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An Investigation of Linguistic Stress and Articulatory Vowel Characteristics for Automatic Depression Classification

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1. Abstract

The effects of psychomotor retardation associated with clinical depression are linked to a reduction in variability in acoustic parameters. However, linguistic stress differences between non-depressed and clinically depressed individuals have yet to be investigated. In this paper, by examining vowel articulatory parameters, statistically significant differences in articulatory characteristics are found at a paraphonetic level. For articulatory characteristic features, tongue height and advancement in terms of 'mid' and 'front' vowel sets show similar depression classification performance trends for both the DAIC-WOZ (English) and AViD (German) databases. Considering linguistic stress feature components, for both databases, depressed speakers exhibit shorter vowel durations and less variance for 'low', 'back', and 'rounded' vowel positions. Results for the DAIC-WOZ and AViD datasets using a small set of linguistic stress based features derived from multiple vowel articulatory parameter sets show absolute, statistically significant, gains of 7% and 20% in two-class depression classification performance over baseline approaches. Linguistic stress feature results indicate that specific vowel set analysis provides better discrimination of clinically depressed and non-depressed speakers. Knowledge gleaned from this research allows the design of more effective automatic depression disorder classification systems.

Keywords

Hypoarticulation; Paralinguistics; Psychomotor retardation; Vowel quadrilateral

2. Introduction

Observed speech behaviors and communicative defects are used as frequent indicators of common illness and neurological concerns (Hirschberg et al., 2010). Consequently, during clinical assessments, it is unsurprising that current diagnoses of many prevalent diseases/disorders encompass some degree of subjective and/or objective speech-language behavioral evaluation analyses (Bennabi et al., 2013; Chevrie-Muller et al., 1985). Precluding isolated speech-language disorders (e.g. aphasia, apraxia, stammering),

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