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Parental Engagement in Early Literacy: A Qualitative Exploration of Practices and Beliefs in Northern Mexico

Norma Beltrán-Sierra[a*], Blanca Fraijo-Sing[a], Cesar Tapia-Fonllem[a]

[a] *University of Sonora, Hermosillo, Mexico*

*Corresponding author. E-mail: normaibeltran@gmail.com

Background. Developmental studies have shown that the home environment has a significantly influences subsequent academic performance by supporting the development of skills essential for the acquisition of competencies necessary for school life, including literacy skills. Children with limited early literacy proficiency often experience challenges in acquiring literacy skills. Family literacy promotes the development of skills necessary for their acquisition.

Objective. The aim of this study is to identify and categorize literacy practices conducted at home, examine the participation of parents and children in reading and writing activities, and explore mothers' beliefs on this subject.

Design. For the present study, interviews were conducted with 102 mothers of preschool children in a city in northwestern Mexico. The approach for this study is qualitative and constructivist.

Results. The study identified key dimensions: limiting environment, literacy interface, physical environment, interaction frequencies, and beliefs. These dimensions consistently highlight *shared time* as the main activity to promote reading and writing. However, the strategies deemed most relevant to language stimulation are primarily academic and place special emphasis on remediation and explicit teaching.

Conclusion. Despite expressing interest in developing activities to encourage reading and writing at an early age, these activities often fail to align with skills and developmental period of preschool children. The adult-centered and formal view of literacy practices in the home may be enhanced by educating the parents about their children's developmental stages and literacy needs.

Keywords: early literacy, home literacy environments, preschool children, maternal beliefs, reading practices, writing practices

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Introduction

Early literacy is defined as the nurturing of reading, writing, and language skills in children, beginning from birth and continuing before they start school (Debaryshe et al., 1996; Teale y Sulzby, 1986). In research, early literacy posits that everyday experiences during this developmental period provide the foundation for later language skill acquisition, reading and writing proficiency, as well as academic success and social integration (Adamson et al., 2021; Hassunah-Arafat et al., 2021; Loye et al., 2022; Teale & Sulzby, 1986). The role of literacy extends beyond reading and writing. From a social and cultural perspective, literacy enables individuals to actively participate in their communities. This involves more than just decoding sounds and symbols and encompasses reasoning, critical attitudes, and personal development (UNESCO, 2016). According to Vygotsky's theory on socialization through language and interaction, and Bronfenbrenner's ecological systems model, research on early childhood development highlights the importance significance of children's environments and their interactions with more experienced individuals. Thus, the home environment and the role of mothers are particularly relevant during this stage of development.

Early Literacy

To clarify the construct of initial literacy, McLachlan and Arrow (2017) offer critical perspectives. They advocate for the term *early literacy* over *pre-literacy* to emphasize that foundational knowledge necessary for learning to read typically emerges in early childhood and supports the acquisition of more conventional literacy skills. Previously, literacy was often understood as a set of reading, writing, and math skills; however, it is now recognized as encompassing *identification*, *comprehension*, *interpretation*, *creation*, and *communication* (UNESCO, 2023).

Children are continually involved in cognitive activities related to language use, whether oral or written, and often display reading and writing behaviors in informal settings. The development of listening, speaking, reading, and writing skills occurs concurrently and is closely interconnected (Teale & Sulzby, 1986).

Parental Literacy Beliefs

Parental beliefs reflect socially constructed ideas about literacy and how individuals develop literacy, often shaped by parents' own experiences (Debaryshe et al., 1996; Tsirmpa et al., 2021). These primarily influence child development indirectly through the actions caregivers take based on their beliefs in specific areas of parenting (Aram & Yashar, 2023; Hassunah-Arafat et al., 2021; Tsirmpa et al., 2021). Recent research highlights mothers' and fathers' beliefs as key factors shaping caregiver behaviors and potentially influencing the effectiveness of both adult- and infant-focused interventions (Batista Rocha & da Mota, 2023; Justice et al., 2020; Tanji & Inoue, 2023). Similarly, it is recognized that mothers' and fathers' beliefs affect their actions and behaviors with respect to the expectations held about their daughters and sons in several domains, including early literacy (Aram et al., 2016; Sajawandi et al., 2021). Therefore, mothers' and fathers' beliefs about reading and writing are correlated with children's early literacy skills (Husain et al., 2011).

According to Parecki and Gear (2013) caregivers tend to reflect on their own literacy beliefs and behaviors, which influence the support they provide to infant development, especially if they have higher levels of education, recall positive experiences in their own literacy processes, or have participated in programs aimed at supporting the literacy process. Similarly, it has been recorded that mothers with a low level of education intervene less frequently in literacy promotion activities with their children. Consequently, they engage in interactive reading less frequently, running the risk of limiting their children's exposure to language skills that foster reading and writing from an early age (Carneiro, et al., 2019; Kotrla Topić et al., 2020).

Likewise, caregivers' beliefs often vary regarding their role in literacy instruction. Tsirmpa et al. (2021) note that some mothers and fathers believe it is their responsibility to actively support and promote their children's literacy development, while others assert that this commitment belongs primarily to the school. According to these beliefs, mothers and fathers exhibit a variety of literacy practices, however, these practices may or may not lead them to believe that this responsibility falls within their role as caregivers (Anyikwa & Obidike, 2012; Aram et al., 2016; Bojczyk et al., 2016; Hume et al., 2015; Parecki & Gear, 2013; Sajawandi et al., 2021; Tsirmpa et al., 2021). Therefore, various scholars propose viewing literacy from a developmental perspective and explore the different contexts where they carry out knowledge exchange, with the family being the first and most important environment.

Literacy Environments

McLachlan and Arrow (2017) point out that the study of early literacy developed in homes and early childhood settings is primarily aimed at documenting the process of acquiring and developing these practices from the earliest stages. This is done, in part, in order to understand why some children enter school with greater language skills related to reading and writing. It also highlights the relevance of examining the interaction between their family environments, early childhood contexts, and their access to various resources that promote literacy. One way to approach the study of this phenomenon and evaluate experiences is through the Home Literacy Environments (HLE) model (Lau & Richards, 2021; Rohde, 2015). HLE is defined by Kumalasari & Sugito (2020) as home-based experiences that help children learn a variety of subjects, where every object supports learning and includes people who are involved in contributing to knowledge. It encompasses a wide range of interrelated attitudes, activities, spaces, and resources, with different components of HLE linked to various aspects of literacy and language skills in preschool children (Lau and Richards, 2021; Rohde, 2015; Yeo et al., 2014).

Burgess et al. (2002) argue that the HLE is shaped by both the range of resources and opportunities accessible to children as well as the parental skills, abilities, attitudes, and resources that influence the availability of these opportunities. The author further introduces two concepts—Limiting Environment and Literacy Interface—to deepen the understanding of the HLE. The *Limiting Environment* suggests that a parent's ability and willingness to provide literacy opportunities for their children are determined by the resources at their disposal. These resources encompass broader factors like social class, as well as specific parental characteristics such as intelligence, language and reading skills, and attitudes toward education. On the other hand, the

Literacy Interface highlights the ways in which parents participate in activities that directly or indirectly expose their children to literacy experiences, such as shared reading, or convey the value they place on literacy, for instance, through their own reading habits.

Stimulating HLEs have been found to enhance opportunities for literacy development (Attig and Weinert, 2020; Ebert et al., 2020; Ergül et al., 2017; Karpava, 2021; Luo et al., 2021; Wang et al., 2021), and the creation of these spaces depends on a variety of environmental, psychological, and cultural factors, such as parental education level, socioeconomic status, time and resources available for practice, and household language background, to name a few (Attig and Weinert, 2020; Inoue et al., 2020; Kumalasari & Sugito, 2020; Niklas et al., 2020; Tanji and Inoue, 2023). These factors can promote or hinder the development of a rich linguistic repertoire and the use of language in various contexts that impact literacy (Karpava, 2021). Family literacy practices foster the acquisition of skills essential for academic life, while at the same time present improvements in cognitive level, school performance, oral language, reading process and socioemotional development of children (Kong & Yong, 2023; Pelosi et al., 2019; Wirth et al., 2022).

Research objectives

In Mexico, a decrease in the reading population has been observed, especially in its printed format, according to the results of the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, INEGI) in the reports *Module on Reading* published in 2022, 2023 and 2024. These reports indicate that, the lower the educational level, the lower the reading time; in general, men read a little more than women and on average only 30 percent consider understanding the text read, data that corroborate the lack of reading comprehension and the low scores in evaluations carried out by national and international agencies (OCDE, SEP, UNESCO). Additionally, it has been recorded that almost 70 percent of the reading population are encouraged to read both at home and at school, 16 percent only at school, 4 percent only at home and 9 percent say they have not received any type of motivational stimulus. The respondent population stated that the reasons for not reading most frequently are lack of time and lack of motivation or interest in reading according to INEGI (2022, 2023, 2024). It is only in the most recent survey conducted (2024) that a new series of questions are included, where they address literacy encouragement at home. including access to reading material, modeling by tutors, shared reading and encouraging library attendance (INEGI, 2024).

Considering the situation in Mexico, the purpose of this study is to analyze family beliefs about the literacy process at home based on the attitudes indicated in the questions regarding the creation of HLEs, such as the role of caregivers in the development of reading and writing skills, how language is stimulated, how literacy practices are approached, and the availability of materials and spaces for these activities. With these perceptions of literacy, it is possible to establish plans focused on undermining the deficiencies in the family environment and strengthening the practices already carried out in the home according to the specific needs of the population, based on their own cultural, economic and social capacities, as the concept of *multiple literacies* proposes.

Methods

For this qualitative study, interviews were conducted with mothers in northwestern Mexico who had at least one child between the ages of three and six who was not yet in primary school. The purpose was to inquire about mothers' beliefs about initial literacy and how these beliefs are expressed in the home. A total of 102 interviews were administered to a convenience sample, focusing on topics related to literacy practices in the home, language stimulation, resources and spaces available for reading and writing, and the role of caregivers.

Participants

The participants were mothers from a city in northwestern Mexico, across several localities from varied socioeconomic sectors. The mean age of the participating mothers was 33.1 years, with 18 being the minimum age and 53 the maximum. The age of the children was a minimum of 3 years and a maximum of 6 years with an average of 4.6 years. The families interviewed had an average of 2.1 children per household. Most of the people interviewed reported being married and the most common occupation was housewife, followed by employees, teachers, merchant and students. The schooling of most of the mothers was university, followed by high school, six only went as far as middle school and four reported having postgraduate studies.

Table 1

Sample characteristics (N = 102)

Mother age (mean = 33.1)	**N**	**Geographical distribution**	
Age < 35 years	**57**	Northwest zone	29
Age >35 years	44	Northeast zone	12
Children age (mean = 4.6)		Southeast zone	13
Age < 4 years	46	Southwest zone	12
Age >4 years	56	Coast	2
No. of children (mean = 2.1)		Occupation	
No. of children <2	65	Housewife	39
No. of children >2	37	Academy area	11
Income ($13, 884 MXN)		Administrative area	11
1,700–9,500	28	Arts	2
10,000–20,000	28	Merchant	4
21,000–80,000	11	Employee	3
Mothers' educational level		Student	3
Middle School	6	Freelancer	3
High School	23	Industry	3
University	39	Health	8
Postgraduate	4	Public server	1

There were mothers who, despite having university studies, reported their occupation as housewife. The sectors were distributed throughout the city and the coastal zone of the municipality. The area with the greatest number of participants was the northwestern part of the city, which is distinguished by the growing development of overcrowded settlements and industrial zones, some of which are located on the outskirts of the municipality, placing them in a low socioeconomic stratum, as is the case in the southern areas of the city (see *Table 1*).

Procedure

The interviews were conducted using a pre-designed questionnaire based on the literature. These questions aimed to explore beliefs and behaviors in households related to literacy through various aspects, including the limiting environmental factors, the literacy interface (children's direct or indirect exposure to literacy activities), available spaces, the frequency of literacy activities, and the notions held about reading and writing. The interviews were conducted via video calls and documented through notes and audio recordings.

Following the criteria of content analysis, the information was compiled, the interviews were transcribed, and folio numbers were assigned for easier access at

Table 2

Interview guide and inclusion criteria and resulting categories

Categories	Codes	Example question
Sociodemographic		
Income	Numerical value of monthly income.	What is your monthly income?
Mother's school level	Mother or father's educational level.	What is your last educational level?
Occupation	Mother or father's line of work.	Where do you work?
Residence area	The area where they reside.	In which district do you live?
Limiting Environment		
Available materials	Resources and materials used for R-W activities such as books, pencils, colored pencils, paper, boards, markers, notebooks, textbooks, pen, etc.	What type of writing and reading materials are commonly found in your home?
Mothers' reading and writing ability reported by themselves	Reading and writing habits at home. Type of material used by mother or father to R or W.	How often do you read by yourself?
Attitudes towards learning	Parents show interest in their daughter/son's education. Academic expectations of daughter/son.	Do you help your child with academic work? How?

Categories	Codes	Example question
Literacy interface		
Active HLE	Direct activities for the purpose of teaching to R or W.	Do you read in front of your children?
Passive HLE	Indirect R-W activities without teaching purpose. Leisure and recreation activities.	Does your child see you writing?
Maternal interest	Opportunities that could contribute to the transfer of values and behaviors of learning to R-W Dimension centered on the mother or father.	Do you think that mothers should be involved in the reading and writing process? How?
Maternal motivation	Parents' activities aimed at fostering children's interest in literacy. Child-centred dimension.	Do you think it is important for children to learn to read before elementary school? Why?
Frequency		
Shared reading frequency		How often do you read to or with your child?
Time dedicated to school activities		How many times per week do you engage in such activities?
Beliefs		
Importance of reading	Parents' views on the role of reading in fostering personal growth and development.	What do you think is the best strategy for your child to learn to read and write?
Reading as support to other areas of knowledge	Parents' perspectives on reading as a foundation for supporting other areas of knowledge.	Do you think reading is a support for learning mathematics or science?
Physical environment		
Reading, writing or study areas	Areas around the house designated for R or W purposes.	What area is the most used for reading at home?
Furniture available	Furniture, lighting, and accessibility suitable for children.	Does the space have the appropriate conditions for these practices?

a later date. Subsequently, the data were coded according to a table of key word-frequencies identified for study. The categorization of these codes was established based on the creation of interview questions, as only issues related to the process, beliefs and behaviors concerning literacy in the home were addressed (see *Table 2*). A second analysis was carried out to confirm that the categories were adequate, making only some adjustments in the conceptualization of the themes. Once the coding and classification by themes was completed, a synthesis of the interpretation of the data was conducted, describing the themes that emerged in relation to initial home literacy.

Results

The results were obtained from different analyses: first, a coding of concepts was carried out, followed by a separation of themes, and finally, the different dimensions encompassing these thematic contents were named. The dimensions that emerged include, *constraining environment, literacy interface, physical spaces, frequency of activities*, and *beliefs of literacy learning*. Different themes emerged from these dimensions. The following describes the results obtained from the coding and classification of the interviews conducted with mothers according to different dimensions of the HLEs.

Limiting environment

First, the limiting environment consists of the ability and willingness of mothers and fathers to provide reading and writing opportunities. This general theme includes subcategories such as reading and writing materials in the home, the mother's reading skills, and both positive and negative attitudes toward literacy.

Learning materials

All parents expressed having reading or writing materials at home for either academic or entertainment purposes. The most frequently mentioned reading materials are story books, magazines, textbooks, and newspapers:

I006: "*Most of them* (materials) *are story books, Santiago hardly likes to read.*"

I020: "*We have some story books that have been of interest to him since he has chosen them when we have gone to the supermarket, they have many images and that is what draws his attention the most.*"

I045: *"The same books and notebooks as his older brothers, dinosaur books for the middle son, and he really likes to draw.*"

To a lesser extent, encyclopedias, novels, dictionaries, comic books and digital devices were mentioned. It should be noted that no mention was made of everyday items such as clothing labels, food packaging nor cleaning or hygiene products. The most frequently used writing materials were notebooks, sketchbooks, sheets, boards, and textbooks:

I005: *"He has notebooks and blackboard at home. At his grandmother's house he has more notebooks to write.*"

I032: "*There are notebooks at the house, both mine and my wife's and her own notebooks.*"

I047: "*He has a mini notebook where he writes his name and words that I dictate to him on occasion.*"

I085: "*Lined notebooks for beginners, with guides to learn how to write.*"

The least frequently mentioned were colored pencils, markers, or crayons, which were primarily considered drawing tools. Respondents did not associate these with literacy practices:

I052: *"Well, there in his things he has a writing board, he has paper and crayons. He doesn't have pencils yet.*"

Maternal skills

In exploring maternal skills, we inquired about language use and reading practices within the home. Shared reading emerged as the most frequently mentioned activity, mostly as academic support when mothers assisted with preschool assignments. Some parents were also pursuing their own studies at the time of the interview, making reading and writing part of their daily routine:

> **I048**: *"She sees my partner reading every day, since she is studying at university, and she does homework quite often and my child notices it. I visit my partner every day and I take her with me because she really likes spending time with us. As for writing, whenever I am writing and she notices, she runs to sit next to me and watches carefully as I write, I think she is curious to see the pencil move faster than she can move it."*

> **I049**: *"She sees me reading every day because I am coursing a technical degree, and I have a lot of theory to read. Every time she sees me sitting in the living room she sits down and takes a notebook and imitates what I do. I don't usually write in front of her because she always wants to take the instrument I write with and start writing herself."*

Some parents do not perceive the use of digital devices as reading, nor are they certain that their children recognize this form of activity as a literacy activity:

> **I052**: *"I often don't read physical books because I usually read a lot on my computer or phone from time to time, and rarely a physical book, but I don't know if he knows that we're reading... I honestly hardly write on paper, because I don't need to, almost everything is on the computer. I don't see myself with a pencil and paper, it's very rare, unless I am signing a document or something."*

Another form of shared reading is during thebedtime routine, when mothers often read stories to their children; however, the mothers carry out the activity while the children play a passive role. There is no mention of asking questions or having the children try to guess what will happen next in the reading:

> **I015: "***At the end of the day we read a bedtime story together or at certain times during the day we read stories that interest him."*

> **I058**: "*Every day we try to read them a story, it depends on how many times they want us to repeat it (laughs) and I don't know how often but I think their grandmother also reads to them daily when she takes care of them."*

On the other hand, language stimulation is considered by many mothers and fathers as the correction of phonetic errors or language use. It is important to note that another common response is to play word games, such as singing, saying rhymes and riddles, and spelling words. Despite this, it is observed that activities related to academic teaching are favored in the family environment. In addition to the strategies already established above, another way mothers stimulate language is through the help of tutors, therapy, or motor exercises.

> **062**: *"Look, I feel like it took him a while to talk and a friend of mine who is a psychologist has taught me things like putting honey on his lips and using his tongue to remove the honey from around them, putting a pencil in his mouth doing exercises, things like that. I've never*

really taken it because I don't feel like it's something so serious, it's just that it's his age that's making him take a little longer to talk."

I064: "*Well, he has ADHD so he has a special teacher who gives him activities so he can speak better, so that's what we do.*"

I065: "*Yes, the child has a language delay for his age, which is why he goes to therapy so that he can develop language and also at home certain exercises are carried out so that the language can be more fluid and teach him new words.*"

Attitudes toward literacy

This category indicates favorable attitudes toward HLEs, expressed through explicit and implicit comments about mothers' and fathers' opinions about teaching literacy at home and the importance of education in general. More than 70 percent of respondents state that they are interested in their children learning to read and write and that mothers and fathers should support the literacy development process. However, attitudes of disinterest or misinformation about HLE are also present, ase they allude to the idea that school activities alone are sufficient for the development of reading and writing, with little need to engage in these activities at home. In other words, mothers and fathers believe they should wait until their children enter primary school to learn to read and write, as teachers are better equipped to teach literacy skills, and parents should only assist with homework.

I013: "*Yes, I would like him to know that* (read and write) *when he comes in* (to school) *so that he doesn't get delayed for any reason.*"

I049: "*I think she is still very young, right now I am more interested in her learning to distinguish more dynamic things like colors, letters and numbers.*"

I052: "*Well, it would be good. I don't think it's necessary because that's what school is mainly for, but he's been practicing numbers and letters, he's already familiar with them. What's missing is that in his language class they teach him the syllables and all that, and I imagine that while he's learning that, he'll reaffirm that, since he already has the mechanical part in his little hands of knowing how to draw letters and numbers, it will become easier for him to tie all that together so he can start writing sentences and so on. I imagine that that will come along with the classes.*"

This subcategory also includes comments that refer to waiting for a certain age to begin the literacy process because they do not want to pressure their children to carry out activities that they feel they are not yet ready for.

I002: "*Yes, on the one hand, but I wouldn't want to force him into something that takes its time.*"

I033: "*If he can and have the capacity, of course yes. I would like him to do so* (read and write before elementary school)."

I048: "*Of course I am interested, but I don't plan to pressure the girl. I think that being consistent in her practices and doing the activities that her teachers give her is more than enough, she will do it on her own in her own time.*"

Literacy interface

The next major theme is the literacy interface, which refers to activities carried out at home that facilitate reading and writing practice, such as creating spaces that encourage access to literacy materials and resources. The subcategories are *active HLE, passive HLE, parental interest and motivation*. Parental interest are the opportunities that potentially contribute to the transfer of values and behaviors conducive for literacy processes. On the other hand, parental motivation encompasses all activities aimed at fostering children's interest in reading and writing; therefore, it is a child-centered dimension.

Active HLE

Active HLE are activities designed to direct the teaching of reading and writing by parents. It has been observed that the promotion of reading is common in the homes of interviewees. As mentioned above under maternal skills, the activities most related to this dimension are shared reading, mainly at night before bedtime or during the children's homework, as well as language correction. Similarly, in attitudes towards literacy, it was established that the focus is mainly on academic or explicit teaching. As a result, efforts are centered on the adequate use of vocabulary, proper pronunciation of phonemes, and syntactic and grammatical corrections:

> **I049: "***Sometimes we put into practice some exercises that we find on the internet to improve his pronunciation, since he is only 4 years old and some words are difficult for him, especially those that have rr.*"
>
> **I052**: *"Yes, I try to pay close attention when he doesn't say a word correctly, so as not to scold him, but to correct him, and tell him that it is said "in such a way" but without getting angry and without scolding him. He is already used to it and does not get sad, he knows that I am teaching him.*"
>
> **I054**: *"Talking to him, correcting him when he makes a mistake when saying a word: "Ya sabí", instead of saying "Ya sé" (I know); he is corrected, but in a good way so that he knows how to express himself and what words he should use when he is trying to explain something or talking about something.*
>
> **I090**: *"I write words in notebooks and have him repeat the syllables with me and that is helping him a lot now he says the words more completely and he doesn't stutter when he is pronouncing something.*"

Passive HEA

In contrast, passive HEA are those common reading and writing activities that have no intentional teaching purpose performed by adults, sisters, brothers, tutors, or anyone else with whom children have contact within the home. The development of reading and writing at home mainly occurs when one of the caregivers work at the home or is currently studying. Likewise, it was found that in some homes, there is little to no modeling, even though they report that children can observe mothers read and answer messages or comment on social networks on cell phones, tablets or computers.

I005: "*I don't read a lot. I only use the cellphone during the day. I usually send messages and sometimes I comment on social media. I also read the news on the phone*"

I047: "*Well, I'm not much of a reader, obviously I read, but only on Facebook, and I don't read out loud.*"

They also mention that younger children seek assistance from siblings or other relatives with whom they have direct contact:

I010: *"He doesn't see me, but he is always curious to see how a word is spelled, but he asks his older sister directly".*

I058: *"His grandfather is the one he sees reading the most. He reads the newspaper every day.*"

Parental interest

Parental interest refers to observing and taking advantage of opportunities that could contribute to the transfer of values and learning behaviors. This is a dimension focused on mothers' and fathers' beliefs about HEA and is identified through comments in which they express the importance of literacy and indicate support for it taking place at home. As previously mentioned under other subcategories, the main interest related to literacy is focused on the effectiveness of language use and academic support, considering it a tool for learning and communication.

I002: "*It* (reading) *would help him to be more expressive, and more social, and to develop more in the classroom.*"

I010: *"First of all, it will help you have a better pronunciation and identify how a word is written.*"

I013: *"I think these two concepts* (reading and writing) *are very necessary both to be able to solve problems, and to want to write anything, but also to learn to express oneself because the range of words becomes larger.*"

This parent acknowledges modeling as crucial to the literacy development process, emphasizing the importance of providing access to both printed and digital reading materials and engaging in literacy practices that involve content analysis and interpretation:

I034: *"I really like reading, so my child sees me doing it. I show him magazines so that he gets a little more involved in this, but I prefer to put audiovisual content on digital platforms that have subtitles so that he can analyze and interpret them.*"

Parental motivation

The parental motivation sub-code refers to the activities of either mothers and fathers aimed to foster children's interest in literacy; these are manifest through expressions of support and encouragement, showing interest in the topics their children talk about, and demonstrating the patience and openness to listen to childrens' efforts to explain a topic to them. This subcategory also refers to the childrens' freedom of expression and the bonds of trust established between mothers and children that enable open communication.

052: "*Well, I find it very funny that he is curious about certain things and topics, and I always try to answer him according to his age. Sometimes I give him half-explanations because there are many things that he is very young and will not understand, but I do try to explain to him as much as possible so that he can understand them, and if he still has questions, I try to answer them willingly.*"

I062: "*Well, I think it has a lot to do with the example we give them and motivating them to do it, I think that is very important, and also providing them with material that a 5-year-old child would like, puzzles, stories, different educational materials that help them and get them interested in wanting to read.*"

I091: "*When Renata asks me a question and I don't know the answer, I tell her I'll answer later and I ignore her a bit, evading the question. However, afterwards I take the time to research what she asked me so I can answer her; many times, I answer the first thing that comes to mind.*"

Physical environments

Regarding the physical environment of the home for reading and writing, it was found that most homes have areas for reading. However, these spaces are often adapted from rooms already assigned to other activities such as the living room, dining room or bedrooms. As a result, distractions are common during reading or writing activities. In this respect, answers were considered contradictory.

I009: "*It depends a lot on the time of the day, if you try to read very late there probably won't be any free space.*"

I010*: "She has her own space, it's a special area for her with her own desk.*"

I013: "*There is a special room like an office that also serves when we want complete silence to review or study things.*"

I045: "*Even with three children at home, there is a time when it is just a matter of homework, outside of that time there may be some noise both internally and externally, but not so much that you cannot read.*"

Beliefs

Parental beliefs about early literacy encompass views on the importance of reading and writing before formal education and how these skills lay a foundation for learning in other academic subjects and contribute to overall personal development. Many parents recognize that fostering literacy skills early on has a lasting impact on their child's ability to succeed across various areas of study and in everyday life. These beliefs also reflect parents' ideas about the most effective methods for aiding their child's literacy journey. Some parents see themselves as central to this process, actively seeking information and resources on strategies for teaching, supporting, and enhancing their child's reading and writing abilities. By staying informed and involved, these parents strive to create a home environment that encourages literacy growth, addressing their children's unique learning needs and supporting their academic development:

I019: "*I try to take some time during the day to read stories, most of the time they are digital stories since on the Internet there are pages with interactive stories that really catch the child's attention, also when we walk down the street I try to get him to read short words that appear in advertisements, or even he himself takes the initiative.*"

I020: "*I don't think school is enough, it is also important for children to reinforce what they have learned at home with their parents.*"

I058: "*You are never satisfied, so yes, I like to look for different ways in which I can help them and keep them entertained, but one runs out of ideas quickly. I try to support myself with ideas from relatives of mine who are teachers or things that I see on the Internet, but one always feels that one can do more things.*"

In contrast, some mothers openly recognize their limited understanding of early literacy development and often rely on the teacher's expertise to guide their children's learning journey. Rather than taking an active role in selecting or implementing strategies for reading and writing, they trust that the teacher's knowledge and experience will provide the most beneficial approach for their children's literacy growth. These mothers believe that, without specialized training, their involvement may not be as effective and, therefore, choose to follow the teacher's recommendations closely, confident that this approach will best support their children's educational progress:

I086: "*First, what the teacher says in class and then put her in an extracurricular course.*"

I093:" *Yes, for example, with the letters that my daughter is eager to read, but the teacher told me that it should be little by little, and I have doubts about whether it is bad for me to get ahead of myself in the process of her wanting to read and teach her little by little.*"

Discussion

The results of this study reflect the practices and beliefs of mothers and fathers presiding in a city in northwestern Mexico. First, it is observed that resources are continuously available in the home for children to read and write, thus encouraging interaction with printed materials, exploration of language individually and with a family member, and personal expression. This has been shown to have a significant correlation with the development of early literacy skills, especially in terms of vocabulary growth (Bojczyk et al., 2016; Inoue et al., 2020; Niklas et al., 2016; Silinskas et al., 2020).

However, despite the availability of resources, these are not always appropriate or appealing to children, which can lead to poor interactions in reading and writing, as mothers and fathers tailor their beliefs about literacy based on their own experiences as noted by Bojczyk et al. (2016). Karpava (2021) points out that the choice of teaching or exposure activities can be based on parents' school level and experiences, family socioeconomic status and cultural background which are factors that influence teaching activities and language exposure; so, the richer the HLE, the more opportunities for literacy development children will have.

It is relevant to note that few families indicated that computers, tablets, or cell phones are sources of language exposure despite having at least one of these devices in the households. In this respect, Kotrla Topić et al. (2020) state that children whose

parents have lower levels of education and participate less frequently with their children in activities that stimulate literacy, may be especially susceptible to the negative effects of excessive use of digital media for entertainment purposes. So, it is recommended that these parents be encouraged to participate more frequently in interactive reading, which is found to be positively correlated to early literacy development. In agreement with this view, Attig and Weinert (2020) indicate that no single aspect of parental behavior is associated with children's language development, but that a variety of dimensions are related to child language development, even if contributing only an incremental effect on early childhood development. The authors found that the quality of parental interaction behavior and the frequency of joint activities varied by socioeconomic status, whereby mothers with a lower socioeconomic status (SES) interacted with their children less sensitively, in less stimulating ways, and less frequently than mothers with a higher SES.

Another finding is that maternal beliefs about language stimulation refer to strategies related to explicit teaching activities or those focused on a formal and academic environment, as well as time-sharing and modeling, though to a lesser extent. Studies such as those by Guo et al. (2021) and Inoue et al. (2020) point out that parent-directed teaching of reading skills and formal activities are not significant predictors of a child's initial writing success but are primarily associated with grammatical knowledge and the structure of printed material. On the other hand, shared reading by mothers and fathers has been shown to have a strong influence on language and literacy development, though not all reading practices yield similar results.

The study conducted by Batista Rocha and da Mota (2022) indicates that the reading style adopted by families when reading to their children produces different results in the development of pre-literacy skills. This study suggests that reading the text faithfully with pauses for explanations about the meaning of the text provides greater benefits in the development of phonological awareness and vocabulary skills. Additionally, contact with a new word, even if the child does not initially understand its meaning, expands vocabulary and, with subsequent explanation of the meaning, also improves comprehension skills. During the interviews for this research, a low percentage of families mentioned pausing when reading with their children.

In relation to the belief in exposing children to early literacy practices at home, mothers and fathers expressed an interest in engaging in activities to stimulate their daughters and sons. However, many stated that they did not know how to create a favorable HLE and instead focused, as mentioned earlier, on academic exercises aimed at correcting young children. The findings of the study by Niklas et al. (2016) indicate that starting early supports the development of children's language skills and that the onset of shared reading is a strong indicator of general HLE. Consequently, parents should be encouraged to start reading to their children when they are very young - the earlier the better.

Finally, the findings of this study indicate that parents often view children as passive individuals, believing they lack the ability to express meaning through their doodles. As a result, parents primarily focus on conventional graphic representations of language. As promulgated by Batista Rocha and da Mota (2023); Incognito and Pinto (2023); Justice et al. (2020); Sajawandi et al. (2021) and Tsirmpa et al. (2021),

more research is needed on parental beliefs as this may influence their behaviors towards their children and their ability to create linguistically enriching spaces. Additionally, Sajawandi et al. (2021) and Batista Rocha and da Mota (2023) highlight the importance of promoting reading so that children are not only taught to read but are encouraged to cultivate the taste and culture of reading.

Conclusion

The beliefs of mothers and fathers in this region of Mexico regarding early literacy are favorable for the creation of HLE, as they express interest in having their daughters and sons engage in reading and writing from infancy. Studies indicate that mothers with interest in early literacy tend to provide greater support to their children in the literacy development process (e.g., Hume et al., 2015; Kumalasari & Sugito, 2020; Husain et al., 2011). The establishment of affective bonds between parents and children is emphasized, as it helps children feel comfortable and free. This, in turn facilitates their expression and provides opportunities to explore language without fear of reprisals. On the other hand, constant corrections of word use or correct articulation of phonemes can be detrimental if used as the sole source of stimulation and interaction with spoken and written language leading to elevated, fatigue and diminishment of their willingness to express themselves and possibly instilling problems of self-concept or impairment of language skills. This critical period of cognitive and emotional development has long-term implications, as suggested by Carneiro et al. (2019), further highlighting the need to provide an environment conducive to the comprehensive growth of children in their relationship with language. Findings such as those of Kong and Yong (2023) and Wirth et al. (2022) highlight the relevance of satisfying not only the academic components of language but the importance of establishing a safe and trusting environment where they can freely explore language use and skills. The incorporation and practice of specific behaviors that increase parent-child interaction may produce greater outcomes not only for vocabulary but also for related early literacy skills to school readiness. Therefore, parents may also improve children's future academic success upon entering school (Dicataldo et al., 2022).

Another important aspect to highlight is the ongoing confusion or lack of information regarding what early literacy entails, the potential it holds at this stage of development, and how to foster spontaneous situations that encourage the use of language and a natural approach to reading and writing. This confusion often stems from outdate notions about literacy, such as the idea of readiness or the idea that literacy is solely achieved through maturation. Tsirmpa et al. (2021) point out that parents with conventional ideas about literacy have the belief that school is primarily responsible for teaching children. They view the development of literacy skills a result of code-based activities and often fail to recognize the significance of oral language or the role of reading in improving literacy.

As demonstrated in the studies (Batista Rocha & da Mota, 2023; Incognito & Pinto, 2023; Justice et al., 2020b; Sajawandi et al., 2021; Tsirmpa et al., 2021a), more needs to be learned about parental beliefs as it can influence their behaviors towards their children, as well as the skills necessary to create linguistically enriching spaces.

Additionally, Sajawandi et al. (2021) and Batista Rocha and da Mota (2023) highlight the importance of promoting reading so that children are not only taught to read but are encouraged to cultivate the taste and culture of reading.

For the creation of a maternal intervention program focused on teaching of strategies that promote literate environments at home, it is recommended to begin by deepening of the beliefs of the target population. This approach ensures that the program addresses the particular needs of that group and establishes an action plan aligned with their lifestyles, available resources, and social configuration. Reinforcing beliefs about this process can strengthen parents' awareness and understanding of how a rich HLE contributes to their children's early and natural literacy development.

Limitations

Some limitations encountered in conducting this study relate to control over the interviewers. Despite receiving prior training to conduct the interviews, variations in their approach may have affected the precision or length of the responses. However, the material obtained from the questions was deemed sufficient to achieve the study's objective.

Ethics Statement

Due to the nature of the research and the topic covered during the interviews, no ethics approval was necessary by the University board of ethics to carry out this study. Participants gave informed consent before starting the interviews to be recorded for further analysis.

Author Contributions

N.B. and B.F. conceived the idea. N.B. and F.B. developed the theory. N.B. captured and codified the data. C.T. and B.F. verified the analytical methods. B.F. supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript that could be construed as a potential conflict of interest.

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What does Psychological Well-being Mean for Mexican Late Adolescents? A Study with Natural Semantic Networks in the Post-pandemic Era

César A. García-Avitia[a*], Sara L. Pérez-Ruvalcaba[a], Claudia V. Márquez-González[a]

[a]*University of Colima, Mexico*

*Corresponding author. E-mail: garciaavitia@ucol.mx

Background. Well-being is distinguished by its complex and multifaceted characteristics, integrating both objective and subjective components, so each person's point of view is relevant. In conducting research concerning well-being, it is important account for both age considerations and cultural variability. Additionally, the influence the COVID-19 pandemic should be considered given how it impacted the public including corresponding effects on peoples' perceptions of well-being.

Objective. The study's purpose was to analyze the meaning of psychological well-being from the perspective of late adolescents presiding in Colima, Mexico during the post-pandemic era.

Design. A non-experimental, cross-sectional and exploratory research design was used. The *Natural Semantic Networks* technique was used as the instrument of measurement, employing *psychological well-being* as the stimulus concept to study a sample of 112 high school students in late adolescence (92 women, 20 men, ages 17 to 21; average = 17.3). The Natural Semantic Networks research technique enabled the exploration of participants' subjective meanings associated with well-being.

Results. The analysis identified a set of primary categories of well-being defined by participants including: *health*, both physical and mental; *low-arousal emotions*, such as peace and serenity; *positive affect* like happiness; *positive relationships*, mainly with family; *security*; *self-control*; and *self-acceptance*.

Conclusion. This research highlights that no single theory fully captures adolescents' understanding of well-being. Crucial elements considered by the most important theories are missing from participants conceptual frameworks. Additionally, COVID-19 pandemic has affected adolescent perceptions of well-being, especially it its impact on mental health. Peace is also valued as relevant by participants, especially desirable in the midst of emotional turbulence. Results show the need for a more comprehensive perspective on well-being that incorporates specific dimensions of each age group within a cultural and temporal context.

Keywords: psychological well-being, subjective well-being, psychological meaning, late adolescence, COVID-19 pandemic, natural semantic networks

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Introduction

In recent years, the field of psychology has undergone a significant shift, increasingly emphasizing well-being rather than focusing solely on psychopathology (Ryff & Singer, 1996; Das et al., 2020; Kraiss et al., 2022). This transformation reflects a broader understanding that mental health encompasses more than the absence of illness; it also involves positive aspects of human functioning. Seligman and Csikszentmihalyi (2000) have been pivotal in this paradigm shift, advocating for positive psychology, which focuses on cultivating strengths and virtues that enable individuals and communities to thrive. They argue that this approach can enhance well-being and potentially prevent some mental health disorders before they start. Thus, based on these new perspectives, well-being has gained strength as a central construct for psychology and social sciences more generally. For this reason, it has become a topic of global interest, studied in many places around the world (Tay & Diener, 2011).

The interest in evaluating well-being worldwide has led to efforts such as the Gallup World Poll (Gallup, Inc., 2024). This poll, operational since 2005, consistently measures several well-being dimensions using a core survey that includes evaluative judgments of life through Cantril's Ladder and daily experiences, alongside variables like law and order, health, and standard of living (Lambert et al., 2020). This survey, recently adapted to account for current events and other measurement requirements, is expanded periodically to integrate findings relevant to diverse global perspectives.

Well-being is undoubtedly a relevant issue, but what is it, and what dimensions does it include? For Deci & Ryan (2008), "[well-being] refers to optimal psychological experience and functioning" (p. 1). As Pollard & Lee (2003) have observed the construct of well-being has been approached from different perspectives:

Well-being has been defined by individual characteristics of an inherently positive state (happiness). It has also been defined on a continuum from positive to negative, such as how one might measure self-esteem. Well-being can also be defined in terms of one's context (standard of living), absence of well-being (depression), or in a collective manner (shared understanding) (p. 64).

Well-being is a multidimensional concept that includes both objective and subjective components, each contributing uniquely to the understanding of human health and happiness. Objective well-being typically refers to measurable aspects of life such as economic stability, health, and safety, which are externally observable and often quantifiable (Diener, 2009). Subjective well-being, on the other hand, concerns individuals' perceptions and evaluations of their own lives, encompassing emotional reactions and cognitive judgments (Diener, 1984; Diener et al., 1999). Subjective well-being can be further defined to comprise three main components: positive affect (the presence of positive emotions), negative affect (the absence of negative emotions), and life satisfaction (cognitive evaluations of one's life as a whole). This conceptualization emphasizes the internal and perceived quality of an individual's experience and personal assessment of their happiness.

According to the Millennium Ecosystem Assessment (2005), an international effort led by the United Nations to evaluate the consequences of changes in global ecosystems for human well-being and to provide a scientific basis for conservation actions aimed at sustainable resources, well-being was defined as a multivariate state

comprising five dimensions (Carpenter et al., 2009): health, basic material for a good life, good social relationships, security, and freedom of choice and action. These dimensions of well-being can be considered universal and are useful for approaching this concept, with defined objective and subjective indicators.

The PERMA model, proposed by Martin Seligman (2011), represents a seminal framework in positive psychology, designed to conceptualize and measure well-being. This model identifies five essential elements that contribute to lasting well-being: positive emotions, engagement, relationships, meaning, and accomplishment. *Positive emotions* encompass feelings of happiness and contentment that enhance one's life experiences. *Engagemen*t refers to involvement in activities that fully absorb and challenge the individual, often leading to experiences of flow. *Relationships* highlight the importance of social connections and support systems that are crucial for emotional and psychological health. *Meaning* pertains to the sense of purpose and significance that individuals ascribe to their lives, often through involvement in something larger than oneself. Finally, *accomplishment* involves the pursuit and achievement of goals, providing a sense of success and fulfillment.

Another important theory defines *psychological well-being*. As outlined by Ryff (1989; 2023a; 2023b), psychological well-being extends beyond subjective contentment and encompasses areas such as personal development and purpose. Psychological well-being comprises six dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. These dimensions reflect a comprehensive approach to well-being, emphasizing eudaimonic aspects — fulfillment derived from achieving one's potential and finding meaning in life's experiences (Ryff & Singer, 1996).

While both subjective and psychological well-being are related to the broader concept of well-being, they differ significantly in scope and emphasis. Subjective well-being focuses primarily on hedonic well-being — immediate happiness and emotional states, whereas psychological well-being addresses more comprehensive aspects of human functioning, incorporating the pursuit of meaningful goals and personal actualization (Ryan & Deci, 2001; Morosanova et al., 2021). Together, these constructs provide a complex picture of what it means to lead a fulfilling life. They highlight the importance of not only ensuring that basic needs are met, and that people feel happy, but also that they grow, thrive, and find value in their daily activities.

A factor that influences how people conceive well-being is their age. The relationship between age and well-being is complex and varies significantly across an individual's life. Research indicates that subjective well-being often shows a U-shaped curve with age; younger and older adults tend to report higher levels of happiness compared to middle-aged individuals (Stone, Schwartz, Broderick, & Deaton, 2010). Psychological well-being, characterized by feelings of purpose, autonomy, and personal growth, also demonstrates variability with age. For example, older adults often experience higher levels of autonomy and self-acceptance, potentially due to adjustments in life goals and expectations (Ryff, 1989). Moreover, longitudinal studies suggest that while certain aspects of psychological well-being such as personal growth might decline, others like life satisfaction may improve, indicating a complex interplay between different facets of well-being as people age (Charles & Carstensen, 2010).

Regarding adolescence, Avedissian & Alayan (2021) conducted their study to explore the concept of adolescent well-being and to delineate its characteristics, precursors, and empirical indicators through a review of existing literature. Ninety-four articles were examined in the final analysis. Key characteristics of adolescent well-being were identified as autonomy (adolescents' ability to acquire knowledge and achieve independence), connectedness (maintaining encouraging and supportive interpersonal connections that steer the adolescent toward favorable actions), optimism (assisting the adolescent in remaining optimistic and maintaining a positive outlook despite uncertainties), and competency (aiding the adolescent in positively adjusting to their surroundings and making suitable choices regarding their physical, social, spiritual, and psychological aspects of life). Precursors were categorized into internal and external factors. Internal factors encompassed behavioral, physical, psychological, and spiritual aspects, while external factors covered environmental, economic, educational, leisure, social, and safety and security aspects. For adolescents to achieve well-being, the presence of these domains are necessary, particularly the social aspect.

Late adolescence is a critical developmental stage marked by significant psychological, emotional, and social changes that influence subjective well-being. This period is characterized by increased autonomy from parents, a deeper capacity for abstract thinking, and a heightened focus on peer relationships (Ashfield, 2024; Steinberg, 2014). Adolescents at this stage often experience an intensified quest for identity, as articulated by Erikson's stages of psychosocial development, which posit that the primary challenge of adolescence is resolving identity versus role confusion (Erikson, 1968).

Subjective well-being during late adolescence is particularly influenced by these developmental challenges. As adolescents strive for greater independence and explore various roles, their well-being may fluctuate due to the instability and pressure of forming a distinct identity (Arnett, 2007; Branje, 2022). Social relationships play a pivotal role; peer acceptance becomes extremely important and can significantly impact an adolescent's self-esteem and life satisfaction (McMahon et al., 2020; Scholte & Van Aken, 2020).

Furthermore, late adolescents' cognitive advancements allow them to process emotions more deeply and to consider the future implications of their actions, which can alter their perceptions of happiness and satisfaction. As they develop a more complex understanding of the world and their place within it, their subjective well-being can become more stable or more turbulent, depending on their subjective experiences and coping mechanisms (Erath & Pettit, 2021; Gruhn & Compas, 2020).

In addition to the these various life stage in which a person passes, cultural aspects also influence the perception of well-being (Lambert et al., 2020). Each culture modifies the criteria used to evaluate well-being, and these criteria vary according to context (Díaz et al., 2022). Cultural values profoundly influence the meaning and perception of well-being, reflecting diverse traditions, beliefs, and practices that shape individuals' conceptions of happiness and fulfillment. According to Diener and Suh (2000), cultural norms dictate the desirable states of living and how happiness is pursued, resulting in diverse expressions of well-being across different societies.

Lambert et al. (2020) emphasize the necessity of including additional dimensions to well-being evaluation to foster a more inclusive perspective on cultural differences. They highlighted the importance of including eudaimonic well-being, which involves utilizing and enhancing one's best qualities. This concept of well-being, deeply rooted in Aristotle's virtue ethics, focuses on mastery, life purpose, and personal development. These authors propose incorporating aspects such as connection to nature, mastery, meaning in life, low-arousal emotions, balance and harmony, group relationships, relationships with government, leisure and resilience. These aspects are valued across cultures worldwide as integral components of well-being, extending beyond the perspective of developed Western countries.

Another aspect considered in this research is the effect of the COVID-19 pandemic on people's perception of well-being and the importance of physical and mental health. This global phenomenon had a sensitizing effect on mental health importance, since public policies and mass media gave it a main place never seen before. The pandemic highlighted mental health as a critical component of well-being due to the spike in instances of anxiety, depression and stress that many people experienced during lockdowns in addition to widespread uncertainty more generally (Fernández-Castillo et al., 2021; Ryff, 2024)

These conditions have been observed since the first months of the pandemic. Pfefferbaum and North (2020) discussed the psychological effects of the COVID-19 pandemic, noting an increase in the prevalence of mental health conditions and emphasizing the need for accessible mental health services. Likewise, Torales et al. (2020) examined pandemic implications for public mental health, suggesting that it gained recognition as an essential pillar of well-being, similar in importance to physical health. Moreno et al. (2020) conducted another relevant study, which analyzed how the COVID-19 pandemic influenced the public's perception of mental health. Results indicated that the general population began to value it more, recognizing its impact on overall well-being. These studies suggest that the COVID-19 pandemic has transformed public perception and prioritization of mental health, highlighting its integral importance to well-being and underscoring the need to integrate mental health care into public health responses.

Additionally, as this study was conducted among late adolescents in the state of Colima, Mexico, it is important to highlight that Colima has faced a surge in violence perpetrated by organized crime since 2022 (Mexico Daily Post, 2023), significantly impacting public safety. This heightened insecurity has restricted socialization opportunities, altered young people's perception of risk, and may have influenced their mental health. The unique sociocultural and environmental challenges experienced by adolescents in this region underscore the relevance and pertinence of research in psychological well-being.

After addressing the issues related to well-being, it is important to discuss meaning, a key element in this research. Meaning, as a linguistic representation of an individual's knowledge and plays a critical role in cognitive processing and behavior. It encompasses the way individuals interpret and mentally organize their experiences, translating complex information into understandable and communicable forms (Lakoff, 1987). This conceptual framework allows people to make sense of their world and act upon it effectively. According to Vygotsky (2012), language and meaning

are integral to cognitive development, influencing how individuals learn to perceive, interact with, and respond to their environment. The interplay between linguistic meaning and behavior is evident in how language shapes thought and decision-making processes. For instance, the specificity and structure of language can alter perception and influence behavioral responses, facilitating or hindering communication and social interaction (Boroditsky, 2001). Thus, linguistic representations that constitute meaning not only reflect one's knowledge but also guides behavior, impacting everything from problem-solving strategies to interpersonal relations.

Meaning is organized into complex structures known as semantic networks. These networks are systems of interconnected concepts where each node represents a word or phrase linked by their semantic relationships, reflecting how meaning is structured in the human mind (Collins & Loftus, 1975). This organization allows for efficient information retrieval and cognitive processing; by activating one concept in the network, a cascade of associations can be triggered, enabling quick access to related ideas (Aitchison, 2003). Semantic networks also facilitate language comprehension and production by organizing knowledge in a way that mirrors natural language usage. For instance, the concept of "dog" might be linked to "animal," "pet," and "bark," illustrating how semantic qualities and relationships are mapped cognitively (Hinton & Shallice, 1991). Thus, semantic networks play a crucial role in linguistic representation of knowledge, underpinning the cognitive mechanisms that enable individuals to understand, communicate, and think critically about their world.

Meaning significantly shapes individual conceptions of well-being and its evaluation. The way people linguistically encode and interpret experiences directly influences their understanding of what constitutes well-being. Vygotsky's theory of cognitive development suggests that language not only reflects thought but also shapes it (Vygotsky, 1978), implying that linguistic structures used to define well-being impact how individuals perceive and evaluate their own state of wellness. Therefore, studying the meaning of well-being is relevant, and the Natural Semantic Networks technique, described in the methods section below, is particularly useful for this purpose.

Methods

The research design was non-experimental, transversal and exploratory. The study's purpose was to analyze the meaning of psychological well-being from the perspective of late adolescents in Colima, Mexico in the post-pandemic era. Data were collected through Natural Semantic Networks (Figueroa et al., 1976; Valdez, 2004). This research technique provided an approach to participants' subjective meanings of well-being, offering a deeper understanding of perceptions and belief systems from a more natural perspective, less imposed by the researchers.

Participants

112 respondents took part in this research, 92 women and 20 men, ages 17 to 21 (average = 17.3). All participants were late adolescent students in their last year of high school. The type of sampling was non-probabilistic for convenience. The inclusion

criteria were: that the participants were students in their last year of high school in the state of Colima and that they (if they were of legal age) or their parents (if they were minors) gave their informed consent.

Procedure

The Natural Semantic Networks technique, developed by Figueroa et al. (1976), is a research method used to explore the mental representations individuals have of specific concepts. This technique involves analyzing associative networks that participants create when prompted with a target word, revealing the structure and organization of their knowledge. By mapping these networks, researchers can understand the subjective meanings individuals ascribe to different terms, providing insights into cultural, social, and cognitive dimensions of knowledge. Natural Semantic Networks has been used for research on well-being in studies such as those by Denegri et al. (2015) and Flores-Cano et al. (2020).

The procedure involves asking participants to list *defining words* or concepts they associate with the *stimulus concept*, which in this case was psychological well-being *(bienestar psicológico,* in Spanish). After responding to the five words or concepts, participants were asked to list them according to a its importance, giving the value of *1* to the most important and so on, until reaching the number *5*. The technique was administered on paper, in a format that included written informed consent and was completed by participants whose legal guardians had previously provided informed consent for their participation in March 2024 at the University of Colima facilities. The study was carried out in compliance with the guidelines established by Mexico's Regulations of the General Health Law on Health Research.

After administration, data were transcribed into a Microsoft Excel file and prepared for analysis, which consists of the following procedures described by García-Avitia & Tello-Miranda (2022) and García-Avitia (2024).

1. *J Value (J)* retrieval: This process involves counting the total number of distinct defining concepts listed by participants, excluding repetitions. The resulting value reflects the semantic richness and breadth of the network.

2. *Dispersion and Agreement Levels* based on *J Value*: These metrics are determined by identifying the minimum and maximum numbers of possible defining concepts in a Natural Semantic Network. This is calculated by multiplying the total number of participants by the number of defining concepts requested for a stimulus concept (in this case 5). The outcome is the maximum possible number of defining concepts, achievable when no concept is repeated across the network. The minimum possible occurs when all participants list the same five concepts. From the maximum possible, subtract the minimum possible to obtain a range, which is then used to calculate a percentage by multiplying the *J Value* by 100 and dividing the result by the obtained range. This calculation yields a dispersion percentage, which can be classified into one of five levels: very low (0-20%), low (21-40%), medium (41-60%), high (61-80%), and very high (81-100%) (García-Avitia, 2024). Conversely, agreement level is inversely proportional to dispersion level (the greater the dispersion of meaning, the lower the agreement within a sample). It is obtained by subtracting 100 from the dispersion percentage and eliminating the negative sign. When there is agreement on the meaning that a group assigns to a concept, it indicates a consen-

sus in their understanding and interpretation (García-Avitia, 2024). The same 5-level classification from very low to very high is used as for dispersion level.

3. *First-level categorization*: This involves integrating the defining concepts of the Natural Semantic Network by creating categories based on relationships of synonymy (e.g., *tranquility* and *serenity*) or shared linguistic roots (e.g., *health* and *healthy*).

4. *Post-Categorization J Value (PCJ)* retrieval: This is calculated by counting the total number of categories and defining words from the first-level categorization.

5. *Frequency of Defining Word* retrieval: This is calculated by counting the number of times a defining word or category appears in the Natural Semantic Network.

6. *M Value* or *Semantic Weight (M)* retrieval: This involves scoring each category or defining word in the Natural Semantic Network according to the hierarchy of importance assigned by each participant and then summing all results. This requires multiplying the appearance frequency of each category or defining word by the value corresponding to the order assigned (in this case, words assigned number 1 are multiplied by 5, those assigned 2 by 4, and so on, down to those placed at number 5, which are multiplied by 1). This value estimates importance assigned to each category or defining word. It is important to emphasize that the use of natural numbers does not imply that *M value* has an interval measurement level as it remains ordinal data.

7. *SAM Set* retrieval: This is obtained by identifying the 10 or 15 categories and defining words with the highest M Value, representing the core of the Semantic Network. It should be noted that the number of categories and words chosen, whether 10 or 15, is arbitrary, and the usefulness of delimiting this set lies in the ability to concentrate network analysis on what was most relevant at group level. In this technique, *SAM* means *Semantic Association Memory*.

8. *FMG value*: This is obtained by assigning the highest M value of the SAM set a percentage of 100 and then using a rule of three to obtain the rest of the FMG values proportionally. These values are useful to identify proportional semantic distance between each word or category.

9. *Second-level Categorization*: Categories or defining words of the *SAM set* are grouped according to an associative criterion, such as hypernymy/hyponymy related to a semantic field (e.g., *peace*, *calm*, and *tranquility* are grouped into a category called *peace*) (García-Avitia & Tello-Miranda, 2022).

10. *M Value* retrieval by *Second-level Categories*: This is obtained by summing all M values of categories or defining words grouped in the same S*econd-level category*, expressed as ΣM (García-Avitia & Tello-Miranda, 2022).

Results

To begin the presentation of results on what *psychological well-being* means to participants, the J Value of the network, which represents group's semantic richness, was J = 235. Considering that there were 112 participants and that 5 defining words were requested, the minimum possible spread was 5 and the maximum possible spread was 560. The operation described in point two of the procedure was performed to obtain the range of defining words, and result was 555 (560–5 = 555). With range value, it was possible to obtain dispersion level (42.3%) and agreement level (57.7%), both remaining at the medium level.

With post-categorization, the J Value was reduced to a score of PCJ = 139. The highest M Value represented was a category defined as *peace*, which also includes defining words such as *calm*, *serenity* and *tranquility*, with an M Value = 199 to which an FMG Value of 100 was assigned. This concepts category is also the one with the highest frequency in the entire semantic network, with n = 67. Second place goes to *mental health* category with an M Value = 187 and a frequency of n = 41, which places it close to first place with only 12 points less in the M Value and a FMG = 93.97. Third place goes to *physical health* category with an M Value = 177, FMG = 88.94 and a frequency of n = 46, which places it close to second category with only 10 points less in the M Value and even a higher frequency.

From the fourth category onwards, the M value scores and frequencies decrease noticeably, so the first 3 categories are clearly the most relevant. Data of the 15 categories or defining words and categories of the SAM Set are shown in *Table 1*.

Table 1

Categories or defining words of the SAM Set of psychological well-being meaning

Hierarchy	First-level categories	n	M	FMG
1	Peace	67	199	100
2	Mental health	41	187	93.97
3	Physical Health	46	177	88.94
4	Stability	30	100	50.25
5	Security	22	66	33.17
6	Happiness	23	61	30.65
7	Emotions	16	50	25.13
8	Mind	13	47	23.62
9	Being well	13	41	20.60
10	Family	11	39	19.60
11	Communication	10	29	14.57
12	Emotional intelligence	8	29	14.57
13	Self-esteem	10	26	13.07
14	Being well with oneself	8	25	12.56
15	Self-control	8	24	12.06

Note. n = frequency. M = M value (semantic weight). FMG = proportional semantic distance.

FMG values can be presented using radial diagrams, as shown in *Figure 1*. This facilitates observation of groupings or segmentation within the SAM set, that collectively represent meanings that share similarities or have comparable attributes (Aguilar, 2024). The most significant categories that define psychological well-being are *peace*, *mental health* and *physical health*. A second level is constituted only by the

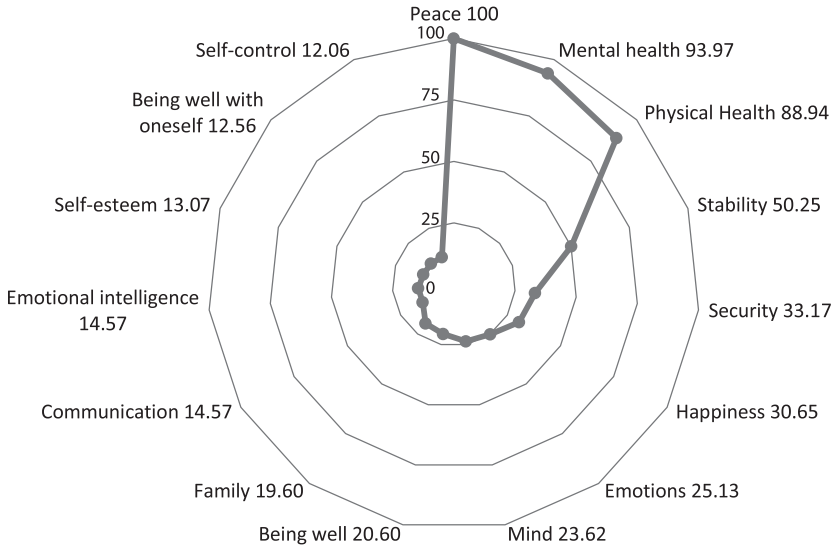

Figure 1. FMG values of the SAM set of psychological well-being

Table 2

Second-level categories of the SAM Set of psychological well-being meaning

2nd level hierarchy	2nd level categories	Σ of M	1st level hierarchy	1st level categories	M
1	Health	411	2	Mental health	187
			3	Physical Health	177
			8	Mind	47
2	Low-arousal emotions	299	1	Peace	199
			4	Stability	100
3	Positive affect	152	6	Happiness	61
			7	Emotions	50
			9	Being well	41
4	Positive relationships	68	10	Family	39
			11	Communication	29
5	Security	66	5	Security	66
6	Self-control	53	12	Emotional intelligence	29
			15	Self-control	24
7	Self-acceptance	51	13	Self-esteem	26
			14	Being well with oneself	25

Note. Σ of M = Sum of M values of each second level category. M = M value (semantic weight).

stability category. At the third level we can group *security*, *happiness*, *emotions*, *mind* and *being well* categories. A fourth level includes *family*, *communication*, *emotional intelligence*, *self-esteem*, *being good with oneself* and *self-control*.

A second level categorization was carried out with the 15 categories and words included in the SAM Set, which accounted for theoretical proposals on well-being presented in the introduction, resulting in seven groups: *health* (Σ of M = 411), *low-arousal emotions* (Σ of M = 299), *positive affe*ct (Σ of M = 152), *positive relationships* (Σ of M = 68), *security* (Σ of M = 66), *self-control* (Σ of M = 53) and *self-acceptance* (Σ of M = 51). *Table 2* presents these categories organization, as well as their hierarchical position and the M Values per second-level category.

Discussion

Health had the most important meaning among second-level categories, with 3 of the 15 defining categories of the Sam Set included and a joint semantic weight of Σ of M = 411. The fact that health has the greatest relevance, and with a notable difference of 112 points, makes it clear that participants' conception of well-being is similar to the Millennium Ecosystem Assessment (2005). It is important to emphasize that in this dimension not only physical health would be considered but also mental health. It is quite significant that mental health appears in second place among the 1st level categories, even higher than physical health. This may represent a greater sensitivity among today's youth toward mental health's importance to well-being. This may also have been influenced by the emphasis that has been placed on mental health in recent years following the COVID-19 pandemic and public opinion changes (Moreno et al., 2020; Pfefferbaum and North, 2020; Torales et al., 2020).

Another striking aspect is that peace is in first place among second level categories. Lambert et al. (2020) mention that cultures other than those of developed Western countries highly value low arousal emotions, such as tranquility, serenity and peace, and not only joy or those of greater intensity, as the hedonistic perspective of well-being considers (Diener, 1984). Although health surpassed peace and serenity during the second level categorization, the importance given by participants is notable. The emotional instability that pandemic brought, combined with the developmental challenges at this stage (Erath & Pettit, 2021; Gruhn & Compas, 2020), could influence adolescents to consider peace and serenity desirable, which also can be interpreted as the absence of negative emotions (Diener, 1984; Diener et al., 1999).

As expected, the category of happiness and positive emotions also appear among the meanings that adolescents have of psychological well-being (Diener, 1984; Seligman, 2011). However, there is a notable distance between these aspects and the categories at the top, such as health and peace. Likewise, positive relationships are something that also appears among the most important meanings of psychological well-being from the perspective of the participants (Avedissian & Alayan, 2021; Carpenter et al., 2009; Millennium Ecosystem Assessment, 2005; Ryff, 1989; Seligman, 2011). However, it is striking that peer relationships, such as friendships, do not appear among the most relevant categories; instead relationships with family are highlighted. This contrasts with what theories suggest about the relevance of peer

relationships at this stage (McMahon et al., 2020; Scholte & Van Aken, 2020). These aspects of socialization could have been affected by the COVID-19 pandemic, since this group experienced contingency and the impossibility of interacting with peers at the beginning of their adolescence. This hypothesis would have to be verified through future studies that can explore the direct influence of the pandemic on the well-being of adolescents.

After positive relationships, the category that obtained fifth place was security. This is a dimension considered relevant in well-being models such as those proposed by Carpenter et al. (2009) and the Millennium Ecosystem Assessment (2005). It is usually considered more as an external factor that influences subjective and psychological well-being (Avedissian & Alayan; 2021). However, the context of Colima, Mexico has been notoriously violent in recent years, with the presence of organized crime that has caused the city of Colima to be considered the most violent in the world due to its homicide rate (Cure Violence Global, 2023). This context may be influencing adolescents to give it greater relevance to security than other dimensions that theories usually consider.

Finally, self-control and self-acceptance appear as the sixth and seventh categories, respectively. Self-control is part of the environmental domain dimension in Ryff's (1989) theory of psychological well-being, as is self-acceptance. These results are consistent with that author's perspective. However, in relation to psychological well-being, dimensions such as life purpose, autonomy and personal growth do not appear to be as relevant to the meaning of well-being for the participants.

Conclusion

One of the contributions of this research is that it demonstrates a single theory is insufficient to encompass adolescents' understanding of well-being. Adolescents associate well-being with various dimensions including those of objective well-being, subjective well-being, and psychological well-being. Notably, several dimensions of psychological and subjective well-being, such as autonomy, purpose in life, personal growth, peer relationships, competence, and optimism, are absent from their semantic networks. This absence suggests that adolescents may not fully recognize these aspects as integral components of their well-being.

Furthermore, the COVID-19 pandemic may have significantly influenced adolescents' perspectives on well-being, placing unprecedented emphasis on mental health. Also, it appears that emotional instability experienced during the pandemic has heightened the value adolescents place on peace and serenity, marking these as highly desirable states amidst ongoing uncertainty. Likewise, in the context of violence, security has been considered relevant to well-being. Contributions by this research serve to show the need for a more comprehensive well-being perspective that incorporates specific dimensions of each age group located in a cultural and temporal context.

Limitations

The first limitation of the study was its limited sample. Furthermore, it was an exploratory study that cannot be generalized. Larger studies are required in different popu-

lations to have a more precise perspective. Also, it cannot be certain that COVID-19 pandemic changed well-being perception since there is no prior study.

Ethics Statement

The research was approved by Psychology's Faculty ethics committee in the University of Colima. Likewise, it is considered risk-free. The confidentiality of the information was respected and no data that would allow the participants to be identified was requested.

Informed Consent from the Participants' Legal Guardians (if the participants were minors)

Written informed consent to participate in this study was provided by those over 18 years of age or legal guardian of minor participants, as well as the informed consent of minors.

Author Contributions

García-Avitia, Márquez-González and Pérez-Ruvalcaba conceived the idea. Márquez-González created the written instrument and devised the application procedure. Pérez-Ruvalcaba performed the data collection. García-Avitia and Márquez-González developed the theory. Pérez-Ruvalcaba performed the computations. García-Avitia applied the analytical methods. Draft preparation was done by García-Avitia. All authors participated in writing, discussed the results, and contributed to the final manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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Dyadic Interactions, Communication and Regulation Skills: Associations with Screen Use in Toddlers from Buenos Aires

Lucas G. Gago-Galvagno[a, b, d]*, María del Pilar Castillo[a, b], Marcos A. Fernández[b], Angel J. Tabullo[c, d], Stephanie E. Miller[e], Angel M. Elgier[a, b, d], Susana C. Azzollini[a, b, d]

[a] *Interamerican Open University, Argentina*
[b] *University of Buenos Aires, Argentina*
[c] *Institute of Human, Social and Environmental Sciences (INCIHUSA), Argentina*
[d] *National Council for Scientific and Technical Research (CONICET), Argentina*
[e] *University of Mississippi, Oxford, USA*

*Corresponding author. E-mail: lucas.gagogalvagno@uai.edu.ar

Background. Screen time has increased, with more frequent use at younger ages during the developmental process. International pediatric associations recommend that its use be minimal before three years of age. However, several studies have shown that in this age range, its use is for at least one hour per day, and in general without the accompaniment of an adult and with no consideration of age-appropriate content. Furthermore, negative associations between screen use in hours and minutes were reported with different cognitive abilities (e.g., language, executive functions, attention, memory) during this period. Many of the studies carried out on associations between these variables used questionnaires or parental reports. This is why it becomes important to study how screen time is associated with early interactions between primary caregiver and toddlers and with early cognitive skills, using measures that observe behavior directly, and in a non-WEIRD sample [a WEIRD population is White, Educated, Industrialized, Rich, and Democratic – ed.] from low-to-medium SES backgrounds in Latin America. This could generate interventions to promote early cognitive development, and evaluate what type of responsible use can be provided for screen consumption in the early years.

Objective. To describe the use of screens in toddlers of low-to-medium SES, compare caregiver–toddler interactions when engaged in play with digital or physical stimuli (with screens or toys), and examine screen use associations with regulation, early communication skills, and sociodemographic variables.

Keywords:
toys, screen, parent–child interaction, regulation, communication, toddlers

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Design. A mixed quantitative research sample was of 33 dyads of low-to-medium-SES primary caregivers and toddlers from 12 to 36 months (M.age = 27.2 months, SD = 7.04, female = 16) from Buenos Aires, Argentina. Sociodemographic and screen use questionnaires, cognitive tasks of regulation and communication, and two free-play sessions of six minutes (i.e., with toys and screens) were used.

Results. Caregivers reported that their toddlers were exposed to TV, background TV, and cell phones for more than one hour per day with different content types. Caregivers generally preferred toys to screens, had a negative view of screens, and reported using them to distract their toddlers. Play sessions with toys promoted more verbal and non-verbal interactions between caregivers and toddlers, and these interactions were positively related to cognition. Also, TV use had differential correlations with toddlers' interactions depending on whether it involved verbal or non-verbal communication. Finally, negative associations of TV and background TV with cognitive and socioeconomic variables were found.

Conclusion. It would be important to encourage participation in traditional games or other face-to-face interaction activities and develop interventions focused on parent education-related screen use, child development, and tips for engaging in quality interactions with toddlers.

Introduction

The American Association of Pediatrics (APP) produced a guide for parents in 1999 (revised in 2011 and 2013) that focused on prohibiting screen time in toddlers and restricting it to two hours per day for older children. Before publishing its revised findings and recommendations in 2016 (Council on Communications and Media, 2016a; 2016b), the AAP conducted a review of up-to date-evidence (Chassiakos et al., 2016). The new guidelines established that toddlers should not be exposed to screens until they are 18 months old unless these are interactive media such as video calls. Starting at 18 months, educational content is recommended if caregivers participate and interact. From 2 to 5 years old, the caregiver should help interpret the content, and usage time should be restricted to one hour per day. In any case, today the APP (APP, n.d.) suggests that, since children and adolescents can have many different types of interactions with technology, it is recommended to consider the quality of interactions with digital media instead of establishing specific time restriction guidelines. Other entities (Canadian Pediatric Society, 2017) also recommend that screen use be supervised by an adult to prioritize educational content appropriate for the age, and that does not interfere with sleep or communication.

Several papers have reported that the use of screens has increased in the daily lives of toddlers (Chen & Adler, 2019; Grané, 2021; Madigan et al., 2020; Rayce et al., 2024; Sas & Estrada, 2021; Simaes et al., 2022). Bergmann et al. (2022) published results regarding the screen use of 2,209 infants and toddlers aged 8–36 months during pandemic quarantines in 12 countries. Caregivers reported that even without online education requirements, toddlers were exposed to more screen time during lockdown than before it. Along the same lines, a meta-analysis found that only a quarter of children under 2 years old and a third between 2 and 5 years old meet the

screen time guidelines. In addition, those who use screens 2 hours or more a day are more likely to have behavioral problems and lower cognitive skill scores (McArthur et al., 2022).

Among the negative effects of screen use are increased adiposity; sleep problems and aggressive behaviors; worse scores in executive functions and motor development; fewer physical activities and more sedentary activities, along with worse behavioral and emotional outcomes (Li et al., 2020). Furthermore, recent lines of evidence suggest a negative impact of screen exposure on children's brain development. Structural magnetic resonance imaging (MRI) showed that screen use affected the microstructural integrity of the brain's white matter in preschool children (Hutton et al., 2020). A further study found that a composite measure of screen times predicted lower cortical thickness and sulcus depth in children's temporal, parietal, and occipital cortexes, indicating a potentially detrimental effect of screen exposure on brain development (Hutton et al., 2022). Along the same lines, a recent longitudinal study showed that children's longer daily screen times were associated with lower connectivity within fronto-striatal circuits involved in inhibitory control, and this effect was mediated by an increased sensitivity to short-term rewards (Chen et al., 2023).

Regulation is an essential capacity for cognitive development, since it predicts language, social skills, mental health, academic achievement, and the type of occupation in later years (Ahmed et al., 2019; Moffitt et al., 2011; Woodward et al., 2017). Based on parental reports and behavioral measures, excessive exposure to TV and cell phones at home generates a decrease in regulatory abilities in preschool children (Munzer et al., 2019; Nathanson et al., 2014; Radesky et al., 2014). Media exposure (computer, cell phone, TV) in the first years of life negatively predicts subsequent regulatory capacities (Cliff et al., 2018; Lee et al., 2024). Lee et al. (2024) found in a meta-analysis that there was a significant association between the frequency of screen use by children and performance of regulatory tasks: the longer the toddlers used them, the lower their regulatory performance.

Regarding language, the meta-analysis by Madigan et al. (2021) associated more screen time and background TV with smaller child vocabularies. However, better quality of screen use (educational and co-viewing) was found to be positively associated with a child's language skills. In another integrative review study (Gago Galvagno et al., 2022b), it was found that these technological devices were negatively associated with communication skills, although this was moderated by the company and scaffolding of caregivers during the activity. Rayce et al. (2024) found in a sample of 31,125 Danish children that excessive screen use (> 1 hour) was negatively associated with the language of toddlers aged 2 to 3 years. Empirical studies have reached similar results (Medawar et al., 2023; Panjeti-Madan et al., 2023). Longitudinal studies showed lower cognitive abilities during preschool years if the age of onset was during toddlerhood, but no long-term effects were studied (McArthur et al., 2020; Supanitayanon et al., 2020). Most of the studies included in these reviews used parent reports, both for screen use and cognitive abilities (Gago Galvagno et al., 2022b, Madigan et al., 2021). Although most of these international studies demonstrate negative relationships between screen use, cognition, and language, it is necessary to highlight that these studies do not show negative

relationships between all measures of screen use, cognition, and language development (e.g., some have contradictory results or lack significance). Other studies find no negative associations between screen use, cognitive development, and language (Karani et al., 2022; Li et al., 2020). For example, two other meta-analyses on the relationship between screen time and psychological impacts (Ophir et al., 2021) and executive functions (EF) (Bustamante et al., 2023) found no significant statistical associations between the key variables. Some studies demonstrating benefits (e.g., problem-solving, imitation ability and word learning, improvements in mathematics and reading ability of preschool children) are found when considering variables such as context, content, or the type of interaction that took place between the toddler/child and the caregiver (Madigan et al., 2021; Medawar et al., 2022; Xie et al., 2018). Thus, results in this area are mixed.

One common hypothesis for why screen use may show negative effects on cognition and language is the displacement theory. This suggests that screen use may come at the expense of time engaged with more developmentally appropriate and rich stimuli important for development (e.g., involving quality reciprocal human interaction and exploration in the physical environment, Bustamante et al., 2023). Research examining children's interactions with physical toys aligns with this hypothesis, as toy interaction has been shown to be important for cognitive development since it stimulates symbolic games, problem-solving, physical activity, self-regulation, and social and linguistic interactions (Milteer et al., 2012; Quinn et al., 2018). Furthermore, several researchers have found that human interaction such as child-directed language and caregiver support for the activity is positively associated with children's cognitive development, regardless of the mediating object they are sharing (Bukhalenkova et al., 2023; Duch et al., 2013; Foursha-Stevenson et al., 2017; Medawar et al., 2022). However, it has been seen that play experiences in early childhood are compromised by the impoverished quality of interactions with primary caregivers during joint play with electronic games (battery-operated or digital) or mediated through screens (Carr & Dempster, 2021; Munzer et al., 2019). Lee and Wood (2021) examined support and scaffolding in 32 dyads using physical and virtual blocks and puzzles in 10-minute sessions. In general, caregivers provided more support in the 3D context than in 2D. On the other hand, Archer et al. (2021) observed 30 dyads (with children aged 12 to 24 months) as they introduced and interacted with novel and familiar mobile technologies and found that familiarity with the device was associated with fewer scaffolds, interactions, and more passive activities. Second, more varied verbal scaffolding was related to higher developmental scores, although when faced with new technologies, parents showed more verbalizations with older children. Finally, the researchers propose that children's interest in mobile technology is not inherent and increases with age.

These results could be interpreted considering Sociocultural Psychology theory. A mediating object is any tool, symbol or artifact that facilitates the interaction between the individual and his or her social environment, allowing the co-construction of knowledge. Screens could be objects that do not include interactions with others and require mostly passive consumption, while traditional toys, such as building blocks, dolls or puzzles, act as mediating objects that invite the active participation of

both the child and the caregiver. Through these toys, caregivers can guide toddlers in their learning, in what L.S. Vygotsky (1978) called the zone of proximal development (ZPD), where the child is able to perform tasks with the help of another, but not yet independently (Archer et al., 2021).

Finally, it has been found that social vulnerability is associated with greater use of screens and less time sharing with toddlers (Celik et al., 2021; Gago-Galvagno et al., 2023). In the last third of 2022, statistical evidence shows that, in Latin America, the poverty rate was 32.1% and extreme poverty 13.1% (CEPAL, 2022). At the beginning of 2024, there were high levels of social inequality and inflation in most of the countries of the region, with a Gini index greater than .40 (World Bank, 2024). It should be noted that socioeconomic status (SES) was negatively associated with screen time during confinement and positively with caregiver screen time, caregiver attitudes toward toddler screen time, and the age of the child. These features make it important to conduct research in these samples from disadvantaged social contexts to better understand the differences in screen use and its relationship to language and cognition, which will be important to developing effective interventions tailored to toddlers' contextual backgrounds.

The gaps in scientific knowledge the present research aims to fill are due to the lack of studies that use cognitive and behavioral tasks instead of relying solely on questionnaires or parental reports in samples of toddlers from low- to middle-income countries, specifically in Buenos Aires, Argentina. Much of the previous research on screen use and interactions with caregivers has focused on preschool children in high-income countries (WEIRD samples) and has used methods that may be more susceptible to bias, such as parental reports. Another goal of this study is to continue finding results, given that previous studies have shown mixed outcomes regarding the impact of screens on cognition in this age range.

The research questions of this study are: Is there a difference on observational dyadic verbal and non-verbal interactions between caregivers and toddlers aged 12 to 36 months from low-to-medium SES from Buenos Aires, depending on which mediating object (screen or standardized toys) they used for 5-minute free-play sessions? How are parents' reports of toddler's screen time use with different devices (TV, PC, Cell Phone and Tablet) related to communication (observational dyadic interactions and expressive and receptive abilities) and regulation skills (working memory, cognitive flexibility, and inhibition), considering sociodemographic variables in a non-WEIRD sample? To respond these questions, the objectives of the research are to describe the caregivers' reports of time use and the content of toddlers' screen usage; explore caregivers' perceptions of screens use among toddlers; compare the interactions of dyads in free-play sessions with traditional toys and screens; and associate communication and regulation skills with screen time, sociodemographic variables, and interactions during free-play sessions. Based on our review of the literature and Sociocultural Psychology, the hypotheses of this study are a) screen times in 1-to-3-year-old toddlers from low-to-medium-SES will exceed those recommended by pediatric associations and with diverse types of content; b) more verbal and non-verbal interactions will be observed in free-play sessions with toys compared to screen-based sessions; c) higher screen use will be negatively correlated with cognitive skills and SES.

Methods

Participants

Sampling was non-probabilistic, intentional, and snowball type. From 36 dyads, 4 children were excluded because of age (>36 months) and 2 because of prematurity. We thus evaluated 33 caregivers and toddlers (M.age = 27.2 months, SD = 7.04, female = 16, range 12–36 months) from low-to-medium-SES attending daycare centers (n = 28) and at homes in shantytowns of the Autonomous City and the Province of Buenos Aires (n = 4). The daycare centers were accessed through a regional director of the institutes, which also provided contacts from caregivers who were interested in participating in their homes.

Measures

Ad-hoc Sociodemographic Questionnaire: Data were collected on gender, age, nationality, and city where the toddler resides. Questions were asked about the relationship of the interviewee to the toddler, the toddler's health history, and the educational level and occupation of the caregiver. Socioeconomic questions were asked such as: how many people live in the home, the number of bedrooms in the home, whether there is a bathroom at home, and whether in the last six months, the household income covered basic needs related to food and healthcare. A composite score of the amount of unmet basic needs (UBN) was formed considering overcrowding, caregivers' educational level (incomplete secondary or less), occupation (or unemployed), lack of a bathroom in the home, less than 3 or 4 meals a day, and lack of access to healthcare.

Screen Use: We asked how many hours, in a typical day, the toddler was exposed to background TV, TV, PC, cell phones, and tablets; the type of content that was predominantly consumed (entertainment, music, educational) and if it was appropriate for the age (for adults, for toddlers, both). In addition, the caregiver was asked open questions about whether it is better to use screens or traditional toys with their toddlers, whether they knew the recommendations regarding the responsible use of screens from the national and international Pediatric Societies, and why they left the toddler alone to use various screens.

Free Play with Toys and Screens: To explore the interaction behaviors during the sessions with the use of cell phones and toys, the free-play procedure was applied that is widely used in observational cognitive development psychology (Archer et al., 2021; Lee & Wood, 2021). Toddlers interact spontaneously with toys and screens in an unstructured environment, which allows them to observe natural behaviors in a context closer to their daily lives. A children's carpet (120 cm long × 90 cm wide) and three toys that remained constant in all sessions (toy car, stuffed animal, and ball) were used. The dyads were asked by a female researcher to play and interact as if they were at home. A Sony HD HDR-CX160® camera was placed out of sight of the dyad. The session was recorded for 6 minutes (measured with a Model CR202 stopwatch from the Galileo Italy® line) once they were alone in the room. When the time was up, the experimenter entered and gave the pair a cell phone with a children's video of the toddler's preference (after asking the caregiver) and they were again asked to play and interact as if they were at home. The first and last minute and

a half of the video were eliminated to avoid the fatigue and learning effect. The intermediate five minutes were then analyzed. The type of play session (toy or screen) was counterbalanced across participants, being that some participants experienced the toy session first, followed by the screen session, while others experienced the screen session first.

Two researchers analyzed the videos. Based on the interaction behaviors observed in previous studies with toddlers (Archer et al., 2021; Mundy et al., 2003), the following behaviors were coded according to established criteria: initiation of joint attention (pointing and showing an object by the toddler), responding to joint attention (following an adult's pointing or gaze), toddlers' verbalizations (isolated words and babble), looking at object (amount of time that the toddlers look at the screen or toy), verbal scaffolding (words directed at objects or the contents of the screen), physical scaffolding (physical guidance for the toddler to perform a task), and time off camera. Inter-rater reliability (intraclass correlation), exceeded .85 for all measures ($p < .001$).

Early Executive Functions Questionnaire Spanish Version v. 1.1. (EEFQ, Hendry & Holmboe, 2020). A parent report scale of 28 items to measure EF between 12 and 36 months was used. Parents had to respond to a Likert scale with eight options (1. never, 2. almost never, 3. less than half the time, 4. half the time, 5. more than half the time, 6. almost always, 7. always, 8. does not apply), rating statements about their child's behavior over the past two weeks, referring to different everyday situations where children have to regulate their behaviors, like: "Has stopped reaching for something when you have said "no/don't touch" or something similar" or "The child has spent a lot of time trying to do something difficult". This questionnaire has four subscales: flexibility (shifting focus to adapt to changes in the context), regulation (emotion regulation), inhibition (inhibits preponderant responses), and working memory (active manipulating of information).

This scale (Hendry & Holmboe, 2020) has three different tasks (which are then calculated with the score of each scale). They were applied by the same male researcher in a quiet room without distractions, and they were recorded. The tests were presented in order by the researcher on a table at the toddler's height, with the primary caregiver present. Two researchers analyzed inter-rater reliability (intraclass correlation) for these tasks, and they exceeded .96 for all measures ($p < .001$).

a) *The Waiting Game (inhibition):* The toddler is told to wait to eat an Oreo® chocolate chip cookie. The time-lapse options ranged from 0 to 30 seconds.
b) *The Finding Game (working memory):* The toddler is shown how a toy was hidden in one of two opaque containers. The hiding places were interspersed four times. The number of times (from 0 to 4) that the child found the toy is counted.
c) *The Sorting Game (flexibility):* five small and large spoons were given to the toddler who was asked to sort them in two different-sized transparent boxes according to the dimension (large spoons in big boxes and vice-versa). Then, they must reverse sorting (large spoons in little boxes and vice-versa). Response options ranged from not being able to sort any spoons to being able to sort them all on the reversal trial.

This scale showed adequate construct validity, limited floor and ceiling effects for subdimensions, appropriate stability, and convergent validity with parent reports of attentional control (see Hendry & Holmboe, 2020). For this sample, McDonald's omega was from .60 to .83 for the subdimensions.

Preschool Language Scale (Fourth Edition, PLS-5, Zimmerman et al., 2011). To assess receptive communication skills, children were asked to point to the object corresponding to a word uttered by the experimenter. The evaluation involved determining the number of accurate identifications out of ten trials, which progressively increased in difficulty through the introduction of more distracting stimuli and challenging vocabulary. Expressive communication was assessed by promoting toddlers to verbally respond to an image presented by the experimenter, such as asking, "What is it?" The task was also video recorded. The number of correct identifications out of nine trials was recorded. A primary coder evaluated both receptive and expressive behaviors across all videos, while a second coder documented instances of these behaviors in a randomly selected subset of 15 videos (25% of the total). Inter-rater reliability (intraclass correlation) exceeded .97 for both communication measures ($p < .001$).

Procedure

Free-play sessions with each dyad and cognitive tasks took place in spaces without environmental noise and adequate illumination at a daycare center at Buenos Aires from May 2022 to May 2023. To minimize potential biases in data collection, the same two researchers participated in all the evaluation and coding procedures to increase inter-rater reliability, enhances the rigor of qualitative analysis, allow data triangulation, and distribute the workload, thereby ensuring more objective and thorough results. Also, all video-recorded sessions followed a standardized protocol, ensuring consistency in instructions, environment, and materials across participants, thus reducing contextual variability. All measures were video-recorded for later analysis. At first, the toddler was placed on the caregiver's lap or on a nearby chair, and in front of the researchers with a table in between. Then, the three tasks were applied by the same male researcher in the following order: waiting, finding, and sorting. Second, the free-play session was applied by the same female researcher. Once the behavioral evaluation was completed, both researchers read the sociodemographic and screen-use questionnaire face-to-face and they answered any questions about the research to the partens. Finally, the caregivers were given information on the healthy use of screens. The evaluation takes an hour and was performed on the same day in the morning by two psychology researchers specializing in toddlers' cognitive development, with academic work in the area.

Data analysis

The JAMOVI program from RStudio v. 2.4.8 was used. (The JAMOVI project, 2023). First, frequency measures of central tendency and dispersion were calculated to test the hypotheses that screen times in toddlers from 1 to 3 years old from low-to-medium SES will exceed those recommended by pediatric associations and to describe the type of content they consumed, and to describe caregivers' perceptions on screen use. Also, the Shapiro-Wilk normality test was used, and since an abnormal distribution

was found for most of the variables and due to the small sample size, non-parametric statistics were used.

The Mann-Whitney U test was used to test the hypothesis that significantly more interactions will be observed in traditional toy sessions compared to screen-based ones. Finally, Spearman correlations were applied to test whether higher screen use will be negatively correlated with cognitive skills, while screen use will be positively associated with higher SES.

The data that support the findings of this study are openly available at: https://osf.io/6rwem/?view_only=9906bbb61e464b4eb1e00c551bf0c02a

Results

Descriptive Statistics on Screen Use and Cognitive Variables

It was found that on average the toddlers' reported screen use was greater than one hour for all devices, except for the PC and Tablet. The most used type of device was background TV, with a usage time of approximately five hours a day, followed by TV (approximately two hours of use) and cell phone (one hour of use). In the case of the PC and Tablet, the asymmetry values demonstrate a floor effect for the measures of the central tendency of these variables (As> 3). The results are summarized in *Table 1*.

Table 1

Descriptive Statistics for Screen Use and Cognitive Variables

						Asymmetry		Kurtosis	
	Mean	**Med**	**SD**	**Min**	**Max**	**Asym.**	**EE**	**Kurtosis**	**EE**
Background TV	5.300	5	4.290	0	15	.390	.40	–.864	.79
TV	2.090	1	2.078	0	7	.991	.40	–.143	.79
Cell phone	1.303	1	1.468	0	6	1.707	.40	2.970	.79
PC	.015	0	.087	0	.5	5.745	.40	33.000	.79
Tablet	.030	0	.174	0	1	5.745	.40	33.000	.79
Receptive Com.	5.000	5	4.450	0	10	.000	.41	–2.012	.80
Expressive Com.	3.656	3	3.588	0	9	.402	.41	–1.453	.80
Inhibition	36.96	36	8.545	14	50	–.342	.42	.291	.82
Flexibility	37.76	38.5	9.368	15	56	–.654	.42	.208	.83
Working Memory	37.16	39	7.710	21	49	–.559	.42	–.375	.83
Regulation	38.48	40	11.65	9	55	–.583	.40	–.186	.79

The types of content entertainment ($n = 13$, 39.4%), educational ($n = 10$, 3.3%), and music ($n = 10$, 3.3%) were distributed almost equally in the sample, while the

majority of toddlers consumed content appropriate for their age ($n = 25$, 75.8%) and the minority consumed content for adults and/or older children ($n = 8$, 24.2%).

Open Responses on Screen Use

For the effect that caregivers think screens have on their toddlers, two (6%) stated that they did not know the effects, 18 (50%) that they have negative effects (e.g., "It hurts the eyes," "They lose concentration.", "They are addictive", "They cause tantrums"), six (16.6%) that they have mixed effects (e.g., "It is positive, because it teaches him colors, numbers, animals", "With the screens he stops socializing, does not enjoy the surroundings, withdraws", "It is bad for the eyes, but that can be avoided with responsible use"), and eight (22.2%) only stated positive effects ("They can learn things from screens, like animals. We also use it to dance". "Teaches").

Regarding whether caregivers prefer traditional toys or screens, 28 primary caregivers (84.8%) responded that traditional toys are more favorable than screens (e.g., "Toys are better because screens can expose children to content that may not be appropriate for their age", "With toys you can give them things appropriate for their age", "Toys because they learn to grasp more, they know how to move, they know what they are doing", "Toys, imagination"), while five (8.44%) responded that both are necessary for the education of their toddlers ("Both, because the screen has many different animals, and with toys, you cannot buy everything they see on the screens", "Screens, he knows things through screens", "Both, because screens can teach and so can toys. Combining makes it possible to identify what is used on the screen". No primary caregiver stated that they prefer screens to traditional toys.

Regarding whether they know the recommendations of pediatric societies, 27 (81.1%) of the adults stated that they did not know them, and only 6 (18.9%) said that they knew them (*e.g.*, "Yes, it is harmful to the eyes", "Yes, the child should watch a maximum of one hour per day", "My private pediatrician says that we should reduce the screen time due to visual problems and sedentary lifestyle").

Finally, regarding why they are given screens, 30 (9.1%) caregivers responded that they used them to distract their toddlers while they were doing something else, to keep them calm or so that they could do another activity (*e.g.*, "Because I have to go to work and get distracted for a moment. So that she doesn't cry", "So that she stays calm, we give her the phone so she can calm down") while only 3 (9.9%) stated that they never leave their toddler alone with the screen ("She is never alone with screens. At most if we go in the car", "I don't give them to him, I leave him toys, markers and little books").

Comparison of Communication Behaviors Based on Free Play with a Toy or Screen

Regarding communication behaviors of the dyads, it was found that in most cases both the caregiver's and the toddler's behaviors were significantly greater in terms of communication during the free-play session with traditional toys than with screens. Specifically, more response behaviors and initiation of joint attention and toddlers' verbalizations were found in the test with traditional toys, with moderate to high effect sizes for this age range. The same results were found with maternal verbal and physical scaffolding behaviors. The results are summarized in *Table 2*.

Table 2

EF and Early Communication by Type of Objects during Free-Play Session

	Type of Free-Play Session							
	Traditional Toys			Cell Phone			U	Rosenthal
	Range	MR	SR	Range	MR	SR		
Toddler Interaction Behaviors								
Responding to joint attention	0–16	42.95	1374.5	0–5	22.05	705.5	177.5	.639***
Initiation of joint attention	0–11	34.95	1118.5	0–10	28.95	897.5	401.5	.203
Initiation of behavioral request	0–10	39.80	1273.5	0–3	25.2	806.5	278.5	.505***
Verbalizations	0–15	41.06	1314	0–6	23.94	766	238	.496***
Adults Interaction Behaviors								
Verbal scaffolding	0–28	41.37	1282.5	0–17	22.92	733.5	205.5	.561***
Physical scaffolding	0–14	43.16	1381	0–7	21.84	699	171	.691***
Off camera (seconds)	0–240	34.61	1073	0–264	29.47	943	415	.148

Notes: MR: Mean Ranks, SR: Sum of Ranks.

Correlations Between Interaction Variables During Free-Play Sessions and Cognitive and Screen Use

In free-play sessions with traditional toys and cell phones, positive correlations between interaction behaviors with communication and executive functions variables were found. Specifically, there were positive associations between the initiation of joint attention and toddlers' verbalizations with receptive and expressive communication, working memory, and cognitive flexibility. The effect size was generally higher in traditional toy free-play sessions than in cell phone play sessions.

Regarding screens, only background TV and TV use were positively associated with responding to joint attention during cell phone free sessions, and to initiation of joint attention in free-play sessions, and there was a negative association with TV use and toddlers' verbalization during traditional free-play sessions with toys. These results are shown in *Tables 3* and *4*.

Correlation Between Screen Use, Cognitive and Sociodemographic Variables

Regarding the use of screens and cognitive variables, only statistically significant and negative associations were found between the time spent with background TV and receptive ($Rho = -.463$, $p = .008$), expressive communication ($Rho = -.533$, $p = .002$), and cognitive flexibility ($Rho = -.492$, $p = .006$). Longer caregivers reported that the toddler's time exposed to background TV was related to lower performance on cognitive variables. Finally, more UBNs were related to higher TV use ($Rho = .578$, $p < .001$). No significant associations were found between the other types of screens and the communication and regulation variables ($p > .05$). The results of the correlations are presented in Table 5.

Table 3

Associations Between Communication, EF, and Sociodemographic Variables with Interactions During Traditional Free-Play Session with Toys

	Communication		Executive Functions			Regulation	Screen Use Reports				
	Receptive Communication	Expressive Communication	Cognitive Flexibility	Inhibition	Working Memory		Background TV	TV	PC	Cell Phone	Tablet
Toddler Interaction Behaviors											
Responding to joint attention	−.300	−.267	−.298	−.230	.054	.054	.410*	.439**	−.334	−.038	−.061
Initiation of joint attention	.571**	.306	.313	.340	.436**	.128	−.115	−.100	−.190	−.013	.064
Initiation of behavioral request	.400*	.203	.247	.291	.355	.286	−.224	−.178	−.218	−.237	−.073
Verbalizations	.724***	.555**	.525**	.534**	.495**	.152	−.284	−.408*	−.295	−.036	−.057
Adults' Interaction Behaviors											
Verbal scaffolding	.285	.140	.187	.213	.489**	.046	−.048	−.133	−.178	.007	.175
Physical scaffolding	.272	.182	.135	.154	.311	.202	−.262	−.176	−.207	−.062	.065
Off camera	−.176	−.052	−.010	−.228	−.301	−.468	−.019	.148	.300	.081	−.264

Note: Spearman Rho partial correlation. Inserting age as a covariable.

Table 4

Associations Between Communication, EF, and Sociodemographic Variables with Interactions During Cell Phone Free-Play Session

	Communication		Executive Functions				Screen Use Reports				
	Receptive Communication	Expressive Communication	Cognitive Flexibility	Inhibition	Working Memory	Regulation	Background TV	TV	PC	Cell Phone	Tablet
Toddler Interaction Behaviors											
Responding to joint attention	−.085	.014	−.057	−.024	.040	.198	.125	.212	−.103	.162	−.069
Initiation of joint attention	.126	.103	.302	.283	.432*	.134	.240	.364*	−.174	−.292	−.088
Initiation of behavioral request	−.058	−.049	−.018	−.041	−.065	.285	−.130	−.057	−.109	−.261	−.204
Verbalizations	.568**	.357	.425*	.366	.235	.253	−.127	−.161	−.220	.061	−.158
Adults Interaction Behaviors											
Verbal scaffolding	.315	.189	.093	.185	.436*	.067	.006	−.062	−.290	.235	.218
Physical scaffolding	.208	.345	.327	.057	.455*	−.166	−.166	.017	−.201	.022	.192
Off camera	.189	.337	.054	−.102	−.116	−.276	−.276	−.064	−.140	.027	−.140

Table 5

Correlations Between Communication, Executive Function, Screen Use, and Sociodemographic Variables

	Receptive Com.		Expressive Com.		Inhibition		Flexibility		WM	Regulation	Background TV	TV	Tablet	PC	Cell phone	UBN
Receptive Com.	–															
Expressive Com.	.788	***	–													
Inhibition	.543	**	.389	*	–											
Flexibility	.720	***	.841	***	.564	**	–									
WM	.546	**	.475	**	.414	*	.582	***	–							
Regulation	.139		.274		.059		.376	*	.240	–						
Background TV	–.463	**	–.533	**	–.077		–.492	**	–.182	–.169	–					
TV	–.113		–.218		–.009		–.273		.005	–.270	.578	–				
Tablet	–.109		–.209		–.246		–.279		–.097	–.046	–.009	–.066				
PC	–.238		–.070		–.020		–.054		–.065	–.223	.056	–.066				
Cell phone	.129		–.023		.209		–.134		.105	–.233	.233	.151				
Amount UBN	–.067		–.052		–.009		–.141		.088	–.149	.233	.434	*			

Note: Com = Communication, WM = Working Memory, UBN = Unsatisfied Basic Needs.

Discussion

The objective of this research was to describe the use of screens in a non-WEIRD sample from Buenos Aires, to explore parents' perception of screens effects on toddlers' development, compare interactions between the primary caregiver and toddler dyads considering the type of objects they used to play (cell phones or traditional toys), and associate these communicative interactions with toddlers' cognitive ability, screen times reported by caregivers, and sociodemographic variables. Regarding the hypothesis that screen times in 1-to-3-year-old toddlers from low-to-medium-SES will exceed that recommended by pediatric associations, it was found that screen times were longer than recommended by these associations and that the content consumed was diverse. Most caregivers believed that screens produced negative effects, and that it is better to use traditional toys. They reported not knowing the recommendations of pediatric associations and used screens as a distraction for their toddlers.

About the first research question, differences were found when observing the dyads' verbal and no-verbal interactions depending on which mediating object they used for 5-minute free-play sessions. A greater number of verbal and non-verbal interactions were found for both toddlers and caregivers in the free-play sessions with traditional toys, and in both sessions, corroborating the hypothesis, and the interaction behaviors were positively associated with the cognitive skills evaluated.

Considering the second research question about how a caregiver's report of toddler's screen time use with different devices related to communication and regulation skills, considering sociodemographic variables in a non-WEIRD sample, the hypothesis was partially corroborated. TV and background TV use were positively associated with a toddler's nonverbal interaction behaviors and parents educational level, and negatively associated with the number of unmet basic needs. Finally, toddlers' verbal interactions were negatively associated with TV use only in the free-play session with toys.

As in other empirical and review studies (Gago Galvagno et al., 2022a; Madigan et al., 2020; Medawar et al., 2023; Panjeti-Madan et al., 2023; Rayce et al., 2024) screen time was greater than recommended by pediatric associations. These antecedents also coincide with the results of this research in that, on average, children were exposed to more than one hour per day, specifically to cell phones, TV, and background TV.

About the associations between communication, regulation, and screen use, the results also coincide with previous research (Cliff et al., 2018; Gago Galvagno et al., 2020, Madigan et al. 2021; Lee et al., 2024), since the greater the screen times, the lower the reported regulation and language scores. However, it is necessary to highlight that only background TV effects were significant. This could be because that is what toddlers are exposed to for the longest time, and as some studies show, such exposure hinders communication channels at home and generates distracting stimuli in the environment that could reduce toddlers' sustained attention (Nichols, 2022; Ribner et al., 2021). Furthermore, caregivers' responses in the open question section indicated that they generally use screens to distract their toddlers. Therefore, it could be inferred that they do not usually accompany this activity. The absence of associations with other types of screens could be due to low time of use, the accompaniment

of caregivers during their use, or the fact that toddlers mostly see content appropriate for their age.

On the other hand, the cognitive regulation and communication skills measured with the behavioral tests were positively associated with the behaviors performed by both the toddler and the caregiver during both sessions. Toddlers with higher and more regulated levels of communication could be more receptive and elicit more behaviors, which would produce more initiations and responses of joint attention and verbalizations in parents. These results coincide with those of Archer et al. (2021), who compared children's use of their own technological devices with novel ones, and those of Lee and Wood (2021) with objects in 2 and 3 dimensions, and highlight that the cognitive abilities of toddlers are important when considering the type of interactions that they carry out during interaction spaces, regardless of the type of mediating object that was used. This highlights the importance of interventions that also consider toddlers' cognitive abilities and optimizing how parents engage with their children's interactions.

Regarding group comparisons, the greater number of interactions during free-play sessions with toys compared to screen sessions is congruent to previous work in many senses and to Sociocultural Psychology theory. First, studies have shown a negative correlation between screen use and these abilities, so this lower amount of communication and regulation (cognitive flexibility) could be partly because the screen did not elicit verbal behaviors or active interactions, distracts attention from another stimulus and the environment (so there is not a constant shifting attention, fundamental to cognitive flexibility), and is, in general, a passive activity (Gago Galvagno et al., 2022b; Madigan et al., 2021), as also demonstrated by the qualitative results of this study. Toys are mediating objects that could promote cognitive development. The lack of associations with inhibition, working memory, and regulation could be because background TV contributions primarily affect areas of cognitive development that are more directly related to social interaction and active learning, such as cognitive flexibility.

Second, and in line with the previous paragraph, sharing toys with toddlers involves the use of stories, labeling objects verbally, moving them closer and further away from the toddler, and producing sounds so that the toddler can interact with them (Sosa, 2016). On the other hand, screen sharing involves showing the toddler certain content, maintaining a stable posture, and pointing to and naming characters or situations that occur. Therefore, it could be stated that the two situations generate interaction dynamics that are very different from each other, with toys promoting and requiring verbal and physical interactions to generate a communicative environment, while the use of screens can dispense with any type of communication to be attractive to toddlers.

Lastly, the small number of interactions that adults carry out with toddlers during interacting sessions with screens is very striking. This could be because toddlers spend more time on screens alone compared to sharing screens with an adult. As caregivers stated, using screens to distract the children means that they are alone during use. It would be important at this point to promote caregiver communication while using screens with the toddler so that they can generate greater pointing and verbalizations during these periods, and thus contribute to the toddler's cognitive

development. Previous research shows that the more scaffolding on the part of the caregiver during the use of screens, the fewer the negative effects generated by them (Gago Galvagno, et al., 2022b; Karani et al., 2022; Li et al., 2020).

Regarding the differences in the associations between screen use, verbal and non-verbal communication, it could be interpreted that the positive associations of non-verbal behaviors (joint attention and responding to joint attention) are due to the higher consolidation of these behaviors within the study age range, which makes them more readily available for toddlers to use them during interactions (Miller & Marcovitch, 2015; Simaes et al., 2022). Additionally, screens could elicit more non-verbal behaviors because the toddler can point out and share with his or her caregiver the content that is being viewed. Regarding the negative associations of verbal communication and TV use, they go hand in hand with other studies (Li et al., 2020, Madigan, 2021; Rayce et al., 2024). It could be expected that, during free-play sessions with toys, toddlers who are more accustomed to watching TV interact less verbally when using toys because: a) they are less accustomed to traditional games; b) they already have a lower verbal repertoire due to the time spent with screens; c) caregivers do not know how to play during these sessions, and therefore elicit the toddler's verbal behavior to a lesser extent.

Conclusion

The relevance of this study lies in the fact that it works with a non-WEIRD sample of dyads: Argentine toddlers and caregivers of low-to-medium SES. Most studies have used questionnaires and measured verbal communication variables, whereas this study is behavioral and measures both verbal and non-verbal communication and regulation variables. The results of the study highlight the importance of continuing to teach responsible use of screens, promoting free play with toys, working with the type of interactions that caregivers engage in during play with screens, and highlighting the possible negative effects of screens on verbal communication and regulation. It would be beneficial to explore strategies to balance screen times with activities that encourage face-to-face communication and social interaction, thereby strengthening communication and emotional regulation skills in children and adults.

Limitations

The sample size was small and obtained with non-probabilistic sampling. The design was transversal and correlational; therefore, causality cannot be established or the development between the variables observed. Also, although communication and regulation were observed behaviorally, the time spent using screens at home was reported by the caregivers and it was not measured whether they shared their use at home.

Future studies would benefit from using larger sample sizes and probabilistic sampling. In addition, a longitudinal study could be carried out to evaluate how interactions vary over time for different play sessions. Finally, a more ecological evaluation of screen use could also be carried out at home itself where interactions occur. This would pave the way for intervention studies, aimed to promote adequate knowledge and responsible screen use practices to protect and stimulate toddlers' development.

Ethics Statement

The study obtained ethics approval from Ethics Committee for Responsible Conduct, Faculty of Psychology, University of Buenos Aires (approval ID: 20020220400165BA).

Informed Consent from the Participants' Legal Guardians

Written informed consent to participate in this study was provided by the participants' legal guardian.

Author Contributions

Lucas G. Gago-Galvagno conceived of the idea, collected data, developed the theory and performed the computations, verified the analytical methods and supervised the findings of this work. M. del Pilar Castillo and Marcos A. Fernandez collected data and verified the analytical methods. Angel M. Elgier conceived of the idea, collected data, supervised the findings of this work. Angel J. Tabullo, Stephanie E. Miller, and Susana C. Azzollini supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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Internationalization and Collaboration in Colombian Psychology During 2014–2023: A Bibliometric Analysis

Claudio Bustos Navarrete[a*], Lina Villota Castillo[b], Astrid Sarmiento Quiñones[c], Ignacio Rojas Rodríguez[a], Lina Sandoval Moreno[d]

[a] *University of Concepción, Chile*
[b] *Virginio Gómez Professional Institute, Concepción, Chile*
[c] *University San Sebastián, Concepción, Chile*
[d] *University of Valle, Cali, Colombia*

*Corresponding author. E-mail: clbustos@udec.cl

Background. Bibliometric studies are essential for understanding the development of a discipline and thus establishing policies to promote evidence-based science. In the case of Colombian psychology, no studies have yet considered the productivity, collaboration, and internationalization of this discipline jointly. In this context, the role of Ministerio de Ciencia, Tecnología e Innovación (Minciencias) research groups in promoting collaboration within Colombia is particularly significant.

Objective. To analyze the scientific productivity, degree of internationalization, and collaboration in Colombian psychology from 2014 to 2023.

Design. A bibliometric study was conducted using data from Web of Science, Scopus, and SciELO, employing bibliometric indicators. A total of 4,196 Colombian psychology articles from 2014 to 2023 were analyzed, employing various indicators to assess productivity, internationalization, and collaboration.

Results. The period was characterized by a sustained increase in productivity. An increase in internationalization was evident, as shown by a greater number of articles written in English and published in foreign journals, along with growing international collaboration, primarily with Spain and the United States. While Colombian-led research has increased, publications with foreign leading authors receive a substantially higher number of citations.

Conclusion. This is the first study to incorporate Minciencias groups into the evaluation of research productivity within Colombian psychology. The study suggests that researchers are adapting to Minciencias's evaluation criteria, with a focus

Keywords: bibliometrics, psychology, Colombia, scientific cooperation, internationalization

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on collaboration and high-impact publications. Strengths include using multiple databases and rigorous data cleaning. Future research can explore international comparisons and the impact of internationalization on research focus.

Introduction

Scientific collaboration is fundamental for the development of any discipline, as it allows complementing strengths and weaknesses of individuals and groups, and generating a critical mass of researchers specialized in specific topics (Aleixandre et al., 2013). Bibliometrics allows the measurement of researchers' collaboration and productivity. This discipline organizes scientific information from various documentary sources for subsequent quantitative and qualitative analysis. Bibliometric analysis enables the identification of fields of production, collaboration networks, and author productivity, among other aspects (Gallegos et al., 2020).

Different disciplines exhibit variations in the forms and extent of their scientific collaboration, which are reflected in their bibliometric indicators (Wagner et al., 2017). The relationship between collaboration and productivity is complex, varying across disciplines, between basic and applied levels, and within the context of domestic versus international collaboration. International collaboration generally results in a higher number of citations, with large multinational projects generating even more citations; however, this relationship depends on the discipline, being stronger in the life sciences (Glänzel & de Lange, 2002). Psychology has shown a low level of international collaboration compared to other sciences. In 1997, approximately 35% of articles involved international cooperation, increasing to 45% in 2012. By comparison, the discipline with the highest level of cooperation is astronomy, which had a cooperation rate of 68% in 1997, rising to 83% in 2012 (Coccia & Wang, 2015).

The global development of productivity in psychology is reflected in the growth of psychology in Spanish-speaking countries. At the beginning of the 21st century, around 500 scientific psychology journals were published in Latin America, covering various branches of psychology (Buela-Casal & López, 2005). Gallegos et al. (2020) conducted a meta-bibliometric review covering 1977–2015, based on 81 bibliometric studies from Ibero-America, which includes Latin America, Spain and Portugal, published in 15 regional journals. They concluded that traditional areas, such as clinical psychology, organizational psychology, and social psychology, predominated over "emerging" fields such as forensic psychology, consumer psychology, and traffic psychology and road safety. Spanish (88%) predominates over Portuguese (6%) and English (6%), with Spain (55%) leading the Ibero-American bibliometric research landscape.

Historical Development of Psychology in Colombia

Psychology in Colombia has made significant strides since its inception in 1930, advancing in both academic and applied fields. Like Latin American psychology, Colombian psychology has a scientific orientation taught in academic institutions, which includes the development of theses and participation in master's and doctoral

programs (Ardila, 2004). In the applied domain, Ardila & Castro (1973) highlight its important role in Colombian society, emphasizing its contributions to the effective use of human resources through personnel selection processes, the advancement of the educational system, and the comprehensive study of motivation and poverty. Today, the discipline continues to generate academic and scientific knowledge that addresses the challenges faced by Colombian individuals and communities (Vesga, 2021).

The history of Colombian psychology can tentatively be divided into three main stages: (a) foundation and expansion; (b) institutionalization; and (c) consolidation. The first stage, foundation and expansion, covers the period from 1930 to 197. It formally began at the university level with the establishment of the Psychotechnical Section at the National University in 1939. This evolved into the Institute of Applied Psychology in 1948, later becoming the Faculty of Psychology in 1957, and finally the Department of Psychology in 1965, solidifying its position as the principal training center for psychologists in the country. In the academic field, significant challenges were encountered, such as the lack of translations of key theoretical works, which necessitated the long-term incorporation of foreign professors (Ardila, 1970, 1999, 2004).

During the 1950s and 1960s, the discipline began to expand into applied areas, marked by the establishment of the Colombian Federation of Psychology in 1954. This organization aimed to regulate the profession and broaden its scope beyond the academic sphere, extending into industry and psychological care. Another significant development during this period was the launch of the Revista de Psicología [Psychology Magazine] in 1956, which published chronicles and specialized bibliographies, including multilingual reviews, thereby contributing to the international dissemination of the field. Despite these advancements, this initial stage was characterized by limited international engagement, with most publications being of national origin (Ardila, 1970, 1999, 2004).

From 1970 onward, experimental psychology gained prominence, coinciding with the establishment of new university programs at institutions such as Universidad de Los Andes, Universidad del Norte, and Universidad Católica de Colombia (Ardila, 1999). In 1974, under the leadership of Rubén Ardila, the so-called Bogotá Model was introduced—a generalist training system inspired by the American Boulder model. This model combined professional and academic training, preparing graduates to work across various fields of applied psychology. It represented a significant milestone, solidifying Colombian psychology as a discipline that contributed meaningfully to both theoretical development and practical application in diverse sectors (Cudina & Ossa, 2019).

The second stage, characterized by institutionalization, spans the 1980s and 1990s. It began with the enactment of Law 58 in 1983, which regulated the psychology profession, and the establishment of the psychology program at Pontificia Universidad Javeriana of Cali in 1984 (Ardila, 1999). During this period, the Colombian Society of Psychology, founded in 1979 to replace the Colombian Federation of Psychology, played a crucial role. It united the majority of Colombian psychologists until 2014 and promoted theoretical and methodological advancements through congresses (Cudina & Ossa, 2019). The 1990s ushered in further changes with the 1991 Consti-

tution and Law 30 of 1993, which, by establishing university autonomy, facilitated the creation of new academic programs. This institutionalization process culminated in 2004 with the launch of the first doctoral program at Universidad del Valle.

The third phase of consolidation began in the 2000s. In 2004, the first doctoral program was established at Universidad del Valle, alongside the emergence of two significant organizations: the Colombian Association of Psychology Faculties (Ascofapsi), which focuses on ensuring the quality of psychology education, and the Colombian College of Psychologists (Colpsic), dedicated to overseeing professional practice (Cudina & Ossa, 2019; López-López et al., 2022). In terms of productivity, the 2000s were marked by limited collaboration between national and foreign authors. Although there was increased editorial acceptance of both national and international articles, this did not necessarily translate into collaborative research efforts (Jaraba-Barrios et al., 2011).

The Current State of Psychology in Colombia: Training, Research, and Productivity

According to López-López et al. (2022), the generation of knowledge in psychology, as well as its dissemination, depends on a *knowledge ecosystem* involving factors such as the infrastructure of higher education institutions, public science and technology policies, and national and international collaboration networks. In the case of Colombia, although academic productivity has increased, driven by the availability of graduate programs, it has primarily focused on national journals. Dissemination in high-impact international journals remains limited, restricting the global visibility of the knowledge produced. This ecosystem also faces challenges due to declining investment in research and development, which decreased from .3% of GDP in 2014 to .23% in 2018, well below the levels of other Latin American countries. Additionally, pressures to meet indexing and accreditation indicators have fostered a publication culture that, while increasing the quantity of outputs, often compromises quality and international visibility. Nevertheless, efforts to strengthen scientific cooperation networks and consolidate Colombian psychology within the regional and international context are noteworthy.

In Colombia, psychology as a discipline has been consolidated in the 2020s. This is evidenced by four indicators: (a) the presence of many undergraduate and graduate programs; (b) the formation of research groups in the field of psychology; (c) the inclusion of Colombian psychology journals in indexed bibliographic databases, such as Scimago Journal Rank and Web of Science; and (d) the increase in bibliographic productivity (Puche-Navarro et al., 2022).

Psychology experienced an exponential increase in academic programs between 1970 and 2020. These programs were developed independently by universities and accredited higher education institutions, offered in face-to-face, distance, and virtual modalities. In 1973, only three programs existed nationwide, but by 2022, there were more than 100 programs and 16 doctoral programs (Puche-Navarro et al., 2022). A descriptive study conducted at the end of 2022 identified 132 active undergraduate programs, with the majority concentrated in the private sector (81%) and delivered in face-to-face modality (92.4%). The current geographic distribution of programs highlights a shift towards decentralization, with higher education institutions now

present across the country, whereas previously, training was concentrated in the capital (Torres, 2023).

Noteworthy is the growth in doctoral training in Colombia, which began with the first doctoral program at Universidad del Valle in 2004 and expanded to 16 programs by 2020. The contribution of postgraduate research to the overall productivity of Colombian psychology is noteworthy. A study examining the productivity of 13 doctoral departments found a positive correlation between the number of graduate theses advised in each department and publication in national journals (rho = .61). Additionally, a moderate correlation was observed between the number of theses and publication in international journals (rho = .41). However, discrepancies were noted between productivity reported in the CvLAC system (Curriculum Vitae de Latinoamérica y el Caribe [Curriculum Vitae from Latin America and the Caribbean]) and Scopus. These differences could be attributed to a limited publication culture within graduate programs and a focus on local dissemination, often at the expense of publishing in internationally indexed journals (López-López et al., 2022).

The consolidation of research groups in psychology is evident in the significant number of groups classified in superior quality categories and their ability to maintain their classification or advance within these categories. In Colombia, Law 1951 of 2019 established the Ministry of Science, Technology, and Innovation (Minciencias) to promote national scientific development. The ministry oversees research and development, identifying the institutions and individuals involved, the products they develop, and their modes of interaction. It primarily funds recognized institutions and groups rather than individual researchers (Ministerio de Ciencia, Tecnología e Innovación [Ministry of Science, Technology and Innovation], 2020a).

Research groups recognized in Colombia are evaluated according to the Model for the Measurement of Research, Technological Development or Innovation Groups and Recognition of Researchers of the National System of Science, Technology, and Innovation. This evaluation includes a collaboration profile with two key indicators: *cohesion*, measuring internal group collaboration; and *cooperation*, assessing intergroup collaboration through co-authorship. These two indicators are part of the Group Indicator, a polynomial that considers eight indicators, in which the cooperation indicator has a weight 4 times higher than the cohesion indicator. Publications in Web of Science and Scopus are prioritized for their visibility and impact (Ministerio de Ciencia, Tecnología e Innovación [Ministry of Science, Technology and Innovation], 2020b).

As of May 15, 2024, there were 160 registered Minciencias psychology groups throughout Colombia. According to the Minciencias evaluation model, these groups were classified into five categories, based on various criteria, including their productivity and level of collaboration, which are A1, A, B, C, and Recognized, ranked from highest to lowest. Of the 160 groups, 36 groups are category A1, 39 groups are category A, 36 groups are category B, 39 are category C, and 10 are in the Recognized category (Ministerio de Ciencia, Tecnología e Innovación Colombia [Ministry of Science, Technology and Innovation Colombia], 2023). Notably, in 2011, only one psychology group held the A1 category, but by 2024, 36 groups had achieved this status. Furthermore, 31% of the groups were promoted, 56% retained their category, and only 9% were demoted (Puche-Navarro et al., 2022).

Another indicator of consolidation is the presence of Colombian psychology journals in international indexed databases. As of October 2024, a total of 14 Colombian journals are registered in Scopus under the psychology category: (a) *International Journal of Psychological Research;* (b) *Universitas Psychologica [Psychological Universities];* (c) *Revista Latinoamericana de Psicología [Latin American Journal of Psychology];* (d) *Acta Colombiana de Psicología [Colombian Psychology Act];* (e) *Avances en Psicología Latinoamericana [Advances in Latin American Psychology];* (f) *Revista CES Psicología [CES Psychology Magazine];* (g) *Suma Psicológica [Psychological Sum];* (h) *Revista Colombiana de Psicología [Colombian Journal of Psychology];* (i) *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud [Latin American Journal of Social Sciences, Children and Youth];* (j) *Revista Criminalidad [Crime Magazine];* (k) *Nómadas [Nomads];* (l) *Psicogente [Psychopeople];* (m) *Revista Guillermo de Ockham [William of Ockham Magazine];* and (n) *MedUNAB.* The first three journals are included in the Social Sciences Citation Index of Web of Science, while the first four appear in the Emerging Sources Citation Index. The latter index also includes the journal *Pensando Psicología [Thinking Psychology],* which is not listed in Scopus.

Finally, there has been a significant increase in overall productivity in psychology. Following the modification of its National Science and Technology System (Law 1289 of 2009), Colombia has promoted the evaluation of research in public and private institutions through productivity and quality indicators, aligning with global rankings such as the Shanghai Ranking, the Ibero-American SIR, and the Colombian Atlas of Science. This shift marks the formal integration of Colombian science into the international citation-based evaluation system, driving strategies to enhance its performance in these metrics (Romero-Torres et al., 2013).

Collaboration and Internationalization in Bibliometric Studies of Colombian Psychology

Bibliometric studies have played a crucial role in analyzing the growth and development of psychology in Colombia, particularly from 2010 onwards. Numerous studies have examined the productivity of Colombian psychology journals (Aguilar & Aguado-López, 2018; Ávila-Toscano et al., 2014; Ávila-Toscano & Marenco-Escuderos, 2016; Morgado-Gallardo et al., 2018; Ravelo-Contreras et al., 2016, 2020; Rivera-Garzón, 2008; Salas et al., 2018, 2019). Also, specific subfields, such as educational psychology (Restrepo et al., 2015) and consumer psychology (Maldonado & Pérez-Acosta, 2020) have been studied through bibliometric analyses.

Two main topics in bibliometric research on Colombian productivity in psychology have been the language of publication and collaboration. Spanish has predominated in the publications. However, over the years, Colombian journals have incorporated the publication of articles in English and some in Portuguese (Ávila-Toscano & Marenco-Escuderos, 2016; Ravelo-Contreras et al., 2016). An increase in the level of collaboration in publications is observed over the years. In the case of the *Revista Acta Colombiana de Psicología [Acta Colombiana de Psicología Magazine],* an increase is observed from 2.64 authors per article in 2010–2014 (Ravelo-Contreras et al., 2016), to 3.32 in 2015–2019 (Ravelo-Contreras et al., 2020). In international collaboration, it was found that between 2015 and 2019, 47% of the articles in psychol-

ogy in Colombian publications were produced by researchers from several countries (León-Cano et al., 2022). Similarly, in the journal *Suma Psicológica [Psychological Sum],* there was an increase from 2.3 authors per article in 1994–1997 to 3.9 in 2014–2017 (Morgado-Gallardo et al., 2018).

Internationalization is understood as the process of integrating global, intercultural, and international dimensions into the purpose, function, and delivery of tertiary education (Knight, 2003). Aguado-López et al. (2017) indicate that, in the case of publications, the percentage of articles published in foreign journals, the percentage of articles co-authored with foreign researchers and the impact abroad—the latter understood as citations received in foreign publications—are used as indicators of internationalization. The importance of internationalization, according to Nassi-Calò (2017), lies in reaching a larger and more demanding audience. This is achieved with the improvement of journals, which attracts better articles and readers and authors from other parts of the world, reinforcing the virtuous circle of larger audience / better articles. However, internationalization can bring negative consequences: by joining foreign research currents, local researchers may abandon lines of research associated with national phenomena and, therefore, stagnation may occur in the scientific development of the country (Chinchilla-Rodríguez et al., 2015).

Regarding the internationalization of publications in Colombian psychology, León-Cano et al. (2022) found that between 2015 and 2019, 47% of the articles in psychology with a Colombian affiliation published in Scopus were produced by researchers from several countries. Cudina & Ossa (2016) analyzed the 100 articles with the highest impact in Colombian psychology from 1972 to 2016, considering those with the highest number of citations registered in Scopus and Web of Science. They found that 81% of these papers were published in international journals and 77% were published in the English language. The same study indicated that the main international collaboration was with authors from the United States and, in second place, Spain, noting that the network between the Colombian academic community and Latin American countries was very incipient. The strength of collaboration with certain countries depends on the area of research; in the specific case of health psychology, the relationship with Spain stands out, sharing 16% of the articles in this area (Salamanca-Camargo & Tovar-Gamboa, 2022).

Research Gap and Objectives

Despite the existence of multiple bibliometric studies of Colombian psychology, there has been no systematic study that considers the different levels of organization of its productivity. This includes individual researchers, their affiliations, and the structure of the national and international collaborative network. Although Minciencias promotes research collaboration, there have been no systematic studies of its relationship to productivity in psychology; there is only one article specifically addressing the gender gap at a university in the Cauca Valley (Caicedo-Ortiz et al., 2021). Furthermore, efforts to evaluate the internationalization of Colombian psychology are incipient, have focused on a limited set of articles and databases, and have not studied the degree of collaboration between domestic and international communities. Finally, most studies consider only a specific group of journals and, at most, a bibliographic database, which generates an important bias when attempting to describe the

productivity of Colombian psychology. Therefore, the general objective of the present research is to analyze the scientific productivity, degree of internationalization and collaboration of Colombian psychology between 2014 and 2023, through the study of the publications indexed in the bibliographic databases Web of Science, Scopus and SciELO. For this purpose, the specific objectives will be: (a) to describe the scientific productivity of Colombian psychology during 2014–2023, (b) to analyze the degree of collaboration between authors, affiliations, Minciencias groups, and countries in Colombian psychology during 2014–2023, (c) to analyze the degree of internationalization of Colombian psychology according to language, country of the journal, and international co-authorship during 2014–2023.

Methods

This study uses a bibliometric design, which analyzes scientific production through mathematical and statistical methods. Productivity was described through bibliometric indicators, providing quantitative and qualitative information related to the scientific articles studied (Gallegos et al., 2020). Both the process of searching for articles and the analysis were generally based on the approach described by Uribe-Bahamonde (2022) in a study of Chilean productivity in psychology. This involves an initial search process, followed by a data filtering and normalization process, and concluding with data analysis.

As the main bibliometric indicators of productivity, we considered the number of articles per year, their language, the authors' affiliations, and their affiliation countries, authors' gender, distribution of productivity per author, productivity of the main national and foreign affiliations, as well as the productivity of Minciencias groups and Colombian affiliations. With respect to collaboration, various indicators were used to measure collaboration, considering the co-authorship of multiple researchers, affiliations, Minciencias groups, and countries. Finally, with respect to internationalization, productivity in foreign journals, number of citations, and language of publication were analyzed. The details of the calculation of the indicators are presented in *Table 1*.

The Lawani and Subramanyam indicators were used as indicators of both national and international collaboration. The Lawani indicator is typically employed to define the number of authors per article (Morgado-Gallardo et al., 2018; Ravelo-Contreras et al., 2016; Ravelo-Contreras et al., 2020), while the Subramanyam indicator has been used to indicate the degree of international collaboration (León-Cano et al., 2022). In the present study, both indicators have been used broadly to define collaboration at the individual, institutional, and country levels, allowing for comparisons with previous studies.

To measure collaboration according to the Minciencias criteria, the cooperation (Icoop) and cohesion (IC) indicators were employed. The former measures the degree of collaboration between groups, corresponding to the Lawani index, which considers Minciencias groups as entities, from which 1 is subtracted. On the other hand, the cohesion index measures the degree of collaboration within each group, considering the average number of individuals from each group who participate in the group's articles, minus 1.

Table 1

Bibliometric Indicators

Indicator	Description
Average annual growth rate	Let k be the number of periods and x_i be the value of the indicator for the i-th period. The average annual growth is: $\mathrm{AAGR} = \frac{1}{\mathrm{k}-1}\sum_{i=1}^{k}\frac{x_i - x_{i-1}}{x_{i-1}}$
Lawani Collaboration Index	Indicates the average number of entities (authors, affiliations, countries) per article. Let N be the total number of articles, and n_j the number of papers with j entities. The Lawani index is (Lawani, 1980): $\mathrm{LCI} = \frac{\sum_{j=1}^{\mathrm{A}} jn_i}{N}$
Subramanyam index total and by year	Proportion of articles with 2 or more entities (authors, affiliations, countries). $SI = \frac{\sum_{j=2}^{\mathrm{A}} n_j}{N}$
Minciencias's Cooperation indicator (Icoop)	Let G be the number of Minciencias groups related to N articles. The index *Icoop* is: $ICoop = \frac{G}{N} - 1$
Minciencias's cohesion indicator (IC)	For a given Minciencias group, let N be the number of articles made by the group. A_i is the number of members of the group who participate as co-authors in the i-th article. The index *IC* is: $IC = \frac{\sum_{i=1}^{N} A_j}{N} - 1$

To describe the increasing or decreasing trend of a specific indicator over the period studied, the average annual growth rate (AAGR) was calculated. This indicator has been used in bibliometric studies in fields such as economics (Ho et al., 2022) and health sciences (Romanini et al., 2021), when the goal is to provide a quantitative measure of trends over relatively long periods of time. In addition, we estimated whether this trend was significant using the nonparametric Mann-Kendall monotonic trend test (Meals et al., 2011).

The population was Colombian psychology articles published during 2014–2023 in journals indexed in Web of Science, SciELO, and Scopus. Inclusion criteria were: (a) the journal where the article was included had psychology as its subject; (b) in journal articles with miscellaneous topics, the content of the article reviewed manually was psychology; (c) the article was a primary source research text (empirical or theoretical study) or secondary source (narrative or systematic review); and (d) at least one author of the article had at least one Colombian affiliation. As exclusion criteria, it was considered that the article was not a primary or secondary source study, such as editorials, book reviews, letters to the editor, etc.

The collection of articles was performed by combining the results of the web interface for Scopus and Web of Science, as well as direct database access via Python for SciELO and Scopus, using the packages *articlemetaapi* (Batalha, 2016) and *pybliometrics* (Rose & Kitchin, 2019), respectively. The collection process started on March 3, 2024, and was concluded on April 8, 2024. Once the information for all the databases had been collected separately, a careful process of standardization of information was carried out by creating two thesauri, one for authors and the other for affiliations, with the aim of correcting errors and eliminating duplicates.

Once the databases were corrected separately, they were all transformed into a common database, eliminating duplicate articles. For this, an adaptation of the method of Jiang et al. (2014) for bibliographic articles and the use of blocks described by Hadzic and Sarajlic (2020) were used. Specifically, we searched for duplicate titles within each database, keeping the version with the oldest year. For each article in a database, we searched for possible duplicates in the others, considering as criteria the DOI, the year of publication, the presence of the same publication meta-information (journal, volume and pages) and the title, both identically written and those written in a similar way. The presence of duplicate information for different versions of the same article made it possible to detect inconsistencies, thus improving the thesauri of authors and affiliations.

At the end of the integration process, a total of 4,686 unique documents were collected. To ensure that the articles were relevant to psychology, a supervised machine learning system was used to determine which articles were not pertinent after a manual review of a larger database of 11,100 articles with Hispano-American affiliation, performed by the lead author. According to this criterion, 490 articles were eliminated, with 4,196 articles ultimately being considered.

Specific procedures were established to identify the gender of the authors; the number of citations per article; the composition of the Minciencias groups; the research communities with which each researcher is associated; and, finally, the affiliation and main country for each researcher. In the case of gender, information from the Namsor gender identification service (Namsor Applied Onomastics, 2023) was used, as well as a custom-trained machine learning system. In the case of citations per article, the maximum number of citations reported by the Web of Science, Scopus and SciELO databases was considered as an indicator, in addition to the information available in Crossref for articles with DOI. This is consistent with the recommendation to combine information from multiple databases to obtain a reliable measurement of citations, as differences in the coverage of each database result in specific biases (Anker et al., 2019).

To determine the Minciencias research groups of the researchers, the complete information of the Minciencias groups and their members was downloaded from the site Science and Technology for All (Ministerio de Ciencia Tecnología e Innovación [Ministry of Science, Technology and Innovation], 2024). An association was made between this information and that available in the databases using the name of the researcher, as well as other identifiers (ORCID, Scopus and Web of Science).

To define the affiliation and main country of the authors, the fractional count was used (Perianes-Rodriguez et al., 2016). For each author, the scores for all affiliations

and countries in the total number of publications in which he/she participated were summed. The affiliation and country with the highest score for each author was considered as his or her main affiliation and country, respectively.

Results

Productivity

The analysis considered a total of 4,196 Colombian psychology articles published in 2014–2023, published in the Web of Science, Scopus, and SciELO databases. Figure 1 shows a significant growth in the number of articles published per year, AAGR = 8.8%, $p < .001$, from 271 in 2014 to 557 in 2023. In the articles published in only one language, the majority are in English ($n = 2314$, 55.1%) and in second place in Spanish ($n = 1{,}839$, 43.8%). Both the number and the proportion of articles that have an English version have progressively increased, this increase being statistically significant, AAGR = 17.4%, $p < .001$. The number of articles published in Spanish per year has remained practically constant over the period, with a AAGR = –.8%, which is not significant, $p = .371$. In proportional terms, the number of articles published in Spanish per year has decreased, from 6.1% of the total number of articles published in 2014 to 23.7% in 2023.

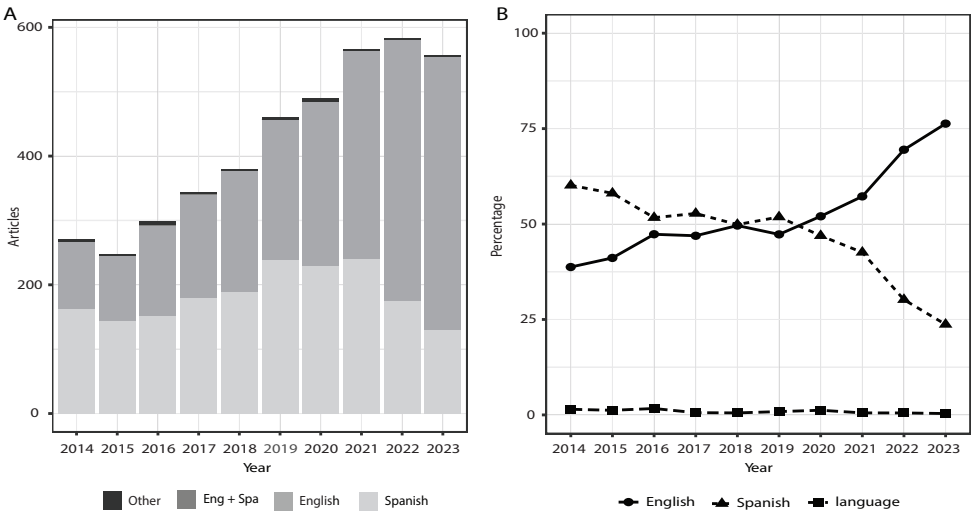

Figure 1. Distribution of papers by language. Panel A: Absolute number of papers among Spanish, English, both Spanish and English, and other languages. Panel B: Percentage of papers in Spanish, English, and other languages relative to the total.

With respect to the bibliographic databases, a total of 2,030 articles were incorporated from Web of Science, 3,076 from Scopus, and 1,546 from SciELO. Regarding the overlap, 2,134 articles (5.9%) were included in a single database, 1,668 (39.7%) in two, and 394 (9.4%) in all three databases. The number of articles indexed in Web of Science has increased significantly, AAGR = 19.1%, $p < .001$, as well as in Scopus, AAGR = 13.8%, $p < .001$. In contrast, the absolute number of articles in SciELO re-

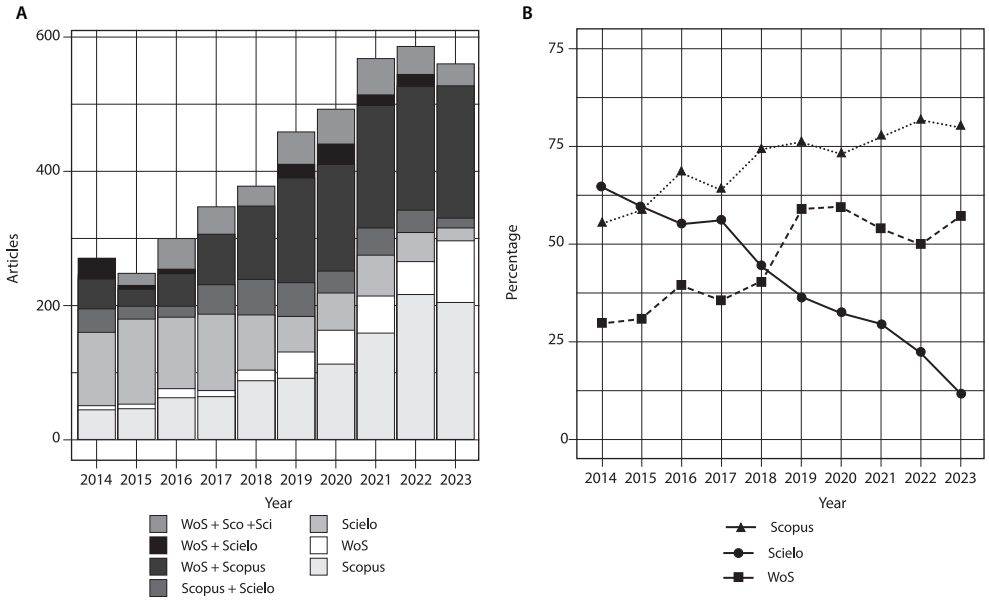

Figure 2. Distribution of papers across bibliographic databases. Panel A: Article coverage by each database and their overlap. Panel B: Percentage coverage of Scopus, Web of Science, and SciELO relative to the total.

mained relatively constant between 2014 and 2021, with a slight average annual decrease, AAGR = –7.8%, which is not statistically significant, $p = .088$. These trends can be viewed in *Figure 2*.

Table 2

Articles and Authors Affiliated with Colombia and Top Collaborating Countries with the Highest Publication Counts (2014–2023)

Country Affiliations	Articles	Authors grouped by Country of Main Affiliation		
		Total	Male	Female
Colombia	4.196	5.752	2.314	3.438
Spain	812	1.104	574	530
United States	642	1.561	821	740
Chile	349	352	196	156
Mexico	289	318	149	169
Brazil	277	373	174	199
United Kingdom	256	403	214	189
Argentina	231	275	133	142
Italy	222	238	109	129
Total	4.196	15.099	7.152	7.937

With respect to the authors of the articles and their main country of affiliation, a total of 15,099 authors with affiliations in 134 countries, including Colombia, were identified. Of the total number of authors, 7,937 were women and 7,152 were men. Table 2 shows that the authors associated with Colombia as the main country were 5,752, of which 3,438 were women and 2,314 were men. The countries with the greatest collaboration with Colombian psychology, with more than 200 articles in the period, were Spain, the United States, Chile, Mexico, Brazil, the United Kingdom, Argentina, and Italy. Spain is the country with the highest number of articles co-authored with Colombian authors, and the United States is the country with the highest number of authors associated with Colombian productivity in psychology in the period.

Table 3

Number of Articles, Number of Authors, and Annual Growth Rate (AAGR) of Articles for Colombian Affiliations with the Highest Publication Counts (2014–2023)

Affiliation	Doctoral program	Articles	Authors	AAGR	*p*-value [b]
Universidad Nacional de Colombia [National University of Colombia]	Qualified Registration	1179	1335	9.9	.001
Universidad de San Buenaventura [Saint Bonaventure University]	Qualified Registration	630	707	1.3	<.001
Universidad Cooperativa de Colombia [Cooperative University of Colombia]	No	391	362	19.5	.127
Pontificia Universidad Javeriana [Pontifical Javeriana University]	Qualified Registration	380	392	6.1	.105
Universidad del Norte [Northern University]	Qualified Registration	222	199	14.7	<.001
Universidad CES [CES University]	No	181	224	13.3	.0153
Universidad Pontificia Bolivariana [Pontifical Bolivarian University]	No	149	166	11.6	.0035
Universidad de Manizales [University of Manizales]	Qualified Registration	145	177	4.3	.0012
Universidad de la Costa [Coastal University]	No	143	84	46.3	.0123
Universidad del Valle [Valley University]	High-Quality Accreditation	129	127	19.9	.0107
Universidad Católica Luis Amigo [Luis Amigo Catholic University]	Qualified Registration	126	142	31.3[a]	.0327 [a]
Universidad de la Sabana [University of the Sabana]	Qualified Registration	108	163	12.4	.0191

Note. [a] *AAGR calculated for 2016–2024, as no articles were published in 2015.* [b] *Mann-Kendall nonparametric trend test.*

Table 4

Minciencias Groups with the Highest Number of Authors

Minciencias Group	Ranking	Area is psychology	Articles	Authors	AAGR	*p*-value [j]
Grupo de Investigación en Ciencias del Comportamiento [Behavioral Sciences Research Groupa][a]	A1	Yes	43	226	25.46	.127
Estudios Clínicos y Sociales en Psicología [Clinical and Social Studies in Psychology][b]	A1	Yes	37	188	21.99	.037
Grupo de Neurociencias de Antioquia [Antioquia Neuroscience Group][c]	A1	No	37	104	14.38	.589
Psicología del Consumidor [Consumer Psychology][d]	A1	Yes	36	169	12.19	.085
Grupo de Investigación de Psicología [Psychology Research Group][e]	A1	Yes	36	101	111.2	.124
Grupo de investigación en psicología cognitiva [Cognitive psychology research group][f]	A1	Yes	34	73	14.26	.030
Estudios de Fenómenos Psicosociales [Studies of Psychosocial Phenomena][g]	A	No	34	99	56.63	.019
Grupo de Investigaciones En Desarrollo Humano [Human Development Research Group][h]	A1	No	31	120	9.943	.037
Grupo Neuropsicología y Conducta [Neuropsychology and Behavior Group][i]	A1	No	31	100	9.88	1
Europsis	A1	Yes	31	151	2.695	.084

Note. [a]*Research Group in Behavioral Sciences.* [b] *Clinical and Social Studies in Psychology.* [c]*Neurosciences Group of Antioquia.* [d]*Consumer Psychology.* [e]*Psychology Research Group.* [f]*Research Group in Cognitive Psychology.* [g]*Studies of Psychosocial Phenomena.* [h]*Human Development Research Group.* [i]*Neuropsychology and Behavior Group.* [j]*Mann-Kendall nonparametric trend test.*

A total of 4,407 affiliations were identified, of which 657 (14.9%) were Colombian. Table 3 displays the Colombian affiliations with more than 100 articles published during 2014–2023. Notably, all 12 affiliations are university institutions, eight of which offer doctoral programs. Of these, seven are certified with Qualified Registration, indicating that their programs meet the minimum quality standards required by the Ministry of Education, and one holds High-Quality Accreditation. Among these 12 affiliations, 10 show statistically significant annual growth in the number of published articles during 2014–2023.

Regarding the Minciencias groups, a total of 1,829 groups associated with the authors who have published articles in psychology in the period were identified. Among these groups, only 149 are officially classified within knowledge areas directly associated with psychology, while the remaining 1,680 are classified in 150 other areas. The total number of authors affiliated with Minciencias groups is 2,509, of whom 2,361 have Colombia as their primary affiliation, accounting for 94.1% of the total. Table 4 displays the top 10 Minciencias groups with the highest number of authors, of which nine belong to the A1 category, denoting the highest productivity, and six are classified within psychology-related areas. Among these 10 groups, four exhibit statistically significant annual growth in the number of published articles within the 2014–2023 period.

Collaboration

During the period under study, there was an increase in collaboration, in terms of authors, affiliations, and participating countries per article, as shown in Table 5. The Lawani collaboration index corresponds to the average number of entities per article. In 2014–2023, the Lawani index of authors was 6.6, that of affiliations 4.6 and that of countries 2.9. There was an increasing trend for the Lawani index of authors, AAGR = 9.4%, $p = .004$, as of affiliations, AAGR = 11.2%, $p = .002$ and of countries, AAGR = 6.8%, $p = .002$. Another indicator of interest is the Subramanyam index, which measures the proportion of articles with two or more authors. During the period studied, the Subramanyam index for authors was .90, for affiliations .66, and for countries .49. A sustained increase per year is observed for authors, AAGR = .6%, $p = .07$, affiliations, AAGR = 3.8%, $p = .002$, and countries, AAGR = 3.2%, $p = .004$. It is relevant to note that, starting from 2020, the proportion of articles in collaboration with other countries exceeds 50%, reaching a maximum of 55% in 2022.

Table 5

Indicators of Collaboration in Colombian Production in Psychology, 2014–2023

Indicator	2014	2023	Total	AAGR	*p*-value[a]
		Lawani			
Author	4.54	8.36	6.56	9.358	.004
Affiliation	2.93	6.16	4.59	11.24	.002
Country	2.23	3.57	2.87	6.757	.002
		Subramanyam			
Author	.87	.92	.90	.6	.074
Affiliation	.54	.74	.66	3.83	.002
Country	.41	.53	.49	3.244	.004

Note. [a] *Mann-Kendall nonparametric trend test.*

Our analysis explored whether the increase in collaboration stemmed from greater local and/or international involvement. The results showed higher collaboration

indices for authors with foreign affiliations (average Lawani index of 4.15) compared to those with Colombian affiliations (average 2.41). The number of foreign authors per article grew annually by 18.4% ($p = .007$), while the number of Colombian authors per article grew slowly (AAGR = 2.1%, $p = .032$). A similar trend was observed in the Lawani index of affiliations, with foreign affiliations per article increasing by 19.03% annually ($p = .002$), and Colombian affiliations showing little change (AAGR = 3.16%, $p = .003$). Within Colombian collaboration, focusing on Minciencias groups, 3,334 articles featured at least one author from these groups, with a high general collaboration level indicated by a Lawani index of 3.6 and a Subramanyam index of .77; no significant trends were noted in these indices during the period analyzed.

Using the indicators defined by Minciencias to evaluate collaboration among the Minciencias groups, the mean of the cooperation indicator (Icoop) for the groups studied is M = 5.0 (SD = 2.5). The minimum value observed is 0, while the maximum value is 23, indicating a high degree of cooperation among the groups. Additionally, the cohesion index, which measures the degree of participation of members within the same group in the articles, has a mean of .13 (SD = .34). The minimum value recorded is 0, while the maximum value is 5. These findings suggest that the articles were produced by a reduced number of members within each Minciencias group.

Internationalization

To evaluate the internationalization of Colombian psychology during the specified period, we considered publications in both Colombian and foreign journals, along with the number of citations per year based on the nationality of the main authors' affiliations, the country of publication, and the availability of an English version. Colombian psychology articles have been published in a total of 702 journals from 2014 to 2023. Of the total number of articles, 1,511 have been published in Colombian journals, accounting for 36.01% of the total.

When analyzing the country of publication for journals associated with Colombian psychology during this period, Table 6 reveals a sustained growth in the number of articles published in foreign journals. Notably, there has been significant growth (19.6%, $p = .001$) in publication in U.S. journals, surpassing the number of publications in Colombian journals in the year 2023, with 124 articles versus 113. Furthermore, significant annual growth rates have been observed for journals published in England (27.1%), Spain (2.7%), Switzerland (25%), Brazil (15%), the Netherlands (21.1%), Latin America in general (3.5%), Europe (3.6%), and Argentina (39.5%).

While the number of articles published per year in Colombian journals remained relatively constant between 2014 and 2021, there was a sharp decrease of 57% between 2021 (164 articles) and 2023 (113 articles). However, the overall decrease for the entire period is not statistically significant, with a TCAP of –3.6% and p-value of .928.

From 2014 to 2023, a notable increase in international collaboration was observed, marked by a rise in the number of foreign authors and countries contributing to each article, as well as a higher proportion of articles involving foreign participation. The analysis focused on whether this rise was due to Colombian-led

Table 6

Number of Articles with Colombian Affiliation, Number of Journals, and Annual Growth in the Number of Articles, According to the Country of Publication

Country	Articles	Magazines	AAGR	*p*-value [a]
Colombia	1.511	24	–3.6	.928
United States	714	254	19.6	.001
United Kingdom	461	165	27.1	.001
Spain	352	47	2.7	.003
Switzerland	236	17	25	.002
Brazil	208	41	15	.008
Netherlands	192	45	21.1	.001
Argentina	118	6	39.5	.003
Chile	100	9	83.7	.088
Latin America	164	32	3.5	.007
Europe	126	47	3.6	<.001
Other	14	13	–	–

Note. [a] *Mann-Kendall nonparametric trend test.*

or foreign-led research. Using the number of articles with a Colombian as either the first or last author (key positions by convention) as an indirect measure, it was observed (*Figure 3*) that while articles by single authors (9.9%, all Colombian due to study criteria) remained steady (AAGR = 6.1%, $p = .088$), articles with both key positions held by Colombians (47.7% of total) grew at an annual rate of 8.08% ($p = .002$). Similarly, articles with one Colombian in these key roles (2.2% of total) increased by 9.33% annually ($p = .003$), while those with no Colombians in these

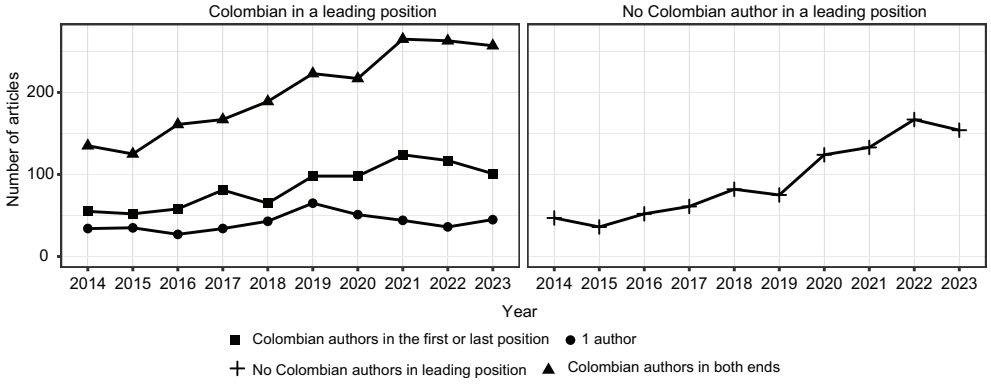

Figure 3. Number of articles per year, according to the presence or absence of Colombian authors in the main positions

positions (22.2% of total) experienced the most rapid growth, surging by 17.18% annually ($p < .001$).

Figure 4 presents the average number of citations per year for articles, considering factors such as the country of publication (Colombia or another country), the presence or absence of an English version, and whether a Colombian researcher holds a leading position. Using the Mann-Whitney U test, a significant difference is observed in the number of citations in favor of articles with an English version (M = 14.3, Med = 4) compared to those without (M = 2.02, Med = 1), U = 1211312, $p < .001$. Articles with a foreign author in leading positions (M = 23.32, Med = 8) have significantly more citations compared to those with Colombian authors in leading positions (M = 4.68, Med = 1), U = 781731, $p < .001$. Moreover, articles published in foreign journals (M = 12.5, Med = 3) receive significantly more citations than those published in Colombian journals (M = 2.48, Med = 1), U = 2776499, $p < .001$. Regarding the trend throughout the period, no statistically significant increases or decreases were observed in the number of citations according to the specified criteria.

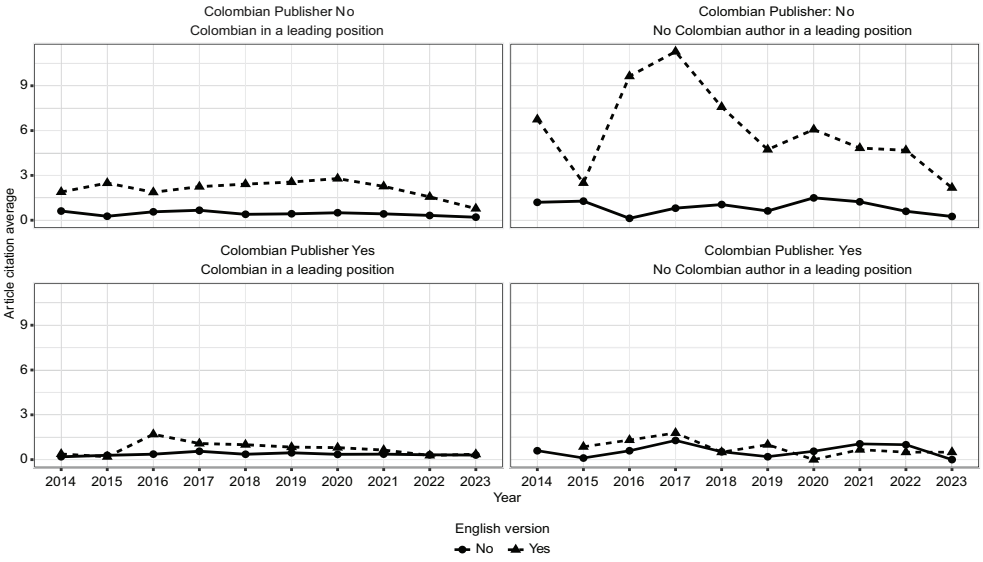

Figure 4. Average number of citations per article, according to the country of the scientific journal, nationality of the main authors, and language of the article

Discussion

The present study aimed to analyze the production of Colombian psychology from 2014 to 2023, utilizing data from three bibliographic databases (Web of Science, Scopus, and SciELO). The study focused on examining productivity, internationalization, and collaboration. The main findings reveal an increase in productivity, particularly in English, as well as collaboration with authors affiliated with foreign institutions. Notably, the level of cooperation and cohesion among groups within Colombia remained consistent.

There is a sustained annual growth in the number of articles published in English, while the proportion of articles published in Spanish has been decreasing in relation to the total. This contrasts with the trend observed in the mid-2010s, when most articles were published in Spanish (Ávila-Toscano & Marenco-Escuderos, 2016; Ravelo-Contreras et al., 2016). León-Cano et al. (2022) highlight that journal articles in Spanish without international collaboration receive a low number of citations. This finding aligns with the results of our study, that the most cited articles are those published in English, authored by individuals from foreign institutions in leading positions, and published in foreign journals.

International collaboration has great relevance in the field, both in terms of the number of authors involved and its growth. Approximately 61.5% of the authors contributing to the Colombian literature in psychology are foreigners, with a significant representation from affiliations in Spain and the United States. This finding aligns with previous literature (Cudina & Ossa, 2016; Gallegos et al., 2020; Ravelo-Contreras et al., 2016). The Subramanyam index for countries during the period stands at .49, which is very similar to the .47 previously reported in a study solely conducted using Scopus (León-Cano et al., 2022).

In terms of the type and productivity of the main Colombian affiliations, all 12 Colombian institutions with more than 100 articles during the period are universities, each showing positive annual growth in their publications. The presence of eight universities with doctoral programs underscores the pivotal role of these institutions in driving the growth of Colombian psychology's productivity, as noted by López-López et al. (2022). These universities act as engines of scientific production, generating high-quality knowledge and strengthening national and international collaboration networks.

Regarding collaboration between affiliations, there is a high degree of international cooperation, with only 14.9% of the 4,407 identified affiliations being Colombian. Among the foreign affiliations, those from Spain, the United States, Argentina, Italy, and Chile have the highest number of associated articles. A similar pattern of collaboration is evident in the field of health psychology, as reported by Salamanca-Camargo & Tovar-Gamboa (2022).

Although, globally, most articles from the period were led by Colombian authors (77.8% vs. 22.2%), the proportion of articles directed by authors with foreign affiliations has experienced significant annual growth of 17.2%, surpassing the growth rate of articles led by Colombian authors, which stands at 7.4%. In 2014, 17.3% of projects were led by international authors, compared to 27.6% of articles in 2024. This trend can be viewed positively, as it reflects the interest of international groups in integrating Colombian academics, which diversifies the productivity of Colombian psychology (López-López et al., 2022). However, it is essential to consider that artificially spurred growth in productivity, driven by external pressures, such as the pursuit of internationalization, could weaken the study of national issues (Chinchilla-Rodríguez et al., 2015), which is one of the strengths of Colombian psychology (Vesga, 2021).

Several indicators demonstrate that researchers and research groups have adapted to the Minciencias evaluation criteria associated with scientific productivity (Ministerio de Ciencia, Tecnología e Innovación [Ministry of Science, Technology and In-

novation], 2020b). Firstly, there is a high level of cooperation among the Minciencias groups, with an average score of 4.9. Conversely, the level of cohesion is relatively low, with an average of .13. This could be attributed to the emphasis placed on the criterion of cooperation over cohesion in the evaluation process. Secondly, the publication rate has shown an increase, particularly in foreign journals indexed in Web of Science and Scopus. This trend aligns with the encouragement to publish in high-impact journals, as promoted by the measurement model.

The strengths of this study lie in the utilization of multiple databases and a rigorous data-cleaning process, which instills confidence in the validity of the analyzed data. This enables the provision of indicators that can be utilized in future studies to assess advancements in productivity and internationalization of Colombian psychology. Furthermore, this study represents the first bibliometric analysis that incorporates the Minciencias groups into the evaluation of productivity within the field of psychology in Colombia.

Conclusion

This paper explores how Minciencias policies, especially the measurement and recognition model, align with academic group strategies, affecting academic production as shown through bibliometric analysis (Pérez-Martelo et al., 2022). The results provide evidence of the consolidation of psychology in Colombia, as the increase in overall productivity, promoted by national policies (Romero-Torres et al., 2013), is sustained by university institutions, primarily those associated with doctoral programs (López-López et al., 2022), as well as by the highest-quality A1-category Minciencias research groups. This development has been largely achieved through collaborative efforts, both locally and internationally (Puche-Navarro et al., 2022). The internationalization of Colombian psychology can now be affirmed as a reality, given the high level of international collaboration and the publication of research in international journals and in English, which enhance the visibility of work by Colombian authors. However, a concerning issue is the stagnation in local journal publications, despite the growth in international journals, as this could limit the visibility of context-specific research, weaken local academic ecosystems, and reduce opportunities for emerging researchers.

Future research should compare these findings internationally to gauge whether the trends in internationalization and collaboration reflect broader disciplinary trends or are unique to Colombia. It is crucial to assess how the internationalization of Colombian research, driven by the increase in articles by foreign and mixed authorship, impacts the focus on locally relevant topics (Chinchilla-Rodríguez et al., 2015).

Limitations

The primary limitation is the potential publication bias due to the exclusion of articles not included in the three databases. However, it is important to note that we utilized the databases recognized as the most relevant and that have been employed in previous studies (Cudina & Ossa, 2016; León-Cano et al., 2022). In the examination of internationalization, another limitation is the inability to differentiate between ci-

tations from articles authored by Colombians versus those by foreign authors. This distinction would have allowed for a more precise assessment of areas or topics with local versus international impact.

Ethics Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics, Bioethics, and Biosafety Committee of the Vice-Rectory for Research and Development at the University of Concepción, Approval ID: CEBB 746-2020-M.

Author Contributions

Claudio Bustos and Lina Villota developed the initial concept. Claudio Bustos and Ignacio Rojas developed the software and conducted the analysis. Claudio Bustos curated the data. Claudio Bustos, Astrid Sarmiento, Lina Villota, Ignacio Rojas, and Lina Sandoval performed the writing, review, and editing of this text. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgments

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Coexistence and Social Exclusion of Venezuelan Migrants in Lima, Perú: A Psychosocial Approach

Rosa M. Cueto[a], Liz S. Ayma[a], César A. Llanco[a]*, Fiorella Acedo[a], Camila Loli[a]

[a] *Pontifical Catholic University of Peru, Lima, Perú*

*Corresponding author. E-mail: cesar.llanco@pucp.edu.pe

Background. An understanding of the dynamics of intergroup relations, particularly in relation to migrant populations, is of critical importance in a variety of societal contexts. This study examines the relationship between conservatism (Social Dominance Orientation, SDO), intergroup dynamics (stereotypes and intergroup emotions), and social distance (openness to coexistence and tendencies toward exclusion) within the Venezuelan migrant population residing in Lima Metropolitana.

Objective. The objective of this study was to investigate the relationships between conservatism, intergroup dynamics, and social distance among Venezuelan migrants in Lima Metropolitana. A sample of 395 residents was utilized for this study.

Design. The study employed a correlational research design to examine the relationships between the variables of interest. Correlation analyses were conducted to assess the associations between variables. Path analysis was utilized to explore the underlying mechanisms. Furthermore, group comparisons were conducted to examine differences in attitudes and perceptions across various demographic groups.

Results. The findings indicated that there were significant associations across conservatism, intergroup emotions (both negative and positive), stereotypes, and the tendencies toward exclusion and coexistence. Notably, younger participants exhibited more inclusive ideological and intergroup indicators. Moreover, the path analysis demonstrated the pivotal influence of the morality stereotype and ideological dimensions on the integration and exclusion of migrants.

Conclusion. The study highlights the significance of cultivating favorable stereotypical perceptions of migrants and emphasizes the impact of age and ideological factors in creating conducive conditions for migrant integration. A contextual understanding of these results underscores the necessity for inclusive policies and interventions that foster social cohesion and integration within communities that have received migrants.

Keywords: migration, exclusion, intergroup relations, Peru

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Introduction

Migration involves the movement of individuals from one territory to another to settle temporarily or permanently (International Organization for Migration [IOM], 2019a). Globally, an estimated 281 million people have migrated to other countries, representing a growth rate of 2.5% between the years 2015 to 2020 (Migration Data Portal, 2021).

A sense of precariousness in the place of origin is linked to this process, driven by the expectation of creating a personal or group project aiming at change and social ascent (Gutiérrez et al., 2020). According to the IOM (2020), migration is a politically significant phenomenon that should be examined from both a rights-based approach and a perspective that considers the sociocultural and civic-political contributions of migrant populations as well as their impact on the development of the receiving host country. The characteristics of migration processes reflects the legal and political frameworks of both the place of origin and destination.

Due to their institutional and legal powerlessness, migrants, especially those in irregular situations, face several risks and difficulties including human trafficking and sexual/or labor exploitation that may occur along their migration path and regions of destination. These unprotected conditions are often followed by experiences of xenophobia and discrimination, which end up hindering their social integration (IOM, 2020). Evidence also indicates that those who migrate because of violence and/or poverty are even more vulnerable to exclusion, as their initial situation may be exacerbated by hostility experienced in the host country (IOM, 2019b).

A highly relevant migration process in Latin America today is that of the Venezuelan migrant population, driven by the severe political and economic instability in that country. The Interagency Coordination Platform for Refugees and Migrants from Venezuela (R4V, 2024) reports that 1.54 million of the 7.8 million Venezuelan migrants reside in Peru. With a relatively equal distribution by gender and a majority holding higher education qualifications, the Venezuelan refugee and migrant population in Peru increased by 41.5% between 2018 and 2022 (Instituto Nacional de Estadística e Informática [INEI], 2023).

The public's image of immigration in Peru has been greatly impacted by the rise in the number of Venezuelan migrants, resulting in a conflict between the economic advantages of immigration and social and cultural issues that arise (Napan, 2023). Eight out of ten Peruvians oppose having more Venezuelans in their personal social circle, with rejection sentiment stronger in rural areas, among women, older adults, and among poorer socioeconomic backgrounds (Amaya & Elguera, 2023). Furthermore, with an average score of 4.15 out of 10, sympathy for Venezuelan refugees is low, indicating a distant and reserved attitude toward this group.

Venezuelan migrants in Peru are a group that experiences social vulnerability (Berganza & Solórzano, 2019; IOM, 2022). These situations include economic insecurities, housing overcrowding or difficulty finding housing, health or education precariousness, and difficulty accessing work, demonstrating the Peruvian State's shortcomings in supporting their integration (Berganza & Solórzano, 2019). In addition, immigrants are exposed to exploitation, discrimination and xenophobia (Freier et al., 2021), highlighting the importance of a psychosocial exploration into the dynamics

and intergroup relations that affect the integration of the Venezuelan population in this country.

Intergroup relations develop from the process of social categorization, a mechanism that organizes and classifies social stimuli into social categories facilitating an individual's differentiation from members of other groups (outgroup) and their identification with members of their own group (ingroup) (Abrams & Hogg, 1998; Fiske, 1998; Stangor, 2009; Tajfel, 1982; 1984). The need of individuals and groups to maintain a positive self-image derives from endogroup characteristics engendering social comparisons between the endogroup and the exogroup. This leads to the accentuation of certain intergroup differences and their valuation in favor of the ingroup, especially socially valued characteristics (Abrams & Hogg, 1998).

The characteristics commonly attributed to social categories and their members are called stereotypes (Castro, 2006). Stereotypical attributes help distinguish between endogroup and exogroup members, acknowledging differences between exogroups, justifying intra- and intergroup actions, validating intergroup differences and dominance, and understanding intergroup tensions and conflicts (Fiske et al., 2003; Jost et al., 2004; Oldmeadow & Fiske, 2007). However, stereotypes will have a detrimental effect if they adopt negative connotations, which is often the case for those exogroups considered to be of lower status and/or perceived as a threat to the ingroup and/or to the status quo (Bodenhausen et al., 2000; Castro, 2006; Stangor, 2009). In these cases, negative stereotypes may result in negative expectations, misjudgments or discriminatory behaviors toward members of negatively stereotyped groups (Fiske, 2012).

Moreover, studies on intergroup relations suggest emotions may be even more effective than stereotypes in predicting behavioral tendencies toward a given group (Cuddy et al., 2007). Intergroup emotions are generated following an evaluation of the intergroup context, based on the perception of potential harm or benefit posed by the exogroup or its members (Mackie et al., 2000). Intergroup emotions are often empirically associated with two stereotypical dimensions attributed to exogroups: warmth and competence. The first dimension refers to the stereotypical attributes associated with the social behaviors and relationships of individuals in each group, allowing inferences about their disposition toward cooperation or potential intergroup conflict (Fiske et al., 2003). The second dimension is related to characteristics linked to the general efficacy and capacity of group members to achieve the goals they set for themselves (Cuddy et al., 2007; Gómez, 2019; Rodríguez et al., 2013).

Both stereotypical dimensions (warmth and competence) form a double-entry model, wherein groups perceived to be competent and warm inspire emotions of pride and admiration; those that are not would inspire contempt; groups perceived as warm but not competent would inspire sympathy; and those that are seen as competent but not warm inspire envy (Cuddy et al., 2007; Fiske et al., 2002).

Studies in the Latin American context find an additional stereotypical dimension: morality, characterized by traits such as honesty and tolerance (Espinosa et al., 2016). High levels of moral characteristics are usually attributed to less-favored groups, often those of lower status, mainly in contexts of discrimination and exclusion (Espinosa et al., 2016; Guillén et al., 2018), as is often the case with migrant groups (Contreras & Saldívar, 2018). Likewise, evidence shows that groups consid-

ered lower status tend to generate emotions such as hostility, anger, contempt or sadness (Espinosa et al., 2007).

Conversely, conservative political ideology, which lies at the core of intergroup relations, is characterized as a set of values, attitudes, and beliefs that allow an individual to understand the social and political world, assess it, and act to preserve the status quo; this perspective facilitates the analysis of intergroup behavior (Jost et al, 2003; Jost et al., 2004). Accordingly, the widespread inclination to feel compelled to support social hierarchies that maintain intergroup inequalities is explained through social dominance orientation (SDO), a component of conservative political ideology (Pratto et al., 1994). Beliefs regarding each person's proper place in society are based on their social category of membership, which is typically tied to their ethnicity of origin, and economic standing, as well as the conventional traits that are associated with these categories (Duckitt & Sibley, 2007). Thus, the mere existence of social categories perceived as low status will be perceived as a threat to the social order, which encourages the most conservative ideological sectors to prejudge and discriminate against members of these groups (Rottenbacher et al., 2011).

According to numerous studies, the SDO promotes prejudice against members of socially disadvantaged groups (Duriez & Van Hiel, 2002; Sidanius & Pratto, 2004). SDO has been found to be a strong predictor of prejudice against migrants, particularly when they are perceived as competent in the workplace (Cohrs & Asbrock, 2009; Vezzali & Giovanni, 2010). This is because a receiving society's perception of migrants as a threat to labor market access, impedes their social and cultural integration (Blouin, 2019; IOM, 2022).

In accordance with research on intergroup interactions in the context of Venezuelan migration to Peru, some segments of the Peruvian population express mistrust and anxiety toward them, which has occasionally resulted in violent crimes and discriminatory practices (Loayza, 2020). This also aligns with the unfavorable intergroup portrayals and assessments of this social category that other writers have documented (Berganza & Solórzano, 2019; Diaz et al., 2018). In this regard, some studies find that the social category of Venezuelan migrants is stereotyped as being not very competent and lazy. Additionally, they are blamed for generating unfair competition for native Peruvians, as they are associated with labor precariousness and informality (Blouin, 2019). According to Koechlin et al. (2021), the presence of Venezuelan communities in Lima, the city with the highest concentration of Venezuelan migrants, is linked to higher levels of crime, disorder, and insecurity.

However, there is also evidence of a more positive perception of this social category, linked to stereotypical characteristics of competence, warmth and morality, which are linked to less negatively charged affective and emotional indicators (Cueto, 2017; Robinson & Espinosa, 2021). Similarly, a study conducted in Arequipa revealed that the levels of prejudice towards the Venezuelan community were significantly lower among younger age groups, who also showed greater openness to their integration into Peruvian society (Álvarez & Chávez, 2018).

Based on the above, conservative ideology establishes the framework for general beliefs about the dynamics of intergroup relations (Jost et al., 2003; Jost et al., 2004). This includes how people think, value and perceive emotions in relation to particular social categories and their members, as well as how they assign them a certain level

of status based on the stereotypical traits and social valuations attributed to them (Duckitt & Sibley, 2007; Rottenbacher et al., 2011). Hence, in the case of the migrant population, it is relevant to study the extent to which political ideology serves as an antecedent to intergroup variables (stereotypes and intergroup emotions) that hinder integration and social coexistence, considering that this social category is usually perceived as low status (Berganza & Solórzano, 2019; Blouin, 2019; Contreras-Ibañez & Saldívar, 2018; Diaz et al., 2018).

In the case of the Venezuelan migrant population in Peru, most recent studies focus on general immigration issues, but fail to offer an articulated analysis of the influence of conservative ideologies and particular intergroup dynamics on attitudes toward this community. By investigating these factors, the study seeks to improve understanding of the obstacles to the integration of the Venezuelan population in Peru, thereby contributing to the formulation of interventions that mitigate prejudice and promote social inclusion.

The central objective of this research is to analyze the influence of social dominance orientation (SDO) and intergroup dynamics (intergroup emotions and stereotypes towards exogroups) on attitudes of social distancing, specifically focusing on openness to coexistence and tendency toward exclusion of the Venezuelan migrant population, among residents of Metropolitan Lima. The first objective is to examine the relationships between ideological variables, such as the SDO, and attitudinal variables. This analysis aims to elucidate the way these ideological constructs shape attitudes towards Venezuelan migrants. Secondly, the study seeks to identify the specific emotions and stereotypes associated with the tendencies toward either exclusion or inclusion of this migrant population. This will be done by considering how emotional responses and stereotypical representations can influence the disposition of individuals towards the interaction or rejection of these groups. Finally, the third specific objective is to assess differences in attitudes toward Venezuelan migrants between age groups — those over and under 30 years old. This focus stems from the Peruvian context, where social conditions have led to varied responses to social phenomena based on age, distinguishing the so-called "bicentennial generation" from previous generations. This analysis aims to elucidate whether generational differences influence attitudes towards the integration or exclusion of Venezuelan immigrants and to ascertain the extent to which these differences may be related to underlying ideological and psychosocial factors.

The hypotheses of the present study aim to clarify the relationships between SDO, emotions and stereotypes about Venezuelan immigrants, as well as attitudes towards the inclusion or exclusion of this community in the Peruvian context. First, it is hypothesized that SDO levels will be positively correlated with negative emotions towards Venezuelan immigrants and inversely correlated with positive emotions toward them (H1). Additionally, an inverse relationship is expected between SDO levels and positive stereotypical attributes of Venezuelans and directly associated with tendencies toward exclusion and negative emotions toward this community (H2).

Conversely, it is proposed that openness to coexistence with Venezuelan immigrants will be inversely related to SDO and negative emotions and positively related to positive emotions toward them (H3). Similarly, it is expected that positive intergroup stereotypes and positive emotions towards Venezuelans will be directly related

to greater openness to coexistence and inversely related to a tendency towards exclusion (H4). Finally, it is expected that participants under the age of 30 will have lower levels of prejudice and greater openness to coexistence with the Venezuelan community than those aged 30 and over (H5).

Methods

Participants

A total of 395 residents of Lima Metropolitana participated in the study, ranging in age from 18 to 75 years (M = 29.54, SD = 11.19). Of the total, 62.5% were women, 64.3% had higher education, 31.4% had secondary education, and 4.3% reported having another level of education. Additionally, 23% reported having children. Of those surveyed, 71.4% were born in Metropolitan Lima, 56.4% reported that their parents were born in Lima, and 83.8% had relatives living abroad. Finally, regarding political orientation, 17% identified as left-wing, 48.6% positioned themselves as center, and 34.4% expressed being right-wing.

The inclusion criteria required participants to be Peruvian, reside in Lima, and at least 18 years old. To facilitate accessibility to study participants, a non-probabilistic convenience sampling approach was implemented. To broaden demographic representation within the sample, selection criteria were used to ensure the inclusion of a variety of age groups. As part of the ethical criteria of the research, participants were informed of the study's objective and asked for their permission to participate through informed consent, indicating that participation was strictly voluntary and confidential. They were also informed that the collected information would only be used for the purposes of the study and any dissemination in academic spaces would maintain anonymity.

Measurement

Social Distance [SD] (Bogardus, 1947)

This scale has been adapted to measure the desired level of contact with Venezuelan immigrants. It consists of 7 statements, of which 5 correspond to the dimension of *openness to coexistence* (ie, "I would live with a Venezuelan person as a partner") and 2 items refer to *tendency to exclude* (ie. "I would exclude Venezuelan people from my neighborhood"). The survey consists of a 7-point Likert response scale ranging from 1 ("completely disagree") to 7 ("completely agree"). The first factor, *openness to coexistence*, showed a Cronbach's $\alpha = .94$, while the second factor, 'tendency to exclude', obtained a $\alpha = .8$.

Social Group Stereotype Scale (Espinosa et al., 2016)

This instrument measures the stereotypical characteristics associated with different ethnic or social groups. For this study, the instrument included 20 items, each consisting of pairs of 20 positive adjectives and their respective antonyms, potentially representative of the Venezuelan social category. The response options are presented

on a 7-point Likert scale, indicating the perceived proximity or distance of the social category to these attributes. The items are grouped into 3 dimensions: Competence (6 items, "Unsuccessful – Successful"); Warmth (7 items, "Sad/Melancholic – Happy"); and Morality (7 items, "Dishonest – Honest"). Cronbach's α were found to be α = .90 for Skill, α = .86 for Warmth, and α = .94 for Morality.

Differential Emotions Scale (Izard, 1991)

The Spanish version of Espinosa et al. (2007) was used to measure the intensity of 10 emotions towards a specific stimulus: in this case, the Venezuelan social category. A Likert scale was used, ranging from 1 ("not at all") to 7 ("a great deal"). Cronbach's α = .76 was reported for positive emotions, and α = .88 for negative emotions.

Social Domination Orientation Scale (Sidanius & Pratto, 2004)

The Spanish version of the Sidanius and Pratto (2004) SDO scale was used (Cárdenas et al., 2010), consisting of 16 items with a Likert response scale ranging from 1 = "strongly disagree" to 7 = "strongly agree". *Opposition to equality* and *group dominance* were the two dimensions utilized in the adaptation of the scale. The present study reported the following Cronbach's α = .94 for opposition to equality and α = .84 for group dominance. Additionally, a satisfactory reliability coefficient was obtained for the overall scale: α = .89.

Procedure and data analysis

An online survey form was designed using the Google Forms platform. The first section of the form presented the informed consent document, which indicated the voluntary, confidential, and anonymous nature of participation. A sociodemographic information sheet was included, as well as the previously described instruments. The form was disseminated through virtual means to Peruvian individuals over 18 years of age residing in Metropolitan Lima. After completing the questionnaires with the entire sample, data analysis was performed using the Statistical Package for Social Sciences (IBM SPSS) version 25.

The research had a non-experimental correlational design. First, normality analyses were conducted using the Kolmogorov-Smirnov test ($N > 50$). Additionally, histograms and box plots were reviewed. Although the Kolmogorov-Smirnov coefficient indicated a non-normal distribution, considering the skewness and kurtosis criteria ($|Sk| \leq 2$; $|Kr| \leq 7$), there were no signs of serious breach of normality (Curran et al., 1996).

Descriptive statistics were obtained for the sociodemographic data and applied scales. The Student's t-test was used to compare the participants' age groups. Pearson's correlation coefficients were calculated. The effect size of the results obtained in the analyses was determined. The nature and magnitude of the relationships between the studied variables were analyzed in an integrated manner through path analysis using the AMOS v.26 program. Both dimensions of the social distance scale were considered as output variables.

Results

Table 1 shows the sample statistics for mean, standard deviation, minimum, and maximum. The mean values indicate moderately high scores for the dimensions of exogroup stereotypes and openness to coexistence. Positive scores are reported overall regarding attitudes towards the Venezuelan population and social interaction with them. On the other hand, low scores are identified for the dimensions of negative emotions towards Venezuelans and the dimension of tendency to exclude on the social distance scale. It is noteworthy that the score for sadness is quite close to the average score between the minimum and maximum scores on the scale.

Table 1

Descriptive data of the study variables

	M	SD	Sk.	Kr.
SDO				
1. Opposition to equality	2.59	1.50	.91	–.07
2. Group dominance	2.43	1.16	.86	.20
National Stereotypes				
3. Competent Venezuelans	4.84	1.02	–.55	.90
4. Warm Venezuelans	5.31	.90	–.51	.28
5. Moral Venezuelans	4.35	1.07	–.25	.25
Intergroup Emotions				
6. Joy	3.33	1.83	.16	–1.11
7. Surprise	3.24	1.75	.21	–1.03
8. Sadness–Grief	3.88	1.84	–.03	–1.09
9. Interest	3.26	1.64	.16	–.92
1. Anger	2.06	1.48	1.51	1.77
11. Disgust	1.83	1.38	1.80	2.63
12. Contempt	1.63	1.18	2.25	5.24
13. Guilt	1.68	1.16	1.79	2.75
14. Shame	1.60	1.20	2.35	5.55
15. Envy	1.36	.88	2.80	7.74
Social Distance				
16. Coexistence	5.32	1.78	–.97	–.29
17. Exclusion	1.76	1.30	2.18	4.68

Note. Source: Own elaboration based on collected data. Min = 1, Max = 7

Contrast of means by age groups

The statistical analyses revealed significant differences between the age groups (15–29 years and 30 years and over) according to emotions and openness to cohabitation. In the category of emotions, the younger age group (15–29 years) showed significantly higher scores for the emotions of joy and guilt compared to the group aged 30 and over. In the category of openness to coexistence, significantly higher scores were also

observed in the younger age group, suggesting a greater willingness to interact with the Venezuelan immigrant population (see *Table 2*).

Table 2

*Comparison of means between groups by age**

	Bicentennial group (n = 265)		Non Bicentennial group (n = 130)		*t*(393)	p	*d*
	M	SD	M	SD			
SDO							
1. Opposition to equality	2.51	1.43	2.75	1.64	–1.40	.16	–.16
2. Group dominance	2.38	1.12	2.53	1.25	–1.25	.21	–.13
Intergroup Stereotypes							
3. Competent Venezuelans	4.88	.95	4.77	1.14	1.03	.30	.11
4. Warm Venezuelans	5.30	.93	5.34	.84	–.49	.63	–.05
5. Moral Venezuelans	4.38	1.00	4.29	1.22	.73	.47	.08
Intergroup Emotions							
6. Joy	3.52	1.79	2.96	1.85	2.86	.001	.31
7. Surprise	3.29	1.69	3.13	1.85	.83	.40	.09
8. Sadness–Grief	3.89	1.80	3.84	1.95	.28	.78	.03
9. Interest	3.35	1.61	3.08	1.70	1.54	.12	.17
1. Anger	2.08	1.42	2.02	1.59	.38	.70	.04
11. Disgust	1.84	1.33	1.82	1.47	.15	.88	.02
12. Contempt	1.64	1.14	1.62	1.27	.12	.91	.01
13. Guilt	1.75	1.21	1.52	1.02	1.99	.04	.20
14. Shame	1.59	1.22	1.61	1.18	–.12	.91	–.01
15. Envy	1.39	.92	1.29	.78	1.07	.29	.11
Social Distance							
16. Coexistence	5.54	1.60	4.87	2.02	3.31	.001	.38
17. Exclusion	1.70	1.21	1.88	1.47	–1.20	.23	–.14

Note: According to our own elaboration based on collected data, individuals up to the age of 29 are classified as part of the bicentennial group.

Associations among the study variables

Table 3 displays the associations found among the study variables. Concerning the SDO dimensions, a medium and inverse correlation was obtained between the dimension of openness to coexistence and opposition to equality, and an inverse and small correlation with group dominance. Regarding exogroup stereotypes, a strong positive correlation was obtained with the dimensions of competence and morality, while a small positive correlation was observed with warmth. Regarding intergroup emotions, a moderate positive correlation was found with joy and interest, and a small positive correlation with sadness and surprise. Additionally, a small negative correlation was reported with anger, disgust, and contempt.

Lastly, a small negative correlation was found with age. The tendency to exclude dimension showed a small positive correlation with opposition to equality and a moderate positive correlation with group dominance. Regarding exogroup stereotypes, medium to low inverse correlations were found with the dimensions of competence and morality, and a small inverse correlation with warmth. As for intergroup emotions, a small inverse correlation was found with joy and interest, and a small direct correlation with shame, as well as a medium direct correlation with anger, disgust, and contempt. Finally, a moderate inverse correlation with openness to coexistence is reported.

Table 3

Study Variable Pearson Correlations

	1	**2**	**3**	**4**	**5**	**16**	**17**	**18**
Social Dominance Orientation								
1. Opposition to equality	–							
2. Group dominance	.24**	–						
Intergroup Stereotypes								
3. Competent Venezuelans	–.32**	–.26**	–					
4. Warm Venezuelans	–.23**	–.17**	.74**	–				
5. Moral Venezuelans	–.28**	–.30**	.82**	.65**	–			
Intergroup Emotions								
6. Joy	–.17**	–.06	.37**	.37**	.44**	.35**	–.15**	–.17**
7. Surprise	–.06	–.04	.24**	.24**	.29**	.17**	–.06	–.06
8. Sadness–Grief	–.22**	–.11*	.26**	.26**	.25**	.23**	–.06	.05
9. Interest	–.21**	–.16**	.39**	.36**	.40**	.31**	–.13*	–.07
1. Anger	.09	.14**	–.20**	–.09	–.23**	–.19**	.33**	–.06
11. Disgust	.20**	.22**	–.30**	–.14**	–.31**	–.25**	.36**	–.04
12. Contempt	.22**	.15**	–.30**	–.15**	–.30**	–.26**	.37**	–.05
13. Guilt	.14**	.02	–.06	–.05	.01	–.02	.05	–.11*
14. Shame	.17**	.11*	–.15**	–.05	–.14**	–.10	.14**	–.02
15. Envy	.21**	.04	–.08	–.04	–.03	–.04	.05	–.05
Social Distance								
16. Coexistence	–.43**	–.19**	.51**	.35**	.60**	–	.17**	–.23**
17. Exclusion	.24**	.36**	–.42**	–.25**	–.49**	–.46**	–	.07

*Note: 18 = Age. Source, Own elaboration based on collected data, *p<.05; **p<.01*

In turn, opposition to equality showed a small direct correlation with group dominance, age, and emotions of disgust, contempt, guilt, shame, and envy. Additionally, it obtained moderate inverse correlations with the dimensions of warmth, morality, joy, interest, and sadness, and a moderate inverse correlation with the dimension of competence. The group dominance report showed small inverse correlations with the competence, warmth, interest, and sadness dimensions, and a medium inverse

correlation with morality. Additionally, it found small direct correlations with the emotions of Anger, disgust, contempt, and shame.

The dimensions of the social group stereotypes scale (warmth, morality, and competence) showed a moderate positive correlation with the emotion of joy, and a small positive correlation with the emotions of surprise, sadness, and interest. Competence showed a moderate negative correlation with anger, disgust, and contempt, as well as a small negative correlation with shame. Warmth, in contrast, exhibited small negative correlations with disgust and contempt. Lastly, morality showed a moderate inverse correlation with the emotions of disgust and contempt, and slight inverse correlation with anger and shame.

Path analysis of the study variables and their effect on Social Distance: Openness to Coexistence and Tendency to Exclusion

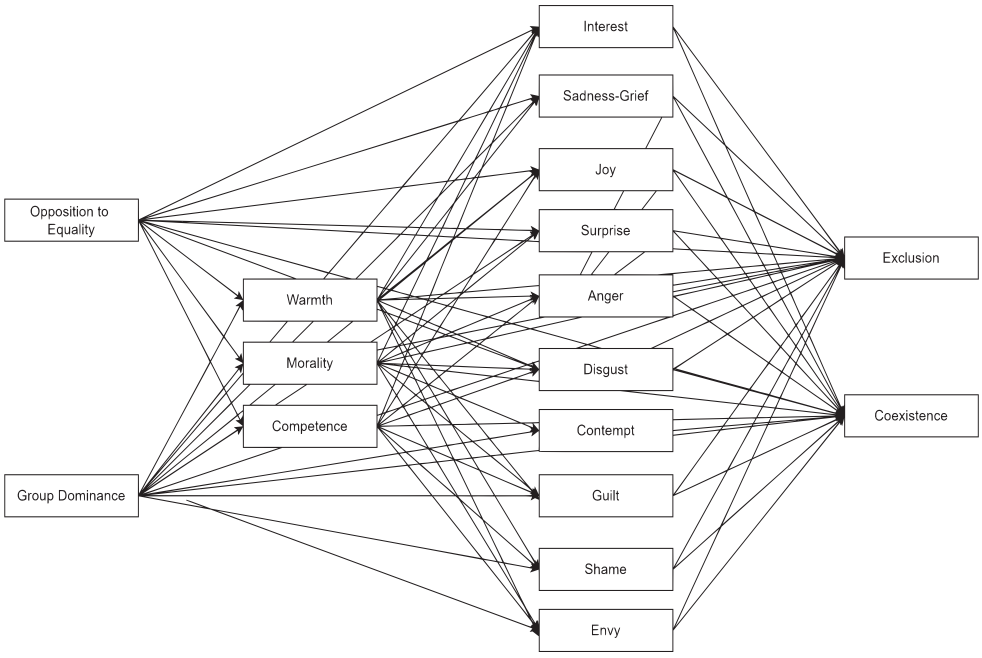

Figure 1. Hypothetical Model

A path analysis was conducted to comprehensively examine the relationships across the study variables. A hypothetical model was proposed to illustrate the relationships across the variables at four levels (see *Figure 1*). At the first level, the dimensions of SDO as an ideological component (opposition to equality and group dominance) are considered exogenous variables, exerting a direct influence on the other variables. stereotypes of outgroups (warmth, morality, and competence) are placed at the second level, and intergroup emotions (positive emotions, negative emotions, and sadness) at the third level. Lastly, at a fourth level, the dimensions of social distance (tendency to exclude and openness to coexistence) are considered output variables influenced by the preceding set of variables.

The goodness of fit of the proposed models was evaluated according to specific criteria outlined by Ruiz et al. (2010). Thus, the Chi-square coefficient (χ2) relative to the degrees of freedom (x2/gl) was evaluated with scores less than or equal to 3 considered indicative of good fit. In the same vein, the Bentler-Bonett comparative fit index (CFI) was evaluated with scores greater than or equal to .95 indicating a good model fit. Additionally, the Bentler-Bonett normed fit index (NFI) was considered adequate with scores greater than or equal to .9. Finally, the Steiger-Lind root mean square error of approximation (RMSEA) indicator was included with scores lesser than or equal to .08 considered indicative of an acceptable model fit.

The goodness-of-fit indicators for the hypothetical model exceed the established thresholds: $\chi^2/gl = 37.73$, CFI = .355, NFI = .499, and RMSEA = .3. The alternative models are detailed below. A detailed evaluation of the impact of the variables on the *social distance* dimension would be facilitated by analyzing the models and the significance of the cases. Two independent alternative models were used, each with its respective dimensions as output variables.

Alternative Model for the Tendency to Exclusion

The goodness-of-fit indicators for the alternative model that considers exclusion tendency as the output variable were: $\chi^2/gl = 3.19$, CFI = .978, NFI = .97, and RMSEA = .075.

In this model, opposition to equality has an inverse effect on morality ($\beta = -.16$, $p < .001$). Group dominance, on the other hand, has an inverse effect on morality ($\beta = -.23$, $p < .001$) and a direct effect on exclusion tendency ($\beta = .24$, $p < .001$). From a secondary level, morality has an inverse effect on contempt ($\beta = -.32$, $p < .001$) and anger ($\beta = -.33$, $p < .001$). Finally, the dimension of exclusion tendency receives a direct effect from contempt ($\beta = .17$, $p < .001$) and anger ($\beta = .11$, $p < .001$), and an inverse effect from morality ($\beta = -.43$, $p < .001$).

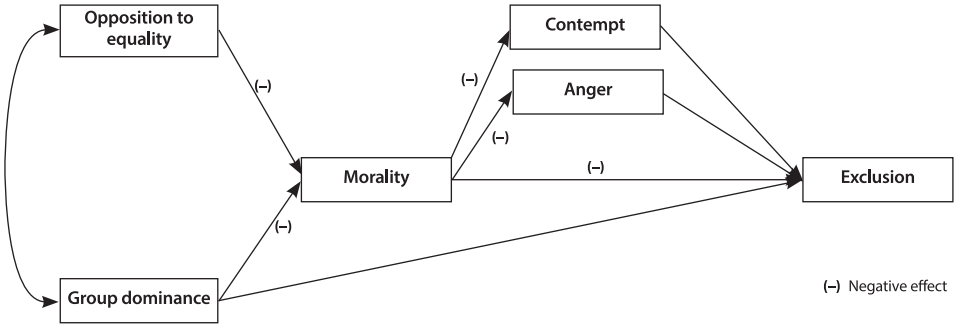

Figure 2. Alternative Model – Social Distance: Exclusion

Alternative Model for Openness to Coexistence

The goodness-of-fit indicators for the alternative model for the dimension of openness to coexistence are as follows: $\chi^2/gl = 1.76$, CFI = .994, NFI = .987, and RMSEA = .044. In this model, opposition to equality has an inverse effect on both morality ($\beta = -.22$, $p < .001$) and openness to coexistence ($\beta = -.28$, $p < .001$). Group dominance, on the other hand, only has an inverse effect on morality ($\beta = -.24$, $p < .001$). At a secondary

level, morality has a direct effect on joy ($\beta = .44$, $p < .001$) and openness to coexistence ($\beta = .48$, $p < .001$). Joy has a direct effect on openness to coexistence ($\beta = .09$, $p < .001$).

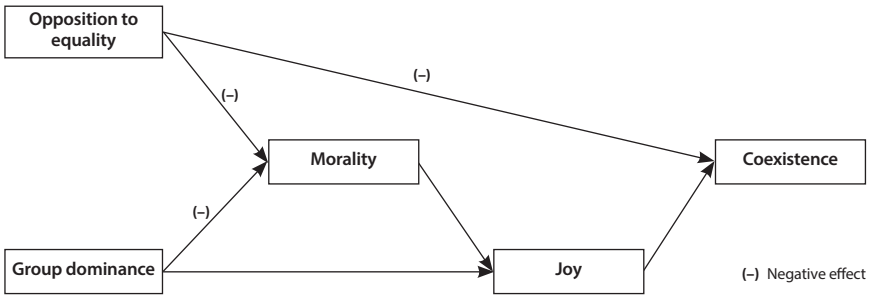

Figure 3. Alternative Model – Social Distance: Coexistence

Discussion

An important observation to highlight is the sample does not exhibit a strong tendency towards social dominance in any of its dimensions. This finding is consistent with studies of similar samples of Lima adults with medium or high levels of education, who tend to show lower levels of social dominance orientation alongside more positive evaluations and orientations towards outgroups, even those perceived as being lower status (Cueto et al., 2021; Guillén et al., 2018).

Meanwhile, stereotypical perceptions of Venezuelans as warm are noteworthy, corresponding to stereotypical perceptions of Latin American groups as sociable, friendly, and helpful (Cabrera et al., 2018; Guillén et al., 2018; Gissi et al., 2019). Perceiving immigrants as competent is also important, as it relates to recognizing their ability to find employment, even informally, as national statistics indicate (Barajas et al., 2021).

Regarding intergroup emotions, the level of sadness felt for Venezuelan immigrants and the positive emotions they elicit in the sample, suggests an emotional scenario characterized by a mix of victimizing anger and pity. This condescending view has also been observed in studies with Latin American samples towards groups considered competent but still of low status (Cueto et al., 2021; Guillén et al., 2018).

In the Ecuadorian context, studies on negative emotions and attitudes toward immigration typically focus on emotions such as fear, distrust, hopelessness, anger, and anxiety, with little attention given to sadness as a negative emotion. These emotions are strongly correlated with anti-immigrant attitudes and the rejection of Venezuelan immigrants, highlighting the exclusionary sentiments that characterize the public discourse on migration more generally (Umpierrez et al., 2023; González et al., 2022).

In line with earlier research, the sample for this study indicates that younger participants are more likely to support equality and inclusion and to be less conservative (Diaz et al., 2018). Youth between the ages of 18 and 24 exhibit greater levels of empathy and respect for others, according to studies using Peruvian samples (Ipsos Peru, 2019). Specifically, regarding Venezuelan immigration, it has been found, as in the present study, that the youngest participants in the sample exhibit relatively

low levels of prejudice, a better perception, and a greater openness to coexistence with Venezuelan immigrants (Alvarez & Chavez, 2018; Institute of Democracy and Human Rights of the Pontifical Catholic University of Peru [IDEHPUCP], 2020).

Regarding the associations between variables, as in previous studies (Cohrs & Asbrock, 2009; Ferreyros, 2019; Vezzali & Giovanni, 2010), and as hypothesized, higher levels of social dominance orientation are linked to a more negative view of the migrant population, as well as emotions align with aversive or hostile emotions, such as anger, disgust, and contempt. Literature suggests that these emotions are correlated with negative behaviors towards the exogroup. Specifically, emotions such as disgust and contempt are linked to increased avoidance of the exogroup (Mackie et al., 2000). This finding confirms the hypothesis proposed in this study. As aversive or hostile emotions towards the migrant population intensify, the tendency to coexist with them decreases. Conversely, the probability of acting in an exclusionary manner towards them increases.

It has been found that the emotion of guilt aroused by exogroups is connected to the authority that is ascribed to them. Thus, groups perceived as powerless are often devalued, invalidated, and excluded, thereby favoring the maintenance of social asymmetries (Sabido, 2019). This study shows that shame increases alongside social dominance, consistent with the devaluing agenda of dominant sectors toward immigrant populations of perceived lower status and power, to whom they attribute less positive stereotypical characteristics. In contrast, dominance tends to mitigate approach emotions (Cohrs & Asbrock, 2009; Ferreyros, 2019; Vezzali & Giovanni, 2010) such as joy and interest, and instead promotes avoidance and a lower perception of positive outgroup characteristics.

From another perspective, it is important to highlight that openness to coexist with the migrant population is directly associated with positive emotions and sadness, which creates an ambivalent emotional scenario. This ambivalence in emotions could be influenced by personal interactions with Venezuelan migrants, who represent a significant percentage of the sample and may generate these positive emotions, as found in previous studies (Freier et al., 2021). These positive interpersonal experiences with the Venezuelan immigrant population contrast with the negative messages about this group that are spread particularly through the media and social networks, as well as by authorities and law enforcement agencies (Menéndez, 2022; Peru 21, 2022; Sánchez, 2021).

In the case of Colombia, social perceptions of Venezuelan migrants reflect a duality: they are seen both as a threat to social and economic stability, and as victims of the crisis in Venezuela. This perception, influenced by individual experiences and stereotypes, generates a complex and varied attitude, in which Venezuelans are perceived as outsiders to the national group. This division in perception highlights the contrasting attitudes within Colombian society, where some view Venezuelans as a burden, while others recognize the need for solidarity and assistance (Perdomo et al., 2023).

According to studies pertaining to stereotypes within press media concerning Venezuelan immigration in Peru, both print and digital publications frequently link migrants to criminal activity. This approach can influence public perception, contributing to the formation of stereotypes and prejudices against this population (Regis,

2024). Thus, Freier et al. (2021) found that the Venezuelan migrant population are perceived as responsible for the increase in criminal violence, citizen insecurity, and job loss for Peruvians, as well as associated with greater informality and tax evasion, which perpetuates a negative stereotypical image of this group.

In terms of path analysis models, the χ^2/df values of the *alternative model 1* slightly exceed the acceptable range, however, this is attributed to the fact that this estimate is highly sensitive to sample size (Hu & Bentler, 1999). Conversely, some authors accept a χ^2/df value of less than 5 in samples larger than 300 participants (Aguilar et al., 2020).

In the identified SEM pathways, social dominance orientation plays a central role in promoting the tendency to exclude migrant populations and in hindering openness to coexistence with them. This observation correlates with both the levels of conservatism in Peruvian society, where dynamics of exclusion and differentiation prevail among ethnic and social categories (Cueto, 2017), and the precarious social conditions in which migrants are inserted, commonly associated with informality, poverty, and violence (Freier et al., 2021). According to the study, both elements would encourage people from dominant ideological sectors to associate the Venezuelan immigrant social group with unfavorable stereotyped traits and linked to fewer positive feelings regarding social integration.

The study's findings not only highlight the negative evaluation of migrants by more conservative sectors, but also provides evidence of the presence of an ideological system and psychosocial scenarios that place the migrant population at risk of harmful effects derived from conservative attitudes, as suggested in previous studies on the topic (Cohrs & Asbrock, 2009; Ferreyros, 2019; Vezzali & Giovanni, 2010).

The differentiated effect of the SDO dimensions on the model's output variables is a particularly interesting result exhibited by the path analysis models. It appears that opposition to equality has a subtle negative effect on the integration of immigrants, while group dominance actively promotes actions against this group. Previous studies have found that opposition to equality is associated with system justification, which implies a lack of questioning regarding the inequality suffered by marginalized sectors (Silván & Bustillos, 2007). Meanwhile, dominance is linked to endogroup favoritism, which at the intergroup level, reinforces the devaluation of the exogroup and therefore increases the tendency towards their exclusion (Jost & Thompson, 2009).

Nevertheless, the role of morality stereotypes as a central variable in understanding both the tendency to exclude and the openness to coexist emerges as one of the most notable findings of this study. This finding is partially supported by previous studies that have observed the impact of morality perception on the relative status of social groups (Espinosa et al., 2016), as well as on positive expectations about the behavior of their members, which favor interpersonal trust (Beramendi, 2014; Van Vugt & Hart, 2004). Morality is a central variable in intergroup relations, particularly in the evaluation of outgroups in Latin American countries, where this dimension often receives negative scores when evaluated as a characteristic of the national collective (Beramendi, 2014; Espinosa et al., 2016; Monsegur et al., 2014). Thus, identifying social categories that act as moral reserves within a national category appear to have a positive effect on the evaluation of subnational categories (Cueto, 2017; Espinosa et al., 2016). Therefore, the findings of this study highlight the importance

of consolidating and positioning a positive perception of Venezuelan migrants, based on morality, given the potential positive effect of this stereotypical characteristic on the overall evaluation of the category.

The results obtained in this study are consistent with the findings of Romero et al. (2020) in Chile, who found that both morality and SDO can predict prejudice toward migrants. It is important to highlight that the authors emphasize a negative relationship between the specific dimensions of SDO (opposition to equality) and RWA (aggression toward authority), suggesting that individuals who identify with a social elite do not necessarily support extreme punitive measures against migrants. This finding underscores the complexity of attitudes toward migrants, indicating that, while there may be rejectionist views, they do not always translate into support for harsh policies of exclusion or punishment.

In addition, prior research has reported that the effects of emotions like disdain and anger on endogroup exclusion are similar to the effects found in the path analysis. These hostile emotions are considered agentic and promote active discriminatory behavior and exclusion (Cuddy et al., 2007; Mackie et al., 2000). Conversely, although joy, as an intergroup emotion, is traditionally associated with the evaluation of high-status groups (Espinosa et al., 2007), it is recognized as playing an important role in the active integration behavior of outgroups. Evidence in this regard suggests a positive role of positive intergroup emotions in promoting a favorable intergroup contact scenario and probably in preventing intergroup conflicts and tensions (Cueto et al., 2021).

Therefore, despite a complex scenario of social exclusion, it is important to consider that there are central elements that can facilitate greater integration and intergroup coexistence. As previously mentioned, perceived stereotypes, such as warmth and competence are highly relevant as they influence positive emotions and prosocial behavior (Fiske, 2015). Specifically, being perceived as competent could have a key role in receiving support and opportunities, which might be essential for immigrants' adaptation (Gaucher et al., 2018). Finally, a positive perception of Venezuelans' morality could improve their public image and generate greater social acceptance and thus mitigate xenophobia (Blouin & Zamora, 2022). However, it is important to reinforce the coordination of government and civil society actions so that integration efforts are sustained over time.

Conclusion

The results of this study enable us to understand a historical problem from a psychosocial perspective, which has gained greater relevant in Latin America due to the recent international displacements. The study emphasizes the significant role of perceptions and evaluations of social categories as promoters or repressors of intergroup integration intentions that could trigger dynamics of inclusion or exclusion (Freier et al., 2021; Menéndez, 2022; Perú 21, 2022; Sánchez, 2021).

Additionally, the study results identify other potential factors that could promote the process of social integration. One of these factors is lowering of an orientation toward social dominance, whose positive effect could be enhanced by generational influences. It is the young people in the sample who, as in other studies, stand out

for exhibiting a more critical and discerning understanding of situations of exclusion in vulnerable sectors. The authors Alvarez and Chavez (2018) and Ferreyros (2019) suggest a more inclusive approach to cultural diversity, one which contrasts with the ideologically of conservatism.

Finally, although this study focuses on understanding intergroup dynamics at the psychosocial level, it cannot be overlooked that the construction of social hierarchies and the possibilities for integrating vulnerable groups in migration contexts are also influenced by the socioeconomic conditions of migrant communities. Based on the structural and sociopolitical characteristics of host societies (Silván & Bustillos, 2007; Jost & Thompson, 2009), reflections and conclusions regarding intergroup behavior within the context of Venezuelan immigration to Lima invite us to reconsider the contribution of academia in preventing and reducing situations of social exclusion and achieving integration goals. Transformation and justice for the most vulnerable sectors of society must be pursued while acknowledging the structural and systemic limitations and challenges inherent in contexts of displacement and reception.

Limitations

This study yields significant insight into the relationships between conservatism, intergroup dynamics, and social distance in the Venezuelan immigrant population residing in Metropolitan Lima. However, it is essential to consider several inherent limitations that may impact the generalizability of the findings. It is crucial to acknowledge that the sample utilized may not fully encapsulate the demographic composition of the Venezuelan migrant population in the region. This may potentially restrict the ability to generalize the findings beyond these specific circumstances.

Moreover, the lack of access to specific data may have constrained in-depth analysis of certain variables or aspects of the phenomenon under study. These limitations underscore the necessity for future research that addresses these issues and expands our understanding of complex intergroup dynamics in migratory contexts.

Ethics Statement

Although the study did not undergo a formal ethics committee review, it should be noted that the nature of the research did not necessitate this approval. Nevertheless, all ethical procedures associated with human research were rigorously followed. This entailed the acquisition of informed consent from all participants involved in the study, as well as the assurance of the confidentiality of the data collected.

We are aware of the significance of ethical considerations in academic research and are dedicated to maintaining the highest ethical standards in all our projects. We are prepared to provide any additional documentation that may be required to substantiate our ethical procedures.

Informed Consent from the Participants

All participants in this study were of legal age. They were given written informed consent.

Author Contributions

R.C., L.A and C.LL. conceived of the idea. R.C and L.A. developed the theory and performed the computations. C.LL., C.Lo and F.A. verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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Psychometric Analysis of the Spanish Version of the *Identity Distress Scale* in Ecuadorian Emerging Adults

Fernanda Cordero-Hermida[a*], Juan Diego Sacoto[b], Evelyn Sinchi[b], Paúl Arias-Medina[a]

[a] *University of Cuenca, Ecuador*
[b] *Integral Psychopedagogy Center "Jade", Cuenca, Ecuador*

*Corresponding author. E-mail: fernanda.cordero@ucuenca.edu.ec

Background. Emerging adulthood is a newly known developmental stage in humans, between late adolescence and fully-achieved adulthood. This stage is characterized by continued indecision and postponement of individuation; it also corresponds with a delay in identity actualization. Personal identity is related to the development of the individual across various aspects of life including the identification of long-term goals, career selection, friendship, and sexuality. Therefore, identity is understood to be an individual's perception of themselves and the conceptualization of their place within a social context. Identity development is expected to reach this critical stage between late adolescence and emerging adulthood, where specific factors may arise to hinder the realization of identity, potentially resulting in identity problems or identity distress. The latter considered a disorder within the DSM-III, and based on its diagnostic criteria, the *Identity Distress Scale* was created to measure the presence of identity distress.

Objective. First, to report evidence of validity and reliability of the IDS using exploratory and confirmatory factor analysis, internal consistency, and invariance testing according to the Identity Distress Scale across a sample of Ecuadorian emerging adults. Second, to report the scores of the Identity Distress Scale among the participants.

Design. The study employed a quantitative approach with a non-experimental, cross-sectional design, and an instrumental scope.

Results. The results reveal that the scale operates with a first-order two-factor model, demonstrating a good fit and internal consistency (χ^2 (df) = (34) 125.03, CFI = .97, TLI = = .95, SRMR = .07, RMSEA = .07, α = from .72 to .76, ω = from .66 to .73). Evidence of measurement invariance was found between males and females.

Conclusion. The IDS has adequate psychometric properties for its use in the Ecuadorian context.

Keywords: identity distress, exploratory factor analysis, confirmatory factor analysis, construct validity, identity, emerging adulthood

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Introduction

Emerging adulthood (EA), a transitional developmental stage between late adolescence and early adulthood (Barrera-Herrera & Vinet, 2017), spans 17 to 29 years of age (Arnett, 2015; Wood et al., 2017). It signifies a time of continued development and self-discovery for individuals, who, in parallel with generational sociodemographic changes, are pursuing new experiences (Arnett, 2005; Gfellner & Córdoba, 2023).

According to Arnett, emerging adults tend to refrain from making commitments such as marriage or family planning. Instead, they are driven by the need to pursue various goals related to higher education, engagement in informal employment, pursuit of new experiences, and exploration of diverse romantic and sexual relationships. This inclination may lead emerging adults to engage in risky and harmful activities such as substance abuse, promiscuous and unsafe sexual behaviors, and even antisocial behaviors (Salvatore, 2018).

One of the main characteristics of EA is a phase of identity exploration (Arnett, 2000). In this exploratory stage, individuals are unsure about who they are, what they want, or what they seek in others (Salvatore, 2018). The formation of identity, a crucial concept for understanding the adolescent developmental process, has therefore extended to EA (Gfellner & Cordoba, 2017).

Within the field of psychology, identity was first explored through psychoanalytic theory. Although psychoanalytic literature does not explicitly use the term identity, it does refer to *identification*, to explain how conflicts arise between levels of consciousness and consequently influence the emergence of personality (Elgarte, 2011).

Freud (1923/1986) conceptualized the ego as the defensive pole of personality, responsible for mediating and directing impulses in response to the demands of reality. Along the same theoretical line, Lacan (1961/2009) conceptualized the process of identification as a foundational mechanism in the very constitution of an individual, regarding the subject's relation to the symbolic. Conversely, Erikson (1985), who, elaborated on the concept, defined personal identity as "the perception of sameness and continuity of one's existence in time and space and the perception that others recognize that sameness and continuity" (p.19).

According to Erikson's theory, identity formation occurs throughout life, but during adolescence, the process reaches its most critical phase, the time when individuals seek to establish their place in the society they are immersed in (Tesouro, et al., 2013).

Therefore, the development of identity is related to what makes the individual different from others; it involves self-discovery, future goals, values, and beliefs, which in turn enables individuals to position themselves within a certain social group they feel capable of belonging to (Barrera-Herrera & Vinet, 2017; Tesouro et al., 2013). There are facilitating factors and factors that hinder identity development. Among the facilitating factors, are context and its diversity, the ability to make decisions, having a partner, and being independent which promotes identity formation. Conversely, factors such as dependence on parents, insecurity, and dependence on others' opinions would limit identity achievement (Barrera-Herrera & Vinet, 2017).

Identity is primarily formed through social interaction across three dimensions: self-recognition, recognition of others, and others' recognition of us (Mar-

cús, 2011). Given that development through adolescence and EA requires stable mental health (Yuguero et al., 2020), instability caused by a deficit or delay in psychological maturity, can incur the risk of potential maladaptation and even possible mental health problems (Gfellner & Córdoba, 2017). Moreover, a strong characterological conflict can confuse the individuals in their perception of themselves (Erikson, 1985).

The difficulty in this transition from adolescents into adulthood is evidenced in resolving both the identity crisis (Erikson 1968, cited in Sica et al., 2014) and the conflict between identity synthesis and role confusion (Crocetti et al., 2012). Due to the different decisions and changes faced by adolescents, the subsequent EA stage is prone to increasing identity distress (Berman et al., 2004). Contemporary youth may exhibit a variety of identity distressers due to several factors including, but not limited to a prolonged period of academic study, and job uncertainty (Luo et al., 2020). Identity distress has been directly related to psychological instability and it is considered a significant issue among university students (Gfellner & Córdoba, 2020). Problems related to identity may even be considered pathological (Berman, 2020).

Within the study of identity, identity distress is a focus that has not been deeply investigated but has gained strength in recent years. Berman et al. (2004) developed the Identity Distress Scale (IDS) to study this phenomenon. This instrument is derived from the diagnostic criteria for identity disorder, included in the DSM-III and DSM-III-R, although this classification was modified in the DSM-IV (1994), where the disorder was reclassified as an identity problem and categorized among other conditions that may be a focus of clinical attention.

The main characteristic of this disorder, according to the DSM-III (1980), is the development of severe subjective distress caused by an inability to reconcile aspects of the self into a single coherent and acceptable sense of personhood. The diagnostic criteria evaluated in the IDS include the degree of long-term goals, career choice, friendships, sexual orientation and behavior, religious identification, moral value systems, and group loyalties.

In addition to these seven distress factors, the IDS also evaluates a *global* factor, which measures the generalized distressing effects of the aforementioned criteria on the participant's life. Finally, item 10 of the IDS addresses the timeframe of discomfort, distress, or concern associated with the evaluated criteria. This last item fulfills the diagnostic criterion of symptoms across time, which, according to the DSM-III, must be present for at least three months (DSM-III, 1980).

The authors report acceptable values of internal consistency ($\alpha = .84$), reliability ($\kappa = .82$), and convergent validity; the correlations were significant and ranged between $r = .11$ and $r = .64$). The survey is scored in the event a participant meets the diagnostic criteria for identity disorder; however, this scale has not been validated in Ecuador.

In terms of research, Capella & Andrade (2017) acknowledge that psychology in Ecuador lacks widespread dissemination of empirical studies, whether qualitative, or quantitative. Additionally, in Ecuador, the repertoire of psychometric instruments suitable for use in research is limited As Costales (2011) asserts, assessment tools used in Ecuadorian organizations (cognitive tests, personality inventories, scales,

surveys, etc.) lack psychometric studies supporting their validity and effective application (p. 6).

The present study aims to evaluate the construct validity, internal consistency, and invariance of the IDS tool. Psychometric studies of the Spanish version of this instrument are nonexistent. According to the reviewed literature, the IDS is the only tool that addresses the construct of identity distress, applicable to various age ranges, but especially during EA. Finally, the present study contributes to an understanding of how identity develops in Ecuadorian emerging adults. The findings not only enhance theoretical knowledge but also provides a basis for practical interventions that can support emerging adults in their journey towards establishing an identity. Additionally, the study lays the foundation for future research into identity in Ecuador and the broader Latin context.

Methods

The study adopted a quantitative approach with a non-experimental, cross-sectional design, and an instrumental scope.

Participants

The sample consisted of 517 university students (67.9% female and 32.1% male). Additionally, the population fell within the age range of 17 to 29 years. The ages comprising the population correspond to the developmental stage known as emerging adulthood.

Procedure

The instruments were administered to psychology students at the University of Cuenca after receiving approval from the dean. Initially, a pilot test was conducted with ten volunteers who reviewed the Spanish translation of the instruments and assessed the appropriateness of the content. Subsequently, participants were selected based on convenience sampling. Both the consent form and the application form were provided in digital format, and students were directed to a computer lab to complete the necessary documentation.

Questionnaire

The Identity Distress Scale, developed by Berman et al. (2004), aims to measure severe interference or disturbance in identity development according to the conceptualization of identity distress (DSM-III) and identity problems (DSM-IV TR). It consists of 10 items, the first seven items are created based on a 5-point Likert scale response format (from 1 = not at all, to 5 = very severely) to indicate the extent to which respondents have been recently upset, distressed, or worried about identity issues: long-term goals, career choice, friendships, sexual orientation and behavior, religion, values and beliefs, and group loyalties. Two items prompt respondents to rate the overall level of discomfort, distress, or anxiety and how much uncertainty interferes with their life overall. One final item asks respondents to indicate the time (from 1 = never to 5 = more than 12 months) they felt upset, distressed, and worried about these issues.

Data Analysis

A qualitative review process was conducted which included translations from English to Spanish and back-translations from Spanish to English, as well as a qualitative evaluation of item wording and relevance to context and culture.

Quantitative analysis was conducted in three stages: the first stage involved descriptive analysis; the second stage comprised exploratory and confirmatory factor analyses and internal consistency analyses; the third stage involved invariance analysis and comparisons of scores across the categories of sex.

Skewness, discrimination, and difficulty values are reported. Discrimination, also referred to as item-total correlation, indicates how participants perform on the test as a whole compared to how they behave on each item individually. Values > .3 are considered good, values between .1 and .3 are acceptable, and values < .1 are poor (Mikulic, 2007). Regarding difficulty, this reflects how strongly respondents endorse higher-end responses to an item; high values indicate that respondents frequently select higher response categories, and those close to 0 indicate that respondents generally select lower response categories, with the ideal range between .5 and .8 (Aiken, 2003).

The Kaiser, Meyer, and Olkin (KMO) statistic is calculated with values ≥ .8 considered acceptable. Additionally, Bartlett's sphericity test is performed, and a significant result is expected. Factor extraction is performed using the unweighted least squares method (ULS), as it is the most efficient for exploratory factor analysis (Lloret-Segura et al., 2014). The number of factors to be extracted is determined by utilizing very simple structure (VSS) and Velicer's minimum average partial (MAP) analysis (Horn, 1965; Revelle, 2020).

Classic indices of absolute and incremental fit are used to evaluate the goodness of fit. The χ^2/degrees of freedom ratio is expected to be less than 3, the RMSEA value and its confidence interval are expected to be less than .06, although other authors suggest a cutoff of .08 (Browne & Cudeck, 1989). The SRMR value is expected to be less than .08 (Steiger & Lind, 1980), and CFI and TLI values are expected to be above .95 (Hu & Bentler, 1999). Internal consistency of the instrument was evaluated using ordinal Cronbach's alpha (α), and McDonald's omega (ω) as suggested by Raykov (2001). Average variance extracted (AVEVAR) scores above .50 are considered to show adequate convergence across all factors (Franco-Guanilo & Hervias-Guerra, 2022). Scores between .7 and .8 are considered acceptable, values above .8 indicate high consistency, and values above .9 may indicate question redundancy (Cicchetti, 1994; Tavakol & Dennick, 2011). Invariance analysis begins by assessing population covariance equality, followed by configurational, metric, residual, and scalar invariance applying the criteria proposed by Cheung & Rensvold (2002).

Lastly, the behavior of the variables *age* and *sex* within the two-factor model is analyzed. Regarding age, its correlation with the distress and global factors is analyzed. Similarly, the sex variable is compared within both factors, but also subjected to distribution tests to verify the magnitude of the difference between males and females.

All analyses were conducted using R software (R Core Team, 2021) utilizing several packages including lavaan (Rosseel, 2012), nFactors (Raiche & Magis, 2020), psych (Revelle, 2020), sjPLot (Lüdecke, 2021), REdaS (Maier, 2015), sem-

Tools (Jorgensen et al., 2021), semPlot (Epskamp, 2019), and equaltestMI (Jiang et al., 2021).

Results

The descriptive analysis of each item of the Identity Distress Scale (IDS) revealed that items I4 and I5 exhibit a right-skewed distribution. Furthermore, items I4, I5, and I7 reflect a low level of difficulty. Additionally, it is shown that all items discriminate effectively *(See Table 1)*.

The KMO index = .8438 and the significant result derived from Bartlett's sphericity test ($\chi^2 = 1089.355$, df = 45, $p < .001$) indicate that the correlation matrix can be factored.

Table 1

Descriptive Analysis of the Variables

Items	Mean	SD	Skew	Difficulty	Item Discrimination	α if deleted
I1.	3.13	.93	–.07	.63	.51	.77
I2.	2.89	1.14	–.07	.58	.44	.77
I3.	2.64	1.01	.09	.53	.49	.77
I4.	1.53	.89	1.65	.31	.38	.78
I5.	1.64	.98	1.49	.33	.37	.78
I6.	2.19	1.07	.7	.44	.48	.77
I7.	1.94	1.1	.9	.39	.41	.78
I8.	2.34	.99	.31	.47	.54	.76
I9.	2.8	.94	.15	.56	.57	.76
I1.	2.3	1.34	.77	.46	.44	.78

The Very Simple Structure (VSS) analysis was conducted to evaluate the appropriateness of different factor solutions. According to the VSS complexity 1 and complexity 2 indices, the maximum VSS score was achieved with one factor (.68) under complexity 1 which improved to .75 with two factors under complexity 2. This indicates an incremental benefit in explanatory power with the addition of a second factor. Additionally, the Velicer MAP test supported the one-factor model, achieving a minimum score of .02, which indicates that a single factor is sufficient in capturing the underlying structure of the dataset.

The exploratory factor analysis (EFA) using unweighted least squares (ULS) estimator and oblimin rotation was performed for a two-factor solution. Both factors cumulatively accounted for 41% of the variance among the items. For factor 1, we observed high loadings on D4 (.59), D6 (.68), D8 (.63), D9 (.71), and D10 (.56), indicating a robust alignment with constructs expected to measure aspects of identity distress. Factor 2 primarily captured substantial loadings with D2 (.85) and moder-

ate associations with D1 (.52) and D7 (.43). Most items demonstrated a high level of shared variance with their respective factors, ranging from .2 to .52 (*See Table 2*).

Table 2

A two-factor solution obtained through EFA

	factor 1	factor 2	item communality
D1	.24	.52	.45
D2	-.07	.85	.68
D3	.31	.37	.35
D4	.59	-.04	.33
D5	.51	.01	.26
D6	.68	-.07	.42
D7	.2	.43	.31
D8	.63	.08	.45
D9	.71	.02	.52
D10	.56	.04	.33

For confirmatory factor analysis and internal consistency analysis, a first-order two-factor model was evaluated, grouping the first 7 items into the distress factor and items 8, 9, and 10 into the global factor. The results are shown in *Table 3*.

Table 3

Goodness of fit and internal consistency of the two-factor model

Factor	χ^2	df	CFI	TLI	SRMR	RM SEA	RMSEA 90% CI	α	ω	AVE
Distress	125.03	34	.97	.95	.07	.07	.06 – .09	.76	.73	.33
Global								.73	.66	.48

Note: α, Cronbach's alpha; ω, omega; AVE, average variance extracted

The first-order two-factor model yielded acceptable goodness-of-fit indices in incremental fit indices: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). According to Hu & Bentler (1999), CFI and TLI values should be close to .95, and SRMR should be less than .08 for adequate goodness of fit. However, the Root Mean Square Error of Approximation (RMSEA) with a score of .07 and a confidence interval between .06 and .09 exceeds the expected value of .06 proposed by Hu & Bentler (1999), although other authors suggest a value of .08 (Browne & Cudeck, 1989), which still allows for a reasonable fit. *Figure 1* shows a good level of item-factor and inter-factor relationships, as the acceptable range is between .5 and 1. Cronbach's alpha for the whole scale was .79.

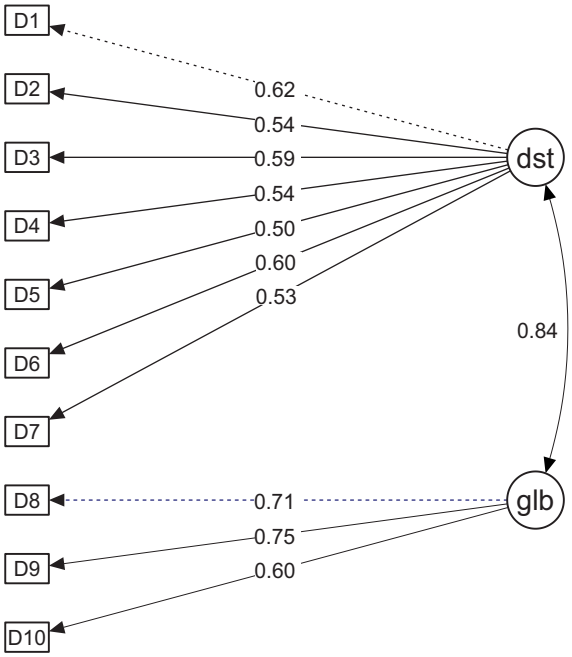

Figure 1. Factor loadings obtained in the confirmatory factor analysis

The adjustment indices for calculating factorial invariance in the first-order two-factor model (for each gender separately) are displayed in *Table 4*. Configurational invariance, metric invariance, scalar invariance, and strict invariance were progressively evaluated from the established model (Byrne, 2008).

Table 4

Invariance analysis

Model	χ^2	gl	CFI	RM SEA	SRMR	ΔCFI	ΔRMSEA	ΔSRMR
Model (two groups)	14.11	34	.97	.08	.07			
Men Model	74.88	34	.97	.09	.09			
Women Model	96.61	34	.97	.073	.07			
Configural Model	171.49	68	.97	.08	.08			
Metric Model	203.01	76	.96	.08	.08	–.007	.004	.004
Scalar Model	205.74	103	.97	.06	.08	.007	–.019	–.003
Strict Model	212.82	104	.97	.06	.08	–.002	.002	0
Variance and covariance Model	222.662	107	.97	.07	.07	–.002	.001	.001

Firstly, it is observed that there is a better fit in the women's group than in the men's group, especially when comparing the RMSEA values. Secondly, when comparing the changes (ΔCFI and ΔRMSEA) between models, no significant changes are observed.

The correlation analysis between the distress, global factors, and the age variable (see *Figure 2*) indicated that age has a low-magnitude negative relationship with the distress factor (ρ = –.13). In contrast, age does not present a relationship with the global factor (ρ = –.06). However, a moderate to high-magnitude positive relationship was observed between the distress and global factors (ρ = .57).

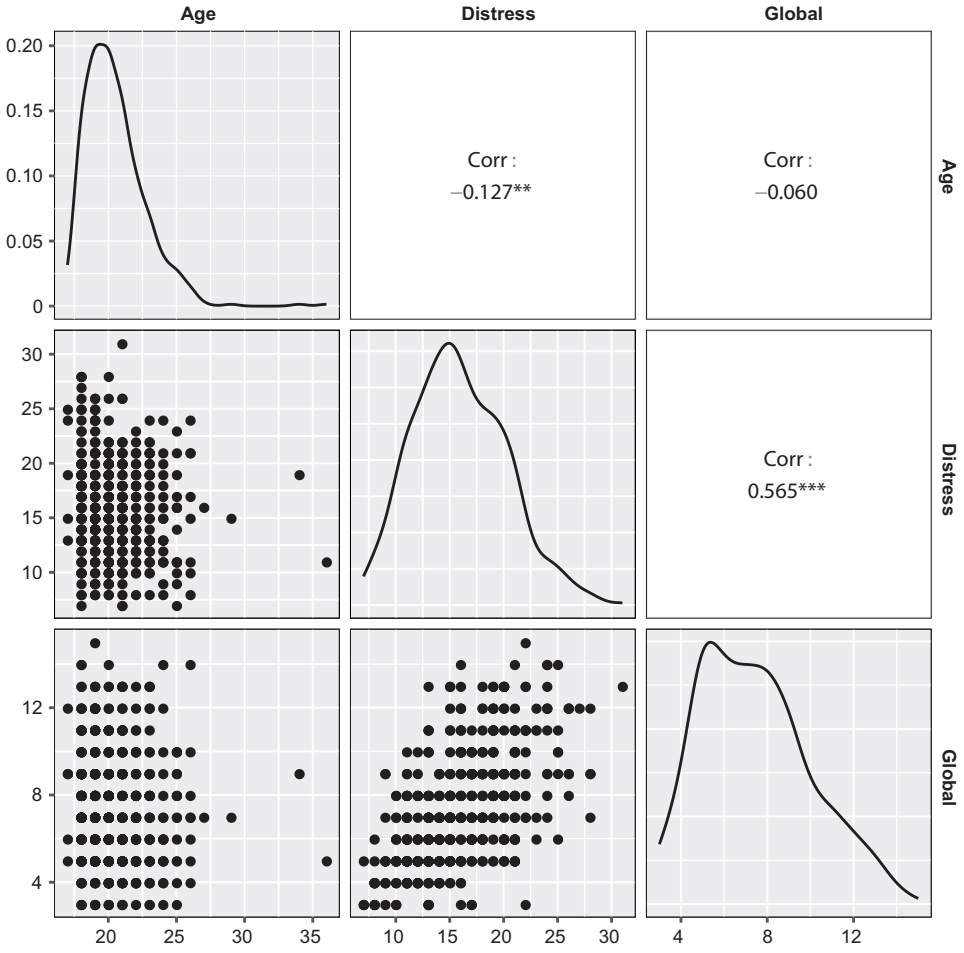

Figure 2. Correlations of Age with Identity Distress and Global scores of the IDS

Furthermore, distribution tests were conducted to verify the difference between men and women. When comparing the sex category within the distress factor, it was found that there is no significant difference between men and women ($p = .06$), in-

dicating a minimal effect (Cohen's $d = .18$). Similarly, when comparing sex with the global factor, a similar result was obtained ($p = .82$; Cohen's $d = .02$), indicating no significant difference between men and women.

Lastly, when graphically comparing the behavior of the sex variable in the distress and global factors, it is observed that the distress factor in women has an atypical score and less dispersion when compared to men. Additionally, both sexes exhibit the same limits and a positive skew towards the right, although in women, it denotes a greater skew (see *Figure 3*).

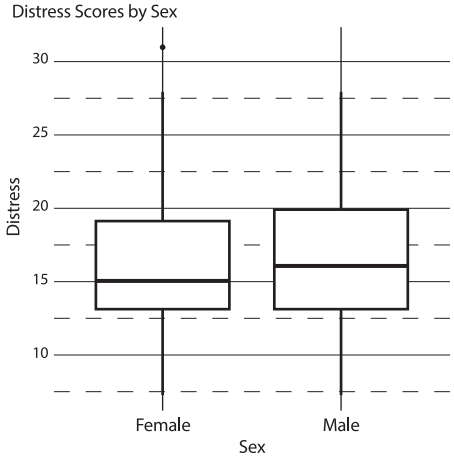

Figure 3. Box plot, Distress, and Sex

Conversely, in the global factor, both women and men show similar dispersion. In both cases, there is a positive skew towards the right, with women showing a greater skew (see *Figure 4*).

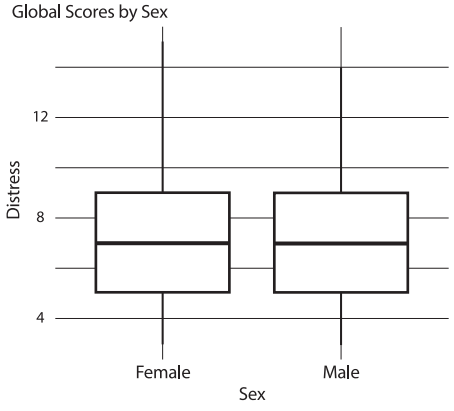

Figure 4. Box plot, Global, and Sex

Discussion

The present study highlights that there are cultural factors among Ecuadorian participants may influence identity distress, potentially differing from results in other studies conducted predominantly in the Global North. This investigation found no significant differences between genders, regarding identity distress, though it acknowledged that cultural expectations concerning gender roles may still influence how individuals experience their identity issues. Moreover, emerging adulthood in Ecuador and in Latin America is shaped by unique socio-cultural factors, like familial expectations, familial closeness, economic challenges, and societal norms, which influence identity formation (Torres et al., 2023). Finally, Ecuadorian emerging adults often navigate collective cultural values that prioritize family and their community, which may impact their identity development as well as the experience of identity distress.

A deeper understanding of the development of identity, the challenges it entails, and its correlation with socio-emotional issues is essential. A thorough theoretical understanding can aid in the timely detection of these issues while enhancing their prevention and intervention (Potterton et al., 2022). Building upon this premise, the current study aimed to evaluate the IDS instrument to determine its applicability within the Ecuadorian context.

Upon evaluating the ten questions of the IDS, acceptable results were obtained. However, items I4 and I5 stand out for their right-skewed asymmetry. Similarly, items I4, I5, and I7 reflect a low level of difficulty. Possible reasons for the difficulties in each item include the significant influence of social context. As noted by Jensen (2021), culture is a core element of psychological and social processes. The church's influence on sexual regulation (Wolf & Platt, 2022) helps explain behaviors related to item I4, particularly among women who have received restrictive sexual education (Ordoñez et al., 2017). For item I5, young people often adopt their family's religion without critically considering personal choice (Kelemen et al., 2021), which fosters an extrinsic approach to religion that may negatively impact psychological well-being (Allport & Ross, 1967). Regarding item I7, its interpretation varies due to the negative connotation of the term *gang* in the Ecuadorian context, leading participants to distance themselves from related stress.

All items demonstrate effective discrimination, suggesting that preliminary, the scale could be used in the Ecuadorian context. These findings align with the analysis conducted by Papazova & Bakracheva (2021), who successfully adapted the IDS for the Bulgarian population, as analytical studies demonstrated the instrument's reliability and validity for use in that cultural context.

The EFA results suggest partial confirmation of the theoretical constructs, with some notable discrepancies that may warrant model revision or further investigation. Specifically, the strong loadings of items D8, D9, and D10 on Factor 1, along with items theoretically associated with the distress factor, challenge the distinctiveness of the *global construct* as originally theorized. This might indicate that the defined constructs share more common variance than expected. Future studies might explore the inclusion of additional items or the modification of existing items.

Additionally, the present study employed the first-order two-factor model, where the distress factor was organized around items 1–7, while the global factor comprised

items 8, 9, and 1. Results from this analysis demonstrate acceptable fit indices in both the CFI and TLI, as well as in the SRMR. However, the RMSEA score of .07 exceeds the expected value of .06 (Hu & Bentler, 1999), although other authors suggest .08 (Browne & Cudeck, 1989), which permits its fit. Furthermore, internal consistency values (α and ω) are considered valid when they fall between .70 and .90 (Campo-Arias & Oviedo, 2008); they reveal acceptability in the distress factor but omega fall below the acceptable range in the global factor, considering that these items have different Likert scales, particularly item 1. Findings from Janowicz et al. (2024) are consistent with the present study, indicating that the two-factor model is the optimal framework for analyzing the IDS instrument. However, it is uncertain if the original work included any factor analysis. Berman et al. (2011), in their U.S, Chinese, Japanese, and Taiwanese versions of the IDS, tried a one-factor model; however, the analyses were incomplete due to the absence of calculation for additional fit statistics (Janowicz, 2024).

It is worth noting that within the invariance analysis, the scalar invariance exhibits the most disparate values in terms of ΔRMSEA. However, this does not compromise meeting the criteria, as Rutkowski & Svetina (2014) argue that the while stricter criteria recommend ΔRMSEA values below .01, their findings suport a criterion of less than .03. This permits a proper fit, affirming that the instrument demonstrates invariance. Regarding the correlation analysis, the correlation between age and distress factor is significant but very low, whereas the relationship between age and the global factor is non-significant. It is also noteworthy that the correlation between the raw scores of the factors are moderate to high ($\rho = .57$). Finally, when analyzing the variable sex, both through distribution tests and graphical representations, no significant differences are observed. According to Palmeroni et al. (2019), gender differences in identity distress remain ambiguous. Current literature that addresses differences between men and women regarding identity distress is scarce, and findings remain inconsistent.

Janowicz et al. (2024), consider that analyzing this model enables the capture of the two aspects of identity distress: the intensity of the various identity domains and their interference in the individual's daily life.

Finally, the difficulties encountered in the analysis of the items can be addressed in future research endeavors, with a focus on examining various themes such as gender, religion, and group loyalty, among others. However, such analysis was beyond the scope of the present study.

Conclusion

The present research conducted an exploratory and confirmatory factor analysis on the Identity Distress Scale (IDS) within the Ecuadorian context. This process involved several phases aimed at determining the construct validity and internal consistency of the measurement tool. Initially, a qualitative review of the items was conducted to determine the appropriateness of the translation. Subsequently, a descriptive correlation analysis was performed for each item to investigating the levels of correlation between them. Following this, an exploratory factor analysis was executed, with the data processed under the premise of two underlying factors to which the

variables correspond. Finally, in the confirmatory factor analysis, the obtained data were examined to determine their alignment with the proposed statistical model by assessing the goodness of fit and how well the data corresponded with the theoretical framework.

Throughout the various phases of this study, it became increasingly evident that the association between the latent construct and the manifest variables was strong. However, certain items (2, 4, 5, 7) exhibited statistically different behavior, not fully reflecting the identity distress construct as expected, albeit within acceptable limits. Based on the results, it is concluded that the tool demonstrates satisfactory construct validity and internal consistency, making it a reliable instrument for psychologists, researchers, educators, and students interested in studying identity distress within the Ecuadorian context.

It is recommended to expand the validation of the instrument through processes of convergent and discriminant validity. Additionally, employing other qualitative methods, such as cognitive interviews, would help understand the invariance across genders.

Furthermore, it is also suggested to expand the research by conducting studies that explore how cultural differences influence the experience of identity distress. This could include comparisons between various regions of Ecuador or among different ethnic groups. Additionally, it is recommended that the scale be applied to other population groups, encompassing different age ranges, as well as populations in migratory contexts or those that present specific implications for identity, such as women in the perinatal stage, to assess its validity and utility in diverse sociocultural contexts.

Moreover, it would be highly beneficial to incorporate qualitative methods, such as interviews or focus groups, to enrich the understanding of how individuals experience and manage identity distress, providing a deeper context to the quantitative findings.

Limitations

The generalization of the results might be limited due to the higher prevalence of women in the study sample. Additionally, the difficulties in obtaining a larger sample, due to various factors not related to the authors, may further restrict the broader applicability of the findings.

Ethics Statement

The study was reviewed and approved by the Psychology Faculty Board of the University of Cuenca as part of a broader research initiative led by Brandon University. Prior to participation, all individuals provided informed consent. Consent was obtained via an online survey, where participants were presented with a description of the study and explicitly indicated their agreement by selecting the consent option.

Author Contributions

FCH collected the database and reviewed the existing literature. JDS and ES analyzed the data and PAM performed the computations and verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Post-pandemic Work Motivation, Work Behavior and Psychic Structure in University Professors

Pablo Fernández-Arias[a], Álvaro Antón-Sancho[a], César J. Antona[a], Diego Vergara[a*]

[a]*Catholic University of Ávila, Spain*

*Corresponding author. E-mail: diego.vergara@ucavila.es

Background. Because of the pandemic, it has been suggested that motivation and job performance may have declined in various professional groups, a phenomenon known as *quiet quitting*. This study focuses on understanding this issue and its broader effect within the educational sector.

Objective. This study analyses work motivation, work behavior, and psychic structure in a sample of university professors from Latin American and Caribbean countries.

Design. A total of 612 professors from Argentina, Bolivia, Ecuador, El Salvador, Honduras, Panama, Paraguay and Peru participated in the study. Of the total sample, 379 (61.93%) of them were female. A subset of nine questions from the Bochum Inventory of Personality and Skills (BIP; Arribas et al., 2006) was used as the research instrument. The evaluation employed a cross-sectional multivariate factorial design.

Results. The data revealed high overall scores and suggested a general profile of motivation, commitment and personal stability. Among the most salient results linked to years of teaching experience, statistically significant differences were observed between teachers at the beginning and end of their working careers compared to the scores obtained in the intermediate years of experience. The lowest scores derived from the majority of dependent variables were found among teachers with the least work experience. In contrast, teachers with more than 25 years of teaching experience presented the highest values in those constructs such as emotional stability and self-confidence. The area of subject matter which teachers taught (technical or humanistic) also significantly influenced the main variables evaluated.

Conclusion. The evaluated university teachers did not present problems in terms of work motivation, work behavior and psychological structure. In other words, overall, they do not align with the phenomenon described as quiet quitting. However, the first years of teaching experience may be the most challenging for teachers to navigate, a factor that institutions may want to consider.

Keywords: burnout, work experience, area of knowledge, emotional stability, COVID-19

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Introduction

Since April 2021, more than 4 million workers have quit their jobs each month in the United States (Şahin & Tasci, 2022; Tessema et al., 2022). During 2022, the number of workers leaving their jobs voluntarily rose to 5.6 million, the highest figure since records began in 2001 (The Bureau of Labor Statistics, 2023). This phenomenon has also affected other Western countries (Kuzior et al., 2022). At the same time, a reduction in workers' commitment, referred to a *quiet quitting,* has been suggested as a concurrent phenomenon. This does not involve quitting major work duties but reducing commitment to activities requiring extra time or attention to non-compulsory matters (Tessema et al., 2022). The main factors contributing to quiet quitting include: (a) the psychological impact of the COVID-19 pandemic (Brooks et al., 2020; Jiskrova et al., 2022); (b) a change in priorities with increased emphasis on health, well-being and family; (c) a perceived absence of appreciation from bosses, organizations and institutions. Indicative of the perceived increase of this phenomenon., an instrument has recently been validated in Greece to assess the prevalence of quiet quitting (Galanis et al., 2023).

Quiet quitting was not unique to any given field of work, but occurred in all sectors and professions, including academia. Traditionally, teachers are one of the groups most at risk of suffering from work-related stress and burnout syndrome (Anderman, 2020; Urbina-Garcia, 2020). Attrition and professional desertion among teachers have been very high, especially among young educators, as verified in a study conducted in 25 countries across the Americas, Europe, Asia and Oceania (OECD, 2005). Given the prevalence of this phenomenon in the teaching profession, the experience of teachers may be particularly relevant to study this trend. This variable has been linked to self-efficacy (Wolters & Daugherty, 2007), although the relationship is complex. For example, in a study evaluating 1430 Canadian professors Klassen and Chiu (2010) observed that, although years of experience were associated with professor self-efficacy, self-efficacy gradually increased up to 23 years of experience before it decreased toward the end of their careers. Younger and less experienced professors presented higher levels of emotional exhaustion and depersonalization relative to their older colleagues (Antoniou et al., 2006). For example, a study evaluating 251 Colombian professors (Ibáñez et al., 2012) found an inverse relationship between emotional exhaustion and the variables of age and time in the position (i.e., older and more experienced professors reported less emotionally exhaustion)Similarly, older professors reported less emotional exhaustion and greater job fulfillment than younger ones (Droogenbroeck et al., 2014), although the relationship between age and burnout remains complex and yields inconclusive results (Capone et al., 2019). The relationship between years of teaching experience and variables linked to burnout appears to be influenced by numerous contextual factors (Fiorilli et al., 2016). Moreover, years worked did not significantly affect the level of stress and burnout experienced by professors (Galanakis et al., 2020).

In teaching and research, the main fields of knowledge include the scientific-technical area and the humanistic-social area, both equally valuable but clearly differentiated by their objects of study. These two branches of knowledge have been examined to determine whether university professors working in their respective

fields of specialization exhibited significant differences in adapting to the new digital environments created by the pandemic (Antón-Sancho et al., 2022). The results suggested that several factors may be involved, among which the level of technological development of each country was significant. The Antón-Sancho et al. (2021) study which evaluated 219 university professors, found a lower self-assessment of personal and interpersonal competencies among teachers in the scientific-technical field compared to those in the humanistic-social area. It should be noted that, for teachers, the choice of a particular subject area is often vocational and provides meaning for their teaching and research tasks. Job engagement, defined as a psychological sense of accomplishment, positively affects employees (e.g., satisfaction, commitment and performance) and institutions (Wood et al., 2020). Conversely, a lack of meaningful or purposeful employment is among the primary reasons for job disengagement (Bailey et al., 2019). In this study we aimed to determine whether teaching experience and the previously mentioned subject matter specialization were related to work motivation, work behavior and the psychic structure of university professors; more specifically, , whether aspects of quiet quitting were observed in their work behavior.

The constructs defined above have been studied extensively. Regarding work motivation, research focus is placed on the teacher's leadership, manifested through effective goal setting, and a capacity to offer support that includes feedback that is specific, positive and motivating (Ryan & Deci, 2020). Other notable teacher behaviors include the fostering of student autonomy and order, which increase intrinsic motivation (Guay et al., 2016), predict classroom performance (Aelterman et al., 2019), and lead to greater engagement and well-being at all stages of education (Ryan & Deci, 2020) and across cultures (Nolen, 2020). Furthermore, outcome orientation influences effort and persistence in teaching (Dornyei & Ushioda, 2011). Regarding work behavior, teachers have an immediate impact, often evident in each class, on the interest and motivation of their students (Tsai et al., 2008). Flexibility in the classroom is very important, as it is correlated with listening to students, reinforcing effort and suggesting possibilities when students are uncertain about how to continue. Finally, in regarding to psychic structure, teachers who have already satisfied their needs for autonomy, competence and social relationships will be more emotionally stable and promote the motivation, commitment, initiative and adjustment of their pupils. Thus, the tendency of professors to experience positive feelings about their work behavior mediates their enthusiasm and commitment to work (Andreychik, 2019; Schoeps et al., 2019). Professors' emotional regulation has been found to be strongly associated with emotional intelligence (Fernández-Berrocal et al., 2017). The capacity to experiencing positive emotions may help professors prevent emotional burnout and increase job satisfaction (Wu et al., 2019). Conversely, professors who experience an elevated frequency of unpleasant emotions report a lack of motivation and increased emotional exhaustion (Abós et al., 2019). Additionally, the intensity of unpleasant emotions correlated with emotional exhaustion and burnout (Chang, 2013; Fiorilli et al., 2016). Improved perception, understanding, expression and emotional management enhance professors' communication with students and colleagues, fostering the creation and maintenance of healthy relationships (Hopman et al., 2018; Mayer et al., 2016).

The aim of the current research is to analyze the phenomenon of quiet quitting among university professors in Latin American and the Caribbean, considering teaching experience and the subject matter areas of knowledge in which they teach (i.e., scientific-technical or humanistic-social). Furthermore, dependent variables related to work motivation, work behaviors and aspects of the psychic structure are considered. The specific objectives are as follows: (a) to determine the general profile of the sample in relation to the three dependent variables - *work motivation*, *work behavior* and *psychic structure*; (b) to examine whether teaching experience influences the aforementioned dependent variables; and (c) to assess if the area of subject matter knowledge affects self-assessments of the dependent variables across different age groups. Additionally, the study analyses the factor structure and reliability of the questionnaire used. In this sense, two more objectives were added: (d) to perform factor analysis of the questionnaire responses, and to ascertain the percentage of total variance explained; and (e) to elicit data reflecting the reliability of the questionnaire according to Cronbach's alpha index.

The main explanatory variable is *teaching experience*, a polytomous nominal variable with six possible values (less than or equal to 5 years, between 6 and 10 years, between 11 and 15 years, between 16 and 20 years, between 21 and 25 years, and more than 25 years). The secondary explanatory variable is the *area of knowledge*, a dichotomous nominal variable derived from the International Standard Classification of Education (ISCED) established by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2011). The study defines the following categories: a) the scientific-technical area includes experimental sciences, natural sciences, health sciences, statistics, mathematics and physics, and b) the humanistic-social area, encompassing arts and humanities, geography, sociology, law, economics and business. The dependent variables evaluated include self-assessments in: (a) work motivation, (b) work behavior, and (c) psychic structure. The following hypothesis are tested: (a) teaching experience influences professors' self-assessments of work motivation and work behavior and (b) the area of knowledge influences the dependent variables as teaching experience increases.

Method

Participants

There were 612 university professors in the study, of which 379 (61.93 %) were female. The distribution of participants from each country is shown below. Peru represented the largest number of participants, with 282 respondents reflecting 46.1% of the total, followed by Argentina with 177 participants (28.9%) and Ecuador with 102 (16.7%). El Salvador included 27 participants (4.4%), whereas Bolivia, Honduras, Panama and Paraguay were minimally represented, each with only 6 participants, representing 1.0% of the total.

Questionnaire

A subset of nine questions from the Bochum Inventory of Personality and Skills (BIP; Arribas et al., 2006) was used as the research instrument. The original questionnaire demonstrates strong psychometric properties and has been specifically

designed and adapted for use in Spanish-speaking countries. Previous studies have used subsets of the BIP and validated the corresponding instruments (Fernández-Arias et al., 2023). Our research team selected those items from the BIP that constituted a relevant and representative sample of the phenomenon of quiet quitting. We asked all teachers to assess their level of development and competence in three categories: (a) work motivation, (b) work behavior, (c) psychic structure. They assessed themselves on the following items: (1) initiative for change, (2) leadership, (3) results orientation (items related to work motivation), (4) conscientiousness, (5) flexibility, (6) action orientation (items related to work behavior), (7) work capacity, (8) emotional stability, and (9) self-confidence (items related to psychic structure). These items were measured on a Likert scale from 1 to 5 (1 indicating the lowest rating and 5 to the highest). We also provide a factor analysis and Pearson correlations to reinforce this validation.

Procedure

Participants were selected using a non-probabilistic incidental sampling process. The evaluation was cross-sectional multivariate factorial. The sample consisted of university professors from Latin America and the Caribbean. Results were obtained in June 2023. Teachers' countries lie within the same geographical area and, according to the Global Innovation Index (GII; WIPO, 2022), are homogeneous in terms of their level of innovation and digitization. The questions were sent to the target population through a GoogleForms™ questionnaire.

Data analysis

The validation of the instrument was performed by determining the latent factors that explain the variance through exploratory factor analysis. Pearson correlations between the ratings of the different constructs were computed to verify high correlations within the same group. Internal reliability was tested through Cronbach's Alpha. After verifying that the responses were normally distributed, hypothesis were tested by analysis of variance (ANOVA) and multifactor analysis of variance (MANOVA). All statistical tests were performed with a significance level of 5%.

Table 1

Distribution of participants by teaching experience and area of knowledge

Teaching experience	Scientific-technical (%)	Humanistic-Social (%)	N (%)
Less than or equal to 5 years	72.2	27.8	54 (8.8)
6 to 10 years	56.0	44.0	75 (12.3)
11 to 15 years	65.8	34.2	114 (18.6)
16 to 20 years	53.3	46.7	90 (14.7)
21 to 25 years	48.8	51.2	123 (2.1)
More than 25 years	63.5	36.5	156 (25.5)

Note. The rows sum to 100% each.

Results

More professors in scientific-technical areas were represented (59.31%) compared to humanistic-social areas (4.69%; see *Table 1*). A homogeneous distribution of participants by areas of knowledge cannot be assumed (chi-square = 21.24, p-value < .0001).

Both subject matter areas of knowledge are represented with at least 25% of the participants in each of the teaching experience ranges considered.

Instrument validation

The factor analysis performed on the responses to the questionnaire showed three groups of constructs: *work motivation*, *work behavior* and *psychic structure* (*Table 2*).

Table 2

Factorial weights of the exploratory factor analysis

	Factor 1 Work motivation	**Factor 2 Work behavior**	**Factor 3 Psychic structure**
Initiative for change	.724		
Leadership	.739		
Results orientation	.772		
Concientiousness		.732	
Flexibility		.609	
Action orientation		.637	
Work capacity			.639
Emotional stability			.759
Self-confidence			.788

The grouping of the items analyzed into the three identified groups in the factor analysis defines a theoretical model that aligns with the BIP. Moreover, this theoretical model accounts for 68.1% of the total variance of the responses. The proportion of variance explained by the model which includes the three families of constructs obtained in the exploratory factor analysis is as follows: work motivation (.243), work behavior (.204) y psychic structure (.234). Finally, the Pearson correlation coefficients for the different constructs considered are consistently greater than .60 within each of the families defined by the theoretical model (*Table 3*). All the correlation coefficients presented are statistically significant.

The internal consistency was measured using the Cronbach's Alphas, which are adequate, ensuring the internal reliability of the instrument. Their values are shown, in succession, for each construct: work motivation (.8575), work behavior (.8551) and psychic structure (.8634).

The assessments obtained are very high in three categories: work motivation (M = 4.20; SD = .86), work behavior (M = 4.41; SD = .71), and psychic structure (M = 4.42; SD= .75). The mean motivation towards work is significantly lower than the mean rating of work behavior, as the t-test for means highlights (t = 8.24,

Table 3

Pearson correlation coefficients between the different skills analyzed (all p-values are <.05)

	Initiative for change	Leadership	Results orientation	Conscien-tiousness	Flexibility	Action orientation	Work capacity	Emotional stability	Self-confidence
Initiative for change	1								
Leadership	.67	1							
Results orientation	.65	.68	1						
Conscien-tiousness	.48	.49	.41	1					
Flexibility	.55	.44	.47	.65	1				
Action orientation	.49	.58	.54	.66	.68	1			
Work capacity	.46	.50	.44	.61	.59	.57	1		
Emotional stability	.40	.39	.36	.42	.57	.43	.64	1	
Self-confidence	.33	.49	.37	.51	.55	.55	.69	.70	1

p-value < .0001) and the rating of psychic structure skills (t = –8.62, p-value < .0001). The Kolmogorov-Smirnov normality test indicates that the responses are not normally distributed (D = .24, p < .0001 for work motivation; D = .31, p < .0001 for work behavior; and D = .33, p < .0001 for psychic structure). However, the sample size endures the strength of the parametric tests used (mainly t-tests, ANOVA and MANOVA).

Table 4

Mean responses according to the teaching experience and statistics of the ANOVA test for comparison of means.

	≤5 years	6–10 years	11–15 years	16–20 years	21–25 years	>25 years	F-statistic	p-value
Work motivation	3.80	4.20	4.09	4.37	4.36	4.19	12.10	< .0001*
Work behavior	4.15	4.48	4.40	4.46	4.48	4.39	4.26	.0008*
Psychic structure	4.33	4.35	4.46	4.41	4.33	4.56	6.27	< .0001*

The ANOVA indicates that teaching experience significantly influences the mean self-assessments expressed for the three categories analyzed (note that all p-values in *Table 4* are less than .05). It can be assumed that: (a) professors with less than 5 years

of teaching experience give lower ratings than the rest in the three constructs analyzed (paired p-values confirm that the differences between these professors and the rest are significant); and (b) for work motivation and work behavior, professors with more than 25 years of teaching experience give lower ratings than professors with between 16 and 25 years of experience (also in this case the paired p-values prove that the differences are significant). This latter observation would support the idea that, among university professors, there is a decrease in work motivation toward the end of their career. Therefore, results confirm the hypothesis that teaching experience significantly influences the assessed constructs.

The results concerning the influence of subject matter area of knowledge on the variance in evaluations made according to teaching experience are presented, differentiating each of the three constructs studied (*Table 5*).

Table 5

Work motivation, work behavior and psychic structure differentiated by teaching experience and area of knowledge

	≤5 years	6–10 years	11–15 years	16–20 years	21–25 years	>25 years
			Work motivation			
Scientific-technical	3.77	4.12	4.15	4.46	4.35	4.01
Humanistic-social	3.87	4.30	3.98	4.26	4.37	4.49
			Work behavior			
Scientific-technical	4.10	4.36	4.28	4.50	4.43	4.35
Humanistic-social	4.27	4.64	4.64	4.41	4.52	4.46
			Psychic structure			
Scientific-technical	4.36	4.40	4.40	4.58	4.27	4.51
Humanistic-social	4.27	4.27	4.56	4.21	4.38	4.65

The MANOVA test shows that the area of knowledge is the best explanatory factor for how mean perceptions vary with teaching experience. Moreover, the MANOVA test confirms that the area of knowledge has a significant influence ($F = 8.19$, p-value $< .0001$) on work motivation. Specifically, among professors in scientific-technical areas, there is a decrease in the ratings among professors with more than 25 years of experience (they follow the trend of the entire population). However, this decrease does not occur among professors in humanistic-social areas. There is also a significant correlation between the area of knowledge and the evaluations of work behavior ($F = 3.64$, p-value $= .0028$). Specifically, among professors in scientific-technical areas, there is a decrease in ratings after 25 years of experience. However, this decrease in ratings is observed among professors in humanistic-social areas after 15 years of experience (among them, the highest ratings occur between 6 and 15 years of teaching experience). Regarding psychic structure, growth is perceived after 25 years of experience in both areas of knowledge analyzed. However, in the scientific-technical area there is also a growth after 5 years of experience, while in the humanistic-social area this does

not occur until 10 years of experience is reached. This difference between areas of knowledge is statistically significant ($F = 5.84$, p-value $< .0001$). Finally, the hypothesis regarding the evolution of self-report scores in relation to teaching experience, as it differs between professors in scientific-technical areas and those in humanistic-social areas, can be considered confirmed.

Discussion

The study provides data derived from questionnaire responses of 612 university professors, representing a wide range of work experience, from novice professors to those with more than 25 years of experience. Their overall scores on the main dependent variables (work motivation, work behavior and psychic structure) were high and suggest a general profile of motivation, commitment and personal stability (the latter two factors being statistically higher than the first). A more detailed analysis of the data reveals significant differences between professors at the beginning and the end of their careers, in relation to the scores obtained in the intermediate years of experience. Therefore, professors with less than 5 years of experience present lower scores in the 3 variables mentioned above, while professors with more than 25 years of experience present a differential pattern. Regarding the latter (*Table 5*): (a) their work motivation differs notably according to their subject matter area of knowledge, (b) their work behavior exhibits intermediate values compared to the rest of the age groups, and (c) their self-perception of their psychic structure is very high.

The study includes a sample of equivalent professors who share the same profession and belong to a similar geographic and socioeconomic area. It was conducted using an evaluation questionnaire with adequate psychometric properties concerning the reliability and validity of its items and item groupings.

Work motivation and professional behavior have been studied for decades. They are influenced by individual factors (personality), structural factors (related to the job and the institution or specific work environment) and contextual factors (which include economic and social variables, as well as the effects of overcoming a pandemic). Among this amalgam of variables, the present study considers the impact of two other factors on the work motivation and job behavior of university professors: a) years of teaching experience and b) area of knowledge. These variables had a significant influence on motivation and job behavior and could be linked, at least partially, to the phenomenon of quiet quitting (Mahand & Caldwell, 2023).

Teaching experience

Consistent with a variety of studies, teaching experience has been shown to be a variable that can affect the job performance of professors. For example, more experience has been associated with greater effectiveness (Wolters & Daugherty, 2007), although the relationship is observed to diminish after 23 years of experience (Klassen & Chiu, 2010). In addition to years of experience, other relevant variables appear to have an influence, including social support both inside and outside the institution (Fiorilli et al., 2016). While the literature tends to indicate younger professors with less work experience exhibit differences in their work motivation in relation to their more senior peers (Antoniou et al., 2006; Capone et al., 2019; Droogenbroeck et al., 2014; Ibáñez et

al., 2012), not all studies observe differential effects between this variable (Galanakis et al., 2020). In the present study, it was observed that teachers with less than 5 years of experience presented statistically significant differences compared to the rest, revealing a pattern of lower work motivation and proactivity compared to their older colleagues (Table 4). Conversely , after the age of 25, a decrease in these factors was also observed. Professors with fewer years in the profession basically perform the same functions (teaching, research and management) without the accumulation of knowledge and experience acquired later in their careers. Additionally, younger subjects may not yet have as realistic a perception of their career as their more experienced colleagues. Consequently, they may not utilize the most suitable coping strategies (Antoniou et al., 2006) and may be very demanding of their families, especially the female subgroup.

Professors with more than 25 years of professional experience presented statistically lower scores in work motivation and work behavior compared to teachers with experience between 16 and 25 years (Table 4). The world of work is constantly changing, and technological development has experienced exponential growth. Therefore, more experienced workers may experience a certain obsolescence and greater stress in relation to the adoption of new technologies. Caution might suggest that the accumulation of stressful life events could be greater in more experienced workers, potentially leading to a change in priorities. Yet, the scores of the group of teachers with more than 25 years of experience are higher in psychic structure than those of other age groups (Table 4). These results are consistent with those suggesting that younger teachers suffer greater emotional exhaustion and experience less commitment to their profession than their more experienced colleagues (Antoniou et al., 2006). This observation may be relevant for universities.

Knowledge areas

The professors' subject matter area of knowledge significantly influences the three dependent variables (Table 5). In relation to work motivation, understood as achievement motivation, involves performing to the best of one's ability. It is acquired during childhood and adolescence (strongly influenced by the family environment), remains relatively stable throughout the life cycle and is strongly linked to personality (Morán & Menezes, 2016). The group of teachers with less than 5 years of experience had the lowest scores pertaining this variable; the fewer the years of experience, the lower the leadership capacity and initiative to make changes, possibly because they have less influence within the educational institution. Subsequently, it rises in the two groups in the intermediate phases and differs notably between them in the later stages.

In terms of area of knowledge, in general, the humanistic-social area tends to show higher levels in all three variables, especially in professors with more than 25 years of experience. Work motivation in the scientific-technical area reaches its maximum in the 16-20 years age group, while in the humanistic-social area it is highest in the group with more than 25 years. Work behavior shows a similar trend, with generally higher scores in the humanistic-social area. The psychic structure shows more pronounced fluctuations, with the scientific-technical area peaking in the 16-20

age group, while the humanistic-social area shows its highest score in the group with more than 25 years of experience.

Conversely, if a job is perceived as meaningful and has some personal significance, it may affect achievement motivation and drive job improvement (Bailey et al., 2019). A job's meaning and significance as perceived by university professors may be linked to their general performance , but it may also be affected by the subject matter taught and the topics they research. That is, to the extent that the area of knowledge is related to a vocational choice, it could be thought that there is greater motivation and pleasure in work performance. Thus, the results of this study indicate that professors in the humanities with more than 25 years of experience presented the greatest difference in work motivation comparted to their colleagues in the scientific-technical area (Table 5). In this sense, in the area of scientific and technical knowledge, these scores can be related to quitting, but this is not the case in the area of humanities where the subgroup of professors over 25 years of age presented higher value than the rest of the age groups.

Of the three dependent variables, work motivation exhibited the greatest variability. In the initial stages of professors' careers, there may be a greater risk of job abandonment. Additionally, from an institutional point of view, the evaluation and analysis of each employee may be considered in order to identify those individuals who may present greater difficulties.

The area of knowledge also has a significant influence on work behavior. In this variable, the group of teachers with less than 5 years of experience presented the lowest scores (Table 5). The development of skills and competencies is acquired over time, and, early in a career, these tend to be lower. This idea is consistent with the view that difficulties at the beginning of teachers' careers may be related to adaptation to the profession and may not necessarily pose a long-term problem (van Dick & Wagner, 2001). The data from the present study indicates that this is the case in the first half of the work cycle; however, the perception of one's own work behavior decreases after 25 years of experience, with this decline being even more pronounced in the scientific-technical field (Table 5). In this sense, attention should be given to both the beginning and end of the work cycle.

Work motivation and work behavior vary significantly according to age group and area of knowledge, presenting differentiated profiles in the three dependent variables (Table 5). The profiles of the scores for workers in the scientific-technical knowledge area are very similar across the dependent variables including work motivation and work behavior, suggesting both are closely linked. For work behavior, teachers in the humanities with 6 to 15 years of experience rate themselves with the highest scores and, thereafter, scores fluctuate. As previously indicated, professors indicate their work motivation increases progressively after 15 years of experience.

In the realm of psychic structure, internal factors predominate and, consistent with personality trait theories, they are likely to remains stable throughout the life cycle. In the case of teachers with less than 5 years of work experience, scores in both the scientific-technical and humanities branches are low and suggest moderate self-confidence and emotional stability. Professors with more than 25 years of experience, particularly those in the humanistic area of knowledge, exhibit exceptionally high values in the psychic structure variable. The progression of scores in the two ar-

eas of knowledge to which the teachers belong is not linear, rather they are low at the beginning of the work cycle and significantly higher at its conclusion. One of their main constructs is emotional stability, which indicates that may exhibit a high degree of affective (Fernández-Berrocal et al., 2017; Wu et al., 2019) and motivational balance (Andreychik, 2019; Schoeps et al., 2019), even if this does not correspond to sustaining the workload they managed earlier in their career. Moreover, greater emotional stability may mitigate symptoms such as emotional exhaustion (Chang, 2013; Fiorilli et al., 2016). The accumulation of experience may provide professors with a broader perspective as their years of work experience increase. However, personal factors also play a critical role, as learning from experiences depends not only on having undergone them, but also on the ability to understand and interpret them adaptively (Hopman et al., 2018; Mayer et al., 2016). The data suggest the development of an internal locus of control at the latter stages of a career, potentially due to the prolonged trajectory professional trajectory that provides opportunities for significant personal learning and growth. Although the beginning and end of a career present a similar pattern, differences are observed in the intermediate stages as scores present contrasting results (Table 5).

Regarding the objectives linked to the subset of the 9 selected items of the BIP, it is significant that: (a) the three factors observed align with those of the original instrument and account for almost 70% of the total variance measured, and (b) the internal reliability of this subset is high.

Conclusion

Among the main results, it is worth noting that:

a) The sample exhibits high scores in work motivation, work behavior and psychic structure.
b) Professors with less than 5 years of experience exhibit statistically significant differences characterized by lower motivation and proactivity compared to their more experienced colleagues. The finding underscores the importance of addressing the risk of early career attrition within educational institutions.
c) Professors with over 25 years of experience, particularly those in the humanities, achieved higher scores in psychic structure, encompassing factors such as emotional stability and self-confidence.
d) The subject matter area of knowledge significantly influences motivation levels. Moreover, humanities professors with over 25 years of experience present the highest levels of work motivation compared to their colleagues in the scientific-technical fields.
e) Science professors scored significantly lower than their colleagues in the humanities on work behavior.

Recommendation for future research include an increased personalization of the assessment instrument, particularly among age categories where scores across dependent variables have been lower. Factors that may influence work behavior, such as gender (a variable commonly linked to burnout), marital status, number of children or dependents, should be considered. Additionally, evaluating factors such as the perception

of job security and the possible presence of other relevant stressful life events would provide valuable insights.

The primary sources of work stress could also be evaluated to determine whether they stem from interaction with students, superiors or peers, feeling overloaded with teaching changes and/or their research work, lack of continuous training, and other factors. Additionally, the profile of workers with more than 25 years of experience could be further analyzed, as this group is the most numerous, and potentially categorized into more significant segments according to years of experience. Finally, it would be valuable to assess the different teaching modalities (classroom, blended or online) to examine their impact on work-related stress and performance.

Limitations

Among the limitations of the study is that the cross-sectional assessment could be complemented by a longitudinal assessment to mitigate threats related to the cohort effect such as the impact of cultural, technological, educational changes over time. With the conclusion of the pandemic, a reassessment of the results is appropriate. Another aspect to consider is the number of professors in some of the countries evaluated varied considerably, with some countries under-represented. Finally, the cultural and economic idiosyncrasies of the study's context should be taken into account, as they may have implications for the generalizability of the findings to other geographical areas.

Ethics Statement

All participants were informed about the anonymous nature of their participation, the scientific purposes of this research, how their responses will be used, and that under no circumstances would their data be used to identify them. They gave their consent for voluntary participation by checking a box indicating informed consent. All participants were adults and their participation was voluntary and free. The postulates of the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, APA; 2017) were respected throughout the research.

Author Contributions

P. F-A, Á.A-S. and D.V. conceived of the idea. All authors developed the theory and performed the computations. Á.A-S. and D.V. verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Summary Graphs Covary with Reading and Language Comprehension in School-age Children in the Spanish Language

Anabel Fernández-Blanco[a], Nancy Estévez-Pérez[b]*, Klency González Hernández[c]

[a] *University of Talca, Chile*
[b] *Cuban Neurosciences Center, Cuba*
[c] *University of Havana, Cuba*

*Corresponding author. E-mail: nancy.estevez@cneuro.edu.cu

Background. The standardized identification, psychoeducational assessment, and diagnosis of children at risk of reading comprehension (RC) difficulties is a highly specialized, time-consuming, and cumbersome process for teachers, psychologists, and researchers. Following the graph theory framework, text summaries, a ubiquitous RC measure used in schools, can be represented as networks of words (nodes) connected by arcs (TSGraphs). Do their resulting topological properties highlight individual variability in traditional reading/language comprehension measures?

Objective. The objective of this study was to determine whether there is a significant association between individual variability in the connectivity measures of the TSGraphs of selected texts produced using graph theory and individual variability in traditional standardized measures of reading and language comprehension in Cuban school-age children.

Design. Two correlational studies were conducted. Study 1 evaluated the association between the TSGraph properties and the reading comprehension of good and poor fifth-grade readers (N = 21). Study 2 evaluated the association between the TSGraph properties and language comprehension in sixth-grade children at risk of intellectual disability (IDr) and typically developing (TD) controls matched in age and gender (N = 42). Reading fluency, intellectual capacity, and vocabulary were controlled for in both studies.

Results. Study 1 showed a significant association between TSGraph density and reading comprehension in fifth graders after controlling for reading fluency. Study 2 found that density significantly covaried with language comprehension in sixth graders after controlling for intellectual capacity.

Conclusion. Topological measures of text summaries show promise for the assessment and characterization of reading and language comprehension. This is the first such study conducted on native Spanish speakers. Additional experimental studies in larger samples are required.

Keywords: reading comprehension, language, Speech Graph, text summaries

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Introduction

Reading comprehension (RC) is the ability to understand, use, and analyze texts to fulfill the reader's purposes, develop knowledge, and participate in society (OECD, 2019; 2023). RC impacts varied academic areas (Oakhill, 2020; Smith et al., 2021; Vaughn et al.; 2015) and is considered a strong predictor of future academic success (Oakhill, Cain & Elbro, 2019; Silva & Cain, 2014). It influences cognitive processes such as problem-solving (McCarthy & McNamara, 2021), memory formation (Davidson et al., 2018; Mcnamara & Scott, 2001; Peng, 2018), and decision-making (Cartwright, 2015; Sun et al., 2018) and leads to devising effective and creative solutions to problems (Gick & Holyoak, 1983; Griffith & Lacina, 2017).

Difficulties in RC may slow the development of social and emotional skills and affect the individual's self-esteem and self-concept (Cain, 2022; McCarthy & McNamara 2021). In Cuba, González and collaborators (2016) reported RC difficulties in more than 20% of the fifth- to sixth-grade children assessed in their study. Hence, identifying children at risk or presented with RC difficulties is key to providing the available remediation/intervention resources and orientation to the children, teachers, and families.

Several theoretical models of RC have been proposed to elucidate this complex process (see Sanır & Özmen, 2022; for a review). The main components of most comprehension models are reading fluency, prior knowledge, vocabulary, reading comprehension strategies, inference, and motivation (Sanır & Özmen, 2022). Additionally, other complex cognitive processes including intellectual capacity and working memory influence RC (Smith et al., 2021). Hence, the standardized identification, psychoeducational assessment, and diagnosis of children at risk of RC difficulties is a challenging and time-consuming process that requires specialized personnel.

Different types of RC assessments have been used in pedagogical and experimental scenarios, including free recall, cued recall, cloze/multiple choice/true-or-false questions, sentence recognition, reenactment, and summaries (Smith et al., 2021; Duke et al., 2021; Bogaerds-Hazenberg et al., 2020). This methodological variability reflects the lack of consensus regarding the comprehension outcomes that could/should guide teachers in the classroom and, hence, the best methods for measuring these outcomes (Smith et al., 2021).

RC assessment using text summaries affords an ecological alternative for teachers/researchers in the classroom or parents at home. Learning to summarize texts is a skill acquired through schooling as it is useful in any academic domain. Summaries are considered a surface level representation of the reader's recollection of the literal aspects of texts (the literal, propositional representation of a text held in the working memory or textbase, according to Kintsch & Van Dijk, 1978). The ability to summarize information is of great pedagogical interest. However, RC assessment using text summaries relies on the subjectivity/expertise of the evaluators despite the availability of rubrics, and it is a laborious undertaking owing to the difficulty of giving detailed feedback on every summary, especially in large classes.

New developments in data mining and complex systems analysis allow us to treat texts as measurable structures. Specifically, graph theory offers a systemic analysis

of the structural characteristics of recall-based reports to quantify cognitive deficits (Bertola et al., 2014; Mota et al., 2012; 2014). In these studies, discourse is represented by a graph where the words are represented by nodes and the temporal relationships between consecutive words are represented as axes or arcs. It is possible to calculate the general attributes, or properties, of the resulting "speech graph" and interpret these as parameters that provide information on the processes underlying the production of discourse/texts.

The quantitative properties produced by speech graph analysis can be classified into general, recurrence, and global measures (Mota et al., 2012; Palaniyappan et al., 2018). General properties are represented by the number of nodes and arcs (the number of different words and the connections between words in a text, respectively) and reveal the lexical diversity and language cohesion/articulation of the text or discourse. Recurrence measures are sequences of one to three different words indicating sequences that are revisited. Global measures such as density (number of directly connected words divided by all possible connections between words) and the largest connected component (LCC) (the number of nodes in the maximal component in which all pairs of nodes are reachable from one another, indicating how well connected the words of the text are) are associated with the connectivity of the network and therefore with discourse cohesion.

This approach is particularly valuable in clinical or psychoeducational settings, where traditional assessments may fail to capture the nuances of disorganized speech/text production patterns. Speech graphs have been used to reveal cognitive deficits in pathological populations such as patients with obsessive–compulsive disorder (OCD) (Gomes et al., 2023), psychosis (Mota et al., 2012; Palaniyappan et al., 2018, Spencer et al., 2020), or dementia (Bertola et al., 2014). The studies found that the dream-based reports of psychotic patients are less interconnected than those of the control subjects, similar to OCD patients who exhibit significantly lower lexical diversity, lower speech connectedness, and a higher recurrence of words (Gomes et al., 2023). Additionally, a negative correlation was found between connectivity measures (global measures associated with network connectivity and therefore discourse cohesion) and the symptoms, indicating that the less coherent the speech production, the more cognitively damaged the subject (Mota et al., 2014).

In the case of dementia, graph theory applied to tests of verbal fluency allowed a correct classification of subjects with Alzheimer's Disease and cognitive impairment (Bertola et al., 2014). The cognitive damage was proportional to the increase in graph density, the reduction in diameter, and the average decrease in the shortest path length.

Additionally, graph theory was used to explore the relationship between episodic memory reports and academic achievement, also including cognitive measures such as IQ and theory of mind (Mota et al., 2016). Speech parameters covaried with cognitive measures and with reading performance, namely, the number of words (nodes), the connections between words (arcs), and the minimum count of word–word association repetitions (repeated arcs). Children with a higher performance in intellectual capacity tasks, theory of mind, and reading reported episodic memory events with richer vocabulary and higher speech articulation.

More recently, two studies investigated the relationship between speech graph properties and relevant variables in language production. The first study (Lemke et al., 2021) explored bilingual Portuguese–English-speaking children, revealing a correlation between graph attributes (i.e., connectedness measured by the number of nodes and edges, LCC, and text density) and the levels of syntactic complexity in both languages, demonstrating that, as children develop more complex writing strategies in Portuguese, they progress in written English to the same extent. The second study (Botezatu et al., 2022) focused on second language learners of Spanish and Chinese, examining the impact of lexico-semantic processes on the connectedness (measured by the number of nodes inside the LCC) of narratives. The results indicated a significant positive correlation between connectedness and speech production measures in second language (L2)-Spanish and L2-Chinese learners.

These studies suggest that speech graph properties are useful when investigating the typical development of complex cognitive processes such as memory and language and, potentially, reading comprehension. Speech graph analysis seems a suitable and robust framework for understanding the organization and coherence of spoken or written language by focusing on how speech/texts are structured rather than on their content (without needing to interpret the meaning behind the words produced). Hence, the following question arises: Is it possible to quantitatively measure the properties of text summaries using graphs (TSGraphs) as a proxy for individual variability in the reading and language comprehension of school-age children?

The present investigation aims to determine whether there is a significant association between individual variability in the connectivity measures of the TSGraphs of selected texts produced using graph theory and individual variability in traditional and standardized measures of reading and language comprehension in Cuban school-age children. We hypothesize that there exists a statistically significant association between the variability in general and global measures of connectedness in the TSGraphs and the individual variability in standardized measures of reading and language comprehension.

To test this hypothesis, two studies were conducted to more comprehensively evaluate the comprehension processes implicated in both reading and language tasks. The first study examined the association between a standardized measure of reading comprehension and the TSGraph topological properties calculated from summaries produced by fifth-grade poor and good readers. Since children at risk of intellectual disability are more likely to exhibit lower language performance (Adlof et al., 2017; Di Blasi et al., 2019), the second study examined the association between a standardized measure of language comprehension and the properties of the TSGraphs of summaries produced by sixth-grade children exhibiting the risk of intellectual disability and typically developing pairs matched in grade and gender.

To the best of our knowledge, no speech graph studies have been conducted on native Spanish speakers to explore the feasibility of using the topological properties of summaries, understood as speech graphs, to determine individual differences in reading and language comprehension in school-age children. Hence, this is an opportunity to contribute data to this yet unexplored field and contrast it with previous

reports on English, Portuguese, L2-Spanish, and L2-Chinese (Bertola et al., 2014; Botezatu et al., 2022; Lemke et al., 2021; Mota et al., 2012, 2014, 2016; Coelho et al., 2018). The results will enhance automated psychoeducational assessment and psychiatric screening/diagnostic accuracy by establishing a reference for developing a cost-effective, scientifically driven alternative to assess summaries, relevant to the population at risk of learning disabilities.

Methods

Participants

The sample was recruited as part of the KHE PhD project. It comprised 63 school-age children: 21 (11 girls) fifth graders and 42 (21 girls) sixth graders (see sample details in Table 1). The children were assessed by trained psychology students in a well-lit and quiet room in their schools.

Table 1

Sample description

5th Grade (N=21, F=11)				
WM Index	Vocabulary Index		Fluency Index	
M (SD)	M (SD)		M (SD)	
.60 (.10)	37.10 (12.10)		103.40 (30.60)	
6th Grade (N=42, F=21)				
	Attention (d2)		Vocabulary Peabody Raw Score	Intellectual Capacity RIST Index
TP	FR	CP		
M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
33.05 (78.06)	112.48 (25.01)	17.02 (6.43)	102.07 (0.27)	72.38 (17.31)

Note: M: Mean, SD: Standard Deviation, WM: Working Memory, TP: Total Performance, CP: Concentration Performance, FR: Fluctuation Rate

Procedure

Two studies were conducted. In each study, groups of children with difficulties in reading comprehension and intellectual capacity/language comprehension were evaluated. Concurrent assessments using standardized comprehension tests and summaries of age-appropriate texts were conducted. The selected texts had a difficulty level appropriate for fifth and sixth graders, according to Inflesz 1.0 software (González & Estévez, 2019). This program evaluates the readability of texts written in Spanish by considering nine parameters (number of words, syllables, phrases, relationships between them, etc.) and classifies the texts into five difficulty levels (very difficult, quite difficult, normal, quite easy, and very easy). Cognitive assess-

ments were performed to control for variables that covary with reading comprehension and academic performance, such as executive functions (Cortés Pascual et al., 2019), vocabulary (Schmitt & Schmitt, 2020), intellectual capacity (Blakemore & Bunge, 2012), reading fluency (Stanley, Petscher & Catts, 2018), and attention (García-Madruga et al., 2012).

Study 1: TSGraph properties and reading comprehension

Fifth-grade children's reading comprehension was evaluated using the raw score obtained in the Reading Comprehension Assessment Test (PECL, from its acronym in Spanish: "Prueba para Evaluar la Comprensión Lectora") (Ferreres et al., 2009) text "El Rebelde". Using this test as a golden rule, children were classified into good and poor readers. The fifth-grade children produced a summary of the text "El relicario". The text was given to the children to read independently and without time restriction. Then, they were asked to summarize the text without time restriction. Intellectual capacity was assessed using the percentile on the Raven's Coloured Progressive Matrix Test (Raven, Court & Raven, 1993). The included children ranged between the 25th and 95th percentiles and met the criteria of not having repeated any grade. In this group, a reading fluency index was calculated using a reading fluency test (Mosquera, 2011), multiplying the total number of words correctly read in the text by 60 and dividing the resulting value by the total reading time in seconds. A working memory index, assessed using a working memory task, was calculated as the ratio between the individual score/maximum possible score (McInerney, Hramok & Kerns, 2005), and an individual vocabulary measure, the individual raw score in the Vocabulary Subtest of the WISC-R (Wechsler, 1974), was included.

Study 2: TSGraph properties and language comprehension

Sixth-grade children at risk of intellectual disability (IDr) and a group of typically developing (TD) controls were compared. Language comprehension was evaluated using the free recall, recognition, and total raw scores obtained in the Narrative Memory subtest from the NEPSY II Battery (Korkman, Kirk & Kemp, 2014). The children produced a summary of the text "Japón, primero en dibujos animados". The text was given to the children to read independently and without time restriction. Then, they were asked to summarize the texts without time restriction. Intellectual capacity was assessed using the RIST Index of the Reynolds Intellectual Screening Test (RIST; Reynolds & Kamphaus, 2013). Vocabulary was assessed using the raw score in the Peabody Vocabulary Test (Manzano et al., 2003). Finally, attention was assessed using the Concentration Endurance Test (d2) (Wassenberg et al., 2008) with its three related indicators: Total Performance (TP), Concentration Performance (CP), and Fluctuation Rate (FR).

TSGraphs

SpeechGraph software (https://www.neuro.ufrn.br/softwares/speechgraphs) was developed by the Federal University of Rio Grande do Norte (Brazil) in 2012. This tool represents a text as a graph (G): the words (w) of the text are represented as nodes (N) and the connections between the words are represented as edges (E). G = (N, E), with N = {w1, w2, w3,…} as the set of nodes and E = {(wi, wj)} as the set of edges between words wi and wj in N (see the definition of the output parameters in *Appendix*). In both studies conducted, graph attributes were calculated using the whole text.

Statistical Analysis

Descriptive statistics of the data were produced using the STATISTICA program (StatSoft, Inc., 2007; version 8.0., www.statsoft.com). The univariate normality of data was evaluated by examining skewness and kurtosis, with absolute values of skewness lower than 2 and kurtosis lower than 7 considered low departures from normality (Bryne, 2010). Most variables met these criteria except for density (skewness = 2.47 and kurtosis = 6.54) in Grade 6, and RE (skewness = 2.57 and kurtosis = 7.99) and PE (skewness = 2.27 and kurtosis = 6.66) in Grade 5. For these variables, a logarithmic transformation (log10) was applied to achieve a normal distribution. However, the skewness and kurtosis did not improve; therefore, non-parametric alternatives were used in the corresponding analyses.

To control for the possible contribution of domain-general cognitive variables to variability in reading/language comprehension and academic performance, correlations were performed between the corresponding variables. Taking into account the small sample size in the fifth-grade group, partial correlations were conducted between the summaries' properties and reading comprehension, controlling for domain-general cognitive variables exhibiting significant correlations. In the sixth-grade sample, following the correlations analysis, a multivariate linear regression analysis was conducted to identify the general cognitive processes explaining a significant proportion of variance in language comprehension. Additional simple regression analyses were conducted to calculate the residuals of the dependent variable and include them in the correlations with the syntactic properties of summaries.

Finally, the independent-samples Student's t-test and Mann–Whitney U test were conducted to compare the syntactic properties between the children classified as good/poor readers and IDr/controls (significance level of 0.05).

To address multiple comparisons the false discovery rate (FDR) correction method was applied. This approach is particularly suited for studies with many comparisons involving multiple psychological variables, such as the present studies. The FDR provides a balance between controlling for false positives and maintaining statistical power. The adjustments were performed using the Multiple Test Correction Tool (https://multipletesting.com/analysis), as implemented by Menyhart, Weltz, and Győrffy (2021).

Results

Descriptive statistics for both studies

The descriptive statistics regarding domain-general cognitive processes and the academic performance of fifth graders are in *Table 2*. Results of the domain-general cognitive processes and language assessment of sixth graders are presented in *Table 3*.

In the fifth-grade group, 9 out of 21 children (42.86%) were identified as being at risk of intellectual disability (below the 50th percentile). However, the independent-samples Student's t-tests indicated that children at risk exhibited similar performance compared to their typically developing peers in all cognitive tasks, including the verbal reasoning WISC subtest and the text summary quantitative measures calculated using the SpeechGraph (see details in *Table 4*).

Table 2

Descriptive statistics of the domain-general cognitive processes and academic achievement of 5th-grade children

Measures	All Sample (N=21) Mean (SD)	Minimum Value	Maximum Value
Academic Achievement			
Spanish Language Achievement RS	45.69 (4.41)	32.30	50.00
Reading Achievement RS	17.42 (1.75)	14.00	20.00
Writing Achievement	18.05 (1.56)	15.00	20.00
Cognitive Processes			
Working Memory Index	.56 (.08)	.44	.69
Reading Fluency Index	103.44 (30.63)	61.27	175.81
WISC Vocabulary RS	37.14 (12.07)	16.00	62.00

Note: M: Mean, SD: Standard Deviation, RS: raw score

Table 3

Descriptive statistics of the domain-general cognitive processes of 6th-grade children.

Variables	All Sample (N=42) Mean (SD)	Minimum Value	Maximum Value
Cognitive Processes			
RIST Index	72.38 (17.31)	48.00	115.00
Attention (d2) – TP	233.05 (78.06)	116.00	475.00
Attention (d2) – CP	112.48 (25.01)	76.00	217.00
Attention (d2) – FR	17.02 (6.43)	6.00	35.00
Vocabulary (Peabody)	102.07 (10.27)	88.00	126.00

Note: M: Mean, SD: Standard Deviation, TP: Total Performance, CP: Concentration Performance, FR: Fluctuation Rate

Table 4
Independent-samples t-tests comparing 5th-grade children at risk of intellectual disability (IDr) and typically developing (TD) controls.

Cognitive measures	IDr Children (N=9) M (SD)	TD Children (N=12) M (SD)	t(p)
Working Memory Index	.59 (.06)	.55 (.09)	1.18 (.25)
Reading Fluency Index	92.85 (31.67)	111.39 (28.56)	–1.41 (.18)
WISC Vocabulary RS	34.33 (13.74)	39.25 (10.78)	–.92 (.37)
TextoRebelde_ PECL	6.44 (2.30)	6.25 (2.05)	.20 (.84)
Graph metrics			
WC	75.00 (32.16)	97.75 (48.28)	–1.22 (0.24)
Nodes	52.67 (18.41)	65.42()25.85	–1.26 (0.22)
Edges	73.67 (32.05)	96.17 (48.07)	–1.21 (0.24)
RE	2.22 (2.82)	4.25 (5.19)	–1.06 (0.30)
PE	2.56 (2.88)	4.75 (5.17)	–1.14 (0.27)
L2	.33 (.50)	.00 (.00)	–.55 (.59)
L3	1.78(1.56)	.50 (.80)	–.96 (.35)
LCC	52.67 (18.41)	2.58 (2.11)	–1.26 (.22)
LSC	48.78 (18.91)	65.42 (25.85)	–1.11 (0.28)
ATD	2.72 (0.27)	60.42 (26.62)	–1.18 (0.25)
Density	.06 (0.02)	2.88 (.34)	1.07 (.30)
Diameter	9.00 (1.66)	.05 (.02)	–.94 (.36)
ASP	4.03 (.39)	10.08 (3.15I	–.22 (.83)
CC	.05 (.05)	4.09 (.71)	.16 (.88)

Note: SD: Standard Deviation, ID: Intellectual Disability

Study 1: TSGraph Properties and Reading Comprehension

Correlations between Domain-General Cognitive Processes and Reading Comprehension

The fifth-grade sample showed a statistically significant covariation between the reading fluency index and reading comprehension ($r = .66$, $r^2 = .44$, $t(21) = 3.88$, $p = .001$). After applying the FDR correction for multiple comparisons (the critical p-value was adjusted to .002), this result remained significant. No statistically significant correlations were found between working memory, vocabulary, and reading comprehension in this sample.

Correlations between Graph Properties and Reading Comprehension

The correlations between all graph attributes and reading comprehension were analyzed. Only density showed a significant covariation ($r = –.64$, $r^2 = .41$, $t(21) = –3.66$,

p=.002). This result remained significant after the FDR correction for multiple comparisons.

Considering the statistically significant association observed between reading fluency and reading comprehension, as well as between the graph-derived density attribute and reading comprehension, a partial correlation was conducted between the TSGraph density and reading comprehension, controlling for the effect of reading fluency. The result revealed a negative, statistically significant correlation between the raw scores for reading comprehension and density ($r = -.45$, $r^2 = .21$, $t(21) = -2.16$, $p = .045$) (see *Figure 1*; note that the linear correlation shown is not corrected for the effect of reading fluency).

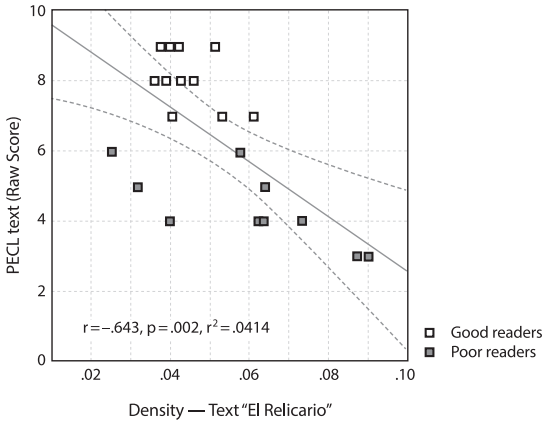

Figure 1. Linear correlation between density and reading comprehension (PECL_Raw Score).

A closer examination of individual summaries confirmed that poor readers' summaries included details and information not directly related to the central idea of the text (see *Appendix* for a translation of the texts to English).

Comparison of Academic Achievement and Domain-General Cognitive Processes in good vs. poor readers

After applying the FDR correction for multiple comparisons (compared variables: academic achievement, domain-general cognitive processes, and TSGraph properties), the new critical p-value was set to $p < .014$. Comparisons with p-values lower than this threshold are subsequently considered statistically significant.

The independent-samples t-test showed that good readers exhibited significantly higher results in all academic achievement variables compared to poor readers. After the FDR correction for multiple comparisons, the differences in reading and writing achievement were maintained. In the case of cognitive processes, a statistically significant difference was observed only in the reading fluency index, even after the FDR correction for multiple comparisons (see *Table 5*).

Table 5

Comparison of academic achievement, domain-general cognitive processes, and syntactic properties between good and poor readers

Measures	Good readers (N=11) Mean (SD)	Poor readers (N=10) Mean (SD)	t(p)
Academic Achievement			
Spanish Language Achievement RS	48.32 (1.97)	42.80 (4.60)	3.64 (.002)
Reading Achievement RS	18.55 (1.04)	16.20 (1.55)	4.12 (.001)
Writing Achievement	18.82 (1.47)	17.20 (1.23)	2.72 (.014)
Cognitive Processes			
Working Memory Index	.60 (.08)	.53 (.06)	2.12 (.047)
Reading Fluency Index	120.74 (29.90)	84.42 (18.01)	3.33 (.004)
WISC Vocabulary RS	38.82 (13.70)	35.30 (10.38)	.66 (.519)

Note: RS: Raw Scores

Comparison of TSGraph properties in good vs. poor readers

The independent-samples Student's t-test indicated that good readers exhibited a significantly lower graph density (t (19) = 2.14, p = .046; M = .045, SD = .007) compared to poor readers (M = .059, SD = .021, see *Figure 2*). While this result was statistically significant before applying the FDR, with a critical p-value of.014, it no longer reached statistical significance. No significant differences were found between the subgroups in any of the remaining syntactic properties of the summaries.

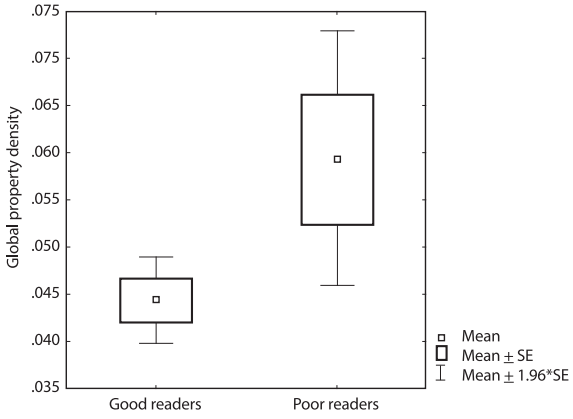

Figure 2. Box plot representation of the TSGraph attribute density in good and poor readers.

Study 2: TSGraph properties and language comprehension

Correlations between Domain-General Cognitive Processes and Language Comprehension

Significant Pearson correlations were found between language comprehension and the RIST Index (r = .46, r2 = .21, t(42) = 3.34, p = .002) and vocabulary (r = .36, r2 = .13, t (42) = 2.48, p = .017). After applying the FDR correction (critical p-value = .017), these results remained significant.

The multivariate regression analysis showed that only variability in intellectual capacity had a statistically significant effect on the dependent variable (RIST Index: SS = 224.71, df = 1, MS = 224.71, F = 4.32, p = .044, partial eta-squared = .0996, observed power = .526; Peabody RS: SS = 3.71, df = 1, MS = 3.71, F = .071, p = .79, partial eta-squared = .0018, observed power = .058).

Correlations between TSGraph properties and Language Comprehension

The correlations between the properties of the summary graphs of sixth-grade children derived from the text "Japón, primero en dibujos animados", and the residuals of the regression between language comprehension and intellectual capacity yielded statistically significant covariations with the number of nodes (r = .34, r^2 = .12, t(42) = 2.30, p = .026), the largest connected component (r = .34, r^2 = .12, t(42) = 2.30, p = .026), and the density of the summary (r = –.35, t(42) = –2.36, p = .023). The correlation associated with density was calculated using Spearman's rank correlation, as this variable did not meet the normality assumption. After the FDR correction for multiple comparisons was applied (the critical p-value was adjusted to .023), only the correlation with density remained significant. However, although the correlations with the number of nodes and the largest connected component showed a clear trend, these did not remain statistically significant (see *Figure 3*).

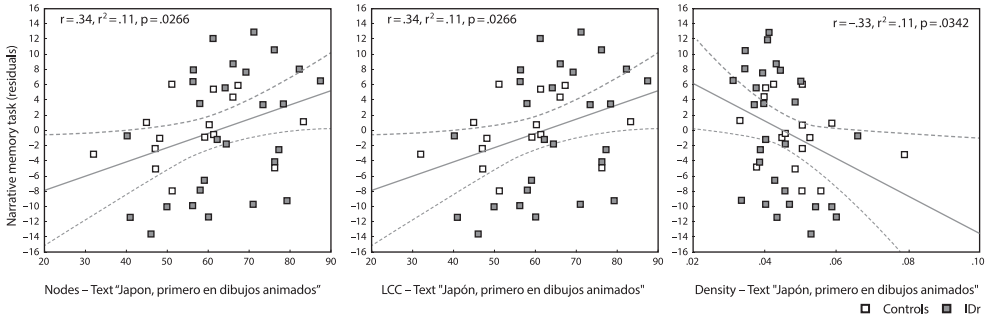

Figure 3. Linear correlation between TSGraph properties and language comprehension.

Domain-General Cognitive Processes and syntactic properties between IDr and TD groups

As expected, the 27 sixth graders (64.29%) at risk of ID (RIST index < 80) showed significantly lower results in most of the cognitive measures (see *Table 6*). Notably, the majority of these measures remained statistically significant after applying the FDR correction (critical p-value = .034).

Table 6

Independent-samples t-tests comparing 6th-grade children at risk of intellectual disability (IDr) and typically developing (TD) controls.

Cognitive measures	IDr Children (N=27) M (SD)	TD Children (N=15) M (SD)	t(p)
Narrative Memory Free Recall RS	20.59 (9.11)	28.93 (5.55)	–3.22 (.003)
Narrative Memory Free Recall SS	17.78 (2.01)	19.00 (.00)	–2.35 (.024)
Narrative Memory Free+Guided Recall RS	24.89 (8.40)	31.60 (4.87)	–2.83 (.007)
Narrative Memory Free+Guided Recall SS	14.96 (3.59)	17.53 (1.68)	–2.61 (.013)
Narrative Memory Recognition RS	13.44 (1.97)	14.60 (1.24)	–2.05 (.047)
Narrative Memory Total RS	38.33 (9.89)	46.20 (5.93)	–2.80 (.007)
RIST Index	61.30 (9.02)	92.33 (7.92)	–11.14 (.000)
TP	260.19 (79.50)	184.20 (46.13)	3.39 (.002)
CP	106.44 (26.38)	123.33 (18.52)	–2.19 (.034)
FR	17.74 (6.32)	15.73 (6.65)	0.97 (.339)
Peabody Verbal Test RS	97.96 (7.96)	109.47 (10.01)	–4.09 (.000)

Note: RS: Raw Scores, SS: Standard Scores

The independent-samples Student's t-test comparing the subgroups' TSGraph properties showed no statistically significant differences in any of them (Nodes: t(40) = -1.83, p = .075) IDr Children: M = 64.29 SD = 12.22, Controls: M = 56.93 SD = 13.05; LCC: t(40) = -1.83, p = .075 IDr Children: M = 64.29 SD = 12.22, Controls: M = 56.93 SD = 13.05). The non-parametric independent sample comparison conducted on density was the same (Rank Sum TD Children = 382.5, Rank Sum IDr Children = 520.50 U = 142.50, Z = -1.56, p = 0.12).

Discussion

The results of these studies suggest that the summary density of grade-appropriate texts is informative regarding the individual variability in standardized measures of reading and language comprehension in both fifth- and sixth-graders' samples. Note that these studies were conducted in different grades, using different measures of information processing and comprehension. Moreover, different statistical procedures controlling for the effect of domain-general cognitive factors were used, and yet consistent results were found, in line with previous reports.

In both samples, density was informative and showed a negative association with reading and language comprehension. Additionally, poor readers showed significant-

ly higher density values. Therefore, the higher the density of the summary, the worse the cohesion and organization of ideas. As suggested by this negative correlation, poor readers' summaries included details and information not directly related to the central idea of the text.

A previous study discriminating degrees of severity of cognitive impairment through verbal fluency, evaluated using the SpeechGraph properties (Bertola et al., 2014), found that patients with more severe symptoms showed higher density values for the derived networks, as well as lower values for the average shortest path (ASP). Both properties, together with the word count, nodes, edges, and diameter, discriminated with adequate sensitivity and specificity between the clinical sample and controls. Control subjects displayed less dense networks than patients with cognitive impairment.

Another study reported that density, understood as an index of linearity in discourse (Coelho, Mattos & Tannock, 2018) and used as a measure of narrative efficiency, showed the greatest difference between patients identified with attention-deficit/hyperactivity disorder and controls. The latter showed significantly lower values of the speech graph's density. The results presented here are in line with those of Bertola et al. (2014) and Coelho, Mattos & Tannock (2018).

Moreover, in relation to the construction–integration model (Kintsch & Van Dijk, 1978), our results suggest that an atypically structured textbase could be implicated in low reading and language comprehension. The construction–integration model posits that reading comprehension stems from the interactions between the literal, propositional representation of a text held in working memory (the textbase) and the reader's preexisting schemata contained in long-term memory (Kintsch & Van Dijk, 1978), which forms a representation of the meaning of the text (the situation model).

For most readers, the textbase is automatically constructed and requires little conscious effort. In contrast, poor readers are believed to construct a less detailed situation model as compared to fluent readers, putatively due to a less coherent textbase and/or less developed schemata (Kintsch, 1998, Smith et al., 2021). The TS-Graphs can be interpreted as a suitable structural representation of the textbase and may advance our understanding of the cognitive underpinnings of comprehension processes in the context of both reading and communication.

Additional global attributes showed statistically significant covariations before the FDR multiple comparison correction and did not maintain them after the correction; nevertheless, given the low sample size and the stable results obtained in the same sample for the rest of the variables, we will briefly discuss the implications of the trends in the sixth-grade sample toward significant correlations in the case of nodes and largest connected component with reading comprehension. In these cases, the correlations between the previously mentioned attributes and language comprehension were positive and direct. These results are also in line with previous findings. Nodes, which indicate the lexical diversity of the summaries, were positively correlated with language comprehension even though the length of the studied summaries ranged between one and three paragraphs and were considered short texts (Brown, 2018). Nodes were also reported to correlate positively with IQ, which included language skills in Mota et al. (2016).

The LCC (and LSC) properties have also been reported to directly covary with language comprehension. In the study of the relationship between the structure of autobiographical memories and cognitive and reading performance (Mota et al., 2016), LCC and LSC were the properties more stably correlated with reading competence at different moments of the investigation. The authors found a similar direct association between these properties in all cases, despite several differences between the studies.

In Mota et al. (2016), the text input to SpeechGraph was the transcription of autobiographical memories, based on reports of long- and short-term declarative memory. Here, the task consisted of writing a summary of a narrative text, whose length could hinder the ability to evoke related details. It may be easier to establish connections between known events that are directly retrieved from memory than from the content of a narrative text that does not necessarily refer to the child's experience. The chance of producing a longer, varied, and interconnected text favors oral discourse (McCarthy & McNamara, 2021; Roberts & Street, 2017). Additionally, from the executive perspective, organizing a written text requires greater attention and planning resources than oral discourse (Cain, 2022; Ellis, 2016; Smith et al., 2021). However, similar correlation sizes were found in both studies: cognitive performance (IQ and theory of mind (ToM) performance) and nodes (IQ: r =0.36, p =.0014; ToM: R =0.35, p =.0022) and LCC (IQ: r =0.40, p =.0005; ToM: r =0.34, p =.0023). These similar results suggest that children who employ a larger number of different words, make more connections among them, and have fewer repetitions of word–word associations (in either spoken or written discourse) performed better on IQ, ToM, and language comprehension tests.

Regarding school achievement, Mota et al. (2016) also found significant positive correlations between reading performance and LCC (r =0.33, p =.0041), consistent with the above-discussed result. LCC was also directly correlated with reading, even after controlling for the effect of IQ and ToM.

The study conducted by Lemke et al. (2021) of bilingual Portuguese–English-speaking children demonstrates how levels of syntactic complexity in writing are mirrored by increases in graph attributes such as connectedness and text density. Similarly, the present results reveal associations between topological measures such as graph density and reading comprehension in native Spanish-speaking fifth and sixth graders. This correspondence suggests the plausibility of generalizing the application of graph theory principles across diverse linguistic contexts and tasks, despite the difference in task demands—speech production in Lemke's case and reading comprehension in our studies. Such parallelism reinforces the plausibility of graph theory as a framework for understanding language processing mechanisms, transcending specific linguistic modalities and tasks.

In general, the results reported here suggest that evaluations based on quantitative measures derived from graph theory provide a suitable framework for a more in-depth analysis of the impact of syntactic variables, especially topological attributes related to reading comprehension, and SpeechGraph attributes to differentiate between clinical samples. The inability to produce a text with distinctive properties such as cohesion (which can be quantified through density) or a specific connectivity pattern (captured by LCC) can be a predictor of low reading/language comprehen-

sion. Identifying this will contribute to improving the precision of evaluation systems and the effectiveness of intervention and follow-up strategies for subjects at risk of learning/language difficulties hampering reading and language comprehension.

Conclusion

The quantitative properties/attributes of text summaries treated as graphs can indicate the individual variability in standardized language and reading comprehension measures in school-age children. They support generalizing the application of graph theory principles across diverse linguistic contexts and tasks. Further research should explore including these measures in automated evaluation systems that identify and stimulate reading/language comprehension processes and/or the impact of different intervention strategies. They can be applied to larger samples of typically developing children and children at risk of language/reading/learning disabilities or low academic achievement. To the best of our knowledge, this is the first study using the TSGraph properties to explore reading/language comprehension in the Spanish language.

Limitations

The preliminary results presented here should be interpreted with caution, owing to the small sample size of the groups compared and the fact that, in Study 1, a high percentage of children at risk of low intellectual capacity were identified (approximately 42% were classified in the 25th percentile in the Raven Test). These results were unexpected, considering that the sample was made up of children who had already passed at least four grades of the general education system. It should be taken into account that the children were classified using foreign norms (Chilean in the case of the Raven Test). This could explain the discrepancy between the children's intellectual performance and academic achievement, particularly since they exhibited statistically similar results to the children in the ≥50th percentile in the rest of the cognitive and academic assessments conducted. Finally, please note that most of the research on SpeechGraphs has been conducted on oral, not written, narratives; hence, interpretation of these preliminary results should also consider this factor.

Ethics Statement

Both studies were approved by the Psychology Faculty Ethics Committee, Havana University.

Informed Consent from the Participants' Legal Guardians

Informed consent was obtained from the legal guardians of all children included in the samples. Additionally, all children provided verbal assent to the assessments.

Author Contributions

NEP conceived the idea. AFB and NEP developed the theoretical framework and performed the statistical analysis. KGH obtained the data and verified the analytical

methods. AFB and NEP prepared the first draft of the manuscript. NEP and KGH provided corrections. All authors discussed the results and contributed to the final manuscript.

Conflict of Interest

On behalf of all the authors, the corresponding author states that there are no conflicts of interest.

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Appendix

Variables derived from the SpeechGraph (outputs)

Syntactic properties of the summary	Operational definition
General Properties: quantification of the main elements that make up the network.	
Word Count: WC	Number of words in the text.
Number of nodes: N	Number of different words in the text.
Number of Edges: E	Number of links between words in the text.
Recurrence Properties: quantification of the repetition of the edges between words and patterns of repeated words.	
Repeated Edges: RE	Sum of all edges linking the same pair of nodes.
Parallel Edges: PE	Sum of all parallel edges linking the same pair of nodes (connections between two words) in opposite directions.
Loop of one node: L1	Sum of all edges linking a node with itself.
Loop of two nodes: L2	Sum of all loops containing two nodes (sequences of two different words).
Loop of three nodes: L3	Sum of all loops containing three nodes (sequences of three different words).
Connectivity Properties: quantification of the number of words connected through paths of edges, regardless of directionality.	
Largest Connected Component: LCC	Number of nodes in the maximal component in which all pairs of nodes are reachable from one another in the underlying undirected subgraph (an indicator of how well connected the words of the text are).
Largest Strongly Connected Component: LSC	Number of nodes in the maximal component in which all pairs of nodes are reachable from one another in the directed subgraph (also, an indicator of how well connected the words of the text are).
Global Properties: quantify the topological characteristics of complex graphs.	
Average Total Degree: ATD	Given a node n, the Total Degree is the sum of "in and out" edges. The Average Total Degree is the sum of the Total Degree of all nodes divided by the number of nodes (how many links the word has with any other words).
Density	Number of edges divided by possible edges (D = 2*E/N*(N-1)), where E is the number of edges and N is the number of nodes (number of directly connected words divided by all possible connections between words).
Diameter	Distance, in number of nodes, from the connection between the most distant pair of connected nodes in the text.
Average Shortest Path: ASP	Average of the shortest paths between each pair of nodes in the text.
Average Clustering Coefficient: CC	Given the node *w1*, the clustering coefficient is the measure of how many nodes are directly connected to the node *w1*, being also directly connected to each other in a neighborhood; the average clustering coefficient is the sum of the clustering coefficients for each node divided by the number of elements in its neighborhood.

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