Medical and Research Publications
International Open Access

Research Article **Journal of MAR Neurology and Psychology (Volume 5 Issue 6)**

Working Memory and Verbal Comprehension and their Relation to Employment: A Pilot Study

Robert Rosic *

Corresponding Author: Robert Rosic,

Received Date: November 21, 2022

Published Date: December 01, 2022

Abstract

Despite a comparatively low unemployment rate and increasing job opportunities in the province, many people in Ontario remain on public assistance for years without securing or maintaining meaningful employment. Indeed, the length of time that people remain enrolled in Ontario Works public assistance has nearly doubled over the past decade or so and the costs that are associated with the provision of this financial assistance have likewise increased dramatically. While the antecedents of this eventuality continue to be investigated, the research to date indicates that far too many of these individuals suffer from specific deficits that prevent them from getting and keeping a job. The purpose of this study is to develop a benchmark pilot study using selected case files of people receiving public assistance from the Ontario Works program concerning the relationship between working memory and verbal comprehension to determine whether deficits in these areas have an adverse effect on individual employability. A statement of the problem, the study's guiding research questions and the importance of the study are described in chapter one, followed by a review of the relevant literature concerning these issues in chapter two. Chapter three provides a brief description of this study's content analysis methodology. Chapter four presents an analysis of the data that resulted from an analysis of 25 selected case files. Finally, chapter five provides a summary of the research, relevant conclusion, and potential directions for future studies in this area.

Introduction

Today, Ontario is geographically the second-largest province in Canada, containing more than 415,000 square miles (1 million square kilometers), representing an area larger than Spain and France combined (About Ontario, 2022). The healthy economy of Ontario is fueled by an abundance of natural resources and a motivated and educated workforce as well as a commitment by the private sector to prioritize innovation to achieve and sustain a competitive advantage. As a result, Ontario boasts nearly half of all of Canada's employees in high tech and financial services industries. These knowledge workers generate fully 37% of the nation's gross domestic product (About Ontario, 2022). In sum, Ontario is currently an incredibly important part of Canada's economy, but like other regions of the country, it shares some significant challenges, most especially with respect to providing employment opportunities to everyone who wants a job, an issue that directly relates to the purpose of this study which is described further below.

Purpose of the Study

Although additional studies are needed, the research to date indicates that there may be a relationship between working memory, verbal comprehension, and overall cognitive ability with employability. Therefore, the overarching purpose of this study was to provide a benchmark pilot study of selected case files of people receiving public assistance from the Ontario Works program concerning this relationship to determine whether deficits in these areas have an adverse effect on individual employability.

Statement of the Problem

The vast majority of the 12.5 million people in Ontario who are aged 15 years and older who want a job are able to secure one. In fact, the unemployment rate in Ontario declined to 5.3% in March 2022, a level that is comparable to pre-Covid-19 pandemic levels as well as the national average (see Figure 1 below).

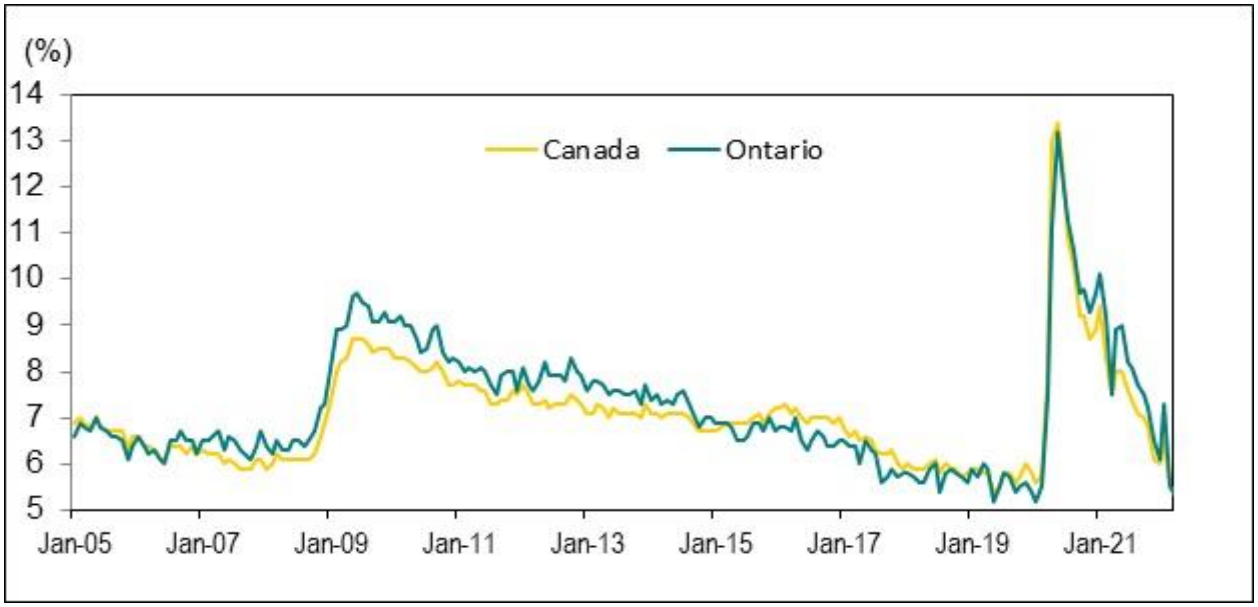

Figure 1. Canada and Ontario unemployment level: January 2005-Januar 2021

Source: Labour market report, March 2022

Nevertheless, far too many people remain unemployed in Ontario for inordinately lengthy amounts of time despite aggressive efforts by the public and private sectors to help them secure meaningful, permanent employment. For example, during the one-year period from 2017 through 2018 (the latest figures available), the Ministry of Children, Community and Social Services Ontario Works program provided varying level of assistance to more than 450,000 people (Ontario Works, 2019).

Research Questions

While the specific causes of long-term unemployment are multiple, there is a growing body of evidence that indicates that many people who receive prolonged social assistance suffer from deficits in verbal comprehension and working memory. In addition, this segment of the population also performs poorly when it comes to higher order daily living skills. In other words, the research to date suggests that people with these deficits are not employable in the traditional sense. These issues form the basis of this study's guiding research questions which are set forth below:

1. How does working memory affect employability ?
2. How does verbal comprehension affect employability ?
3. What changes are needed in the protocols that are currently followed by service managers and caseworkers in the Ontario Works program to better assist those recipients with deficits in working memory and verbal comprehension ?

Importance of the Study

Studies of this nature are needed because the average length of time that recipients receive public assistance from Ontario Works has almost doubled since fiscal year 2008-2009 despite the program's original intention to only provide temporary assistance for those in need. In fact, the average amount of time that people have remained on the Ontario Works' increased from an average of 19 months in fiscal year 2008-2009 to nearly 3 years by fiscal year 2017-2018 (Ontario Works, 2019). In response to this alarming increase, service members reviewed their case files and determined that more than one-third (36%) of Ontario Works recipients suffered from various types of barriers to employability, including, most especially, mental health problems and homelessness, which require ongoing support to resolve. Not surprisingly, the effectiveness of the Ontario Works program in helping these and other recipients secure and maintain meaningful employment has been limited, and service managers also found that just between 10% and 13% of recipients succeeded in obtaining and maintaining sufficient employment to leave the program (Ontario Works, 2019).

Beyond the incalculable human costs that result from this scenario, the economic costs to the province have been severe and have steadily increased over the years. For example, according to an Ontario Works' annual report, "The cost of the Ontario Works program to the Province has increased more than 55% since our audit in 2009, from $1.9 billion to almost $3 billion in 2017/18" (p. 494). Furthermore, as of January 2018, the province provides all the funding for the Ontario Works program compared to previous years when service managers funded one-fifth of these costs (Ontario Works, 2019).

As a society, Canadians need to consider requiring people who have been receiving social assistance for some time to undergo cognitive testing and perhaps consider a disability support application based on the results. At present, however, there appear to be significant societal prejudices directed to individuals receiving social assistance for prolonged periods which has dampened public support for additional interventions. The evidence suggests, however, that the cognitive challenges are so entrenched that multidisciplinary, multi-level supports (disability supports, social work (in home) interventions, psychological and medical supports) are needed to address this longstanding social problem.

Review of the Literature

Working Memory

As one of the brain's executive functions, working memory, previously known as "short-term memory," serves some vitally important, specialized purposes for humans. For example, according to Rosen (2020), working memory "allows us to work with information without losing track of what we're doing" (para. 4). In addition, working memory is also a dynamic rather than a static function and the brain constantly updates its working memory to take into account new information that is needed for goal-directed activities (Hartmann et al., 2022). In this regard, Corinne (2021) reports that, "Working memory is your brain's ability to temporarily store information (think placeholder or sticky note) for a number of seconds in order to focus your attention on manipulating that same information for another use" (para. 3).

The functioning of working memory as originally conceptualized by Baddeley is depicted in Figure 2 below.

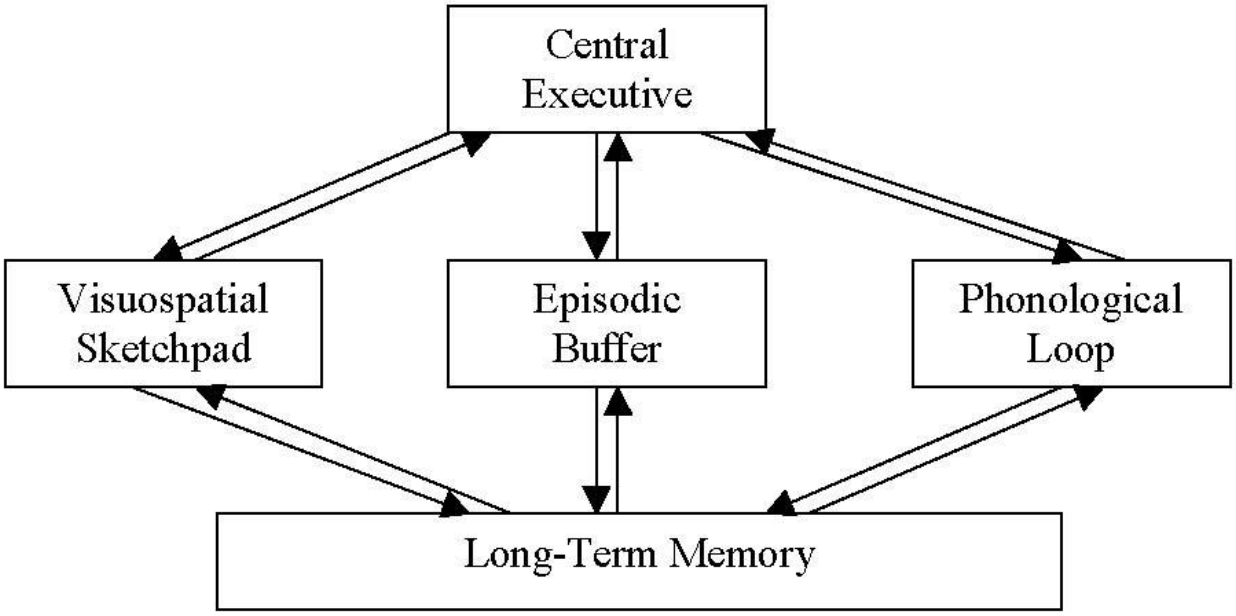

Figure 2. Baddeley's model of working memory

Source: http://mercercognitivepsychology.pbworks.com/f/1353275322/e.jpg

The individual components of working memory depicted in Baddeley's model in Figure 2 above are described in Table 1 below.

Component	Description
The phonological loop	● This component processes sounds and is responsible for speech-based information. This includes sounds that are processed in one's mind. For example, the phonological loop is used in learning new vocabulary, problem-solving, math problems, and remembering instructions. In all these tasks, sounds are being processed through the phonological loop. ● The two components of the phonological loop are the phonological store and the articulatory control process. The phonological store holds the information for 1.5-2 seconds. The articulatory control process refreshes the information in the phonological store. It also converts written material into phonological code so that it can be registered by the phonological store
The visuo-spatial sketchpad	● This component is responsible for processing visual and spatial information. It can be fed either directly, through perception, or indirectly, through a visual image. The visuo-spatial sketchpad allows people to store images of objects and their locations. ● The sketchpad is also used in navigation. When a person goes from one location to another, it is the visuo-spatial sketchpad that is stimulated. It is also activated in various activities such as puzzles, mazes, and games. ● There are two components to the sketchpad. The visual cache stores information pertaining to color and visual form. The inner scribe rehearses information from the visual cache and transfers information from the visual cache to the central executive. The inner scribe also deals with spatial and movement information and is involved in the planning and execution of body movements.
The central executive	● This component incorporates information from the phonological loop, the visuo-spatial sketchpad, the episodic buffer, and from long-term memory. The complexity of the central executive is not yet fully known. ● Some of the major functions involved with the central executive are the switching of retrieval plans, time sharing in multitasking, selective attention, suppressing irrelevant information, daydreaming, and temporary activation of long-term memory. These are not all of the functions of the central executive, and it is important to realize that it is not fully clear what the central executive is capable of.
The episodic buffer	● This component was not a part of Baddeley's original model but was added to his model a quarter century later. It is seen as a place to temporarily integrate information gathered from the phonological loop, visuo-spatial sketchpad, and long-term memory. ● The episodic buffer is controlled by the central executive, yet it transfers information into and out of the long-term store. The addition of the episodic buffer allowed a clearer connection to be made between working memory and long-term memory.

Table 1 Description of working memory components

Source: Adapted from Baddeley's Model of Working Memory, 2014

A study by Viesel-Nordmeyer et al. (2022) examined the impact of working memory on a number of outcomes in people's lives, including academic achievement and employability. According to the definition provided by these researchers:

Working memory is an information processing system for learning, roughly divided into three components: the central executive as a higher-level component for controlling and coordinating information processing as well as two helping components for short-term storing and maintenance processes of verbal or auditive (phonological loop) and visual or spatial (visuo-spatial sketchpad) information. (p. 3)

In other words, working memory provides humans with the ability to navigate complex situations with an end goal in mind even when new information is constantly added to the calculus. While each of the three components of working memory are integral to this process, it is clear from the studies to date that all three operating in tandem are essential for language development and mathematical learning (Viesel-Nordmeyer et al., 2022). Although the majority of people in the world today enjoy working memories that allow them to pursue virtually any employment opportunity that may present itself, some people suffer from deficits in this executive function of the brain that inhibits their employability.

Research has indicated that the assessment of working memory can serve as an accurate human resources tool for selecting optimal candidates for different occupations (Hartmann et al., 2022). Moreover, other studies have also suggested that working memory assessments provide a better gauge of individuals' employability compared to traditional cognitive ability assessments (Martin et al., 2020). Taken together, it is apparent that working memory is an essential function of the brain that has specific implications for individual employability; but there are other factors that also play a role including verbal comprehension which is discussed below.

Verbal Comprehension

Virtually every occupation requires some level of verbal comprehension, and many jobs demand high levels of this attribute (Simos et al., 2014). In brief, verbal comprehension is "the ability to read, understand and process language" (Story, 2019). Certainly, written comprehension skills are also essential for many occupations, but verbal comprehension includes the ability to follow detailed instructions, apply appropriate responses "on the fly" and take other actions when and where they are necessary. Therefore, just as working memory plays a critical role in employability, so too does verbal comprehension. For instance, Montego and Jamon (2018) emphasize that, "Paying attention while listening, following instructions, and verbal reasoning are some of the most important skills we need

to get through life. This is why verbal comprehension and verbal reasoning are always part of an attempt to facilitate communication and performance" (p. 55).

In some relatively rare cases, deficits in verbal comprehension are due to lesions in various left hemisphere regions of the brain (Simos et al., 2014). In most cases, however, verbal comprehension deficits may be related to individuals' cognitive functioning levels that do not necessarily have an organic source. Whatever their specific cause, it is clear that any significant deficits in verbal comprehension affect peoples''s ability to secure and maintain meaningful employment. There are some constraints in the protocols that are currently followed by Ontario Works that exacerbate these issues as discussed further below.

Current Ontario Works Constraints

The findings that emerged from the most recent audit of Ontario Works by the Ministry of Children, Community and Social Services included several that have implications for recipients who suffer from deficits in working memory and verbal comprehension. Although these two constructs were not specifically discussed, the issues that are described in Table 2 below are directly related to the manner in which recipients are periodically assessed to determine whether supplemental interventions are needed to help them become self-sufficient and improve their quality of life

Finding	Implications for Ontario Works' clients with working memory/verbal comprehension deficits
Ministry contracts with service managers lack meaningful targets for recipient employment	Service managers' contracts do not specify the program requirements that service managers are expected to comply with. More significantly, almost half the current contracts lack meaningful targets for employment and earnings as service managers had already achieved their targets halfway into their two-year contracts.
The Ministry lacks measures to assess whether service managers are effective in helping recipients identified as having barriers to	Caseworkers had assessed 36% of Ontario Works recipients as having barriers that affect their ability to prepare for or find employment because they needed to stabilize their life. Service managers across Ontario told us that

Finding	Implications for Ontario Works' clients with working memory/verbal comprehension deficits
employment to overcome them	these barriers include mental health conditions, addictions, and homelessness. Although the Ministry expects service managers to help recipients overcome these barriers, it does not analyze and assess whether service managers are effective in assisting recipients to overcome their employment barriers.
The Ministry does not measure whether recipients find stable employment to become self-reliant	A one-time Ministry study that examined recipient exits to employment in 2013 found that 35% of these individuals returned to Ontario Works within about a year-and-a-half of their exit; however, the Ministry's current performance measures do not measure whether individuals leaving the program retain employment over time or later return to Ontario Works.
Caseworkers do not consistently work with recipients to help them progress toward obtaining employment.	At the four service managers visited, caseworkers did not always meet with recipients on a timely basis to review their progress in activities designed to help them find employment, including in 50% of the files examined at two service managers. Caseworkers are required to meet recipients at least once every three, four or six months, yet in several of the files examined, periods between reviews were longer than one year, or twice the maximum allowable time. In one case, a recipient's progress had not been reviewed for approximately three years.

Table 2 Selected findings from the Ministry of Children, Community and Social Services

Source: Adapted from Ontario Works, 2019, pp. 495-497

Methodology

In my capacity as a psychologist, 100 client files were randomly selected and then narrowed to 25 (again randomly selected from the original 100 files) that were used in the current study. All clients were receiving Ontario Works benefits (social assistance) for at least 5 years with the lengths of time suggesting that the recipients are experiencing major challenges in securing employment. The recipients were numbered "Client #1" through "Client #25" to protect their privacy and no personal identifier information was included in the data analysis that follows below.

Each client's working memory and verbal comprehension scores were included as well as how many years they have been receiving public assistance. The working memory and verbal comprehension scores were based on recipients' performance on the Wechsler Adult Intelligence Scale which has demonstrated efficacy and reliability (Cherry, 2020).

Data Analysis

The working memory and verbal comprehension scores for the 25 selected cases are averaged in Table 3 below, followed by a graphic depiction of these results for each of the categories of interest in Figures 3 through 5 that follow. A narrative analysis of these data is provided for each figure.

Note:

WM = Working memory based on the results of the Wechsler Adult Intelligence Scale

VC = Verbal comprehension based on the Wechsler Adult Intelligence Scale

Time = Amount of time receiving public assistance from Ontario Works in years

Client #	WM	VC	Time
#1	12	1	9
#2	1	1	10
#3	1	1	18
#4	8	18	5
#5	4	10	19

Client #	WM	VC	Time
#6	2	19	17
#7	2	2	23
#8	8	7	7
#9	12	21	21
#10	8	2	13
#11	5	7	7
#12	1	7	8
#13	4	45	16
#14	4	28	17
#15	1	13	6
#16	5	13	9
#17	1	2	9
#18	2	3	8
#19	1	2	9
#20	1	1	10
#21	2	2	14
#22	1	1	8
#23	4	1	10
#24	3	1	11
#25	27	1	13
Averages	4.8	8.36	11.88

Table 3 Clientele scores for working memory, verbal comprehension and time receiving public assistance

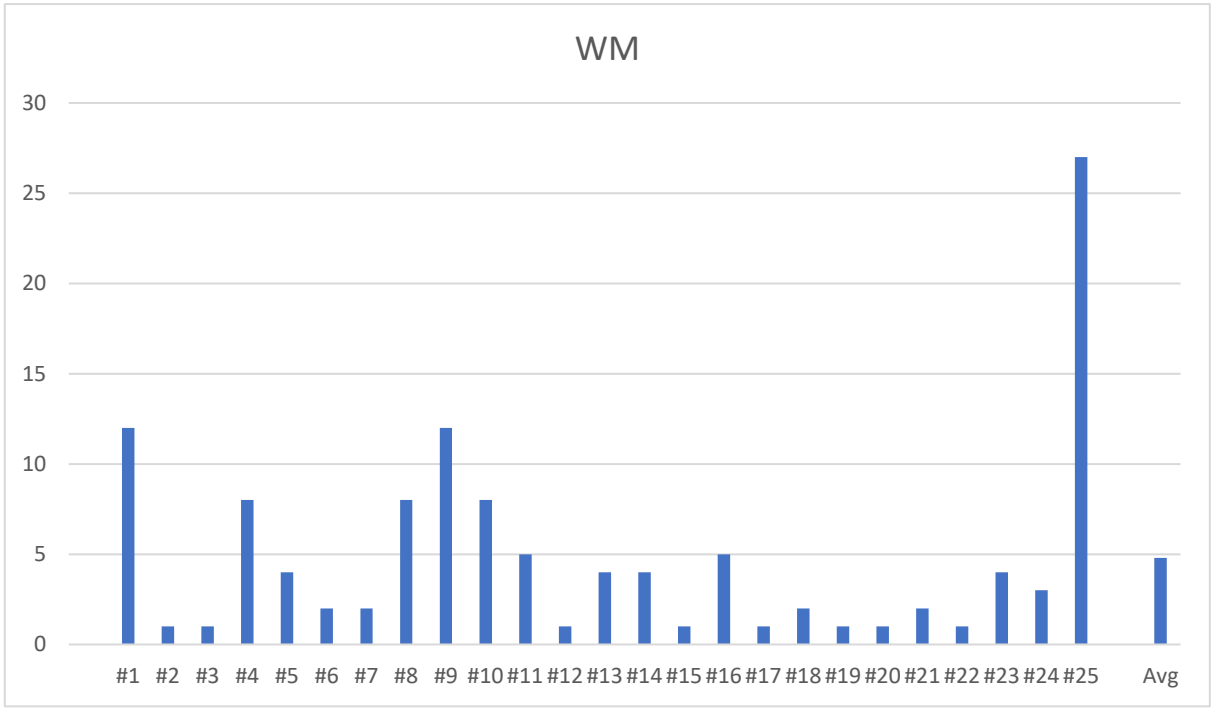

Figure 3. Working memory scores and average

As can be discerned from the data depicted in Figure 3 above, seven of the 25 clients (or 28%) scored above the 5th percentile, with one outlier scoring in the 27th percentile. The average working memory score for the total 25 clients was 4.8.

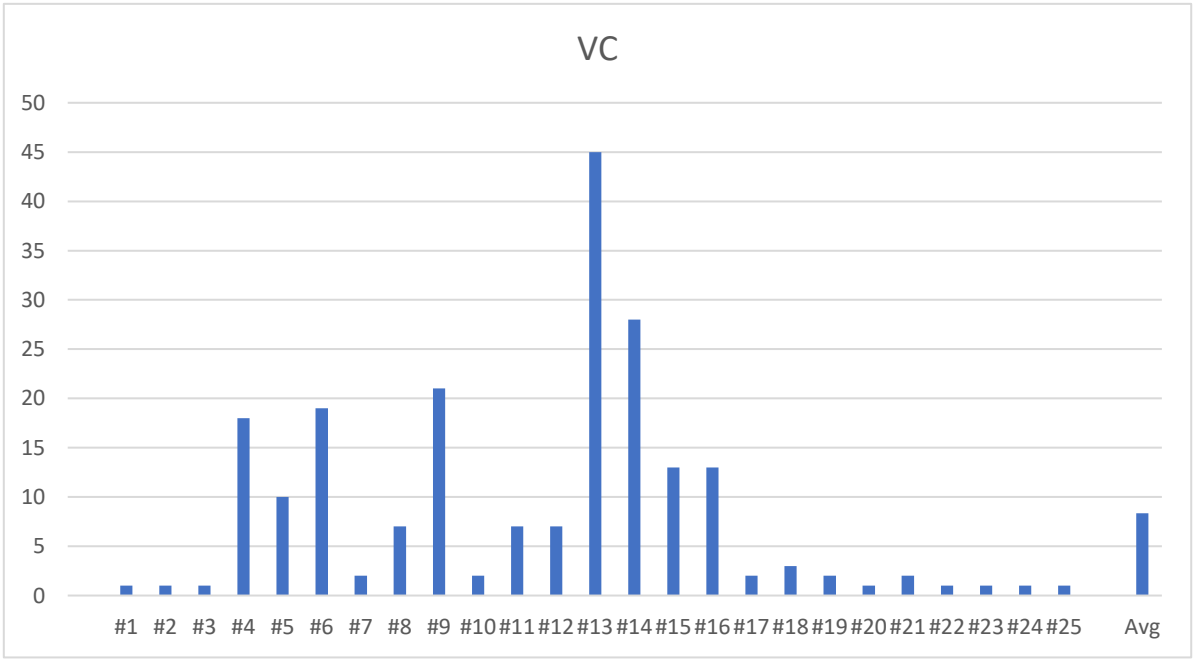

Figure 4. Verbal comprehension scores and average

Eight of the clients (32%) scored in the 10th percentile or above as shown in Figure 4 above, with one outlier scoring in the 45th percentile. The average verbal comprehension score for all 25 clients was 8.36.

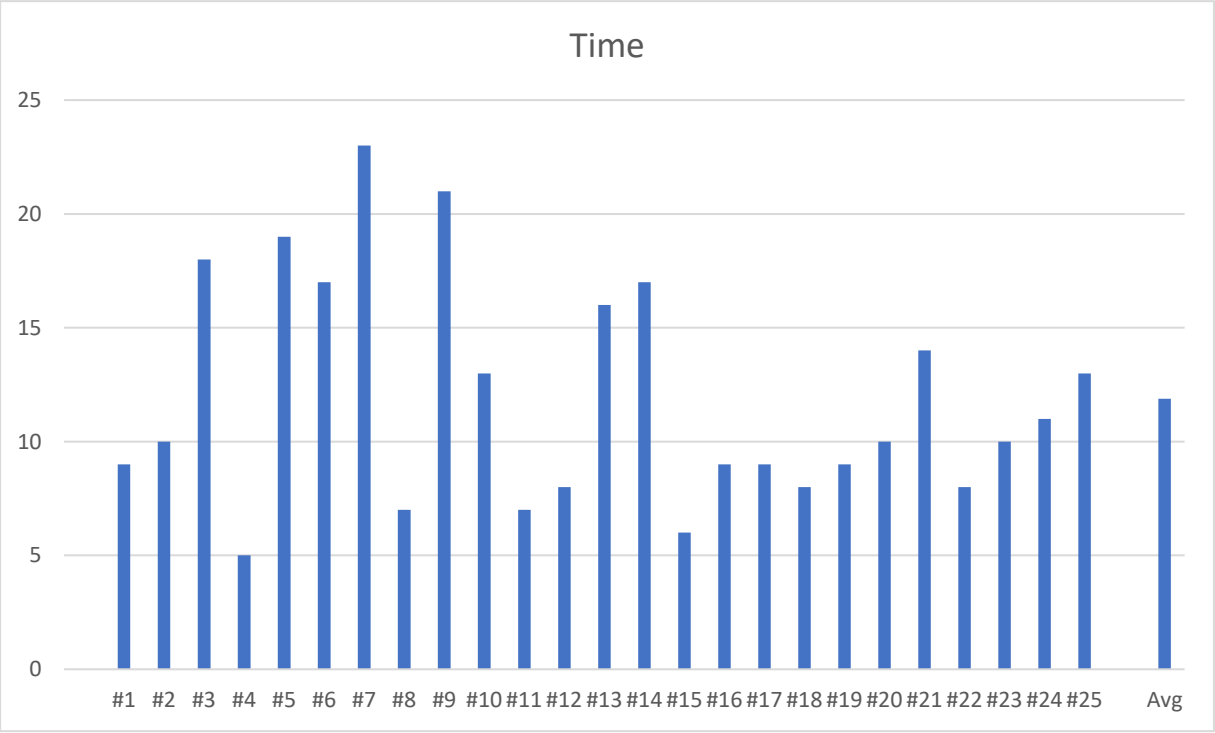

Figure 5. Number of years in receipt of public assistance from Ontario Works

Figure 5 above depicts the number of years that clients have been in receipt of public assistance from Ontario Works. As noted above, one of the inclusion criteria was the requirement that clients were enrolled in this programming for a minimum of 5 years. Fully 14 of the clients (56%) have spent 10 years or more in receipt of public assistance, and seven (28%) had been enrolled for 15 years or more. The average length of time in receipt of public assistance for the total 25 clients was 11.88 years, a finding that is congruent with the most recent analysis by Ontario Works.

There is another consideration that requires documentation. Clients number 2, 3, 7, 12, 17, 18, 19, 20, 21, 22, 23 and 24, qualify for Developmental Services in Ontario. Forty eight percent of the current sample of Ontario Works clients have developmental disabilities, and their cognitive challenges have been present prior to age 18, special education was also required.

Conclusion

The findings that emerged from the secondary and primary research indicate that people who have been receiving prolonged social assistance also suffer from deficits in their working memory and verbal comprehension. These deficits also mean that these individuals likely perform poorly when it comes to higher order daily living skills. In sum, these data seem to indicate that individuals with these deficits are not employable, or far less employable, compared to those without such deficits. Just under half of the current client sample had developmental disabilities.

References

1. About Ontario. (2022). Government of Ontario. Retrieved from https://www.ontario.ca/page/about-ontario#:~:text=Ontario%20is%20Canada's%20second%20largest,the%20north%2C%20and%20the%20St.
2. Cherry, K. (2020, November 30). The Wechsler Adult Intelligence Scale. Cognitive Psychology. Retrieved from https://www.verywellmind.com/the-wechsler-adult-intelligence-scale-2795283.
3. Corinne, J. (2021, November 6). The Role of Working Memory in Cognitive Development, Everyday learning, and Academic Performance. Learnfully. Retrieved from https://learnfully.com/the-role-of-working-memory-in-cognitive-development-everyday-learning-and-academic-performance/.
4. Hartmann, E.-M., Gade, M., & Steinhauser, M. (2022). Adaptive control of working memory. Cognition, 224, 105053.
5. Labour market report. (2022, March). Government of Ontario. Retrieved from https://www.ontario.ca/page/labour-market-report-march-2022#:~:text=to%20March%202022.-,Source%3A%20Statistics%20Canada%2C%20Labour%20Force%20Survey%2C%20Table%2014%2D,%2C%20(seasonally%20adjusted%20data).&text=Ontario's%20unemployment%20rate%20was%205.3,rate%20was%205.5%25%20in%20February.
6. Martin, N., Capman, J., Boyce, A., Morgan, K., Gonzalez, M. F., & Adler, S. (2020). New frontiers in cognitive ability testing: working memory. Journal of Managerial Psychology, 35(4), 193–208.
7. Maseda, A., Lodeiro-Fernández, L., Lorenzo-López, L., Núñez-Naveira, L., Balo, A., & Millán-Calenti, J. C. (2014). Verbal fluency, naming and verbal comprehension: three aspects of language as predictors of cognitive impairment. Aging & Mental Health, 18(8), 1037–1045.

8. Montejo, H. B., & Jamon, B. E. V. (2018). Verbal Comprehension and Verbal Reasoning of Graduated Senior High School Students: Critical Success Factors in College. TESOL International Journal, 13(4), 55–66.
9. Ontario Works. (2019). Ministry of Children, Community and Social Services. Retrieved from https://www.auditor.on.ca/en/content/annualreports/arreports/en18/v1_311en18.pdf
10. Rosen, P. (2020). What is working memory? Understood. Retrieved from https://www.understood.org/en/articles/working-memory-what-it-is-and-how-it-works.
11. Simos, P. G., Kasselimis, D., Potagas, C., & Evdokimidis, I. (2014). Verbal comprehension ability in aphasia: demographic and lexical knowledge effects. Behavioural Neurology, 2014, 258303.
12. Story, J. (2019). What Does Poor Verbal Comprehension Mean? Classroom. Retrieved from https://classroom.synonym.com/.
13. Viesel-Nordmeyer, N., Röhm, A., Starke, A., & Ritterfeld, U. (2022). How language skills and working memory capacities explain mathematical learning from preschool to primary school age: Insights from a longitudinal study. PLoS ONE, 17(6), 1–25.