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Original articles

Children's expressive vocabulary in social isolation during the COVID-19 pandemic

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ABSTRACT

Purpose: to characterize and classify the frequency of occurrence of expressive vocabulary words in children during the social isolation of the pandemic period.

Methods: a quantitative study with a sample consisting of 44 typical children, aged between 18 and 37 months. The assessments applied to the sample to compose the eligibility criteria were carried out during the pandemic. The study used the MacArthur-Bates Communicative Development Inventory (IDC-MacArthur), adapted to Brazilian Portuguese, answered by parents/guardians, to assess children's expressive vocabulary and subsequently analyze them in terms of frequencies and occurrences of words produced. To evaluate the frequency of occurrence of words, the FREQ procedure was used and the classification of occurrences as High, Medium and Low Frequency, using tercile analysis for distribution.

Results: the results show the classification of the percentage of word occurrences, providing examples of high, medium and low frequency words. The high frequency words included familiar and everyday words, inserted in early childhood, the medium frequency words were distributed in daily life activities and their relationships and finally, the low frequency words resulted in more specific words, also related to the structure of Portuguese.

Conclusion: the high-frequency expressive vocabulary words were related to family members, greetings, sounds of animals, body parts, and toys. The medium frequency ones pointed to a diversity of words (food, activities, clothing, actions), the low frequency ones pointed to connectors and verbs.

Keywords: Language Development; Vocabulary; Child Language; Child; Pandemics

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INTRODUCTION

Language can be defined as a system in which information is exchanged, based on understanding and linguistic expression[1]. Using language, it is possible to communicate to express ideas, emotions and desires, in addition to helping in the development of other areas, such as cognition[2].

The development of oral language is intrinsically linked to a complex set of cognitive, perceptual and linguistic abilities, originating in the period before the acquisition of speech[3]. Language acquisition cannot be understood in isolation in the context of child development. Its emergence is closely linked to cognitive aspects, neuropsychomotor development, sensory functions and environmental stimulation, where communicative and encouraging exchanges must occur[3].

In language development, lexical acquisition is one of the first linguistic manifestations and is related to the ability to understand and produce different words, observing their meaning[4]. Neuroplasticity is emphasized in the first three years of life, being a stage of development characterized by the acquisition of new functions and skills and the acquisition and mastery of language[5]. Careful attention to the initial aspects of children's vocabulary is important because the earlier words are acquired, the faster and more accurately they are recognized and produced[6].

Concerning expressive vocabulary, it is expected that the first words will be produced around 10 to 15 months, around 30 words will be produced between 18 and 22 months, and at two years of age (24 months) the "vocabulary explosion" will occur, where children are able to produce more than 200 words. Later, at two years and six months, the production of more than 500 words is observed, and between three and four years of age, the production of between 500 and 1000 words is expected[7].

In oral language development, vocabulary expansion is a necessary milestone for the child's linguistic expression. The words the child understands will be easily incorporated into their lexicon, to achieve oral production and expression, evolving to syntactic constructions with more words and connectives[8]. Children actively seek out experiences, means of communication, and interactions that favor cognitive, linguistic, psychoaffective, and social development for effective oral language and vocabulary improvement.

The COVID-19 (Corona Virus Disease 2019) pandemic has impacted young children's acquisition and linguistic development. This impact was observed in studies that highlighted social isolation, reduced interactions and socializing with loved ones, and especially the impossibility of attending Early Childhood Education, with a lack of opportunities to stimulate neurocognitive development, language, gross and fine motor skills, and neurofunctional skills[8,9]. Furthermore, during this period, there was an increase in the use of screens for young children[8,9]. It is also worth noting that, during the pandemic period, speech therapy services were reduced, making assistance impossible due to social distancing[10].

Upon resuming social and academic activities, speech therapy interventions revealed delays in expressive vocabulary, with complaints of children "speaking little" and with a reduced expressive vocabulary (i.e., children producing fewer words)[11]. Assessing children's vocabulary during the pandemic is crucial to understanding word frequency, semantic preferences, and potential educational impacts.

Speech and hearing assessment for vocabulary is significant and necessary for following up and monitoring oral language development. In Brazilian Portuguese, tools such as the Child Naming Test[12], ABFW Child Language Test – Vocabulary Test[13], and the MacArthur-Bates Communicative Development Inventories (MB-CDIs) assess the early identification of expressive vocabulary production[14]. The MB-CDIs, developed by Fenson et al. in 1993[14] are designed for children aged 8–37 months and are divided into Words and Gestures (8–16 months) and Words and Sentences (16–37 months). Recently, its third version, the CDI-III, was developed[15,16] and translated and adapted into Portuguese by Teixeira[17]. This version, the MacArthur-Bates Communicative Development Inventory, is available in UFBA's Moodle environment and maintains the two-form structure to align with the Brazilian context.

Speech-language pathology assessment for vocabulary is a significant and necessary item for monitoring and development of oral language[18]. The use of the MB-CDI's adapted for Brazilian Portuguese helps in the early identification of the production of expressive vocabulary[17].

The COVID-19 pandemic and resulting social isolation negatively impacted social interactions, which may have influenced language development. Reduced opportunities for communication may have led to lower-than-expected vocabulary frequency and

diversity in young children, highlighting the need for further research on this impact.

The frequency of words in children's expressive vocabulary is negatively associated with social isolation during the pandemic. This study aimed to characterize and classify the frequency of words in children's expressive vocabulary during the pandemic.

METHODS

This cross-sectional, quantitative study was approved by the Research Ethics Committee of the Federal University of Santa Maria, RS, Brazil (process no. 051970, CAEE no. 18419319300005346). The study complied with the ethical guidelines outlined in Resolution CNS no. 466/12. Parents or guardians signed the Informed Consent Form, and the children were invited to participate using simple language. The research was conducted at a higher education institution in the school clinic during 2021 and early 2022, adhering to pandemic-related biosafety measures. All children were in social isolation during the study period.

The sample was selected through convenience, using the researchers' networks and social media platforms. It comprised 44 children with typical cognitive, language, and motor development, categorized into age groups: 18–24 months, 24–30 months, and 31–37 months. Eligibility criteria required participants to obtain a composite score classified as "Competent" on the Bayley Scales of Infant and Toddler Development[19] in the Cognitive, Language, and Motor domains and have normal hearing. Children who scored within the "Emerging" or "At Risk" classifications on the Bayley-4, or those with neurological diagnoses or developmental impairments, were excluded. During the pandemic, data collection was hindered by restrictions and logistical challenges in accessing the university, significantly impacting the sample size.

The children's expressive vocabulary was assessed using the MacArthur–Bates Communicative Development Inventory: Words and Sentences, translated into Brazilian Portuguese. This assessment, suitable for children aged 16–37 months, evaluates expressive vocabulary (words the child produces) and is divided into Part I – use of words, and Part II – sentences and grammar.

In Part I, guardians marked words their child spontaneously produced from 599 words divided into 23 semantic categories. Part II included questions on grammatical complexity, such as using suffixes (e.g., plural, masculine/feminine, augmentative/diminutive, gerund, participle) and verb forms (past, present, future). The form also collects information on whether the child over-regularizes irregular words and uses irregular verbs correctly. Guardians must also record the child's three longest recent sentences and select, from 39 sentence pairs, those that best match the child's spontaneous speech.

Data collection involved providing parents/guardians with printed copies of the adapted MB-CDIs inventory[17] and detailed instructions for completion. Parents/guardians were instructed to complete the questionnaire by marking the words their child produced, as per the inventory instructions: "Children understand more words than they produce. Here, we are only interested in the words the child SAYS. Read the words below carefully and mark those you hear your child say, even if the pronunciation is not as expected."

This study used Part I of the inventory, comprising a list of 599 lexical items across 23 semantic categories: 1. Sounds of things and animals (12 words), 2. Animals (43 words), 3. Vehicles (16 words), 4. Toys (14 words), 5. Clothes and accessories (32 words), 6. Body (31 words), 7. Food and drink (62 words), 8. Places outside the house (20 words), 9. External objects (27 words), 10. Furniture and living quarters (27 words), 11. Household utensils (40 words), 12. Daily routine and social formulas (28 words), 13. People (18 words), 14. Words related to time (7 words), 15. Quantifiers and locatives (22 words), 16. Action words (91 words), 17. Auxiliary verbs (24 words), 18. Qualities and attributes (46 words), 19. Questions (6 words), 20. Articles (6 words), 21. Prepositions (5 words), 22. Pronouns (13 words), and 23. Connectors (9 words). After completing the inventory, parents/guardians received feedback on the results.

The data was organized using Google Forms, with the semantic classes from Part I of the inventory categorized accordingly. Data was then tabulated as "YES" for words produced by the child and "NO" for words not produced. The methodology for classifying word frequency was based on previously published studies Oliveira, Santos, Capellini (2021)[20] e de Oliveira e Capellini (2016)[21].

Statistical analyses were conducted to calculate the frequency of each word in the children's vocabulary by gender and age group using the FREQ procedure. Tertile distribution analysis was used to classify word frequency: (a) high frequency: 31–44 occurrences, (b) medium frequency: 19–30 occurrences, (c) low

frequency: 0–18 occurrences. Based on these criteria, the 599 words were distributed as follows: 162 low frequency, 284 medium frequency, and 153 high frequency. Descriptive analysis determined the tertiles, with mean, maximum, and minimum values calculated to define the range of results. All analyses were conducted using SAS® Studio software (SAS Institute, USA).

Table 1. Frequency of children according to sex and age group

Age group	Sex		Total
	Females	Males	
18 to 24 months	6	8	14
24 to 30 months	7	3	10
30 to 37 months	13	7	20
TOTAL	26	19	44

RESULTS

Tables 2, 3, and 4 present the distributions of occurrences of high, medium and low frequency words, respectively, and their examples, according to the objectives of the study.

Table 2. Classification of the percentage of occurrences of high-frequency words

Classification	n (%)	Words
≥ 95%	5 (3.27)	BauAu, ChirpChirp, Grandpa/Grandma, Mom/Mom, Dad/Dad
86 to 94%	21 (13.72)	Ouch!, Meow, Moo, Airplane, Car, Ball, Poop, Hand, Foot, Pee, Water, Banana, Cake, Egg, Bread, Hi/Hello, No, Bye, Uncle/Auntie, Open, Sleeping
76 to 85%	72 (47.06)	Bibi, Méééé, Bug, Dog, Horse, Chicken, Cat, Monkey, Bird, Duck, Fish, Pig, Mouse, Frog, Turtle, Bear, Cow, Truck, Motorcycle, Bus, Train, Balloon/Bladder, Pants, Jacket, Sock, Clothes, Sneakers, Belly, Mouth, Butt, Hair, Finger, Nose, Rice, Potato, Cracker, Meat, Bean, Milk, Apple, Corn, Juice, House, Tree, Rain, Flower, Moon, Sun, Bed, Door, Key, Spoon, Cup, Knife, Garbage, Paper, Plate, Hello, Where are you?, Baby, More, Eat, Jump, Blue, Sick/Hurt, Dark, Black, Green, What, A, O, Mine
≤ 75%	55 (35.95)	Cocoococó, Butterfly, Elephant, Lion, Bicycle, Toy, Blouse, Slipper/Sandal, Diaper, Shoe, Arm, Head, Tooth, Eye, Ear, Belly Button, Coffee, Food, Orange, Fish, Popcorn, Grape, School, Swing, Sky, Cloud, Street, Chair, Table, Sofa, TV, Light/Bulb, Bottle, Found! Lunch/Food, Bath, Thank you, Take it off, Your name, There, Here, Help, Play, Fall, Run, Draw/Paint, Close, Stop, Leave, Sit, (Es)tá, Hot, Dirty, Red, One
Total	153 (100)	-

Captions: n = number; % = percentage

Table 3. Classification of the percentage of occurrences of words

Classification	n (%)	Words
≥ 95%	73 (25.70)	Toc Toc, Bee, Spider, Ox, Rabbit, Ant, Giraffe, Alligator, Wolf, Boat, Doll, Pen, Crayon, Pasta, Nipple/Cup, Bag, Hat, Glasses, Cheek, Knee, Tongue, Leg, Nail, Carrot, Chocolate, Papaya, Watermelon, Strawberry, Pizza, Cheese, Market, Beach, Sand, Star, Grass, Stone, Bench, Bathroom, Ladder, Fridge, Window, Bedroom, Living Room, Bag, Blanket/Cover, Brush, Toothbrush, Fork, Medicine, Picture/Photo, Soap/Sabonet, Cup, Kisses, (Let's) go?, Godmother/Daughter-in-law, Girl/Boy, Inside, There, Everything, Finish, Tidy up, Kiss, Cry, Lie, Clean, Look, Up, Take, Is, Yellow, White, Cold, Me
86 to 94%	67 (23.59)	Qu-Quá- Quen- Quen, Whale, Cockroach, Mosquito, Tiger, Shark, Zebra, Tractor, Book, Cap, Boot, Button, Umbrella, Dress, Chicken, Ice, Yogurt, Ice Cream, Hospital/doctor, Hole, Pool, Shower, Kitchen, Stove, Sink, Bucket, Box, Bottle, Telephone, Scissors, Towel, Pillow, Broom, License, Please, Godfather/Granddaughter, After, There, Under, Outside, Other, Walk, Knock, Drink, Rain (raining), Kick, Dance, Hurt, Enter, Wait, Play, Walk, Catch, Search, Can, Want, Will, Good, Big, Clean, Small, Sad, Where/Can You Go, One, She/He, Ouch
76 to 85%	55 (19.37)	Grrr, Snake, Fly, Shirt/T-shirt, Bracelet, Face, Candy, Macaroni, Popsicle, Soup, Toast, Work, Slide, Closet, Bathtub, Drawer, Comb, Bag, Give a hug, Give a piece, Dinner, Snack/Gift, Well done! Nana neném, Sleepy, Friend, Coursin, Teacher, Now, Night, Already, A lot, Again, Sing, Put, Give, Say/speak, Hide, Like, Call, Break, Want, Hold, Drink, Work, Sweep, See, Want, Awake, Pretty, Wet, Broken, That, And
≤ 75%	89 (31.34)	Donkey, Crab, Hippopotamus, Lizard, Penguin, Ambulance, Police Car, Helicopter, Panties, Pajamas, Watch (wrist), Skirt, Face, Back, Shoulder, Ear, Chin, Cookie, Candy, Lollipop, Party, Forest, Church, Store, Park, Mall, Flag, Sidewalk/Sidewalk, Elevator, Wall, Shovel, Plant, Crib, Garage, Wardrobe, Potty, Pillow, Computer, Money, Can, Plant, Radio/Sound, Clock, Fan, Ribs, Scare, Cheers!, All good, Turn, I'll get you, Clown, Police, Daytime, Well, Up, Near, Little, Down, Buy, Cut, Push, Write, Do, Yell, Wash, Read, Stand up, Bite, Swim, Pull, Laugh, Cover, Go, Have, Silly, Beautiful, Ugly, New, Heavy, Fast, Which, The, With, From, To, That, You, That
Total	284 (100)	-

Captions: n = number; % = percentage

Table 4. Classification of the percentage of occurrences of low frequency words

Classification	n (%)	Words
> 90%	32 (19.75)	Baby carriage, Block/Lego, Glue, Underpants, Bullet, Butter, Salt, Club, Hose, Thunderstorm, Hammer, Board, Quickly, Listen, Stay, Join, Release, Bring, Dress, Come, I (am), Jaguar, Can, Will, High, Tired, Full, Hard, Strong, Bad, Why, Me
73 to 89%	53 (32.72)	Trimm, Turkey, Fire engine, Ship, Sword, Drum, Belt, Necklace, Throat, Chest, Sugar, Peanut, Sweet, Coca-Cola, Snack, Sandwich, Vegetable, Farm, Gas station, Garden, Plate, Roof, Washing Machine, Napkin, Sister/Brother, Today, Like This, Behind, Beside, Also, Erase, Win, Take, Comb, Lose, Tear, Know, Have, Touch, Change, Am, Have, Scared, Weak, Same, Old, Who, In, People, That, Me, Your, Because
51 to 72%	43 (26.54)	Skates, Top, Bib, Short, Dick, Vagina, Hot dog, Guarana, Hamburger, Porridge, Nescau, Tangerine, Pie, Circus, Fair, Zoo, Babysitter, Babysitter's name, Tomorrow, In front, Carry, Suck, Fold, Show, Think, Arrest, Burn, We're, Are, Different, Difficult, Fat, Slow, Better, Soft, First, Torn, Dry, Empty, That, But, Runner, Jar/Vessel
≤ 50%	34 (20.99)	Sheep, Velotrol, Hoop, Sweater, Sweater, Cereal, Chewing Gum, Jelly, Guava, Pudding, Vitamin, Cinema, Backyard, Balcony, Shut Up!, Maid, Tie, Cover, Fix, This, Be, We Can, Could, Want, Have, Have to, Go, When, By, You, Then, Or, Because of, If
Total	162 (100)	-

Captions: n = number; % = percentage

DISCUSSION

The MB-CDIs have been widely used in speech-language pathology research to assess expressive vocabulary in typically developing children and those with language impairments, demonstrating its effectiveness[22-25]. Although the inventory contains 599 words across various semantic categories, not all words are necessarily stimulated or acquired within this age range. Conversely, evidence supporting the validity of the MB-CDIs as a screening tool is limited, as it does not definitively identify linguistic difficulties[26]. However, this does not invalidate its role in documenting expressive vocabulary, particularly in word production quantity.

The chosen age range (18–37 months) encompasses a critical period for vocabulary acquisition, especially the "vocabulary explosion" phase at around 24 months[7]. While the analysis did not specifically address demographic distribution, the sample predominantly comprised female participants, particularly children aged 30–37 months, indicating potential convenience sampling.

The findings provide valuable insights into the distribution and usage of words across different frequency categories, illustrating patterns in early vocabulary acquisition during the COVID-19 isolation period. High-frequency words primarily include familiar and commonly used words, such as family members (Mom, Dad), greetings (Hi, Bye), onomatopoeic animal sounds (BauAu, ChirpChirp), body parts (Foot), and ordinary objects/toys (Car, Ball).

Medium-frequency words exhibit greater lexical diversity, encompassing daily activities, food, clothing, places (School, Home), attributes (Beautiful, Sad), and actions (Play, Cry). These words tend to be more specific than high-frequency words. Low-frequency words consist of less common, specialized, or complex terms, including unconventional animal names (Hippo, Gecko), objects related to specific activities (Slide, Broom), and more abstract connectors and verbs.

The prominence of high-frequency words suggests that everyday interactions are crucial in vocabulary enrichment, mainly through simple phonological structures and phonotactic patterns. However, considering that children typically acquire 200–300 words during this developmental phase, the study revealed an average of only 153 high-frequency words in the sample. This discrepancy results from reduced social interactions and limited exposure to diverse linguistic stimuli during pandemic-induced isolation, particularly the absence of peer interactions and early childhood education. Vocabulary acquisition occurs gradually and continuously. Given the study's focus on word frequency during the pandemic, the findings suggest that reduced stimuli and social interaction may have influenced language development.

Low-frequency words appear to reflect terms more commonly learned through external social experiences, such as nurseries, schools, outings, and family gatherings—opportunities significantly limited during the pandemic. Consequently, this study suggests a probable reduction in expressive vocabulary due to decreased environmental exposure.

Additionally, particular medium- and low-frequency words (e.g., "board," "forest," "arrest," "change," "napkin") require greater phonological, syntactic, and cognitive effort, making their acquisition more dependent on contextual exposure. These words demand higher memory retention and articulatory skills, emphasizing the role of environmental stimulation in vocabulary expansion[27,28]. Most words in the MB-CDIs inventory fall within the medium-frequency range (n = 284 words) due to their greater representation across multiple semantic categories and the study's focus on a period of accelerated lexical development[7].

The method used to classify and analyze word frequency aligns with previous research in speech-language pathology[20,21]. The ability to categorize words by their frequency of occurrence is an important tool for understanding vocabulary acquisition patterns. It has been employed in studies analyzing word frequency in teaching materials, underscoring the scientific validity of measuring vocabulary frequency as a meaningful metric in language development research.

Phonological and vocabulary development are positively correlated, meaning that as vocabulary expands, phonology develops simultaneously[29]. Conversely, grammatical words and phonemically complex structures were negatively correlated, indicating that syntactic and phonological complexity influence vocabulary acquisition. Other sociocultural and environmental factors, such as maternal education level and socioeconomic background, also contribute to semantic-lexical acquisition[30]. Evidence suggests that children tend to select words based on pronounceability at the onset of phonological acquisition, reinforcing that practicing word production facilitates subsequent vocabulary growth[31]. The gradual nature of this learning process highlights the significance of early exposure to diverse linguistic stimuli.

Studying expressive vocabulary in young children, particularly during and after the COVID-19 pandemic, is crucial. Research suggests that children born during the pandemic exhibited delayed verbal development compared to pre-pandemic demographics[32]. Reduced social interactions, limited access to early education and healthcare services, and a lack of external stimuli diminished vocabulary growth[33,34]. This study underscores how social isolation influenced expressive vocabulary, emphasizing reduced exposure to words outside the family environment. These findings reinforce the study's primary objective, demonstrating the frequency and characterization of expressive vocabulary in children during the pandemic.

The MB-CDIs proved to be an effective tool for assessing and classifying expressive vocabulary based on parents' observations. The word frequency analysis detailed early vocabulary development, offering valuable data for future speech-language therapy assessments. Several studies have used the MB-CDIs to analyze children's vocabulary size and semantic content[35-39]. For instance, the inventory can be applied to compare vocabulary acquisition in children with repaired cleft lip and otitis media versus typically developing children, revealing a reduced vocabulary expansion in children with speech-related conditions[40]. Similarly, a study tracking 30 children at 24 and 30 months using the MB-CDIs showed an average vocabulary increase of 118 words, independent of pandemic-related factors[41].

This study is highly relevant to speech therapy, providing statistical data on typical vocabulary development in children, particularly in the context of the pandemic. Furthermore, it offers valuable insights into the expressive vocabulary of BP-speaking children, based on parental/guardian observations during social isolation, while identifying the most and least frequent words in early language development.

These findings contribute to speech therapy assessments and inform the selection of words for intervention strategies. It can also serve as a resource for parents, caregivers, health professionals, and educators, offering guidance on incorporating these words into everyday language stimulation. Analyzing the pandemic's impact on early childhood language acquisition is crucial for understanding its long-term effects. Therefore, it is essential to monitor and characterize children's expressive vocabulary during this critical developmental period.

Therefore, this study adds meaningful data to the existing body of knowledge. Further research is needed to compare vocabulary acquisition trends during and after the pandemic, particularly in assessing whether word frequency and language complexity have changed in the post-pandemic period,a focus beyond the scope of this study.

CONCLUSION

Amid the challenges of social isolation during the pandemic, the acquisition of expressive vocabulary in children stands out as a topic of significant relevance. This study concludes that classifying expressive vocabulary into high-, medium-, and low-frequency words during the pandemic reflects children's lived experiences and exposure to everyday situations. High-frequency words primarily include terms for family members, common greetings, onomatopoeia, body parts, and toys. Medium-frequency words encompass a broader range of concepts, including daily activities, food, clothing, places, and actions. Finally, low-frequency words are associated with more complex connectors and verbs, reflecting less standard linguistic input and higher cognitive demands.

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ASF: Conceptualization; Data curation; Writing - Original draft, Writing - Review and editing.

MKS: Research; Supervision; Writing - Review and editing.

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