

Review of: "Effects of Schizophrenia on Attention"

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The paper is highly comprehensive, detailed, and demonstrates a clear mastery of both the theoretical and empirical literature on attention deficits in schizophrenia. Greater cohesion between sections, more accessible language for non-experts, and a stronger focus on practical implications for schizophrenia treatment would enhance the impact of the paper.

Abstract

The abstract is informative and addresses key elements of the relationship between schizophrenia and attention. However, there are a few areas that could be clarified or improved for better readability and precision:

Suggested revisions:

(1). Clarity in top-down and bottom-up processing:

The phrase "The attentional modulating signal could be in forward (bottom-up) or backward (top-down) direction from attentional sources such as thalamic reticular nucleus or fronto-parietal network, respectively" is slightly convoluted.

Simplifying this could make it clearer:

"Attentional modulation can occur through bottom-up (feedforward) or top-down (feedback) pathways, originating from structures such as the thalamic reticular nucleus or the fronto-parietal network, respectively."

(2). Disturbed attentional signals in schizophrenia:

You mention that attentional signals are disturbed in schizophrenia, but you may want to briefly explain how this disturbance manifests or introduce it more clearly before the critical review part.

Example: *"In individuals with schizophrenia, disruptions in attentional modulation impair cognitive functions, particularly in switching and selective attention."*

(3). Schizophrenics:

Consider using "individuals with schizophrenia" instead of "schizophrenics" for more person-first language, which is generally preferred in scientific and clinical writing.

(4). Neuromodulators:

The sentence about dopamine and glutamate could be expanded to specify how these neuromodulators interact with attention systems in schizophrenia.

Example: *"In schizophrenia, attention modulation is influenced by disruptions in dopamine and glutamate signaling, which play critical roles in regulating cognitive processes."*

(5). Experimental design:

The mention of the experimental design at the end could be expanded to briefly outline the objective or method. As it stands, it feels somewhat abrupt.

Example: *"To further investigate attention switching deficits, an experimental design using functional magnetic resonance imaging (fMRI) is proposed, aiming to identify neural correlates of attentional dysfunction in schizophrenia."*

1. Introduction

- **Affective flattening:** Reduced emotional expression

This section provides a clear and structured overview of the paper, but there are a few areas where improvements can enhance clarity, flow, and academic tone. Here are some suggestions:

(1). The phrase *"attention plays important role"* should be changed to *"attention plays an important role."*

(2). Instead of listing all disorders with impaired attention mechanisms in one long sentence, consider splitting them into two or grouping similar ones:

"These include neurodegenerative and psychiatric disorders such as schizophrenia, Alzheimer's disease, and dementia with Lewy bodies, as well as conditions like posttraumatic stress disorder (PTSD), drug abuse (e.g., MDMA, cocaine, and marijuana use), and Parkinson's disease. Attention deficits are also prevalent in cases of frontal lobe damage, attention deficit hyperactivity disorder (ADHD), bipolar disorder, depression, autism, and chronic pain (see Table 1 for references)."

(3). The outline of the paper in the last few sentences is good but could be slightly refined for clarity:

"In Section 2, we define attention, review five types of attention tasks and associated neurotransmitters, and explore how attention impacts emotion, face recognition, the reward system, and working memory. Section 3 focuses on schizophrenia, attention deficits, and existing models of the disorder. In Section 4, we suggest a future research project, and the Conclusion synthesizes our main thesis."

2.1 Definition

(1). The formatting of the first list of main signals and attentional effects could be clearer:

"Main signals are (a) sensory signals in feed-forward pathways (e.g., vision-related ventral and dorsal pathways), and (b) signals related to emotion, memory, and reward. Attention modulates these signals by (a) facilitating or sharpening the

firing of already activated cells, or (b) suppressing or inhibiting neighboring deactivated cells."

(2). The description of attentional neural signals needs clarification. Consider rephrasing to make the source of the feedback or feed-forward signals more explicit:

"Attentional neural signals may originate as re-entrant feedback signals from areas like the prefrontal cortex [2], or as feed-forward signals from regions such as the thalamic reticular nucleus [4]."

(3). Briefly explain what Table 1 contains so the reader understands why it is included and how it connects to the argument.

"Table 1 lists attention deficits in various disorders, organized by the different forms of attention affected."

(4). It would be helpful to include a brief transitional sentence between the explanation of attention's modulation of signals and the reference to Table 1 to ensure smooth flow.

2.2 Visual attention tasks

(1). To improve the overall flow, try to group related concepts together, especially when introducing subtypes (e.g., foveal attention). Additionally, adding a brief concluding statement that summarizes how these different attention tasks are relevant to the rest of your work might help with continuity.

(2). The first sentence could be revised for clarity:

"Visual attention tasks can be grouped into five types [54]: foveal attention, covert attention, divided attention, selective attention, and switching attention."

(3). The descriptions of foveal short-sustained, long-sustained, and vigilance attention are a bit wordy and could be streamlined:

"First, in foveal attention tasks, subjects focus on a target at the fovea for varying durations: (a) short-sustained attention (1-30 seconds), (b) long-sustained attention (seconds to minutes), and (c) vigilance attention (minutes to hours)."

2.4 Effect of Attention on Emotion, Face Recognition, and Reward System

(1). Consider including brief transition sentences between subsections to tie the ideas together more clearly. For example, after Section 2.3, you might transition by stating:

"Given the role of neurotransmitters like dopamine and glutamate in attention, it is also important to explore how attention interacts with other cognitive functions, such as emotion, face recognition, and reward processing."

2.5 Attention and working memory

(1). The first sentence states that *"Attention and working memory (WM) are closely related cognitive processes,"* but this could be expanded slightly to provide more depth. You could include a brief explanation of why they are related:

"Attention and working memory (WM) are closely related cognitive processes, both of which are essential for maintaining and manipulating information over short periods."

(2). The final sentence, *"Schizophrenics have selective attention deficit; therefore, their WM should also be degraded,"* could be rephrased to make the connection more explicit and to use more respectful language.

"Individuals with schizophrenia often exhibit deficits in selective attention, which likely contributes to impairments in working memory."

(3). It would be helpful to briefly mention the implications of this connection between attention and WM for schizophrenia, since this is a key part of your argument. For example, you could conclude:

"Understanding this link between attention and WM is critical for addressing cognitive impairments in schizophrenia, as interventions aimed at improving attention may also benefit working memory."

3.1 Schizophrenia

(1). You could clarify the definitions of each symptom to help readers unfamiliar with these terms:

- **Alogia:** Poverty of speech or diminished verbal output
- **Avolition-apathy:** Lack of motivation or inability to initiate goal-directed activities
- **Anhedonia-asociality:** Inability to experience pleasure and reduced interest in social interactions
- **Cognitive disturbances,** such as attentional impairment

3.2 Attention deficits in schizophrenia

The section covers a wide range of symptoms and findings, but the structure is somewhat disorganized. Breaking it into subsections or grouping related concepts would help. For example:

- **Attention Dysfunctions in Schizophrenia:** Discuss the general over- and under-attention mixture and difficulties with selective and sustained attention.
- **Positive vs. Negative Symptoms and Attention:** Discuss differences in attention deficits between individuals with positive and negative symptoms.
- **Comparison with Other Disorders:** Discuss the similarities and differences in attention deficits between schizophrenia and other disorders such as PD and ADHD.
- **Impact on Daily Life:** Highlight how these attention deficits impact social functioning and daily life.
 - **Emotion Recognition and Facial Processing Deficits** Discuss how individuals with schizophrenia struggle with tasks involving facial emotion recognition, matching, and the interaction of emotion and identity.

3.3 is missing

3.4 Attentional deficits related to emotion, face recognition, reward, and working memory in schizophrenia

(1). The section contains many important concepts, but the flow is somewhat difficult to follow. Consider breaking the section into smaller subsections or grouping related concepts together, such as:

- **Attention and Emotion Processing:** Focus on how attention deficits affect emotion processing.
- **Impact on Social Functioning:** Discuss how these deficits translate into social problems.

(2). Summarize the key points at the end of the section for clarity and to reinforce the importance of the relationships between attention, emotion, and facial recognition deficits in schizophrenia:

"In summary, individuals with schizophrenia exhibit significant deficits in facial emotion recognition, identity recognition, and their dissociation. These impairments are closely linked to attention deficits, which disrupt the processing of emotionally salient stimuli. The impact of these deficits extends beyond cognitive impairment, contributing to the social dysfunction that characterizes the disorder. Understanding the mechanisms behind these attentional and emotional deficits is essential for improving therapeutic outcomes."

3.5 Neural correlates

(1). The section introduces numerous brain areas (e.g., fusiform gyrus, amygdala, hippocampus, frontal cortex, etc.) and concepts (e.g., gray matter reduction, BOLD activation, emotional gating). Grouping these elements into thematic clusters (e.g., fusiform gyrus and facial recognition, amygdala and emotion processing) could help improve flow and make the section easier to digest.

(2). You might want to consider breaking the section into subsections for easier readability, such as:

- **Fusiform Gyrus and Facial Processing**
- **Amygdala and Emotion Processing**
- **Frontal Cortex and Cognitive Dysfunction**
- **DLPFC, GABA, and Working Memory Deficits**
- **The Role of Hippocampus in Contextual and Emotional Processing**
 - **Task R: Baseline control without target stimulus.**

(3). It would be helpful to emphasize the real-world consequences of these neural abnormalities. For example, how do these brain deficits impact everyday functioning for people with schizophrenia (e.g., social interactions, recognizing emotions in others, making decisions based on emotional cues)?

3.6 Models of Schizophrenia and Test Hypotheses

(1). The section introduces two core biochemical models (dopaminergic hyperactivity and glutamatergic deficiency) but could benefit from clearer distinctions between these models. Presenting each model separately with its specific role in schizophrenia may improve comprehension.

For example, you could discuss **dopaminergic hyperactivity** first, explaining its involvement in **positive symptoms** (e.g.,

delusions, hallucinations) and its connection to attentional deficits. Then introduce **glutamatergic dysfunction**, focusing on **cognitive impairments** like working memory and attention.

(2). The hypothesis that selective attention deficits underlie various forms of **face-emotion processing impairments** is well presented. However, the list of specific deficits (i.e., face discrimination, emotion discrimination, etc.) might benefit from more concise grouping. Instead of listing each type of discrimination or identification task separately, you could categorize them to reduce redundancy:

For instance, group them into broader categories such as **face perception**, **emotion perception**, and **integration tasks** (e.g., dissociating face identity from emotion).

4. Future Directions

(1). Why is it necessary to explore **low attention levels**? How does this approach advance the understanding of attentional deficits in schizophrenia compared to current methods?

(2). While you acknowledge that other aspects of attention (e.g., **covert, sustained, and divided attention**) should be investigated, you could add a short explanation of why this is the case. Why might these aspects also be important in schizophrenia, and how could they influence functioning?

Example: *"Although switching and selective attention are primary focuses, deficits in covert and sustained attention may contribute to the broader cognitive dysfunction seen in schizophrenia, including issues with maintaining focus over time or attending to stimuli without overt behavioral responses."*

(3). The proposed experimental design is clear and well-structured. However, it could be streamlined to improve readability and comprehension for readers unfamiliar with experimental paradigms. Breaking the experiment into labeled sections or steps (e.g., Task R, Task A, Task N) with brief explanations of their purposes could help.

Additionally, providing a brief **visual flowchart** of the experimental design (with each task and expected comparison) might enhance understanding. For instance:

- **Task A: Switching between color and motion attributes.**
- **Task N:** No switching; maintaining focus on a single attribute (e.g., color only).

(4). The section mentions that **reaction time (RT)** and **number of errors** will be used as key outcome measures, which is a valid choice. However, it might be helpful to briefly mention why these measures are particularly relevant for studying attentional deficits in schizophrenia.

Example: *"Reaction time and error rates are critical in identifying attentional deficits, as slower responses and increased errors are often associated with cognitive inflexibility and distractibility in schizophrenia."*

5. Conclusion

(1). Provide a brief explanation of the term "reentrant" for readers unfamiliar with it.

(2). While the section provides a good overall summary, it would be useful to end with a forward-looking statement about how these insights into attention mechanisms could drive future research.