TECHNICAL COMMENTARY

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Oxytocin

Introduction

A supplementary, or adjunctive, treatment is administered in conjunction with a patient's ongoing antipsychotic therapy. Oxytocin is a neuromodulatory neuropeptide that is important for the correct processing of emotional stimuli in a social context. It has been proposed that difficulties in social cognition in schiozphrenia and other disorders such as autism, are underpinned by disruption in the dopaminergic/oxytonergic circuitry linked to socio-emotional processing. Oxytocin therapy has been linked to prosocial behaviours in some studies, but the opposite in others. So, the impact of oxytocin may be moderated by features of the social environment or individual differences.

Method

We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2000 that report results separately for people with a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder or first episode schizophrenia. Reviews were identified by searching the databases MEDLINE, EMBASE, CINAHL, Current Contents, PsycINFO and the Cochrane library. Hand searching reference lists of identified reviews was also conducted. When multiple copies of reviews were found, only the most recent version was included. Reviews with pooled data are prioritised for inclusion.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist, which describes a preferred way to present a meta-analysis[1]. Reviews rated as having less than 50% of items checked have been excluded from the library. The PRISMA flow diagram is a suggested way of providing information about studies included and excluded with reasons for exclusion. Where no flow diagram has been presented by individual reviews, but identified studies have been described in the text, reviews have been checked for this item. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomised controlled trials (RCTs) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)[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 three systematic reviews that met our inclusion criteria[3-5].

- Moderate quality evidence suggests no benefit of adjunctive oxytocin for symptoms, social cognition or neurocognition.

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TECHNICAL COMMENTARY

Oxytocin

Burkner PC, Williams DR, Simmons TC, Woolley JD

Intranasal Oxytocin May Improve High-Level Social Cognition in Schizophrenia, But Not Social Cognition or Neurocognition in General: A Multilevel Bayesian Meta-analysis

Schizophrenia Bulletin 2017; 43: 1291-303

View review abstract online

Comparison	**Intranasal oxytocin vs. placebo for people with schizophrenia.**
Summary of evidence	**Moderate quality evidence (small to medium-sized samples, inconsistent, precise, direct) suggests adjunctive oxytocin has no benefit for social or neurocognition.**
Social cognition	
12 RCTs, N = 273 *No significant differences between groups;* 11 samples, SMD = 0.07, CI = -0.06 to 0.17, *p* = 0.238 Change scores were also not significant. Social cognition level (low vs. high) explained a significant amount of heterogeneity between outcomes; there was no effect in the low-level social cognition groups, while there was a small significant effect (SMD = 0.20) in the high-level social cognition group. There were no moderating effects of recognition of fear vs. other emotions, single administration vs. chronic administration, country of study, mean age, gender and dosage.	
Neurocognition	
No significant differences between groups; 3 samples, SMD = 0.12, CI = -0.12 to 0.34, *p* = 0.209	
Consistency in results‡	Authors report data are moderately inconsistent.
Precision in results§	Precise
Directness of results‖	Direct

Williams DR, Burkner PC

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Effects of intranasal oxytocin on symptoms of schizophrenia: A multivariate Bayesian meta-analysis

Psychoneuroendocrinology 2017; 75: 141-51

View review abstract online

Comparison	**Intranasal oxytocin vs. placebo for people with schizophrenia.**
Summary of evidence	**Moderate quality evidence (small to medium-sized samples, inconsistent, precise, direct) suggests adjunctive oxytocin has no benefit for symptoms.**
Symptoms	
8 RCTs, N = 238 *No significant differences between groups;* Overall: 7 samples, SMD = -0.13, 95%CI -0.53 to 0.30, *p* = 0.519 Negative: 8 samples, SMD = -0.02, 95%CI -0.32 to 0.28, *p* = 0.848 Positive: 6 samples, SMD = -0.23, 95%CI -0.71 to 0.27, *p* = 0.305 General: 5 samples, SMD = -0.19, 95%CI -0.53 to 0.17, *p* = 0.279 There were no moderating effects of mean age, gender, therapy duration, dosage, administration interval, social training, and country of study.	
Consistency in results	Authors report data are moderately inconsistent.
Precision in results	Precise
Directness of results	Direct

Zheng W, Zhu XM, Zhang QE, Yang XH, Cai DB, Li L, Li XB, Ng CH, Ungvari GS, Ning YP, Xiang YT

Adjunctive intranasal oxytocin for schizophrenia: A meta-analysis of randomized, double-blind, placebo-controlled trials

Schizophrenia Research 2019; 206: 13-20

View review abstract online

Comparison	**Intranasal oxytocin vs. placebo for people with schizophrenia.**

Oxytocin

Summary of evidence	**Moderate quality evidence (small to medium-sized samples, inconsistent, precise, direct) suggests adjunctive oxytocin has no benefit for symptoms.**
Symptoms	
No significant differences between groups; Total psychopathology 8 RCTs, N = 203, SMD = -0.08, 95%CI -0.53 to 0.37, $p = 0.74$, $I^2 = 59\%$ The results were similar in subgroup analyses of positive, negative, and general symptoms. Only 80 IU/day had superiority over placebo in improving total psychopathology and positive symptoms.	
Risks	No group differences were found.
Consistency in results	Inconsistent
Precision in results	Precise
Directness of results	Direct

Explanation of acronyms

CI = confidence or credible (Bayesian) interval, 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), RCT = randomised controlled trial, SMD = standardised mean difference, 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; reporting bias – selective reporting of results; 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[6].

† Different effect measures are reported by different reviews.

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).

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) which 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. Less than 0.4 represents a small effect, around 0.5 a medium effect, and over 0.8 represents a large effect[6].

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 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. Odds ratios (ORs)are similar to RRs, but they are based on the probability of an event occurring divided by the probability of that event not

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occurring. ORs and RRs are similar in size when the event is rare, such as with schizophrenia. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios (HRs) 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 can provide an indirect 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.

‡ 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 represent 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[6];

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

§ 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[7].

‖ 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, which 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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