Mixing apples with oranges: Visual attention deficits in schizophrenia

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A B S T R A C T

Background & objectives: Patients with schizophrenia usually present cognitive deficits. We investigated possible anomalies at filtering out irrelevant visual information in this psychiatric disorder. Associations between these anomalies and positive and/or negative symptomatology were also addressed.

Methods: A group of individuals with schizophrenia and a control group of healthy adults performed a Garner task. In Experiment 1, participants had to rapidly classify visual stimuli according to their colour while ignoring their shape. These two perceptual dimensions are reported to be “separable” by visual selective attention. In Experiment 2, participants classified the width of other visual stimuli while trying to ignore their height. These two visual dimensions are considered as being “integral” and cannot be attended separately.

Results: While healthy perceivers were, in Experiment 1, able to exclusively respond to colour, an irrelevant variation in shape increased colour-based reaction times (RTs) in the group of patients. In Experiment 2, RTs when classifying width increased in both groups as a consequence of perceiving a variation in the irrelevant dimension (height). However, this interfering effect was larger in the group of schizophrenic patients than in the control group. Further analyses revealed that these alterations in filtering out irrelevant visual information correlated with positive symptoms in PANSS scale.

Limitations: A possible limitation of the study is the relatively small sample.

Conclusions: Our findings suggest the presence of attention deficits in filtering out irrelevant visual information in schizophrenia that could be related to positive symptomatology.

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1. Introduction

Visual attention can be compromised in schizophrenia (see Hemsley, 1976; Ravizza, Robertson, Carter, Nordahl, & Salo, 2007). Classic studies of attention in this mental disorder revealed deficits at selecting relevant information from their environment (McChie, 1996; Payne, 1971, 1973). According to most of these studies, these anomalies may be specifically circumscribed to cases where the selection process is driven by top-down (or rule-guided; also known as “pigeonholing”) mechanisms (e.g., Stroop-like tasks). However, the possible presence, in schizophrenia, of alterations in the bottom-up selection of visual information (i.e., “filtering” mechanisms) still remains unclear (see Hemsley, 1975; Hemsley & Richardson, 1980).

In the present preliminary study, we used the Garner paradigm to investigate possible dysfunctions in the early selection of visual information. Participants were instructed to classify, as fast as possible, distinctive features from a “relevant” dimension. The performance in this task was used to test the possible interfering influence of a variation introduced in another “non-relevant” dimension (see Garner & Felfoldy, 1970). Normally, when two visual dimensions are processed in a separable fashion, the perception of a variation in one of them (e.g., shape) does not affect a speeded classification of the other (e.g., colour). In contrast, when selective attention cannot filter out information from a task-irrelevant visual dimension (e.g., height), variations in this dimension slow down responses to a task-relevant dimension.
be expected in both groups, an anomalous processing of these two
integral dimensions (height and width). Although a slow-down could
reaction times (RTs) was expected only in the group of schizo-
integration of these two dimensions and a consequent increase in
visual selection are compromised in schizophrenia, an anomalous
attention deficit (see Morris, Griffiths, Le Pelley, and Weckert, 2013),
which leads us to hypothesize a possible association
between anomalies in Garner interference (e.g., larger RTs
when categorizing separable dimensions) and positive symptom-
atology in the tested group of patients.

2. Material & methods

2.1. Participants

The patient group included 14 right-handed patients (4 female)
with ages ranging between 17 and 60 years (mean = 39.35,
SD = 8.75), diagnosed with schizophrenia (paranoid type [DSM IV];
years of illness average = 7.64; SD = 5.32). The patients were
recruited after a 2–3-week hospitalization at Parc Sanitari Sant
Joan de Déu as consequence of an acute psychotic episode. Patients
were stable at the moment of the study, and left the unit a few days
after the study.

The Control group included 14 healthy control participants that
were equivalent, in terms of gender, age (±2 years; mean = 37.50;
SD = 8.42), and academic level (primary, secondary school or
university) to the group of patients with schizophrenia. Normal or
corrected-to-normal vision was necessary for participation in the
study.

Experiments 1 and 2 were non-invasive, were conducted in
accordance with the Declaration of Helsinki, and had ethical
approval from the Parc Sanitari Sant Joan de Déu's ethics Com-
mittee. The participants provided a written informed consent to
participate in the study.

2.2. Exclusion criteria

2.2.1. Patient group

The exclusion criteria were the presence of any other diagnosis
on axis I or II of DSM-IV (at least two weeks before participating in
the study), a rating in the YMRS (Young, Biggs, Ziegler, & Meyer,
1978) above 7 and above 12 in the MADRS (Montgomery &
Asberg, 1979), the presence of any other medical or neurological
disorder that may affect cognitive functions severely, and the
inability to provide informed consent: Stable medication (type and
dose) was required for at least 2 weeks before the Experimental
session.

2.2.2. Control group

The exclusion criteria were the presence of any declared mental
disorder, a previous history of mental or neurological disorders that
could affect cognitive functioning, and/or a history of several
mental/neurological disorders in first degree relatives.

2.3. Experiments

The visual stimuli were always presented at the centre of the
screen (Asus A55V; refresh rate = 60 Hz). The participant sat at a
distance of approximately 50 cm from the display monitor in a
dimly-lit and sound-proof room at Hospital Sant Joan de Déu.
The presentation of all the stimuli was controlled by a program running
in E-prime 2.0 (Psychology Software Tools, Inc.).

2.3.1. Experiment 1. Separable dimensions (colour and shape)

Visual targets (4 × 6 cm) that could vary in terms of shape
(rounded vs. jagged) and colour (purple vs. orange) were presented
to participants (see Fig. 1). The experiment included 2 Homoge-
neous and 2 Orthogonal blocks. In the Homogeneous blocks, the
target dimension (colour) varied but the irrelevant dimension
(shape) was kept constant. In the Orthogonal blocks, both colour
and shape could vary randomly within each experimental block
(see Fig. 1).
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