of D/deaf situatedness[9, 14, 16]. Consequently, transforming D/deaf disabled into, valued D/deaf different, re-dressing the historical imbalance of power and autonomy[1].

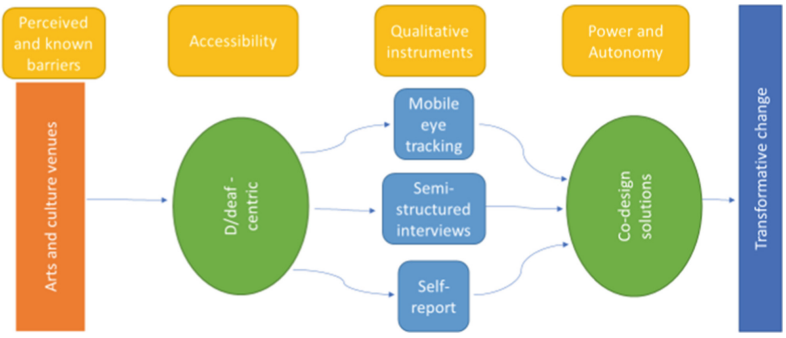

Fig. 1. Conceptual framework of factors positively affecting D/deaf-centric design.

5 Discussion

Although communication between D/deaf people and venues is a complex construct with indistinct variables, these can be overcome through the adoption of D/deaf body difference [9, 14]. This paper has argued the application of MET with semi-structured interviews and self-report, the person who is D/deaf is afforded the authority to co-design solutions to perceived and known barriers to participation in leisure, recreation, and cultural life [16]. The limitation of the conceptual framework is the propensity of singular MET observation, attributable to the immense volume of high-quality data manufactured through the data gathering process. For example, over 50,000 frames of data from studies lasting approximately 3 min, rendering this method prohibitive in some circumstances [10, 18–20]. Further prohibitions are the cost of hardware, software and licenses required, although these may diminish through higher demand, ubiquitous use, and technological innovation. However, the utilisation of MET in a qualitative field study can yield the D/deaf-centric perspective to perceived and known barriers, to design innovative solutions. Moving beyond the scope of this paper to conduct empirical research with diverse D/deaf communities framed within contemporary arts and cultural practice.

References

1. Ladd, P.: Understanding Deaf Culture. In Search of Deafhood. Channel View Publications, UK (2003)
2. Darcy, S., McKercher, B., Schweinsberg, S.: From tourism and disability to accessible tourism: a perspective article. Tourism Rev. **1**(75), 140–144 (2020)
3. Gillovic, B., McIntosh, A.: Accessibility and inclusive tourism development: current state and future agenda. Sustainability **12**(22), 9722 (2020)
4. Kalargyrou, V., Kalargiros, E., Kutz, D.: Social entrepreneurship and disability inclusion in the hospitality industry. Int. J. Hosp. Tour. Adm. **21**(3), 308–334 (2020)
5. World Health Organisation. https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss. Accessed 14 Oct 2022
6. Louw, C., Swanepoel, W., Eikelboom, R.H., Hugo, J.: Prevalence of hearing loss at primary health care clinics in South Africa. Afr. Health Sci. **18**(2), 313–320 (2018)
7. Koller, O., Forster, J. & Ney, H., (2015). Continuous sign language recognition: Towards large vocabulary statistical recognition systems handling multiple signers. Comput. Vis. Image Understanding **141**, 108–125 (2015)
8. Jain, D., Franz, R., Findlater, L., Cannon, J., Kushalnagar, R., Froehlich, J.: Towards accessible conversations in a mobile context for people who are deaf and hard of hearing. In: Proceedings of the 20th International ASSETS '18: ACM SIGACCESS Conference on Computers and Accessibility, pp. 81–92. Association for Computing Machinery, New York (2018)
9. Friedner, M., Kusters, A.: Deaf anthropology. Annu. Rev. Anthropol. **49**(1), 31–47 (2020)
10. Rainoldi, M., Yu, C.-E., Neuhofer, B.: The museum learning experience through the visitors' eyes: an eye tracking exploration of the physical context. In: Rainoldi, M., Jooss, M. (eds.) Eye Tracking in Tourism. Springer Nature Switzerland AG. Switzerland (2020)
11. Doherty, S., Kruger. J-L.: The development of eye tracking in empirical research on subtitling and captioning. In: Seeing into Screens: Eye Tracking and the Moving Image. Dwyer, T., Perkins, C., Redmond, S., Sita, J. (eds) Bloomsbury Publishing, USA (2018)

12. Krejtz, I., Krejtz, K., Wisiecka, K., Abramczyk, M., Olszanowski, M., Duchowski, A.T.: Attention dynamics during emotion recognition by deaf and hearing individuals. J. Deaf Stud. Deaf Educ. **25**(1), 10–21 (2020)
13. Friedner, M., Kusters, A.: On the possibilities and limits of" DEAF DEAF SAME": Tourism and empowerment camps in Adamorobe (Ghana), Bangalore and Mumbai (India). Disability Stud. Quart. **34**(3), 1–22 (2014)
14. Lane, H.: The mask of Benevolence. Disabling the Deaf Community. Dawn Sign Press, USA (1999)
15. Moriarty, E., Kusters, A.: Deaf cosmopolitanism: calibrating as a moral process. Int. J. Multiling. **18**(2), 285–302 (2021)
16. Zajadacz, A.: Sources of tourist information used by Deaf people. Case study: the Polish Deaf community, Current Issues in Tourism **17**(5), 434–454 (2014)
17. Schindler, M., Doderer, J.H., Simon, A.L., Schaernicht, E., Lilienthal, A.J., Schäfer, K.: Small number enumeration processes of deaf or hard-of-hearing students: a study using eye tracking and artificial intelligence. Front. Psychol. **13**, 909775 (2022)
18. Bergstrom, J.R., Schall, A.: Eye Tracking in user Experience Design. Elsevier, London (2014)
19. Bojko, A.: Eye Tracking the User Experience: A practical Guide to Research. Rosenfield Media, New York (2013)
20. Eghbal-Azar, K., Widlok, T.: Potentials and limitations of mobile eye tracking in visitor studies: Evidence from field research at two museum exhibitions in Germany. Soc. Sci. Comput. Rev. **31**(1), 103–118 (2013)
21. Chua, H.F., Boland, J.E., Nisbett, R.E.: Cultural variation in eye movements during scene perception. Proceedings of the National Academy of Sciences, U S A. 200 (2005)
22. Savin, G.D., Fleșeriu, C., Batrancea, L.: Eye tracking and tourism research: a systematic literature review. J. Vacat. Mark. **28**(3), 285–302 (2022)
23. Kiefer, P., Giannopoulos, I., Kremer, D., Schlieder, C., Raubal, M.: Starting to get bored: An outdoor eye tracking study of tourists exploring a city panorama. In: Proceedings ETRA '14: Proceedings of the Symposium on Eye Tracking Research and Applications, pp. 315–318 Association for Computing Machinery, USA (2014)
24. Rørbæk Olesen, A., Holdgaard, N., Løvlie, A.S.: Co-designing a co-design tool to strengthen ideation in digital experience design at museums. Int. J. CoCreation Des. Arts **18**(2), 227–242 (2022)