Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(2), 2158-2163 | ISSN:2251-6727

The Grip of Change: Toothbrush Evolution Across Eras

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(Received: 28 January 2026 Revised: 16 March 2026 Accepted: 09 April 2026)

KEYWORDS

Generation-Alpha, Power Grip, Manual Dexterity, Evolution of toothbrush grip

ABSTRACT:

Introduction: Maintenance of oral health is crucial for proper growth, development and overall well-being. Selecting the right toothbrush and introducing effective brushing habits can significantly impact a child's dental health, preventing common issues like cavities, gum disease, etc. Toothbrush grips play a crucial role in Pediatric Dentistry by ensuring that children can comfortably and effectively hold and use their toothbrushes.

Objectives: The aim of this study was to evaluate the various types of toothbrush grips for children in Alpha-Generation and to compare this data to the historical perspective of toothbrush grips in previous generations.

Materials and methods: The experimental design was single-blind study which included 114 school students aged between 7 and 11 years. Data was obtained using video recordings of subjects as they conducted their normal tooth brushing sessions. We observed the manner in which they gripped their toothbrushes. This information was analysed to show the type of grip used in Alpha-Generation. In addition, the study compared the evolution of the toothbrush grips from the previous generations.

Results: The Power Grip, with a frequency of 52 (45.6% of the total), is the most frequently observed grip type among Generation Alpha, accounting for nearly half of the sample. The Precision Grip, with a frequency of 23 (20.2% of the total), is the second most common grip type observed in Generation Alpha, accounting for 85.1% of the cumulative total.

Conclusion: The study confirmed that there is a change in toothbrush grip due to increased manual dexterity in Generation Alpha. Also, there is a significant evolution of grip style from previous generations.

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Introduction:

Good oral hygiene starts early, and one of the best ways to build a strong foundation is by teaching children to brush their teeth regularly. When it comes to technique, kids should be encouraged to use gentle, circular motions with their toothbrush. Most kids don't have the hand coordination to brush properly until they're around seven or eight years old. That's why parental involvement is so important. Toothbrush has been an integral part of a daily routine across many cultures around the world from the times of antiquity to the 21st century [1]. The grip of a toothbrush directly influences the effectiveness of brushing by enabling proper angling, pressure, and reach. Poor grip designs may lead to improper brushing techniques, increasing the risk of plaque buildup, cavities, and gum issues. Toothbrush grip and manual dexterity are closely interconnected in Pediatric Dentistry, as the ability of children to hold and control a toothbrush directly influences their oral hygiene practices. Manual dexterity, which refers to the coordination and skillful use of the hands and fingers, is still developing in children, particularly in younger age groups. Properly designed toothbrush grips are essential for compensating for this developmental stage and ensuring effective plaque removal. Tooth brushing is an essential element of an effective plaque control and Khalid Jamal Alanazi et al. [2] hypothesized that attaining optimal oral health would depend on the efficacy of the method used and the ease of carrying out the procedure. Until children develop sufficient manual dexterity, parents often need to supervise or assist with brushing to ensure thorough cleaning as insufficient manual dexterity can result in inadequate cleaning, leading to plaque buildup, cavities, and gum problems at an early age. In order for the hand tooth brushing to be effective a certain degree of manual dexterity is required. This is especially important in children since the dexterity of the child varies and increases according to his/her age [3].

The most comprehensive classification of toothbrush grips was given by Beals et al. [4] They observed five different types of grips namely – distal oblique, oblique, power, precision and spoon [Figure 1]. In these grips, distal oblique and power use palm of hand while oblique, precision and spoon grips rely on fingers [5].

One of the earliest grips observed is the Power Grip. In this grip, the child holds the toothbrush like they would hold a toy, clenched tightly in their fist with the thumb wrapped around. The Precision Grip, also called the modified pen grip, is the ideal brushing grip that most adults use. Here, the toothbrush is held like a pencil, with the thumb, index finger, and middle finger working together. This grip allows for small, controlled movements and gentle brushing. It typically develops around the age when children start writing or colouring with more accuracy. It's a sign that their fine motor skills are catching up. In Distal Oblique Grip, the toothbrush rests diagonally across the palm and is mostly supported by the outer fingers like the ring and little fingers. It's not as tight as the power grip, but it doesn't offer the precision of a mature grip either. It reflects a phase where the child is experimenting with control but hasn't quite achieved it yet. Another similar variation is the Oblique Grip. In this grip, the brush is held diagonally, but with slightly better positioning than the distal oblique grip. The child may angle their wrist differently and try to use more of their fingers to move the brush. It shows progress and an effort to manage better movement, but it still doesn't provide the best reach or technique for thorough cleaning. Then there's the Spoon Grip, which mimics the way a child holds a spoon while eating. The palm faces upward, and the fingers curve around the handle. Since this is a familiar grip from daily activities like eating, it feels natural to many young children. However, it's not ideal for brushing because it limits the angles they can reach, especially on the inner surfaces of the teeth.

Handheld digital gadgets, such as smartphones, tablets, and gaming devices, can have positive effects on the development of manual dexterity in children as they are used to hold such devices at a very early age. Most of the literature is suggestive of correlations between the method of toothbrushing, plaque removal and type of grips. However, a little attention has been paid to the type of grip used in generation-alpha correlating it with the manual dexterity. Hence, this study aimed to identify and analyze the different types of toothbrush grips used by Alpha-generation children and to examine whether these grip patterns show any secular trend, reflecting changes in brushing behavior over time.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(2), 2158-2163 | ISSN:2251-6727

Material and Method

The study was conducted in 114 school children of age group between 7-11 years. Written expressed consent was taken from parents and school authorities. Suburban schools were selected because children in these areas are more likely to have access to electronic gadgets that influence fine motor development, allowing a clearer assessment of the relationship between manual dexterity and toothbrush grip patterns. Prior to the study, all the historical data about toothbrush grips was collected through various articles from PubMed and Google Scholar between the year 2002 to 2020 representing generation X (1965–1980), Y (1981–1996) and Z (1997–2012). The study was planned in two visits in which students for the study were selected using simple random sampling. In the first visit to school, one to one counselling was done with the children in which importance of toothbrushing and method of toothbrushing was taught. Toothbrushes were then dispensed to the children and toothbrush holding grip was observed, but no record was taken to avoid bias. During the second visit, children were asked to bring the toothbrushes that had been provided earlier. While the children were brushing their teeth one by one, their grip was recorded from the front using a video camera with standard background. During the recording the camera was mounted at a specific angle to capture front on vision of the child. This was only adjusted in height as per the height of child. Recorded videos were seen again and again for assessing the toothbrush grip. The recorded data was analysed statistically.

Inclusion criteria

- School children aged 7–11 years
- Students enrolled in private schools
- Children without any motor disabilities
- Children with access to smartphones for at least the past three years
- Children with obtained parental consent

Exclusion criteria

- Medically compromised children
- Children who were uncooperative
- Children with motor or sensory disabilities
- Children without access to smartphones
- Children without parental consent

Fig 1(a): Power

Fig 1(b): Distal Oblique

Fig 1(c): Precision

Fig 1(d): Oblique

Fig 1(e): Spoon

Results:

All the data were collected, statistical analysis was done by using Pearsons's chi square test. Descriptive statistics was performed in terms of mean, standard deviation and frequency and percentage. Statistical significance was calculated at $p<0.05$.

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TABLE 1- AGE DISTRIBUTION OF DIFFERENT TOOTHBRUSH GRIPS

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	114	7.00	11.00	9.0614	1.43462
Valid N (listwise)	114				

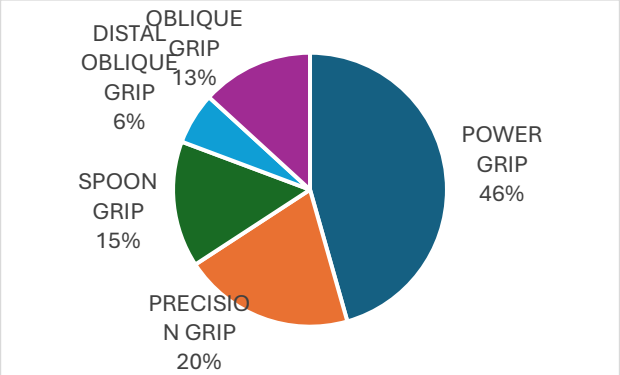
TABLE 2- FREQUENCY AND PERCENTAGE DISTRIBUTION OF VARIOUS GRIPS

Grip of Generation Alpha					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Distal Oblique grip	7	6.1	6.1	6.1
	Oblique grip	15	13.2	13.2	19.3
	Power grip	52	45.6	45.6	64.9
	Precision grip	23	20.2	20.2	85.1
	Spoon grip	17	14.9	14.9	100.0
	Total	114	100.0	100.0	

The Table 1 and Table 2 represents the types of grips observed in Generation Alpha, detailing the frequency and percentage distribution of each grip type among a sample of 114 individuals.

Table 2 shows, the Distal Oblique Grip, with a frequency of 7 (6.1% of the total), is the least common grip type among Generation Alpha. The Oblique Grip, with a frequency of 15 (13.2% of the total), is slightly more common than the distal oblique grip but still not a predominant choice among Generation Alpha. With a cumulative percent of 19.3%, this grip type indicates moderate usage in activities that require an angled or partially rotated hand position. The Power Grip, with a frequency of 52 (45.6% of the total), is the most frequently observed grip type among Generation Alpha, accounting for nearly half of the sample. The Precision Grip, with a frequency of 23 (20.2% of the total), is the second most common grip type observed in Generation Alpha, accounting for 85.1% of the cumulative total. This grip is typically associated with fine motor skills and the handling of smaller objects, requiring more delicate and controlled hand movements, such as holding a pencil, eating utensils, or performing tasks that demand accuracy. The Spoon Grip, with a frequency of 17 (14.9% of the total), ranks moderately in usage among Generation Alpha. Chart 1 shows its cumulative percentage of 100% shows that all grip types have been accounted for, with the spoon grip representing a smaller but still notable portion of the sample.

CHART 1- PIE CHART SHOWING FREQUENCY OF TOOTHBRUSH GRIPS



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DISCUSSION

This study aimed to examine the different toothbrush grips used by children in Generation Alpha and determine how these grips correlate with their manual dexterity, providing insights into their fine motor development. Children aged 7 to 11 were selected for this study because, at this stage, they begin brushing their teeth on their own. It's also a time when the use of digital gadgets begins to influence their fine motor skills, making this a critical period of development. The correlation between handheld devices and toothbrush grips in children is an interesting area of study, particularly as modern technology continues to influence children's fine motor skills and habits. While there may not be direct studies linking these two factors, some general observations can be made based on research in child development and technology use. Frequent use of handheld devices, especially smartphones and tablets, often requires children to use their fingers and hands in ways that may affect their fine motor skills. Motor coordination is one of the fundamental aspects of motor development and its links to cognitive development have been explored, mostly with fine motor coordination [6]. Mentes A. et al. showed that children's toothbrushing grips tend to vary as they develop motor skills [7]. A distal grip might be used more often by younger children, while older children with more developed dexterity may use a power grip.

In our study, Power Grip, with a high frequency of 45.6%, suggests that Generation Alpha often engages in activities that require strength and control, such as holding larger or heavier objects. This grip, while providing strength, may also reflect a stage in their development where manual dexterity is still maturing. As children develop fine motor skills, their ability to control and manipulate smaller objects improves, which could eventually lead to a transition from grips like the Power Grip to more precise grips, such as the Precision Grip, as their dexterity increases. In addition, the significant use of the Precision Grip, accounting for 20.2%, highlights the growing importance of activities that demand fine motor skills, such as writing or manipulating small objects, in the daily routines of Generation Alpha. This grip indicates that as children progress in their fine motor development, they begin to engage in more precise tasks, suggesting that their dexterity is improving. The presence of the Precision Grip reflects a shift towards better control and coordination, a crucial aspect of their overall motor skill development. The Distal Oblique Grip, with a frequency of 7 (6.1% of the total), is the least common grip type among Generation Alpha. Its low prevalence suggests that this grip style has limited utility or application in the daily activities of this generation.

Mafla et al. [8] did a study to investigate the association between Fine Motor Skills and toothbrushing efficacy and found that FMS and toothbrushing efficacy were not significantly associated. Vijay Lakshmi et al. [5] did a study to determine brushing techniques, grip and frequency of tooth brushing in children of rural and urban areas and concluded that toothbrushing is more common in urban area children with distal oblique grip being the most preferred grip with horizontal scrub method of toothbrushing. JO Eigbobo et al. [9] did a study to assess tooth brushing skills and oral hygiene practices and found that the toothbrushing skills and oral hygiene practices of children were less than satisfactory. Das UM et al. [10] in their study found that duration of brushing was short in all age groups and concluded that the required manual dexterity for tooth brushing was present in younger age groups. Macote-Orosco et al. [11] found that children with better manual dexterity showed significantly higher toothbrushing effectiveness, indicating a link between motor control and oral hygiene outcomes. Although this study did not focus exclusively on grip types, it supports the present findings that motor skill development influences toothbrush handling patterns in young children. These results align with the trend observed in the current study where developmental motor characteristics correlate with grip preferences and performance.

Various studies were evaluated to determine the secular trend in toothbrushing grips over a period of time. Our study found out that the most prevalent grip amongst Generation- Alpha was Power grip; most common grip in Generation-Y (Millennials) was Distal Oblique Grip [6]; most common grip in Generation -Z was also Distal Oblique Grip. Therefore, there is a significant evolution in the preferred style of toothbrush grips- change from the Distal Oblique Grip preference to Power Grip currently.

The evolution of toothbrush grips from generation to generation reflects changes in children's motor development, technological advances, and shifts in

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(2), 2158-2163 | ISSN:2251-6727

educational approaches to oral hygiene. While specific data on the grip evolution across generations may not always be available, we can infer trends based on child development, technology use, and changes in how toothbrushes are designed over time [6].

Prolonged use of handheld devices could potentially influence how children adapt their hand muscles and hand-eye coordination, possibly leading to more controlled or precise grips, similar to those used in gaming controllers or touchscreen devices. Handheld devices often have ergonomic considerations such as grip design and size, which could be compared to toothbrush handles. If children are accustomed to holding devices with ergonomic features, they may be more likely to use a toothbrush with a similar design or may hold the toothbrush in a way that feels more comfortable based on their experiences with handheld devices. Further research would be necessary to establish a clear connection between device use and specific toothbrush grip types.

CONCLUSION

Effective oral hygiene is a combination of proper toothbrushing technique and grip. There has been a generational shift from the earlier used Distal Oblique toothbrush grip to the current use of Power toothbrush grip in Generation-Alpha children. This could be influenced by increasing role of digital technology in young children's life. As pediatric dentists help shape children's brushing habits, understanding changing toothbrush grip patterns is important. However, limited evidence exists linking digital device use with grip style and oral hygiene, indicating a need for further research.

Conflict Of Interest: Nil

Source Of Funding: Self-funded

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