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Letter to the Editor

A comparison of simple reaction times in psychotic inpatients with and without hyponatremia

Dear Editors,

Hyponatremia (HN), commonly found in every branch of medicine (Mannesse et al., 2012), presents with an array of symptoms depending chiefly on the rate and degree of [Na+] decline. Acute onset can cause cerebral edema and rapidly lead to neurologic damage, respiratory arrest, brainstem herniation, and death (Adrogue, 2005). Slower onset allows adaptive mechanisms to limit cerebral swelling and the spectrum of symptoms (if any) are more chronic and vague including fatigue, headache, and confusion.

Cognitive and motor deficits associated with mild chronic HN (CHN) are less recognized. Impaired gait and balance, slowed reaction time, diminished processing speed, and bone mineral loss have been studied in elderly and cirrhotic CHN patients (Gankam-Kengne et al., 2013) but have been under recognized in psychiatric populations. There is a growing acknowledgment that CHN symptoms are often subtle and may be misattributed to the underlying psychiatric disorder, or regarded as a medication effect (Siegel, 2008). Bun et al. (2011) reported that among psychiatric inpatients, 12.09% of the mild CHN cases had a history of falls, compared to only 2.55% of the controls. Josiassen et al. (2012) reported that treatment of CHN in psychotic inpatients reduced number of falls and overall resource utilization. Manu et al. (2012) found that psychiatric inpatients with CHN require emergency transfer to a hospital twice as often as normonatremic inpatients. A 20-year mortality study found that life expectancy of psychotic patients with CHN is shortened by a decade (Hawken et al., 2009).

Clearly, motor deficits can increase morbidity and warrant serious concern. This study explored the impact of mild CHN on simple reaction time in individuals with psychotic illness recruited from two state psychiatric hospitals in Pennsylvania. The study was approved by the appropriate Institutional Review Boards and was conducted in accordance with the generally accepted standards for the protection of patient safety and welfare. Written informed consent was obtained from each subject prior to initiating study procedures.

Blood samples were collected using an I-Stat handheld analyzer (Abbott) to measure serum [Na+] to determine eligibility and to serve as raw data for analysis. The Deary-Liewald Reaction Time Task (DLRT v310) (Deary et al., 2011) was used to measure simple reaction time (SRT) using a Dell Inspiron N5040. Subjects were instructed to press the space bar as quickly as possible using the index finger of their dominant hand when a cross appeared within a white box on the screen (crosses appeared randomly with intervals of 1–3 s). All study procedures for each subject were completed during the same session to ensure the RT was being measured within 10–15 min of the serum sodium measurement. All RT administrators were blind to the serum sodium results of the subject.

Three groups of subjects (20 each), were enrolled. Patients for the hyponatremic psychotic group (HP) were selected if they had chronic psychosis per their hospital chart and at least six consecutive monthly serum sodium levels of [Na+] <133 mmol/L. Two control groups were matched for age (±2 years) and gender. The first comparison group (NP) had chronic psychosis and normonatremia (NN) and the second group were healthy controls (HC). Table 1 displays relevant demographic information.

The mean SRT measurements for each group are displayed in Table 1. The mean values for the HP group were 128.73 ms slower than those of the NP group. Both psychotic groups performed slower than the HC group. An ANOVA (3 levels; HP, NP, HC) was performed to examine the overall difference in SRT among the groups. An overall statistically significant difference was found among the three groups ($p < 0.000$). Post-hoc *t*-tests used to measure between-group differences were also found to be significant ($p < 0.001$). All significance tests were performed using two-tailed comparisons with alpha level of $p < 0.05$. All statistical procedures were conducted using SPSS Statistics Version 17.0.

As expected, differences between the HC group SRTs and the two psychotic groups achieved statistical significance; $p < 0.000$ and $p < 0.001$ respectively. In both cases the mean SRT was prolonged for the psychotic groups replicating one of the most consistent findings in the schizophrenia literature (Nuechterlein, 1977).

This is the first known study to quantitatively examine the effects of HN on motor speed in psychotic individuals. While motor speed is only one of many potential variables that could lead to falls, it is a simple and easy variable to assess in seriously impaired psychotic individuals. Falls leading to broken bones have a large impact on the long-term quality of life for this population and are the focus of a significant level of hospital resources. If HN is indeed a contributor to the increased risk for motor disorder in this population, it warrants further investigation, particularly as it can now be treated pharmacologically in a safe and effective manner (Hoorn and Zietse, 2017).

It has become increasingly clear that CHN is associated with increased morbidity and mortality among individuals with psychotic

Table 1
Demographic and clinical characteristics.

Characteristic	Group		
	Psychosis, HN	Psychosis, NN	Healthy control
Participants (*n*)	20	20	20
Mean age (SD)	50.55 (9.8)	49.3 (9.8)	51.1 (10.25)
Gender			
Males	19	19	19
DSM-IV-TR dx			
Schizophrenia or related psychotic disorder	20	20	20
Mean Na^+ mEq/L (SD)	129.1 (4.17)	140.25 (2.51)	136.73 (1.66)
Mean SRT msec (SD)	571.34 (165.77)	442.58 (143.71)	296.02 (27.69)

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disorders. It has a negative impact on quality of life, serves to lengthen hospital stays, and has a significant impact on resource utilization. This study suggests a new avenue for studying motor disorders in psychosis and offers compelling evidence that motor speed is significantly impaired by HN. It is essential for mental health and medical professionals, to more fully comprehend the importance of CHN as a significant factor influencing long-term quality of life, not only for those with psychotic illness, but across the entire spectrum of medical and mental health disorders. Longer-term, prospective studies with larger samples are needed.

Conflict of interest

None of the authors have any conflicts of interest to acknowledge.

Contributors

DMF undertook the statistical analysis and with RCJ wrote the first draft of the manuscript. DMF under the advisement of MP designed the study for completion of her Ph.D. program from where part of the current data came from. All authors contributed to and have approved the final manuscript.

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