TECHNICAL COMMENTARY

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SCHIZOPHRENIA LIBRARY

Voice patterns

Introduction

Some people with schizophrenia display atypical voice patterns. Some atypical voice patterns have been associated with the negative symptoms of schizophrenia, including blunted affect (lack of vocal intonation) and alogia (poverty of speech). Clarifying vocal abnormalities in people with schizophrenia may help support the assessment of cognitive and clinical features related to the disorder.

Method

We have included only systematic reviews with detailed literature search, methodology, and inclusion/exclusion criteria that were published in full text, in English, from the year 2000. Reviews were identified by searching the databases MEDLINE, EMBASE, and PsycINFO. Reviews with pooled data are prioritized for inclusion. Reviews reporting fewer than 50% of items on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA[1]) checklist have been excluded from the library. The evidence was graded guided by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach[2]. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

Results

We found one systematic review that met our inclusion criteria.[3]

- Moderate quality evidence found large effects of longer pauses and less spoken time in people with schizophrenia. There were medium-sized effects of lower speech rate and less pitch variability. No differences were found for pitch, intensity variability, duration of utterance and number of pauses. Significant correlations were found in patients between lower pitch and more positive symptoms, less pitch variability and greater flat affect, less time spoken and more alogia, and more duration of pauses and more negative psychopathology.

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Voice patterns

Parola A, Simonsen A, Bliksted V, Fusaroli R

Voice patterns in schizophrenia: A systematic review and Bayesian meta-analysis

Schizophrenia Research 2020; 216: 24-40

View review abstract online

Comparison	**Voice patterns and relationship with symptoms in people with schizophrenia vs. controls.**
Summary of evidence	**Moderate quality evidence (medium to large samples, inconsistent, imprecise, direct) found large effects of longer pauses and less spoken time in people with schizophrenia. There were medium-sized effects of lower speech rate and less pitch variability. No differences were found for pitch, intensity variability, duration of utterance and number of pauses.** **Significant correlations were found in patients between lower pitch and more positive symptoms, less pitch variability and greater flat affect, less time spoken and more alogia, and more duration of pauses and more negative psychopathology.**

Voice patterns

Large effects were found for;

Longer pauses: 9 studies, N = 371, g = 1.89, 95%CI 0.72 to 3.21, $p < 0.001$, Q$p < 0.001$

Less spoken time: 11 studies, N = 478, g = -1.26, 95%CI -2.26 to -0.25, $p = 0.001$, Q$p < 0.001$

Medium -sized effects were found for;

Slower speech rate: 11 studies, N = 595, g = -0.75, 95%CI -1.51 to -0.04, $p = 0.01$, Q$p < 0.001$

Less pitch variability: 11 studies, N = 644, g = -0.55, 95%CI -1.06 to -0.09, $p = 0.005$, Q$p < 0.001$

No significant effects were found for;

Pitch mean: 4 studies, N = 198, g = 0.25, 95%CI -0.72 to 1.30, $p = 0.273$, Q$p = 0.04$

Intensity variability: 4 studies, N = 169, g = 0.74, 95%CI -2.01 to 3.39, $p = 0.164$, Q$p < 0.001$

Duration of utterance: 4 studies, N = 165, g = -0.15, 95%CI -2.56 to 2.26, $p = 0.739$, Q$p < 0.001$

Number of pauses: 5 studies, N = 108, g = 0.05, 95%CI -1.23 to 1.13, $p = 0.782$, Q$p = 0.02$

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Voice patterns

Significant correlations were found between lower pitch and more positive symptoms, less pitch variability and greater flat affect, less time spoken and more alogia, and more duration of pauses and more negative psychopathology. Moderator analyses revealed that tasks with more demanding cognitive and social components have significantly larger effects.	
Consistency in results	Inconsistent
Precision in results	Imprecise
Directness of results	Direct

Explanation of acronyms

CI = confidence interval, *g* = Hedges' standardised mean difference, I^2 = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, *p* = statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), Q = test for heterogeneity, vs. = versus

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Explanation of technical terms

* Bias has the potential to affect reviews of both RCT and observational studies. Forms of bias include; publication bias - trials that are not formally published tend to show less effect than published trials, further if there are statistically significant differences between groups in a trial, these trial results tend to get published before those of trials without significant differences; language bias – only including English language reports; funding bias - source of funding for the primary research with selective reporting of results within primary studies; outcome variable selection bias; database bias - including reports from some databases and not others; citation bias - preferential citation of authors. Trials can also be subject to bias when evaluators are not blind to treatment condition and selection bias of participants if trial samples are small[4].

† Different effect measures are reported by different reviews.

Odds ratio (OR) or relative risk (RR) refers to the probability of a reduction (< 1) or an increase (> 1) in a particular outcome in a treatment group, or a group exposed to a risk factor, relative to the comparison group. For example, a RR of 0.75 translates to a reduction in risk of an outcome of 25% relative to those not receiving the treatment or not exposed to the risk factor. Conversely, a RR of 1.25 translates to an increased risk of 25% relative to those not receiving treatment or not having been exposed to a risk factor. A RR or OR of 1.00 means there is no difference between groups. A medium effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2[5]. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios measure the effect of an explanatory variable on the hazard or risk of an event.

Correlation coefficients (eg, r) indicate the strength of association or relationship between variables. They are an indication of prediction, but do not confirm causality due to possible and often unforseen confounding variables. An r of 0.10 represents a weak association, 0.25 a medium association and 0.40 and over represents a strong association. Unstandardised (*b*) regression coefficients indicate the average change in the dependent variable associated with a 1 unit change in the independent variable, statistically controlling for the other independent variables. Standardised regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

Weighted mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre to post treatment) and in a randomised trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardised mean differences are divided by the pooled standard deviation (or the standard deviation of one group when groups are homogenous) that allows results from different scales to be combined and compared. Each study's mean difference is then given a weighting depending on the size of the sample and the variability in the data. 0.2 represents a small effect, 0.5 a medium effect, and 0.8 and over represents a large effect[4].

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Prevalence refers to how many existing cases there are at a particular point in time. Incidence refers to how many new cases there are per population in a specified time period. Incidence is usually reported as the number of new cases per 100,000 people per year. Alternatively some studies present the number of new cases that have accumulated over several years against a person-years denominator. This denominator is the sum of individual units of time that the persons in the population are at risk of becoming a case. It takes into account the size of the underlying population sample and its age structure over the duration of observation.

Reliability and validity refers to how accurate the instrument is. Sensitivity is the proportion of actual positives that are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives that are correctly identified (100% specificity = not identifying anyone as positive if they are truly not).

‡ Inconsistency refers to differing estimates of effect across studies (i.e. heterogeneity or variability in results) that is not explained by subgroup analyses and therefore reduces confidence in the effect estimate. I^2 is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) - 0% to 40%: heterogeneity might not be important, 30% to 60%: may represent moderate heterogeneity, 50% to 90%: may be considerable heterogeneity and over this is considerable heterogeneity. I^2 can be calculated from Q (chi-square) for the test of heterogeneity with the following formula;[4]

$$I^2 = \left(\frac{Q - df}{Q}\right) \times 100\%$$

§ Imprecision refers to wide confidence intervals indicating a lack of confidence in the effect estimate. Based on GRADE recommendations, a result for continuous data (standardised mean differences, not weighted mean differences) is considered imprecise if the upper or lower confidence limit crosses an effect size of 0.5 in either direction, and for binary and correlation data, an effect size of 0.25. GRADE also recommends downgrading the evidence when sample size is smaller than 300 (for binary data) and 400 (for continuous data), although for some topics, these criteria should be relaxed[6].

‖ Indirectness of comparison occurs when a comparison of intervention A versus B is not available but A was compared with C and B was compared with C that allows indirect comparisons of the magnitude of effect of A versus B. Indirectness of population, comparator and/or outcome can also occur when the available evidence regarding a particular population, intervention, comparator, or outcome is not available and is therefore inferred from available evidence. These inferred treatment effect sizes are of lower quality than those gained from head-to-head comparisons of A and B

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