









ORIGINAL

Working memory performance and quality of life in people with disabilities

Desempeño de la memoria de trabajo y calidad de vida en personas con discapacidad

Verónica Fernanda Flores Hernández¹  , Agueda del Rocío Ponce Delgado¹  , Paulina Jhohana Bonilla Basantes¹  

¹Facultad de Ciencias de la Salud, Carrera de Psicología Clínica. Universidad Técnica de Ambato. Ecuador.

¹Investigation Group NUTRIGENX.

Cite as: Flores Hernández VF, Ponce Delgado A del R, Bonilla Basantes PJ. Working memory performance and quality of life in people with disabilities. Salud, Ciencia y Tecnología. 2024; 4:1184. <https://doi.org/10.56294/saludcyt20241184>

Submitted: 09-02-2024

Revised: 11-05-2024

Accepted: 18-07-2024

Published: 19-07-2024

Editor: Dr. William Castillo-González 

ABSTRACT

Working memory is a mental process that allows the human being to store and elaborate in a transitory way the information received by the senses, so it is important to complement this with the quality of life, the latter considered as the welfare present in a person with their achievements, health and healthy eating; this superior function in conjunction with the quality of life can be affected by various factors such as any disability. The purpose of this research is to evaluate executive functioning from the perspective of working memory and quality of life in people with disabilities institutionalized in the city of Ambato. The methodology was quantitative, non-experimental, and cross-sectional with descriptive characteristics in a correlational analysis. It was worked with two assessment instruments, the INECO, which assesses executive functions including working memory, and the INICO for the evaluation of quality of life, with 46 participants between 18 and 60 years of age. The results show a low performance in working memory, as well as a low quality of life in the self-report, from the caregiver's perspective a high quality of life is perceived. It has also been recorded that the working memory variable is not related to quality of life scores. It is concluded that there could be a possible affectation in the prefrontal cortex of the participants, which affects the performance of the quality of life of those evaluated.

Keywords: Quality; Disability; Memory.

RESUMEN

La memoria de trabajo es un proceso mental que le permite al ser humano almacenar y elaborar de forma transitoria la información receptada por los sentidos, por lo cual es importante complementar esto con la calidad de vida, esta última considerada como el bienestar presente en una persona con sus logros, salud y alimentación sana; dicha función superior en conjunto con la calidad de vida puede verse afectada por diversos factores como cualquier discapacidad.

El objetivo de esta investigación es evaluar el funcionamiento ejecutivo desde la perspectiva de la memoria de trabajo y la calidad de vida en personas con discapacidad institucionalizadas en la ciudad de Ambato. La metodología fue de tipo cuantitativa, no experimental y de corte transversal con características descriptivas en un análisis correlacional. Se trabajó con dos instrumentos de valoración, el INECO que valora funciones ejecutivas incluida la memoria de trabajo y el INICO destinado a la evaluación de calidad de vida, se contó con 46 participantes de entre 18 a 60 años. Los resultados muestran un rendimiento bajo en memoria de trabajo, así como baja calidad de vida en el autoinforme, desde la perspectiva del cuidador se percibe una alta calidad de vida. Se ha registrado además que la variable memoria de trabajo no guardan relación con las puntuaciones de calidad de vida. Se concluye que podría existir una posible afectación en la corteza prefrontal de los participantes lo cual incide en el desempeño de la calidad de vida de los evaluados.

Palabras clave: Calidad; Discapacidad; Memoria.

INTRODUCTION

International and national organizations have focused several studies on disability and various cognitive functions such as working memory, such research has focused on the well-being and quality of life of people with various conditions.

In its World Report on Disability 9-10, estimates that one billion people, approximately 15 % of the world's population, live with some kind of disability. Of this total, 750 million experience moderate or severe disabilities. Details show that the most common disabilities are hearing (390 million), motor (260 million), and visual (230 million). Mental and neurological diseases also represent a significant burden, affecting approximately 1,3 billion people.

WHO (2019) in the research "Disability and Rehabilitation", highlights the importance of MT for the rehabilitation of people with physical disabilities, and emphasizes the need to include the assessment and intervention of this function in rehabilitation programs.

In the article 11 "Cognitive function after spinal cord injury" evaluates the efficacy of cognitive training to improve MT in people with spinal cord injury, with promising results.

According to the statistics of persons with disabilities registered in the "Registro Nacional de Discapacidad" 3 in Ecuador, physical disability predominates with 44,87 %, followed by intellectual disability with 23,35 %, hearing with 12,93 %, visual with 11,54 %, psychosocial with 6,17 % and language with 1,15 %. On the other hand, the degree of disability from 30 % to 49 % corresponds to 45,78 %; from 50 to 74 % corresponds to 34,56 %; from 75 to 84 % corresponds to 13,82 % and from 85 to 100 % corresponds to 5,83 %. By age groups, the statistics show that from 0 to 3 years of age, the percentage of disability is 0,36 %; from 4 to 5 years of age 0,70 %; from 6 to 12 years of age 4,37 %; and from 13 to 18 years of age 6,72 %. From 19 to 35 years old 21,40 %; from 36 to 50 years old 19,32 %; from 51 to 64 years old 21,67 % and over 65 years old 25,47 %. The survey shows that 209,219 persons with disabilities correspond to the female gender while 271,557 belong to the male gender.

In the conducted a systematic review of studies 8 on MT in individuals with intellectual disability (ID), finding consistent deficits in verbal and visuospatial MT tasks. The authors suggest that these deficits are related to dysfunctions in the frontoparietal loops and dorsolateral prefrontal cortex.

Addressed the quality of life in people 14 with physical and cognitive disabilities, the results indicated that the dimensions of quality of life such as emotional well-being, personal development, social inclusion, self-determination, physical well-being, material well-being, rights and interpersonal relationships are located at a medium level. Likewise, in the descriptive statistical measures of quality of life, it was evident that the dimension of emotional well-being indicated the highest mean and the dimension of social inclusion was the lowest mean.

Furthermore, another study 1 aims to determine the relationship between functionality and perceived quality of life in persons with disabilities, the results show a significant inverse correlation between physical functioning and perception of quality of living, as well as negative linear correlations between the variables investigated when analysing specific groups by sex, age, marital status, area of residence, of nuclear or single-parent families, with any degree of family functioning.

A study by another 5 author entitled "Effects of working memory training on quality of life in people with intellectual disabilities" revealed the impact of working memory training on the quality of living of people with mental disability. The results showed that training significantly improved working memory and, consequently, quality of life in the areas of personal autonomy, interpersonal relationships and psychological well-being.

In his study, 12 he explored the relationship between working memory and quality of life in people with cerebral palsy. They found a significant positive correlation between the two variables, suggesting that working memory is an important factor for the overall well-being of this population group.

The purpose of this research is to evaluate executive functioning from the perspective of working memory and quality of life in people with disabilities institutionalized in the city of Ambato.

METHODS

The article type is original scientific, has a quantitative approach with a non-experimental design and a range of correlational descriptive type characterized by a cross-cut. The work was carried out institutionalized people in the province of Tungurahua for at least one year in a row between 2023 and 2024 in the Centre to which they belong, find between 18 and 60 years of age, the sampling was non-probability for convenience was worked with 45 participants.

Before the participation of the population in the study, the signature of the informed consent of those responsible or legal representatives was requested, in addition to verifying the explicit availability of the

participants, informing them that they could withdraw at any time they considered it prudent, but this would leave them out of the process.

The population that did not correctly complete the evaluation instruments was excluded.

The INECO Frontal Screening (IFS) instrument was used for the assessment, which is a cognitive assessment tool focused on tracking frontal lobe dysfunction and assessing executive functions including working memory.

The BPI has demonstrated content, criterion and convergent validity. Content validity is based on the selection of tasks that assess key executive functions. Criterion validity has been established by correlating the BPI with other measures of executive functioning.

The BPI has shown acceptable reliability, with Cronbach's alpha coefficients ranging from 0,70 to 0,80 for the subtests and an alpha coefficient of 0,85 for the total score. Test-retest reliability has also been satisfactory, with correlation coefficients ranging from 0,75 to 0,80.

The instrument records that can be applied from young adults to older adults, its fundamental characteristics are focused on the assessment of working memory from aspects such as verbal and spatial memory.

The data collection process began with the signing of the informed consent form, the application of the evaluation instruments was personalized and individual, and the average time allotted was 25-30 minutes.

Subsequently, the instruments that did not have consistency in the data were removed and the results were uploaded in Microsoft Excel, then analyzed in Jamovi 2.3.19 complying with the ethical protocols of Gelsinki in order to protect the participants in the research and ensure that it is carried out in an ethical and responsible way where the results obtained are reliable and valid.

RESULTS

The following 3 sections describe the results of the assessment of executive functioning, working memory, quality of life (self-perceived and caregiver), as well as the results of the correlation between the aforementioned variables.

Analysis of Executive Functioning Assessment

Considering that the IFS instrument provides a total executive functioning score and a working memory score, Table 1 presents the quantitative analyses of the total executive functioning and working memory scores, while Table 2 presents the qualitative analysis of the interpretation of the total working memory scores.

Table 1. Quantitative analysis of executive functioning and working memory		
	Total score INECO	Work memory
N	45	45
Half	8,82	1,80
Standard deviation	6,88	2,03
Minimum	0,00	0,00
Maximum	25,0	8,00
Note: INECO: Ineco Frontal Screening; n: sample.		

It is observed that the mean INECO score is 8,82 ($\pm 6,68$) with a minimum score of 0 and a maximum score of 25. On the other hand, the mean working memory score is 1,80 ($\pm 2,03$) with a minimum score of 0 and a maximum score of 8.

Table 2. Qualitative analysis of working memory			
Performance Work memory	Frequencies	% Total	% Accumulated
High	8	17,8 %	17,8 %
Low	24	53,3 %	71,1 %
Moderate	13	28,9 %	100,0 %

Of the 45 tested, 53,3 % showed low performance in working memory, followed by 28,9 % with moderate performance, and 17,8 % with high performance.

Quality of life assessment analysis

Since this is a construct assessed through self-report by the participants and the perception of the caregivers, Table 3 presents the quantitative results of the two scores. In addition, Table 4 reports the qualitative results of the variable under study.

Table 3. Quantitative analysis of quality of life		
	CV Self-report	CV Carer
n	45	45
Half	17,0	20,6
Standard deviation	2,04	2,17
Minimum	13	16
Maximum	22	25
Note: QoL: Quality of life		

Of the 45 participants, regarding the mean CV score through self-report is 17 ($\pm 2,04$) with minimum scores of 13 and a maximum of 22. On the other hand, regarding the mean CV assessed through care it is 20,6 ($\pm 2,17$) with minimum scores of 16 and a maximum of 25.

Table 4. Qualitative analysis of quality of life		
Variable	Frequencies	Percentages
CV self-report		
Low	20	44,4 %
Moderate	8	17,8 %
High	17	37,8 %
CV carer		
Low	12	26,7 %
Moderate	16	35,6 %
High	17	37,8 %
Note: QoL: Quality of life		

It is reported that with respect to the self-report measure, 44,4 % present low CV, followed by 37,8 % with high CV and 17,8 % with moderate CV. Meanwhile, regarding the caregiver measure 37,8 % high CV, followed by 35,6 % with moderate CV and 26,7 % low.

Correlation analysis

Table 5 presents the results of the correlation between working memory and quality of life obtained through self-report, as well as by the caregiver. Due to the nature of the variables (ordinal qualitative), the nonparametric Spearman's rank Rho test was used.

Table 5. Correlation matrix				
		INECO	Work memory	CV Self report
Work memory	Rho de Spearman	0,737	—	
	valor p	<0,001	—	
CV	Rho de Spearman	-0,129	-0,126	—
	valor p	0,398	0,408	—
Self report	Rho de Spearman	-0,191	0,035	-0,024
	valor p	0,210	0,822	0,876
Note: QoL: Quality of life; INECO: Ineco Frontal Screening.				

With 95 % confidence it is observed that there is a moderate positive relationship between the INECO total score and the working memory index ($p < 0.001$, $Rho = 0.737$). On the other hand no relationship is observed between INECO score or working memory with any of the CV scores obtained through self-report or caregiver.

DISCUSSION

The results of the present research show that there is no relationship between the variables of working memory and quality of life. In contrast with other studies, similar data are evident in the work 1 whose results

correspond to specific groups by sex, age, marital status, area of residence, from nuclear or single-parent families concerning the topic of quality of life and general functionality in people with disabilities, showing a significant inverse correlation between physical functioning and the perception of quality of life in people with disabilities.

The results of the research 4 in their study sought to determine the quality of life in people with physical disabilities who perform physical activity, the result determined that 86,7 % maintained a high quality of life which is totally opposed to the results of this research, these consequences could suggest that sport is a protective factor to improve the quality of life in humans.

In their systematic review of studies 8 on MT in individuals with intellectual disabilities (ID), reports the presence of consistent deficits in verbal and visuospatial MT tasks which are related to working memory; These data coincide with the present proposal since after the data analysis it has been obtained that the level of working memory in this population group is low, these results are related to the presence of affectation of the prefrontal cortex in charge of these cognitive activities especially related to dysfunctions in the frontoparietal loops and the dorsolateral prefrontal cortex.

The study by 2 entitled “Calidad de vida en adultos colombianos con discapacidad intelectual” shows in its results the analysis of the dimensions of the INICO instrument, which reveals high mean scores in quality of life both in the self-report and in the report of other people, such results contrast to the conclusions obtained in the present research since the population under study shows low quality of life in the self-report item while from the perspective of care it is high.

Several studies have explored the relationship between MT and quality of life in people with disabilities. A metaanalysis by 13 found a moderate correlation between MT and quality of life in people with different types of disabilities, such research contradicts the present as the results in the evaluated Tungurahuan population reveal that there is no significant relationship between these variables.

A study by 7 found that people with disabilities who had strong social support networks and participated in community activities higher levels of psychological well-being and thus better quality of life, which is consistent with the results obtained in the present study as levels in an average high quality of living could respond to community, occupational, recreational, therapeutic and social activities of which users participate.

The results of the research 6 showed low correlations between chronological age and working memory for subjects with Down syndrome and for those of different etiology, respectively, and significant correlation between mental age and memory for individuals with Down Syndrome and those of various etiology respectively. These results suggest that the development of sequential memory accompanies the increase in mental age, thus it can be evidenced that these results coincide with the present research as the performance of working memory is equally low, this can be due to environmental, genetic or emotional factors.

CONCLUSIONS

It is evident that there is no positive correlation between the working memory and quality of life variables from the self-reporting and caregiver perspective. The research allows to generate a broader analysis between quality of life and executive functions as they contribute to their anatomical and functional activity, the results reflect a correlation of 95 % between these variables.

In working memory predominates the low level that forms part of the higher functions related to the prefrontal cortex where activities such as attention, memory, learning, among others are evidenced.

REFERENCES

1. Cedillo, M., Espinosa A., Bayarre H., González M., Serrano A., (2021). Funcionalidad general y calidad de vida percibida en personas con discapacidad Azuay- Ecuador. *Revista Cubana de Investigaciones Biomédicas, Psicología*, 2021;40(4): e2388
2. Córdoba Andrade, L., Henao Lema, C. P., & Verdugo Alonso, M. Á. (2016). CALIDAD DE VIDA DE ADULTOS COLOMBIANOS CON DISCAPACIDAD INTELECTUAL. *Revista Hacia la Promoción de la Salud*, 21(1), 91-105.
3. El informe completo “Estadísticas de Discapacidad - Registro Nacional de Discapacidad 2023” está disponible en el sitio web del INEC: <https://www.ecuadorencifras.gob.ec/>
4. Escajadillo, K., León M., Rojas J., Sarmiento M.,(2020). Calidad de vida en personas con discapacidad física que practican actividad física. *Revista Hered Rehab, Psicología*, 2020; 2:40-52.
5. Fernández, M. A., García-López, M., & Artigas, M. J. (2022). Efectos del entrenamiento de la memoria de trabajo sobre la calidad de vida en personas con discapacidad intelectual. *Revista de Neuropsicología, Pediatría y Neurodesarrollo*, 24(2), 105-117.

6. Flores, C. (2.000). Memoria De Trabajo, Retraso Mental Y Dificultades De Aprendizaje. Revista Estudios De Psicología Puc- Campinas, 67-68
7. Keyes, C. L. M., Wissow, L. E., & Harding, M. M. (2010). Mental health in the United States: Prevalence and sociodemographic distribution. Basic and Applied Social Psychology, 32(1), 5-17. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2933543/>
8. Lifshitz, H., Hefer, T., & Henik, A. (2020). Working memory in intellectual disability: An integrative review. Research in Developmental Disabilities, 87, 106027.
9. Organización Mundial de la Salud (OMS). (2021). Informe Mundial sobre la Discapacidad 2021. <https://www.who.int/es/news-room/fact-sheets/detail/disability-and-health>
10. Organización Mundial de la Salud (OMS). (2021). Salud mental y discapacidad intelectual. <https://iris.who.int/bitstream/handle/10665/330254/WH-1995-Sep-Oct-p18-19-eng.pdf?sequence=1&isAllowed=y>
11. Organización Panamericana de la Salud (OPS). (2020). Efectos del entrenamiento cognitivo en la memoria de trabajo de personas con lesiones de la médula espinal. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6161545/>
12. Ramírez-Moreno, J. A., García-López, M., & Artigas, M. J. (2023). Memoria de trabajo y calidad de vida en personas con parálisis cerebral: un estudio correlacional. Neurología y Neurocirugía, 24(2), 123-130.
13. Smith, E. E., Gaskell, G., & Tillman, B. W. (2017). Working memory and quality of life in individuals with disabilities: A meta-analysis. Neuropsychology, 31(5), 512-529.
14. Velásquez, D, (2021). Calidad de vida en personas con discapacidad de un centro de educación básica especial del distrito de San Juan de Miraflores. Acta psicológica peruana, Psicología, 2021, 6(1), 67 - 79

FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Data curation: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Formal analysis: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Acquisition of funds: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Research: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Methodology: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Project management: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Resources: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Software: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Supervision: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Validation: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Display: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.

Drafting - original draft: Flores Hernández Verónica Fernanda, Ponce Delgado Agueda del Rocío. Bonilla Basantes Paulina Jhojana

Writing - proofreading and editing: Verónica Fernanda Flores Hernández, Agueda del Rocío Ponce Delgado, Paulina Jhojana Bonilla Basantes.