

ASSESSMENT OF ORAL HEALTH-RELATED QUALITY OF LIFE USING NATURAL LANGUAGE UNDERSTANDING (NLU)

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Thanks for joining us!



Background

- Natural language understanding (NLU) is a type of artificial intelligence technique that can mimic the qualitative text analysis performed by researchers and has the potential to automate this process (Guetterman, 2018)
- NLU might be a helpful tool for analysis of semi-structured interviews; can provide an objective quantitative assessment of interviews in qualitative research
- Hypodontia is the congenital absence of fewer than six teeth (Dzemidzic et al., 2020)
- Hypodontia has a significant impact on patients' quality of life (QoL), particularly social and emotional well-being (Hobkirk et al., 1994)

Theme identification using AI

- VOSviewer software was used to identify the clusters of keywords in the transcripts of the whole interview
- Patients were also asked to fill out an OHIP-49 questionnaire
- The results of the NLU analysis were then compared with the OHIP-49 scores and with the traditional qualitative assessment of the transcripts performed by an independent group of researchers blinded to the NLU analysis

Statistical analysis

- Pearson's correlation coefficient r and correlation squared (R^2) for continuous variables
- Friedman's test for comparison of emotions and sentiments across questions
- All statistical tests were done with SPSS V22

Ethical approval: Cork University Hospital Ethical Committee (2007-2010, ECM5 (9)).

References

Guetterman TC. Augmenting Qualitative Text Analysis with Natural Language Processing: Methodological Study. JAMIA open. 2018;20(6):e231.
Dzemidzic V, Nakas E, Gagula I, Kozadra J, Tiro A. The Prevalence of Hypodontia and Hyperdontia in Orthodontic Patients. Acta medica academica. 2020;49(1):51-6.
Hobkirk, J. A., Goodman, J. R., & Jones, S. P. (1994, November). Presenting complaints and findings in a group of patients attending a hypodontia clinic. British Dental Journal, 177(9), 337-339.

NLU Analysis of the interview transcripts

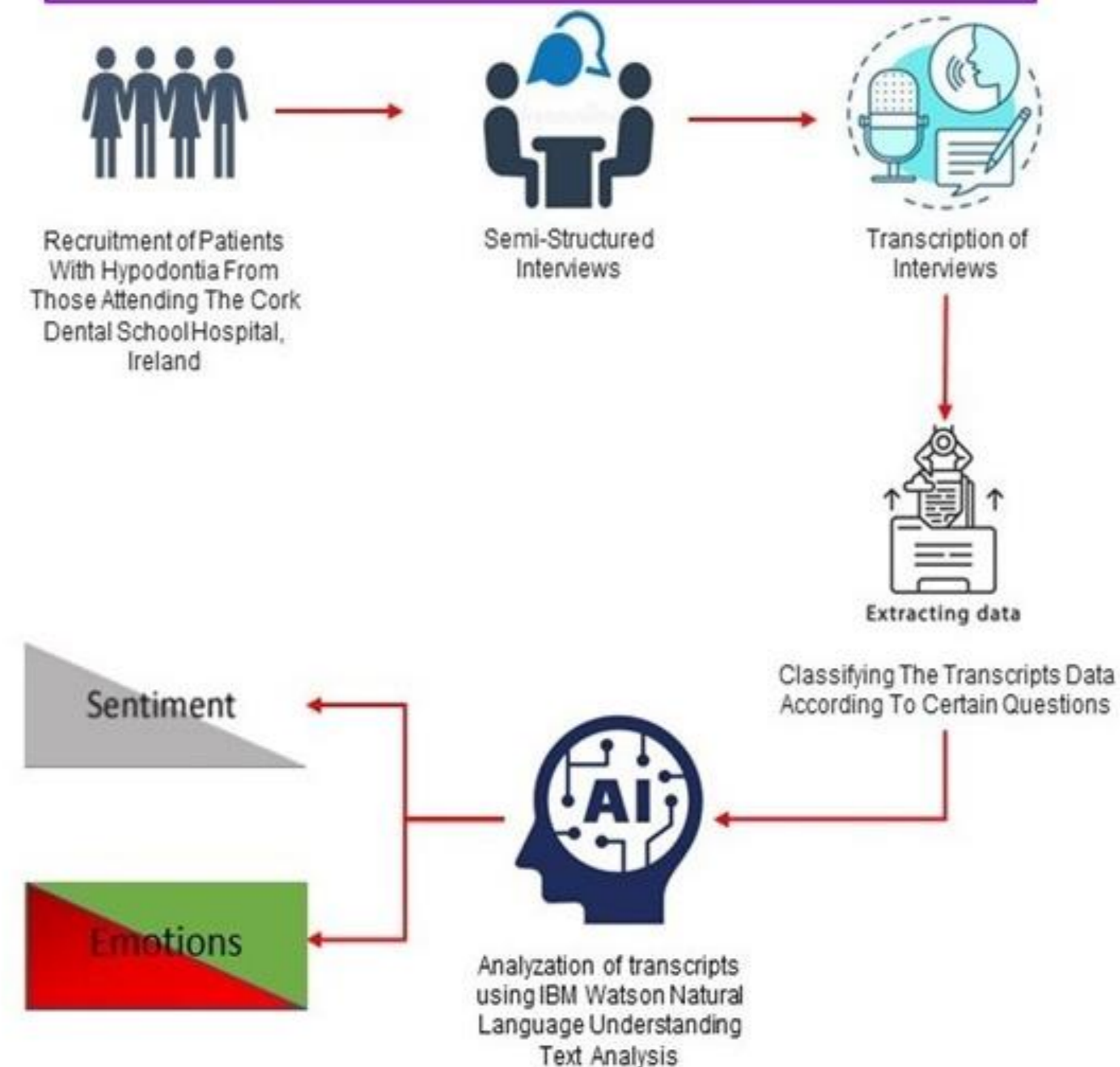
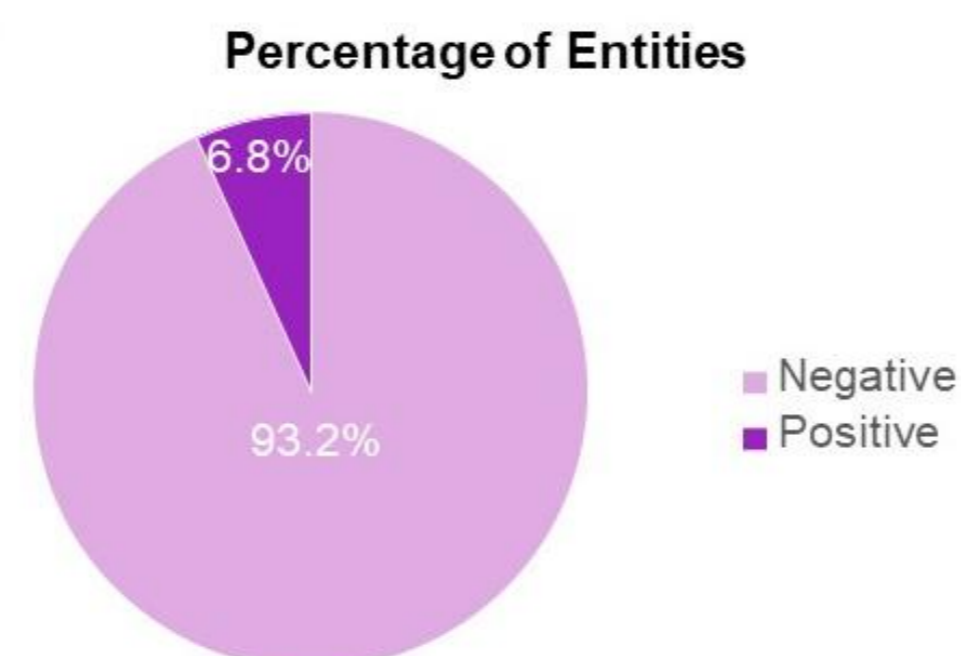


Figure 1. Flow chart of qualitative analysis to interview transcript using NLU.

Results

NLU analysis of the interview transcripts showed a predominantly negative sentiment towards hypodontia and its management; 93.2% of the entities identified by the NLU in the transcript were related to negative sentiment, while only 6.8% had a positive sentiment



Aim and Objectives

The objective of this study was to assess the impact of oral health conditions (i.e., hypodontia) on patients' quality of life using NLU and qualitative research methods.

Methods

- Setting: Cork Dental School and Hospital, Ireland
- Population: 10 participants aged 16–25 years (five males and five females) suffering from hypodontia

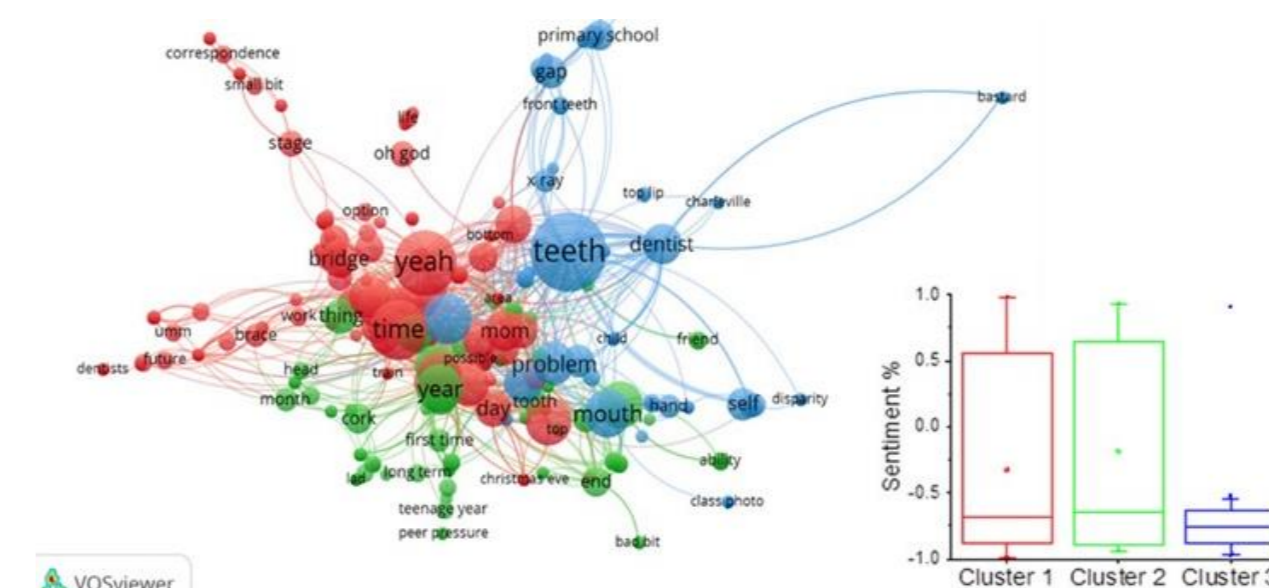


Figure 3. The Network Visualization Map, linking the keywords identified in the patients' transcripts. Three clusters of keywords were identified: cluster 1 (Red), cluster 2 (Green), cluster 3 (blue), and Box plots showing the average of keywords for each cluster.

NLU analysis revealed that patient sentiment during the interview correlated inversely with age ($R=-0.49$), treatment waiting time ($R=-0.22$), and OHIP score ($R=-0.20$).

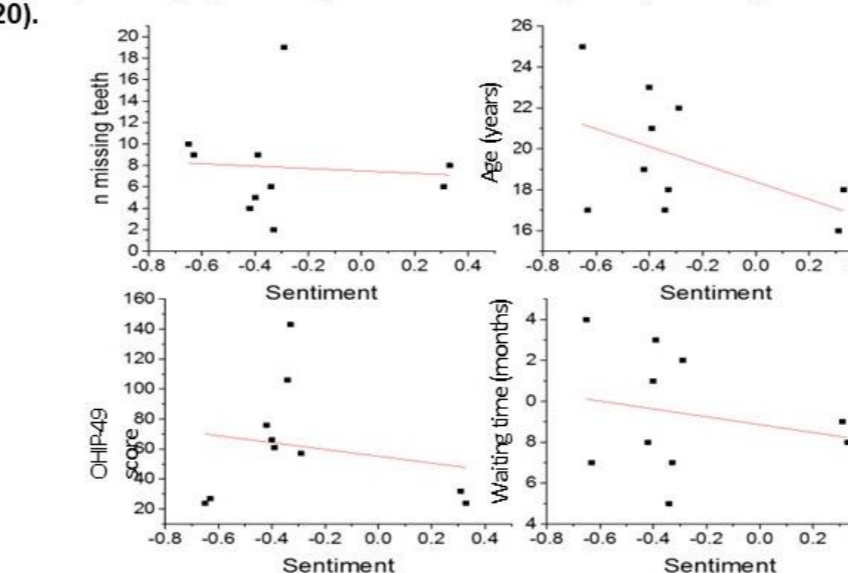


Figure 2. Correlation between the Sentiment Score on one hand and the number of missing teeth, age, OHIP-49 score, and waiting time on the other hand.

Conclusions

NLU identified predominantly negative keyword sentiment towards hypodontia and mainly to the treatment length process. In conclusion, hypodontia impacts a patient's quality of life negatively and is mainly concerned with its presentation and the complexity of the treatment. NLU could be a valuable tool qualitative research in dentistry.