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Diglossia Correlates With Prodromal Symptoms of Psychosis Among First-Generation Migrants

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Background and Hypothesis: **We have previously hypothesized that diglossia may be a risk factor for psychosis, drawing from observations on migration, ethnicity, social adversity, and language disturbances among others. However, empirical data on this association and the tools necessary for its measurement are limited.** ***Study Design:*** **In a cross-sectional online sample of first-generation migrants residing in majority English-speaking countries, a response-based decision tree was introduced to classify the sociolinguistic profiles of 1497 participants as either with or without diglossia. Using multivariate logistic regression, the association of diglossia with psychosis risk screening outcomes in the Prodromal Questionnaire-16 was calculated, adjusting for demographic and linguistic confounders. Differences in the symptom categories endorsed between the 2 groups were also examined.** ***Study Results:*** **Diglossia was identified in 18.4% of participants and was associated with an adjusted odds ratio of 2.58 for a positive risk screening outcome. Other significant factors included subjective social status, hearing difficulty, age, sex, country of residence, education level, and cannabis consumption. The effects of ethnicity, age at migration, fluency, relationship, and employment status were no more significant in the multivariate model. Finally, the largest differences in the proportion of positively responding participants between the two groups were found in symptoms relating to thought insertion and thought broadcasting.** ***Conclusions:*** **In a sociolinguistic hierarchical framework, diglossia is correlated with prodromal symptoms of psychosis in first-generation migrants.**

Key words: language/diglossia/ethnicity/prodromal symptoms of psychosis/hearing difficulty/cannabis

Introduction

In a sympathetic exchange during Freud's newfound fate in exile, a fellow psychoanalyst, de Saussure, attempts to vicariously describe the adversities of life as a migrant.[1] The former replies: "Everything you say is correct, but you have left out that one thing which the emigrant feels as particularly painful. It is—one can only say: The loss of the language in which one has lived and thought and which, despite all efforts to empathize, one will never be able to replace with another."[2]

Migrants are up to 3 times more likely to develop psychosis than natives.[3] In pursuit of an explanatory basis, the elevated risk was found to persist despite adjustments for potentially heightened, yet nonspecific exposures, such as socioeconomic disadvantage,[3] cannabis misuse,[4] ethnicities,[5] and urbanicity[6] among a range of psychosocial stressors corresponding to the general population. However, distinctive to migrants are the experiences that may discouragingly be seen as the inevitable conflicts of old and new, or the familiar and unfamiliar.[7] Language is pertinent to this proposition not only as a source of mismatch, but also due to its theorized influence on thought and perception.[8] It is perhaps of no coincidence that schizophrenia, a disorder of thought and perception, is intertwined with language on multiple levels, including the phenomenological,[9] the developmental,[10] and potentially the diagnostic through natural language processing methods.[11]

On the etiological front, we have proposed that diglossia, a sociolinguistic phenomenon, may be a risk factor for schizophrenia or a common denominator behind some of its observations; These include associations with language disturbances, migration, urbanicity,

ethnicity, and social adversity, as well as potential neuroanatomical correlates with the functional laterality of language.[12] Despite limitations, efforts have since shown that sociolinguistic factors may indeed play a role in psychosis.[13] In particular, a binary measure of linguistic distance combining the historical divergence between the first and second languages of migrants with fluency in the latter, was investigated with conflicting results,[14,15] necessitating a closer investigation of the sociolinguistic elements, if any.[16]

Diglossia refers to the context in which there is a functional difference in the use of 2 (or more) language forms, such that a (H)igh form is preferred for formal, relatively important functions in education, employment, and politics, whilst a (L)ow form is reserved for informal, familiar settings as in daily discourse with family and friends.[17,18] Besides differentiation in function and prestige, the 2 language forms vary in the conditions of their acquisition; Although naturally acquired as a first language or dialect early in life, the more familiar L becomes an obstacle to educational, linguistic, and socioeconomic progression.[19] On the other hand, H is later encountered in an imposed setting such as schooling, or migration in this instance, as the key towards social and professional gain.[20] While this H-L relationship is straightforwardly appreciable with dialects in the face of a national standard,[21] the introduction of an entirely different language in bilingualism brings an important consideration, in which the additional language may instead be perceived as desirable or advantageous for higher societal functions.[22] The differential mechanisms by which some foreign languages are met with social and institutional resistance while others are seen to hold value are speculative, but the interlinguistic context of the latter scenario lacks the H-L sociocultural compartmentalization which is characteristic of diglossia. As such, a hierarchical relationship in which the mother tongue contends unfavorably with a prestigious, imposed, and socially desired language summarizes the individual experience of diglossia.[23]

This phenomenon arises from the temporal and spatial linguistic changes in communities in the face of a resistant and highly codified standard, which lead to notable differences in pronunciation, vocabulary, and grammar.[24] This can become the baseline sociolinguistic situation as in Arabic-speaking countries,[25] or can be associated with specific ethnic or regional communities as is the case with African-American Vernacular English.[26,27] It can also be a consequence of transcultural events such as migration, giving rise to linguistic discordance in the first instance, and possibly the eventual formation of stable multiethnolects in association with urbanicity, as is the case with the Multicultural London English dialect.[28,29] Within this theoretical framework, this study seeks to introduce a measure of diglossia and preliminarily examine its relationship with the prodromal symptoms of psychosis in first-generation migrants.

Methods

Participants

In a cross-sectional survey, participants were recruited from an online crowdsourcing platform (Prolific Academic) which pre-selects participants based on previously given responses. To target a pool of first-generation migrants, the survey was made available to participants who have indicated that they currently reside in an English-majority speaking country, and that they have moved to the country they are now living in. A balanced sample of males and females was prespecified. Further requirements of the platform include acceptable fluency in English, an age of 18 years or older, and residence in an OECD country. The survey was made available to eligible participants who opted in on a first-come, first-served basis over a duration of 2 days as the required sample size was reached. Their migrant status and residence in a majority English-speaking area were confirmed within the questionnaire. Each participant received a token of ~1$ following the completion of the questionnaire as per the platform's policy. Responses were fully anonymous to further promote genuine self-reporting.

The sociodemographic variables included age, sex, country of residence, ethnicity, the highest level of education, employment status, long-term relationship (>1 year), and cannabis consumption as covariates. Potentially important language-related confounders included age at migration, self-rated fluency in the majority language (English), and hearing difficulty. Subjective social status was obtained using the McArthur scale[30] as a correlate of socioeconomic status across different countries and currencies.[31] The participant is shown a symbolic picture of the "social ladder" and asked to place themselves on the steps numbered 1 to 10 based on their relative judgment of personal socioeconomic indicators such as wealth, education, and employment. Beyond its correlation with objective socioeconomic measures, the scale was shown to be independently associated with general health,[31,32] and more recently with mental disorders across the DSM-IV.[33]

The Prodromal Questionnaire

The Prodromal Questionnaire-16 (PQ-16) is a self-reported screening tool for psychosis risk which consists of 16 True/False statements.[34] To enable widespread use, the 16 items were condensed from the original 92-item questionnaire on the basis of predictive validity.[35] A cutoff score of 6 or more endorsed items constitutes a positive screening outcome that warrants further assessment with high sensitivity (87%) and specificity (87%) for at-risk mental states.[34] It has since been validated in various languages and settings,[36] including the general non-help-seeking and online populations.[37] The threshold score of 6 or more items was used as the main binary

outcome measure of this study to calculate and test the classification tree proportions of potentially at-risk participants, and perform logistic regression analyses.[38] The PQ-16 in this study demonstrated good internal consistency with Cronbach's $\alpha = 0.80$, as also reported in the original study.[34]

A Measure for Diglossia

Given the lack of previous tools for capturing diglossia, a response-based decision tree for individual classification was contextualized from Fishman's account of the 4 sociolinguistic speech profiles enumerated thereafter.[18] Firstly, to establish if there is any functional differentiation of language forms, participants were provided 3 options to the question: "How different is the way you speak at home (eg, with family) from the preferred language in formal settings (eg, in work/ school)?." Those who responded with "No difference—I speak the same language" were considered unexposed: "(1) Neither diglossia nor bilingualism." To factor in exposure due to dialectic variation, an option for "Some difference—I speak in a different dialect," along with "Complete difference—I speak a different language" constituted a positive response for functional differentiation. A dialect was prior defined with examples in an attention-checking question as "a variety of a language with different pronunciation, words, and grammar from other forms of the same language."[39] Next, those who have indicated English as their first language among the exposed group were classified into, "(2) Diglossia without bilingualism." Finally, to distinguish those with a potentially advantageous non-English first language, "(3) Bilingualism without diglossia," from those with an unfavorable "L" language as a prerequisite for, and "(4) Diglossia with bilingualism," they were asked, "Do you feel that your first language puts you at a disadvantage in terms of life opportunities (eg, work/ school)?." The decision tree resulted in 2 final groups of participants with and without diglossia (figure 1). To facilitate the classification process and verify significant differences in the proportions of participants meeting the threshold of ≥6 PQ-16 items in each dichotomy, an Interactive Chi-Squared Automatic Interaction Detection (CHAID) model was used (SPSS Modeler version 18.2.1, IBM Corp., Armonk, N.Y., USA).

Pilot and Sample Size Estimation

The questionnaire was administered to a pilot of 50 participants to estimate the required sample size and optimize the clarity and understandability of the items according to feedback. Beyond the inclusion of attention-checking questions, no major changes were subsequently made. Calculation of the sample size estimate was performed on G*Power software (version 3.1.9.6) using Demidenko's method for logistic regression.[40] Out of the 50 participants, 11(22%) were classified with diglossia, 4(36.4%) of whom satisfied the PQ-16 cutoff score for a positive screening outcome. Out of the 39(78%) remaining participants without diglossia, 10(25.6%) met the PQ-16 cutoff score. In addition, 10% of the variability was assumed to be explained by other predictors as approximated by the preliminary regression model. This yielded an odds ratio of 1.66 as the estimated effect size. The required sample size to detect this effect with 95% power at an alpha of 0.05 was 1471 participants. The questionnaire was made available to 1500 participants, with 3 duplicate entries removed following the data collection leaving a total of 1497 participants in the analysis.

Data Analysis

Data analysis were performed using Minitab 19 (Minitab LLC, PA USA) and figures were illustrated using Graphpad Prism 9. Descriptive statistics shown in table 1 for the 1497 participants according to sociolinguistic profile (with and without diglossia) employ the median, interquartile range, frequency, and percentage as appropriate. Differences between the 2 groups for each of the variables were tested using chi-squared tests ($\chi 2$) for categorical variables and the Mann-Whitney test for numeric variables (table 1). Significance testing was performed at the 0.05 error level. In addition, univariate and multivariate logistic regression analyses were carried out to assess the relationship of the sociodemographic predictors with the risk screening outcome (PQ-16 score ≥6) as the binary dependent variable. Lack of multicollinearity between the predictors was verified using the Variance Inflation Factor (VIF) with a range of 1.06–2.07. The odds ratios (OR) and 95% Confidence Intervals (95% CI) for each of the predictors are reported. Lastly, the percentages of participants with and without diglossia who positively endorsed each of the PQ-16 items are presented.

Ethical Approval

Approval was obtained from the ethical review board of the Ministry of Health, Kuwait (1889/2021). Informed consent was obtained prior to the completion of the survey.

Results

A total of 1497 participants were migrants from 124 different countries with 75 first language varieties. Most participants were current residents of the United Kingdom (37.5%) or the United States (31.8%), with a median age of 31, and age at the migration of 18 years. The proportion of males (49.8%) and females (50.2%) was almost equal. The most common ethnicities were White (41%) and Asian (34.3%). In addition, most were employed (65.2%), have been in a relationship lasting 1 year or longer (77%), obtained at least an undergraduate

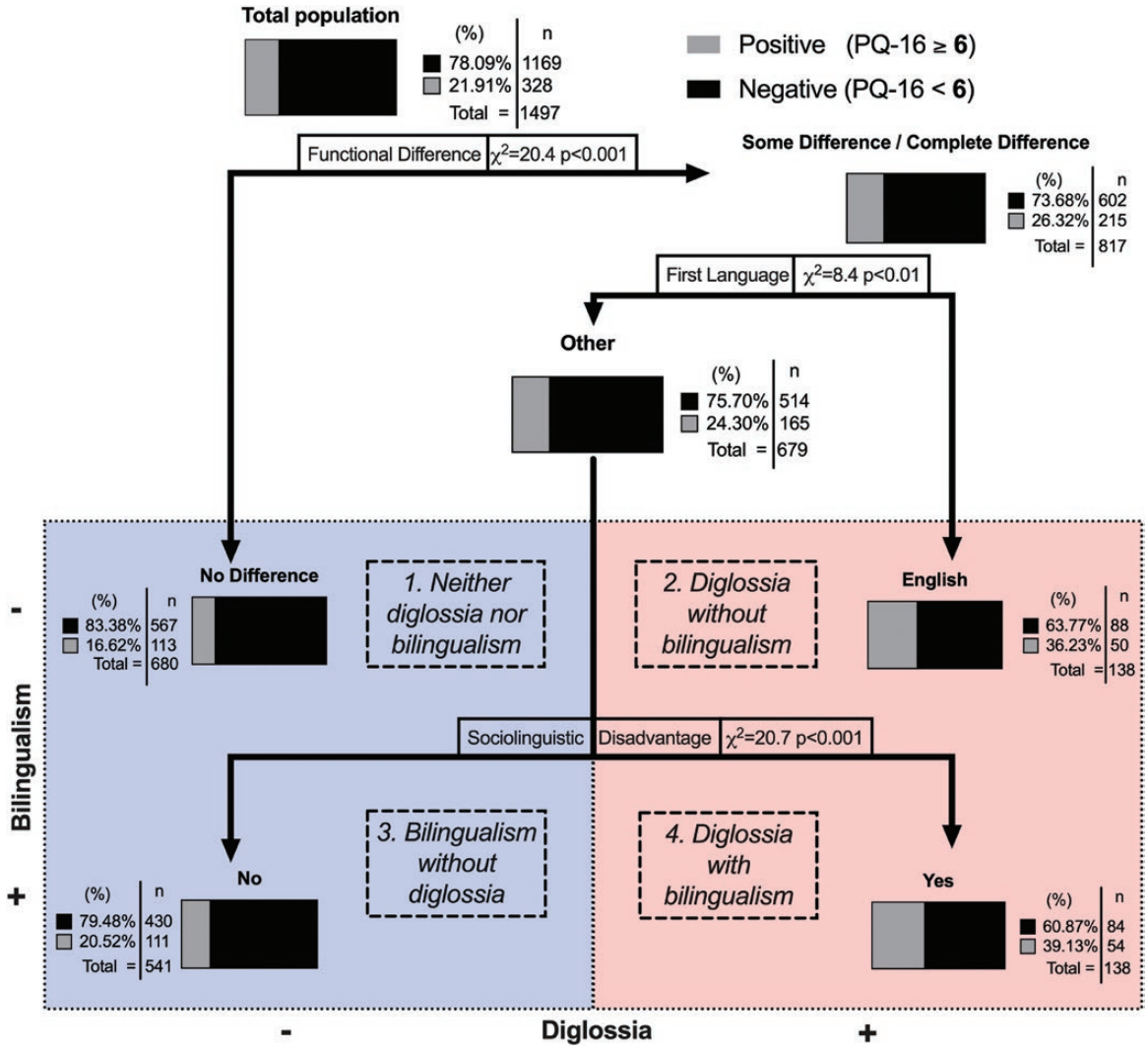

Fig. 1. A decision-tree model to classify participants with and without diglossia based on their responses. Horizontally stacked bars show the proportion of positive and negative PQ-16 screening outcomes in each node.

degree (67.5%), and never consumed cannabis (59.1%). Self-rated fluency in English was reported with a median of 10, and a subjective social status median of 6. Participants with hearing loss comprised 4.1% of the sample. Overall, the median PQ-16 score was 3, with 328 participants (21.9%) noted as having endorsed the cutoff score of 6 or more items indicating a positive screening outcome. table 1 displays the characteristics of the total study sample and according to the sociolinguistic profile (with vs without diglossia).

Out of the 1497 participants, 276 (18.4%) were classified with diglossia, and 1221 (81.6%) without. The 2 groups were similar in composition with regard to their current residence, age, sex, education level, relationship status, employment status, subjective social status, and history of cannabis consumption ($P > .05$). A significant difference was observed between the proportions of their ethnicities ($P < .0001$); Black ethnicity was the largest contributor to this difference, comprising 18.1% of those with diglossia and only 8.1% of those without. All remaining differences in ethnicity proportions were less than 5 percentage points between the 2 groups. Participants with diglossia were less fluent in English, older of age-at-migration, and more likely to have reported hearing difficulty ($P < .05$). The median PQ-16 score for those with diglossia was 4[IQR 2–7], compared to 2[IQR 1–5] for those without diglossia ($P < .0001$). The difference in the distribution of the total PQ-16 scores between the 2 groups is illustrated in figure 2. In addition, 37.7% of participants with diglossia endorsed the PQ-16 cutoff score, compared to 18.3% of participants without diglossia ($P < .0001$).

Table 2 lists each of the variables' association with the screening outcome (PQ-16 score ≥6) as the dependent variable firstly in a univariate logistic regression analysis, followed by a multivariate model incorporating diglossia as an independent variable, along with the confounding variables of age, age-at-migration, sex, country of

Table 1. Distributions of Study Variables According to Participants' Sociolinguistic Profile

Variable		Without Diglossia *N* = 1221		With Diglossia *N* = 276		Total *N* = 1497		χ2/MWU; *P*-value
		F	%	F	%	F	%	
Current residence	- The United Kingdom	446	36.5%	115	41.7%	561	37.5%	.0646
	- The United States	407	33.3%	69	25.0%	476	31.8%	
	- Canada	208	17.0%	63	22.8%	271	18.1%	
	- Australia	99	8.1%	23	8.3%	122	8.1%	
	- New Zealand	35	2.9%	3	1.1%	38	2.5%	
	- Ireland	26	2.1%	3	1.1%	29	1.9%	
Age	Median [IQR]	31[24–40]		31[24–37]		31[24–39]		.1411
Age-at-migration	Median [IQR]	18[7–26]		21[15–28]		18[8–26]		**<.0001**
Sex	Female	598	49.0%	153	55.4%	751	50.2%	.0526
	Male	623	51.0%	123	44.6%	746	49.8%	
Ethnicity	White	510	41.8%	104	37.7%	614	41.0%	**<.0001**
	Asian	422	34.6%	92	33.3%	514	34.3%	
	Black	99	8.1%	50	18.1%	149	10.0%	
	Latino	79	6.5%	10	3.6%	89	5.9%	
	Middle Eastern/ Arab	53	4.3%	6	2.2%	59	3.9%	
	Mixed	24	2.0%	7	2.5%	31	2.1%	
	Other	34	2.8%	7	2.5%	41	2.7%	
Education	- Postgraduate degree	334	27.4%	97	35.1%	431	28.8%	.0813
	- Undergraduate degree	482	39.5%	97	35.1%	579	38.7%	
	- Technical & Vocational	164	13.4%	32	11.6%	196	13.1%	
	- School education	241	19.7%	50	18.1%	291	19.4%	
Relationship	No	283	23.2%	62	22.5%	345	23.0%	.7992
	Yes	938	76.8%	214	77.5%	1152	77.0%	
Employment	Employed	792	64.9%	184	66.7%	976	65.2%	.2711
	Student/ In training	252	20.6%	62	22.5%	314	21.0%	
	Unemployed	177	14.5%	30	10.9%	207	13.8%	
Hearing difficulty	No	1177	96.4%	258	93.5%	1435	95.9%	**.0280**
	Yes	44	3.6%	18	6.5%	62	4.1%	
Cannabis consumption	Never	729	59.7%	156	56.5%	885	59.1%	.3313
	Ever	492	40.3%	120	43.5%	612	40.9%	
English fluency	Median [IQR]	10[9–10]		10[8–10]		10[9–10]		**.0025**
Subjective social status	Median [IQR]	6[5–7]		6[5–7]		6[5–7]		.2286
PQ-16 total score	Median [IQR]	2[1–5]		4[2–7]		3[1–5]		**<.0001**
Risk screening outcome (PQ-16 Cutoff ≥6)	Negative	997	81.7%	172	62.3%	1169	78.1%	**<.0001**
	Positive	224	18.3%	104	37.7%	328	21.9%	

Bold values denote statistical significance at the $P < 0.05$ level.

residence, ethnicity, the highest level of education, employment status, subjective social status, long-term relationship (>1 year), cannabis consumption, English fluency, and hearing difficulty. In the unadjusted univariate analysis, diglossia was significantly predictive of satisfying the PQ-16 threshold, along with decreasing age and age-at-migration, female sex, ethnicity (Black, Middle Eastern/Arab, and "Other"), Education (Technical & vocational/School education), Employment status (Student/ In training), hearing difficulty, cannabis consumption, and a lower subjective social status. Following adjustment for confounders in the multivariate model, diglossia remained a highly significant predictor (adj. OR, 2.58). The significant OR also persisted for age (adj. OR, 0.96), female sex (adj. OR, 1.41), education (adj. OR, 1.89), hearing difficulty (adj. OR, 3.31), subjective social status (adj. OR, 0.80) and cannabis consumption (adj. OR, 1.37). The effects of age at migration, ethnicity, relationship, and employment status were no longer significant. Self-rated fluency in English was insignificant in both analyses. Finally, residence in Australia was revealed to be associated with significantly lower odds for a positive screening outcome after adjustment when compared to the United Kingdom (adj. OR, 0.53).

Finally, to gain an insight into the symptomatic differences between the 2 groups, each of the PQ-16

item categories[41] was examined for the percentage of endorsing participants with and without diglossia. There was a higher percentage of positive respondents with diglossia across all 16 items, though the relative patterns of endorsement were broadly consistent; The most endorsed items in both groups pertained to absorption (déjà vu) experiences (49.6% with diglossia and 37.8% without diglossia), social anxiety (48.2% and 36.9%) and avolition (43.5% and 32.5%) (figure 3A). The largest differences between the 2 groups were found in experiences of thought insertion and thought broadcast, where an additional 14.6% and 13.6% of those with diglossia responded positively, compared to the percentage of those without diglossia (figure 3B). The smallest observed increases were in items relating to voices (4.6%) and visual symptoms (1.3%).

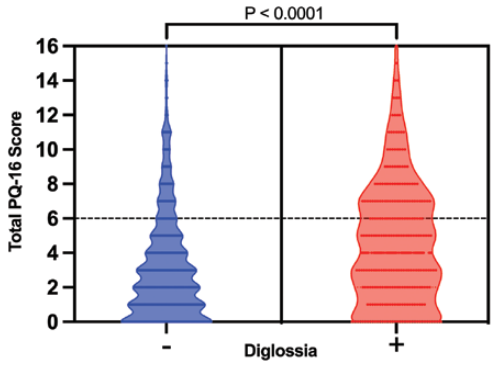

Fig. 2. A violin chart showing the distributions of PQ-16 total scores for participants with and without diglossia.

Discussion and Conclusions

In an online sample of migrants residing in English-speaking countries, diglossia was associated with 2.58 times higher odds of a positive prodromal screening outcome indicative of at-risk mental states for psychosis. Measurement of this association was enabled by the introduction of a response-based classification model of diglossia which incorporates dialectic variation, accounts for sociolinguistic variance in bilingualism, and possesses an integrated social component. Although mostly speculative, several theoretical and observational lines of

Table 2. Logistic Regression Analysis of Study Variables Against the Dependent Risk Screening Outcome as Measured By the PQ-16. The Multivariate Model Includes Diglossia as an Independent Variable, Along With Age, Age-At-Migration, Sex, Country of Residence, Ethnicity, Highest Level of Education, Employment Status, Subjective Social Status, Long-Term Relationship (>1 year), Cannabis Consumption, English Fluency and Hearing Difficulty as Confounders

		Univariate		Multivariate	
Variable [Reference]		OR	95% CI	OR	95% CI
Current residence	United States	0.88	(0.65, 1.18)	0.73	(0.52, 1.04)
[vs the United Kingdom]	Canada	1.20	(0.86, 1.68)	0.96	(0.65, 1.41)
	Australia	0.59	(0.34, 1.00)	**0.53**	**(0.29, 0.95)**
	New Zealand	0.63	(0.26, 1.55)	0.81	(0.31, 2.08)
	Ireland	1.08	(0.45, 2.58)	1.09	(0.43, 2.79)
Age [years]		**0.96**	**(0.94, 0.97)**	**0.96**	**(0.94, 0.97)**
Age-at-migration [years]		**0.99**	**(0.97, 0.99)**	1.00	(0.99, 1.02)
Sex [vs Male]	Female	**1.54**	**(1.20, 1.97)**	**1.41**	**(1.07, 1.86)**
Ethnicity	Asian	1.08	(0.81, 1.45)	1.05	(0.73, 1.52)
[vs White]	Black	**1.63**	**(1.08, 2.46)**	1.33	(0.84, 2.12)
	Latino	1.54	(0.92, 2.56)	1.24	(0.69, 2.21)
	Middle Eastern/Arab	**1.83**	**(1.01, 3.29)**	1.91	(0.99, 3.67)
	Mixed	0.80	(0.30, 2.13)	0.64	(0.22, 1.87)
	Other	**2.16**	**(1.10, 4.24)**	2.09	(0.99, 4.40)
Education	Undergraduate degree	1.35	(0.97, 1.87)	1.15	(0.80, 1.65)
[vs Postgraduate degree]	Technical & vocational	**2.29**	**(1.53, 3.41)**	**1.89**	**(1.19, 2.99)**
	School education	**2.36**	**(1.64, 3.38)**	1.43	(0.92, 2.22)
Relationship [vs Yes]	No	**1.44**	**(1.09, 1.90)**	0.94	(0.67, 1.32)
Employment	Student/In training	**1.80**	**(1.35, 2.41)**	1.04	(0.73, 1.49)
[vs Employed]	Unemployed	1.36	(0.95, 1.94)	1.08	(0.72, 1.62)
Hearing difficulty [vs No]	Yes	**2.71**	**(1.61, 4.56)**	**3.31**	**(1.80, 6.08)**
Cannabis consumption [vs Never]	Ever	**1.42**	**(1.11, 1.81)**	**1.37**	**(1.03, 1.81)**
English fluency [Scale 0–10]		1.00	(0.90, 1.12)	1.05	(0.93, 1.20)
Subjective social status [Scale 1–10]		**0.77**	**(0.71, 0.83)**	**0.80**	**(0.73, 0.87)**
Sociolinguistic profile	With diglossia	**2.69**	**(2.03, 3.57)**	**2.58**	**(1.89, 3.54)**
[vs Without diglossia]					

Note: OR, odds ratios.
Bold values denote statistical significance at the $P < 0.05$ level.

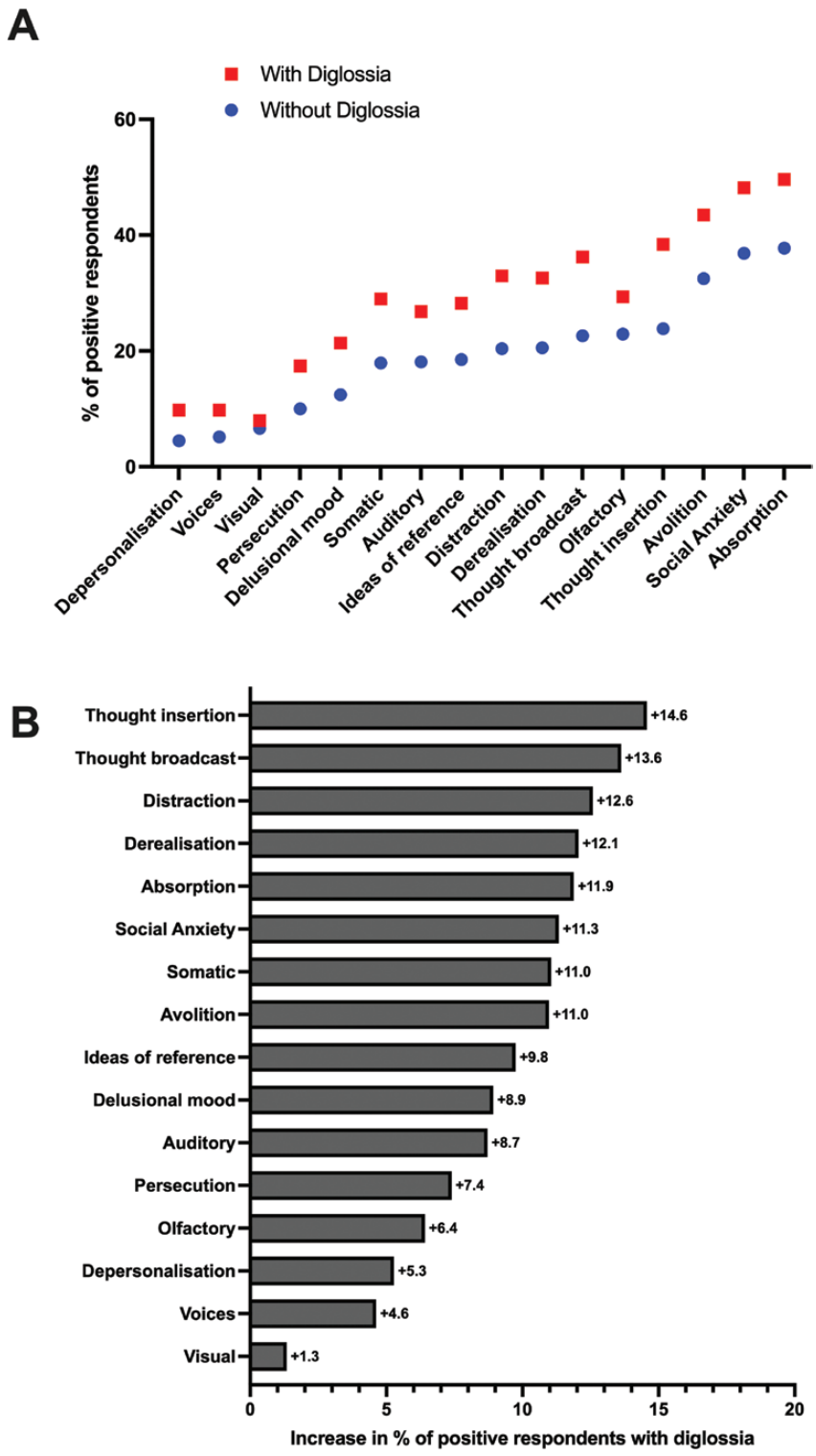

Fig. 3. (A) shows the percentage of positively responding participants with diglossia and without for each of the PQ-16 item categories. (B) visualizes the difference in the percentage of positive respondents in favor of the diglossia group.

exploration surface from these results, along with key limitations.

Firstly, by directing the classical characterization of diglossia in speech communities as a whole to the individual, the model relies on a self-ascribed method of categorization. While limited by the conceivable need for introspective ability and openness to interpretation, a personal judgment of the interplay between language forms is highlighted as an underlying determinant. These subjective, comparative, hierarchical assessments emerge as

a broad theme as also indicated by the predictive effect of the McArthur scale, which although intended to be a cross-country approximate measure of socioeconomic status, has shown to be a more potent predictor than some of the more objective elements examined, such as relationship and employment status. A 1-step increase in subjective social status resulted in 20% lower odds of a positive screening outcome, keeping all else constant. In viewing language as an instrument for determining and navigating positions within social hierarchies,[42–45] a tentative route for diglossia in dopaminergic dysregulation is envisaged; Parallels can be drawn with the neurotransmitter's roles in the establishment and maintenance of social hierarchical structures,[46–49] language novelty and acquisition,[50–52] as well as it's an asymmetrical activity in driving the functional hemispheric lateralization of language production.[53,54]

Secondly, diglossia is a socially conditional exposure in this hierarchical framework; Only in relation to another language does one's naturally acquired features of language use constitute an exposure, which implicates settings of intergroup communication with an H language as a prerequisite, and social withdrawal as an adaptive avoidance strategy.[55,56] Furthermore, evidence refuting pre-migratory explanations in favor of post-migratory environmental factors[57] is consistent with the conditional context of diglossia. Although not investigated in this study, diglossia can also be a persistent exposure across generations as a viable explanation of the elevated risk for schizophrenia in both first- and second-generation migrants,[58] given the dynamics of language acquisition in children from their parents.[59] The effect of diglossia persisted after adjusting for language-related covariates including age-at-migration, fluency, and ethnicity which were insignificant in explaining any of the outcome variation. However, the sample was insufficiently powered to detect small differences between 7 categories of ethnicity, and an adequate level of fluency was a requirement for users of the survey platform. This may have underestimated both the proportion of diglossic participants and the perceived risk of diglossia, given their slightly lower fluency and recent evidence on the effect of majority-language proficiency on psychosis risk from a retrospective study of 2 million migrants.[60] As such, fluency in the majority language as an indicator of language impediment in the traditional sense, did not appear to be a determining factor in this study. Other significant sociodemographic variables included age, education level, and cannabis consumption, as already established in the literature. In addition, country-level differences (Australia vs UK adj. OR 0.53) may involve any of a wide a range of immigrational, social, and health policies[61] in the differential psychosis risk for migrants. Out of keeping with the literature is the higher odds of a positive screening outcome in females (adj. OR 1.41), which brings into question either the generalizability of the sample or the measurement tool; The PQ-16 produces greater sensitivity for psychosis risk in females perhaps owing to the predominance of positive symptoms reflected by the items.[35] Although some studies have identified a lower language proficiency at migration among females in comparison with males, the evidence of a potential interplay between gender differences in language proficiency and mental disorders remains insufficient.[62] Notably, the significantly higher odds ratio for females in this study persists despite adjustment for self-rated fluency in the multivariate model.

Thirdly, hearing difficulty at any degree also demonstrated a significantly high odds ratio for a positive screening outcome, as documented previously.[63] The expandable concept of diglossia,[64] for the purpose of a unifying argument at least, can perhaps be extended beyond strict descriptions of languages and dialects to include any nonstandard, yet personally familiar speech or communication mode which may be perceived as an L and is in contention with a more desirable and advantageous H language. The expressive speech impediments and overall language impairment caused by hearing difficulty may be an example of this speculation.[65] The association of schizophrenia with autism spectrum disorder,[66] is another likely capturable instance of this extended notion of diglossia.

Finally, a clue on diglossia's possible contribution to psychotic experiences is presented by the largest proportional differences observed in symptoms of thought broadcast and insertion, with perceptual abnormalities affected to a lesser extent. The abstract connection of thought passivity to the hierarchical nature of diglossia may be reflective of a pathologic manifestation of linguistic relativity, in which features of the language are believed to exert an effect on processes of individual thought.[67]

The study is limited by using a screening tool as an efficient measure of psychosis risk in a large online sample. Future case-control or cohort studies examining established diagnoses of psychosis will be better equipped to investigate diglossia as a potential risk factor. For future validation of these findings, the utility of the presented model may also be extended to general populations in investigating the excess risk in urban areas for instance, as well as comparisons of native populations where diglossia is differentially prevalent. In conclusion, our findings on the prodromal symptoms of psychosis highlight diglossia as a potentially important sociolinguistic exposure.

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Conflicts of interest

None.

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