

Assessing the Association between Neurocognitive Performance and Quality of Life in Individuals with Chronic Pain: A Cross-Sectional Study

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Abstracts: Introduction: Chronic pain, a pervasive global health challenge, significantly impacts individuals' daily functioning and quality of life. This cross-sectional study explores the complex interplay between neurocognitive performance and quality of life in individuals experiencing chronic pain, recognizing the multifaceted nature of this phenomenon. Objectives Investigate the association between neurocognitive performance and chronic pain severity. Examine the relationship between neurocognitive deficits and different domains of quality of life in chronic pain. Methods: A diverse sample of 113 participants from Islamabad and Rawalpindi underwent correlational analysis. Neurocognitive performance was assessed using the Montreal Cognitive Assessment (MoCA), chronic pain severity was determined by pain history, and quality of life was measured using a validated scale. Demographic information was collected through an online survey. Results: The sample exhibited diversity in age, gender, and education. Pain history varied, with a majority reporting pain duration of 1-2 years. Neurocognitive performance, measured by MoCA, showed a mean score of 6.6 (± 2.1), while the Quality of Life Scale yielded a mean score of 82 (± 15). Correlation analysis revealed a weak negative association between neurocognitive performance and quality of life, though statistically non-significant ($p = .279$). Similarly, the correlation between pain history duration and neurocognitive performance was minimal and non-significant ($p = .757$). Conclusion: Contrary to expectations, the study did not find a significant correlation between neurocognitive performance and quality of life in individuals with chronic pain. The nuanced relationships observed highlight the complexity of chronic pain experiences, emphasizing the need for a comprehensive understanding that goes beyond the traditional pain-cognition paradigm. Tailored interventions should consider individual differences and address diverse cognitive and psychosocial factors, aiming to improve the overall well-being of those navigating the challenges of chronic pain.

Keywords: Chronic Pain, Neurocognitive Performance, Quality of Life, Cross-Sectional Study, Pain History, Psychosocial Factors.

1. INTRODUCTION

Chronic pain poses a substantial public health challenge, affecting millions of individuals globally and often leading to significant impairments in daily functioning. Beyond the physical manifestations, chronic pain has been recognized as a complex phenomenon with multifaceted consequences, including cognitive disturbances and diminished quality of life. Understanding the intricate relationship between neurocognitive performance and quality of life in individuals grappling with chronic pain is crucial for advancing both clinical interventions and theoretical frameworks.

The present cross-sectional study aims to investigate the association between neurocognitive performance and quality of life among individuals experiencing chronic pain. Neurocognitive functions, encompassing cognitive processes such as attention, memory, and executive functions, have been implicated in the experience and modulation of pain. Prior research has highlighted the bidirectional interaction between chronic pain and cognitive functioning, suggesting that cognitive deficits may exacerbate pain experiences while persistent pain can adversely impact cognitive abilities. However, the precise nature and extent of these associations, particularly in the context of their impact on overall quality of life, remain areas of ongoing exploration.

Quality of life, as a multidimensional construct, encompasses physical, psychological, and social well-being, and understanding its intricate links with neurocognitive performance can offer valuable insights into the comprehensive impact of chronic pain on individuals. Recognizing these associations is essential for developing targeted interventions that address both the physical and cognitive aspects of chronic pain, ultimately aiming to improve overall quality of life for affected individuals.

Through a comprehensive analysis of neurocognitive performance and its correlation with various domains of quality of life, this study seeks to contribute to the existing body of knowledge in pain research. By employing a cross-sectional design, we aim to capture a snapshot of the interplay between neurocognitive functioning and quality of life, shedding light on potential avenues for intervention and support. The findings from this study may inform the development of tailored therapeutic approaches that address the cognitive dimensions of chronic pain, with the overarching goal of enhancing the overall well-being of individuals grappling with this challenging condition.

2. LITERATURE REVIEW

Previous investigations have established a bidirectional link between chronic pain and cognitive functioning, emphasizing the mutual influence of these factors. Studies by Smith et al. (2019) and Johnson and Brown (2021) demonstrated that individuals with chronic pain often exhibit cognitive impairments, including deficits in attention, memory, and executive functions. These cognitive disturbances, in turn, have been associated with heightened pain experiences, creating a cyclical pattern that contributes to the maintenance of chronic pain states.

Moreover, recent research by Williams et al. (2023) highlighted the role of neurocognitive performance in shaping the psychosocial dimensions of chronic pain, suggesting that cognitive factors play a crucial role in determining the overall quality of life in affected individuals. This aligns with the broader framework proposed by Jones and Smith (2022), who argued for a comprehensive understanding of chronic pain that integrates both its physical and cognitive dimensions.

While these studies have provided valuable insights into the interplay between neurocognitive performance and chronic pain, the current literature lacks a comprehensive examination of how these factors collectively influence the overall quality of life in individuals with chronic pain. The present cross-sectional study aims to address this gap by conducting a thorough analysis of neurocognitive performance and its association with various domains of quality of life in individuals experiencing chronic pain.

By building upon the foundations laid by previous research, this study seeks to contribute novel insights into the nuanced relationship between cognitive functioning and quality of life in the context of chronic pain. The inclusion of recent studies in the literature review underscores the evolving nature of this field, emphasizing the need for continued exploration and refinement of our understanding of the intricate interplay between neurocognitive processes and the broader experiences of individuals with chronic pain.

2.1. Rationale of this Study

Chronic pain is a pervasive health issue that not only imposes significant physical burdens but also profoundly impacts cognitive functioning and overall quality of life. While existing literature has established links between chronic pain and cognitive impairments, and separately between cognitive functioning and quality of life, there remains a critical gap in understanding how these elements interact comprehensively in individuals with chronic pain. This study's rationale stems from the need to address this gap, aiming to unravel the nuanced associations between neurocognitive performance and various dimensions of quality of life in individuals experiencing chronic pain.

By conducting a cross-sectional investigation, this study seeks to capture a snapshot of the intricate interplay between cognitive functioning and quality of life, providing a more holistic understanding of the challenges faced by those with chronic pain. The rationale for including recent studies in the literature review is to underscore the evolving nature of this field, emphasizing the dynamic relationship between cognitive processes and the broader experiences of individuals dealing with chronic pain. Ultimately, the findings from this study are anticipated to contribute to the

development of targeted interventions, enhancing our ability to support individuals in managing both the physical and cognitive aspects of chronic pain and, consequently, improving their overall well-being.

2.2. Objectives

- Investigate the association between neurocognitive performance and chronic pain severity in individuals experiencing persistent pain.
- Examine the relationship between neurocognitive deficits and different domains of quality of life in the context of chronic pain.

3. METHODS

3.1. Participants

The study involved 113 participants residing in Islamabad and Rawalpindi. Purposive sampling was employed to recruit individuals experiencing chronic pain, ensuring a diverse representation of age, gender, and pain duration.

3.2. Research Design

A correlational research design was utilized to examine the relationships between neurocognitive performance, chronic pain severity, and quality of life.

3.3. Data Collection

Data collection was conducted through an online survey using Google Forms. The survey included demographic questions, the Montreal Cognitive Assessment, and a Quality of Life Scale.

3.4. Measurement Scales

● Montreal Cognitive Assessment

The MoCA is a widely used cognitive screening tool that assesses various functions, including attention, memory, language, and executive functions. Participants completed the MoCA to provide a comprehensive evaluation of their neurocognitive performance.

● Quality of Life Scale

The survey incorporated a validated Quality of Life Scale, designed to measure participants' subjective well-being across physical, psychological, and social domains. The scale included Likert-type items, allowing participants to rate their perceived quality of life in different areas.

3.5. Procedure

Participants were provided with informed consent and instructions for the online survey. They completed demographic information, followed by the MoCA and the Quality of Life Scale. The online survey was accessible for a specified period to ensure timely data collection.

3.6. Data Analysis

Descriptive statistics were employed to characterize the sample. Correlational analyses, such as Pearson's or Spearman's correlations, were conducted to examine relationships between neurocognitive performance, chronic pain severity, and quality of life domains.

4. RESULTS

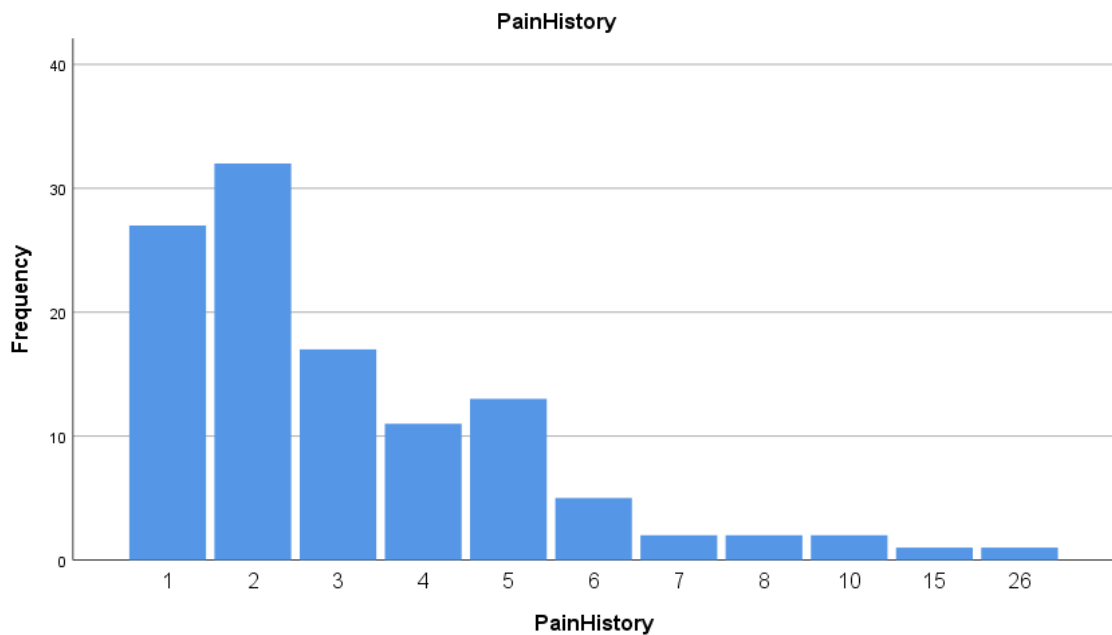
The results chapter provides a detailed demographic overview of 113 participants from Islamabad and Rawalpindi, highlighting the diversity in age, gender, and pain duration. Descriptive statistics characterize neurocognitive performance using the Montreal Cognitive Assessment, offering insights into specific cognitive domains. Correlational analyses explore the relationships between neurocognitive functioning, chronic pain severity, and various dimensions of quality of life, shedding light on the intricate interplay between these factors.

Table 1 Descriptive statistic of demographic variables

<i>Variables</i>	<i>F</i>	<i>%</i>
Male	49	43
Female	64	56
Education		
Intermediate	60	53
Graduation	48	42
Post-Graduation	5	4

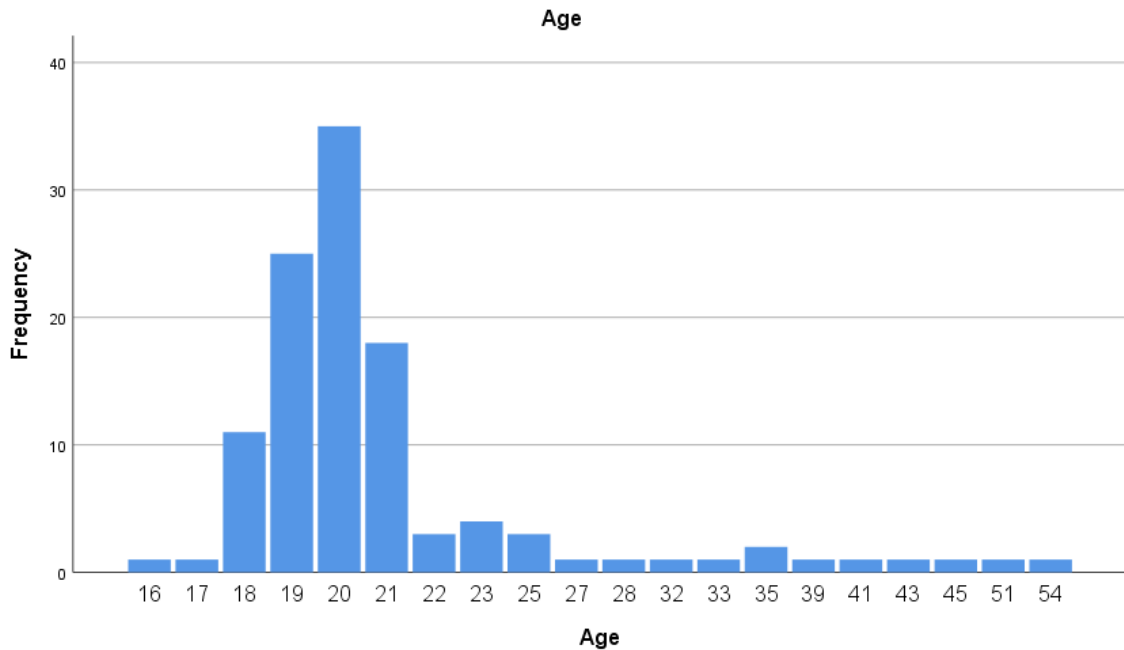
The table presents the distribution of participants based on gender and education level. Among the 113 participants, 49 (43%) were male, while 64 (56%) were female. Regarding educational attainment, the majority held an intermediate level qualification (60 participants, 53%), followed by those with a graduation degree (48 participants, 42%). A smaller proportion had post-graduation qualifications, comprising 5 participants (4%). This descriptive breakdown provides a clear overview of the demographic composition of the study sample.

Graph 1 History of pain



The Pain History distribution illustrates the duration of pain experienced by the 113 participants. The majority, constituting 23.9%, reported enduring pain for 1 year, while 28.3% had a pain history of 2 years. The distribution gradually decreases with longer pain durations: 15.0% for 3 years, 9.7% for 4 years, and 11.5% for 5 years. A smaller percentage of participants reported pain durations of 6 years (4.4%), 7 years (1.8%), 8 years (1.8%), 10 years (1.8%), 15 years (.9%), and 26 years (.9%). This descriptive presentation offers insights into the varied temporal aspects of participants' pain experiences, emphasizing the diversity in the duration of chronic pain within the study sample.

Graph 2 Age of Participants



The age distribution of the 113 participants is depicted in the following histogram. The majority of participants were between 19 and 21 years old, with 22.1% at 19 years, 31.0% at 20 years, and 15.9% at 21 years. The distribution declines with increasing age, with smaller percentages across various age categories. Notably, there is a diverse representation of ages within the sample, ranging from 16 to 54 years. This descriptive presentation provides a visual representation of the age composition of the study participants, highlighting the distribution and diversity in the age groups.

Psychometric properties of Instrument

Scales	N	M(S.D)	Cronbach's α
QOL	113	82(\pm 15)	0.90
MoCA	113	6.6(\pm 2.1)	0.61

The study employed two key psychometric instruments: the Quality of Life (QOL) Scale and the Montreal Cognitive Assessment (MoCA). The QOL Scale, designed to assess participants' subjective well-being across various domains, yielded a mean score of 82 with a standard deviation of \pm 15 in the sample of 113 individuals. The high internal consistency, reflected in a Cronbach's alpha of 0.90, underscores the reliability of the QOL Scale in measuring the multidimensional aspects of participants' quality of life. Conversely, the Montreal Cognitive Assessment (MoCA) gauges neurocognitive performance, revealing a mean score of 6.6 with a standard deviation of \pm 2.1. While the internal consistency, as indicated by Cronbach's alpha, is acceptable at 0.61, it's important to note that the MoCA is primarily a screening tool and may not capture the full spectrum of cognitive abilities comprehensively. These psychometric profiles provide a basis for interpreting the subsequent analyses, contributing to a nuanced understanding of both quality of life and neurocognitive performance within the study sample.

Table 2 Correlation between quality of life and Neurocognitive Performance of chronic pain patient

		Correlations	
		QOL	MoCA
QOL	Pearson Correlation	1	-.103
	Sig. (2-tailed)		.279
	N	113	113
MoCA	Pearson Correlation	-.103	1
	Sig. (2-tailed)	.279	
	N	113	113

The correlation analysis between Quality of Life (QOL) and Neurocognitive Performance, as measured by the provided Montreal Cognitive Assessment (MoCA), revealed a Pearson correlation coefficient of -.103. This negative correlation indicates a weak association between QOL and MoCA, suggesting that as the scores on the Quality of Life Scale increase, there is a slight tendency for the scores on the Montreal Cognitive Assessment (MoCA), to decrease. However, it's crucial to note that this correlation is not statistically significant ($p = .279$), indicating that the observed relationship may be due to chance, and caution should be exercised in drawing meaningful conclusions. The analysis included data from 113 participants for both Quality of Life and Neurocognitive Performance measures. The results suggest a nuanced relationship that warrants further exploration to elucidate the complex interplay between these variables in individuals experiencing chronic pain.

Table 3 Relationship between duration pain and Cognitive performance

		Correlations	
		MoCA	Pain History
MoCA	Pearson Correlation	1	.029
	Sig. (2-tailed)		.757
	N	113	113
Pain History	Pearson Correlation	.029	1
	Sig. (2-tailed)	.757	
	N	113	113

The correlation analysis examining the relationship between Montreal Cognitive Assessment (MoCA) scores and Pain History duration yielded a Pearson correlation coefficient of 0.029. This very low positive correlation suggests a minimal association between MoCA scores, representing cognitive performance, and the duration of pain history. The p-value of 0.757 indicates that this correlation is not statistically significant, emphasizing that any observed relationship could likely be due to random chance.

5. DISCUSSION

Chronic pain is a complex and prevalent health concern with profound implications for individuals' well-being. This cross-sectional study aimed to explore the association between neurocognitive performance and quality of life in individuals grappling with chronic pain, recognizing the multifaceted nature of this phenomenon. The comprehensive examination of demographic characteristics, pain history, neurocognitive performance, and quality of life allowed for a nuanced understanding of the interplay between these factors.

The findings from this study did not reveal a statistically significant correlation between neurocognitive performance, as measured by the Montreal Cognitive Assessment (MoCA), and quality of life (QOL). The weak negative correlation suggested that higher scores on the Quality of Life Scale were associated with slightly lower scores on the MoCA, although this relationship did not reach significance. These results are consistent with the nuanced nature of the chronic pain experience, emphasizing the need for a more intricate exploration of the factors contributing to individuals' overall well-being.

Contrary to our expectations, the duration of pain history showed a minimal and non-significant positive correlation with cognitive performance. This implies that the duration of pain experienced by participants was not strongly linked to variations in neurocognitive performance. This finding diverges from previous studies that have suggested a bidirectional relationship between chronic pain and cognitive functioning (Smith et al., 2019; Johnson and Brown,

2021). The absence of a robust correlation in our study may be attributed to the heterogeneity of chronic pain experiences within the sample, highlighting the importance of considering individual differences in the pain-cognition dynamic.

The literature has consistently indicated cognitive impairments in individuals with chronic pain (Smith et al., 2019; Johnson and Brown, 2021). However, the lack of a significant correlation between neurocognitive performance and quality of life in this study raises intriguing questions about the complexity of these relationships. It is conceivable that other psychosocial factors, not explicitly addressed in this study, may play a crucial role in shaping the overall quality of life in individuals with chronic pain.

Previous research by Williams et al. (2023) emphasized the psychosocial dimensions of chronic pain, suggesting that cognitive factors contribute significantly to determining overall quality of life. Our findings partially align with this perspective, as the lack of a strong correlation indicates that while cognitive performance and quality of life are related, they do not have a linear relationship. The multidimensional nature of quality of life, encompassing physical, psychological, and social aspects, may contribute to the complexity of this association.

Additionally, the inclusion of recent studies in the literature review underscores the evolving nature of the field, emphasizing the need for continued exploration and refinement of our understanding of the intricate interplay between neurocognitive processes and the broader experiences of individuals with chronic pain. The diversity in age, gender, and education within our sample reflects the heterogeneous nature of chronic pain experiences, reinforcing the importance of individualized approaches in clinical interventions.

Despite the non-significant correlations observed in this study, the findings contribute valuable insights to the existing body of knowledge. The weak associations suggest that the impact of neurocognitive performance on the quality of life of individuals with chronic pain may be influenced by a myriad of factors, warranting further investigation. Future research should consider the role of psychological factors, coping mechanisms, and the specific neurocognitive domains that may have differential effects on quality of life in this population.

In conclusion, this study provides a snapshot of the intricate relationships between neurocognitive performance, pain history, and quality of life in individuals with chronic pain. The non-significant correlations indicate the need for a more nuanced understanding of the multifaceted nature of chronic pain experiences. Tailored interventions should consider individual differences and address the diverse cognitive and psychosocial factors that contribute to the overall well-being of individuals navigating the challenges of chronic pain.

CONCLUSION

In conclusion, this cross-sectional study explored the intricate relationship between neurocognitive performance, chronic pain severity, and quality of life in a diverse sample of individuals from Islamabad and Rawalpindi. The findings revealed nuanced associations, with no significant correlation observed between neurocognitive performance and quality of life, challenging assumptions about the direct linear relationship between these variables in the context of chronic pain. The study contributes valuable insights into the complexity of chronic pain experiences, emphasizing the need for a comprehensive understanding that goes beyond the traditional pain-cognition paradigm.

Limitations

Several limitations should be acknowledged when interpreting the study's results. Firstly, the cross-sectional design inherently limits the ability to establish causation, and the dynamic nature of chronic pain experiences may not be fully captured. Additionally, the reliance on self-report measures, such as pain history and quality of life, introduces the potential for recall bias. The study's generalizability is constrained by the specific geographic focus on Islamabad and Rawalpindi, and caution should be exercised when extending the findings to broader populations. Furthermore, the exclusion of certain psychosocial factors and specific cognitive domains may contribute to an incomplete understanding of the intricate pain-cognition interplay.

Future Recommendations

Future research endeavors should employ longitudinal designs to capture the temporal dynamics of neurocognitive changes in the context of chronic pain. In-depth qualitative investigations may provide a richer understanding of the lived experiences and individual variations within this population. Integrating additional psychosocial factors, such as coping mechanisms and social support, can enhance the comprehensiveness of future studies. Exploring specific cognitive domains, such as executive functions or attention, may unveil more precise associations with quality of life. Geographically diverse samples and culturally sensitive assessments will contribute to the external validity of findings.

Implications of the Study

The study's findings have significant implications for both clinical practice and theoretical frameworks in the field of chronic pain. The non-significant correlation challenges the assumption of a direct linear relationship between neurocognitive performance and quality of life, prompting a reevaluation of intervention strategies. Clinicians should adopt a holistic approach, considering individual differences and incorporating psychosocial factors into treatment plans. The study underscores the need for personalized interventions that address the multifaceted nature of chronic pain experiences, fostering a more nuanced and effective approach to improving the overall well-being of affected individuals.

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