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SSS21021- The Influence of orthographic depth of Mother Tongue Languages on reading performance in English

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1. Introduction

- Orthographic depth is the transparency of grapheme to phoneme conversion of language.
- Orthographic depth hypothesis (ODH) postulates that orthographic depth is negatively correlated with reading acquisition ease (Frost et al., 1987).
- Deep orthographies (e.g., Chinese) utilize lexical processing more significantly than shallow orthographies (e.g., Tamil) (Frost, 1994).
- Several cognitive-linguistic (Landerl et al., 2018), language background and socio-economic factors (Lima et al, 2019; Neuman, 2008) are seen to influence reading performance.
- There is a dearth of research on orthographic depth and associated factors in adult bilinguals who read in non-alphabetic orthographies.
- This investigation is important in informing reading interventions for young adults with dyslexia.
- This study seeks to elucidate the role of orthographic depth in reading performance through addressing these research questions (RQ):
  - How does orthographic depth of Mother Tongue [RQ_1], cognitive-linguistic [RQ_2] and socio-economic and language background factors [RQ_3] influence with English reading performance in adult bilinguals?
  - An exploratory analysis [RQ_4] investigates if there is a difference in English reading performance between atypical readers with dyslexia and typical readers.

2. Methodology

Design

- Secondary data was taken from an independent experimental study investigating cognitive processes involved in reading different writing systems (IRB-2016-10-009-04).

Participants

- Chinese-English (CE) Bilinguals (*n* = 87), Tamil-English (TE) Bilinguals (*n* = 45) , Atypical readers with dyslexia (A) (*n* = 14)

Administered Tasks

Test/ Questionnaire	Castle and Coltheart's (C&C) Reading List	Comprehensive Test of Phonological Processing - 2 (CTOPP-2)	Peabody Picture Vocabulary Tests – 4 (PPVT – 4)	Language Background Questionnaire (LBQ)
Factors of interest	Word Reading (Accuracy and Reaction Time)	Phonological Awareness (PA), Rapid Symbolic Naming (RSN), Phonological Memory(PM)	Receptive Vocabulary (V)	Language Use (Modality) + (Contexts) , Social Economic Status (SES), Years of Formal Instruction in English and Mother Tongue (MT), Years of Exposure to English and MT
Relevance to RQs	Reading Performance (Dependent variables)	Cognitive-Linguistic Factors		Socio-economic and Language Background Factors

Statistical Handling

- Reading performance score taken from accuracy and reaction of C&C.
- Each cognitive-linguistic score formulated by taking composite of standardized scores of corresponding behavioural test.
- SES Composite score formulated via factor analysis of LBQ Questions.
- Language Use scores formulated via inputting LBQ's "Proportion of different language use" into Gullifer & Titone's (2018) language entropy.

3. Results

RQ_1: 2-way Mixed ANOVA
Main effect of word type for reading accuracy (Fig.1):
$F(1.71, 222.84) = 291.55$, $p < .001$, $\eta_p^2 = 0.69$

and reaction time (Fig. 2):
$F(1.73, 224.84) = 285.168$, $p < .001$, $\eta_p^2 = 0.69$

Significant interaction for reading accuracy showed CE performing significantly better than TE in irregular words ($p = .009$).

RQ_2: Hierarchical Regression Modelling
Model 1 (Covariates: Age, Gender, Nationality)
Model 2 (Covariates + Cognitive-linguistic factors)

Significance is found in PA, PM, V in reading accuracy ($p < .05$). Standardised β is highest for PA (.463), then V (.270), then PM (.241).

RQ_3: Hierarchical Regression Modelling
Model 1 (Covariates: Age, Gender, Nationality)
Model 2 (Covariates + Socio-economic and language background factors)

Significance is found in SES only ($p < .05$), where standardised $\beta = .215$.

RQ_4: 2-way Mixed ANOVA
Main effect of word type for reading accuracy (Fig. 3):
$F(1.505, 150.535) = 102.728$, $p < .001$, $\eta_p^2 = .507$

and reaction time (Fig. 4):
$F(1.729, 172.912) = 171.06$, $p < .001$, $\eta_p^2 = .631$

Significant interaction for reading accuracy showed Typical group performed significantly better than Atypical group in pseudo words, ($p = 0.011$).

Fig. 1: RQ_1 Accuracy

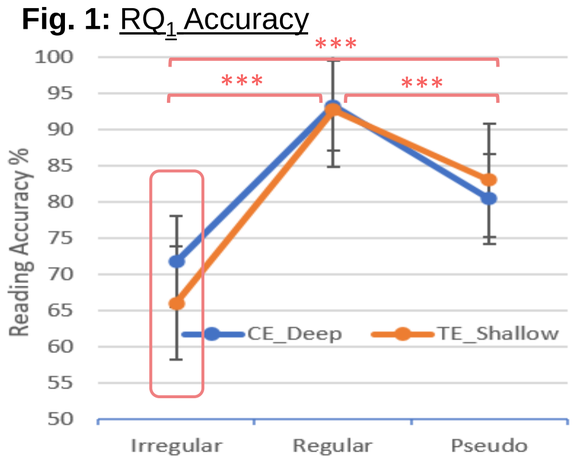


Fig. 2: RQ_1 Reaction Time

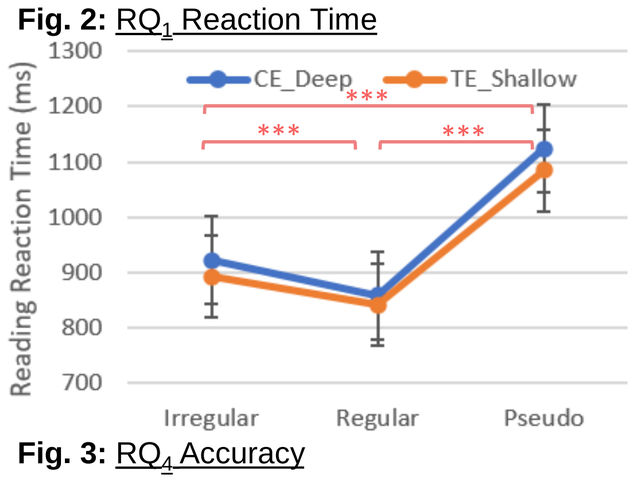


Fig. 3: RQ_4 Accuracy

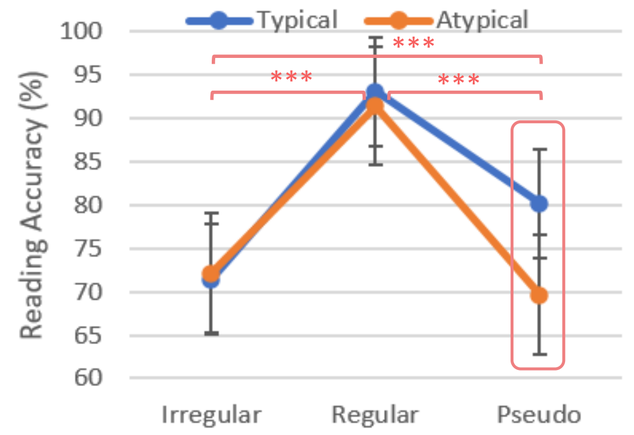
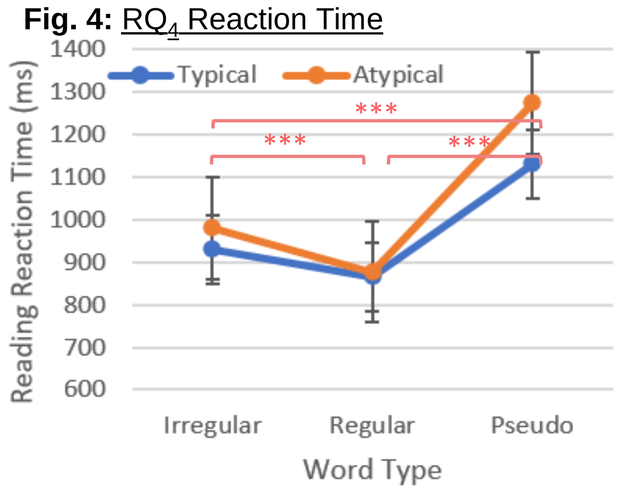


Fig. 4: RQ_4 Reaction Time



Note. Error bars ± 1S.E., *** indicates $p < .001$.

4. Discussion & Conclusion

- RQ_1: Orthographic depth of Mother Tongues influences English reading performance.
  - CE is more accurate in irregular words → strength in lexical processing with MT background (Schmamz et al.,2015)
- RQ_2: PA, PM and V are associated with English reading performance in accuracy.
  - PA as strongest predictor (Jongejan et al., 2007)
- RQ_3: Only SES is associated with English reading performance in accuracy (Durham et al., 2007).
- RQ_4: Atypical readers with dyslexia and typical readers read English word types differently.
  - Atypicals fared less accurately in pseudo words → deficit in sublexical processing (Szenkovits & Ramus, 2005)
- Value: Nascent research that underscores salient factors that contribute to English reading performance in adult bilinguals of Singapore.
- Further studies to understand interplay between orthographic depth and dyslexia to address reading intervention gaps for adults with dyslexia.
- Ongoing analyses is being conducted to account for unequal sample size.

5. Acknowledgement & References

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