

EXPLORING SMARTPHONE USAGE DYNAMICS: UNVEILING APP-SPECIFIC PATTERNS AND TRENDS

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ABSTRACT

With the widespread use of smartphones, it is now possible to gather self-reports alongside passively measuring states and behaviors—such as locations, movement, activity, and sleep—using the built-in sensors and operating system of the smartphone. This enables comprehensive data collection on a single device that typically accompanies participants throughout their daily lives. Existing research often overlooks specific app category details, focusing solely on general smartphone usage patterns. This study addresses this gap by examining the specific applications used and the start and end times of each app session. A smartphone application was utilized to create the dataset, objectively documenting user actions. For inferential analysis, the Mann-Whitney U test was employed, aiming to identify patterns of communication and gaming app interactions within the subset of the SPACE app used. The findings unexpectedly revealed that younger individuals spend more extended periods on smartphones compared to adults, highlighting age-related distinctions. The study underscores the widespread use of communication apps, noting that age and gender do not significantly impact the number of daily launches or the amount of time spent using them. Conversely, age-related differences are evident in the use of gaming apps; younger individuals launch and use games more frequently than adults. The comprehensive investigation also uncovers gender- and age-specific app usage behaviors, providing crucial insights for designing interventions or strategies tailored to diverse populations. Overall, this study contributes to a nuanced understanding of the dynamics of smartphone and app usage and offers valuable perspectives for guiding future research.

KEYWORDS

Digital Consumption, Communication Application Usage Trends, Gaming Application Usage Trends, Daily Smartphone Usage

1. INTRODUCTION

The proliferation of smartphones has led to an equal expansion in the market for mobile applications, forming a varied ecosystem that caters to the demands of users (Christensen & Prax, 2012) (Lopez-Fernandez et al., 2018) (Stachl et al., 2017). This expansion not only reshapes the consumer landscape but also presents untapped potential for innovative mobile marketing beyond traditional strategies, as evidenced by the \$3.5 billion in-app advertising spending reported in a 2013 study by Juniper Research (Grant, 2014). Further evidence suggests that personality traits may also function as predictors of mobile application usage in particular domains, including communication, gaming, photography, transportation, and entertainment (Stachl et al., 2017) (Taywade & Khubalkar, 2019). With features like GPS, Wi-Fi, mobile games, instant messaging apps, and social media access, smartphones provide a range of entertainment options and are necessary for multiple uses, including messaging, browsing the internet, downloading information, taking pictures, streaming videos, and social networking in the free time (Leung, 2020). This individualization further contributes to the dynamic landscape of smartphone and app usage.

Prior studies have primarily focused on the immediate implications of smartphone usage in general or on certain application categories, such as social media, instant messaging, games for mobile devices, and internet use (Nayak, 2018) (Habeset et al., 2018) (Lin & Chiang, 2017). Integrating several mobile applications into a single analysis is essential to provide a more thorough understanding, especially in light of the inconsistent findings on the effects of various programs—such as gaming and communication apps—on intricate associations like age and gender. Throughout this research, "smartphone usage pattern" refers to how consumers use their smartphones, including things like how much time they spend on them and which apps they prefer. Gender disparities are essential for comprehending behavioral patterns and offer important demographic information to researchers, teachers, and regulators (Lin & Chiang, 2017) (Sama, 2020). Similar to other behaviors, there are notable gender disparities in smartphone usage, which adds to a deeper understanding of the topic. Age has a big impact on smartphone usage habits and app choices, with younger and older people using smartphones in quite different ways (Leung, 2020) (Rashid, 2020). While grownups typically display more restricted and targeted usage patterns, youngsters typically engage more extensively with a variety of features and applications, reflecting their broad technological habits (Kavoura, 2014).

Previous research into smartphone usage faced a significant challenge due to their reliance on self-reported data, introducing potential reporting bias and undermining the accuracy of consumers' estimates of their actual usage. Thompson (2020) highlighted that users tend to underestimate key smartphone usage indicators, including average screen time and frequency of launches. The reliability concerns surrounding self-reporting are further underscored by research (Dolan, 2017), revealing discrepancies where users overestimate daily smartphone usage time but underestimate how often they check their devices. These issues challenge the credibility of data acquired in earlier studies. Similarly, contemporary research on communication and gaming apps has limitations, particularly in incorporating all the platforms participants use. Methodological shortcomings may not entirely capture participants' engagement with these apps, and a considerable portion of comparative research often focuses on teenagers, limiting the generalizability of findings.

Our research endeavors to bridge existing knowledge gaps by reassessing demographic variables linked to smartphone utilization, presenting a more inclusive viewpoint across a spectrum of age cohorts. This inquiry aims to unveil intricate patterns of interaction with communication and gaming applications, delving into how individuals engage with diverse content types across multiple platforms. Through a meticulous examination of these interaction patterns, our goal is to acquire profound insights into user behavior, facilitating the enhancement of communication strategies, refining user experience, and potentially anticipating forthcoming trends. The fundamental research inquiries steering this investigation encompass:

RQ1: What is the daily duration of smartphone usage and the total count of daily app launches across all users, differentiated by age group and gender?

RQ2: Which were the predominant apps utilized by all users, and how did these preferences vary by age group and gender?

RQ3: What is the daily time allocation for gaming apps, stratified by age group and gender?

RQ4: How much time is spent daily on communication apps, considering age group and gender differentiations?

2. RELATED WORKS

There has been interest in the pre-pandemic literature regarding the influence of demographic characteristics on smartphone usage and screen time. The research on gender variations in smartphone usage is not entirely conclusive, though. Previous studies (Shade, 2007) (Comunello et al., 2017) demonstrate differences in smartphone usage between genders. These studies show that females use their mobile phones largely for SMS and voice calls to stay in touch with friends, while males use them mostly to access available technology. The same research shows that women are more likely than men to use mobile phones for interpersonal communication. Moreover, research (Noguti et al., 2017) indicates that while internet usage habits vary, both genders utilize phone calls and SMS regularly, and there is no discernible gender difference in these behaviors. Women mostly use the Internet for communication, while men typically utilize it for gaming and information searching (Haverila, 2012). Another finding by (Noguti et al., 2017) shows that women use the internet more regularly than men do, and they also use it more to obtain information.

The study by Auter (2007) indicates that when it comes to digital gadgets, the practices of youngsters and grownups differ, leading to diverse patterns of utilization. According to a different study (Busch et al., 2021), youngsters and grownups have distinct perspectives on mobile phones. In contrast to youngsters, who use their phones more frequently and for a wider variety of purposes, the author claims that grownups use their phones less frequently and for fewer reasons (Stevic et al., 2021). The majority of grownups view their smartphones as safety-enhancing devices. Youngsters, on the other hand, view mobile phones as a source of independence (Csibi et al., 2021). Greater reliance on smartphones than any other age group is seen in youngsters (Odgers & Jensen, 2020). This is partly because youngsters and smartphones have developed a strong relationship due to the distribution of media material and apps. Moreover, there is an inverse relationship between age and the adoption of new technology, meaning that youngsters will accept new technologies faster.

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These results imply that the connection between smartphone usage and addiction exhibits complexity, influenced by a range of factors, despite the identified age and gender differences. Additional research is necessary to comprehensively grasp these patterns and their consequences. Moreover, most studies in this domain employ survey methods for primary data collection (Dessart, 2017), yet these approaches are distinct from the acquisition of secondary data.

Meng et al. (2022) analyzed the digital addiction studies published before Oct 2021 in peer-reviewed journals and used verifiable tools to generate their results. The authors collected the results from the around 500 papers and synthesized the results to come up with a global prevalence characteristics of digital addiction on a global level. Based on their work, digital addiction is split into five categories: internet addiction, smartphone addiction, social media addiction, cybersex addiction, and game addiction. At a high-level analysis and at a global scale, smartphone addiction is at 26.99%; social media addiction is at 17.42%, internet addiction is at 12.22%, cybersex addiction is at 8.23%, and game addiction are at 6.04%. Internet addiction increased with the year of publication across all studies, with male participants registering higher addiction levels compared to females. For smartphone addiction, the highest rates were reported in the Southeast Asia region and the Eastern Mediterranean, while the lowest rates were reported in Europe. The authors found that the trend in digital addiction dramatically worsened during the COVID-19 pandemic.

Wang et al. (2019) focused on internet addiction, smartphone addiction, social media addiction, and game addiction among digital natives, which refers to the generation born in the digital age. Digital natives are more likely to consider social media as an intrinsic part of daily life compared to previous generations. While most studies look at age, the authors used psychological characteristics and behavioral tendencies rather than age as the defining factor. The psychological characteristics of the digital natives are familiarity with technology from an early age, confidence with multitasking, preference for graphics over text in communication, and the need for gratifications. This approach highlights the influential role of individual attributes. Over 1000 people in the US were surveyed, and the authors found robust positive associations between digital nativity and four types of digital addiction.

Gavurova et al. (2022) studied the relationship between the psychological characteristics, as well as academic profile, of college students and internet addiction. The authors collected data from over 3000 students from the Czech Republic and Slovakia in 2020, which overlaps with the COVID-19 pandemic. The collected data included age, gender, family, major, whether in university housing, and various psychological issues such as stress and anxiety. The authors found that 27% of students in both countries have mild internet addiction. A moderate addiction was calculated for the Czech and Slovak students (3% and 6% respectively). A small percentage of 0.1% to 0.2% was reported by the students. Higher internet addiction was found in male students and students who are living away from family. The psychological attributes, mainly the presence of high levels of stress or depression, lead to higher addiction in both countries.

Bertocchi et al. (2022) presented a study on the digital addiction level and whether addiction is associated with any of the physical, mental, and social health (a person's quality of life). To be detailed, the quality of life is measured through mental health, sleep quality, cognition, and loneliness, among others. The study targeted older adults from a low-income population city in Brazil. Over 650 adults were included in the study, which revealed a correlation between digital addiction and better physical and environmental conditions. In addition, digital addiction correlates with lower sleep quality. Addiction was not correlated with health outcomes; however, participants who suffered depressive symptoms and loneliness showed higher

importance for mobile phones. The study also found that older adults had a similar quality of life as those without Internet access.

Xu et al. (2022) investigated the prevalence of internet addiction between mainland China and Macau, among adolescents. The investigation examined the association with quality of life. Almost 2900 secondary school students participated in this study. The authors also studied depressive symptoms and quality of life and their relation to internet addiction. The average Internet prevalence was found to be around 23%. In Macau, the prevalence of internet addiction was around 32%, while it was around 20% in mainland China. This means that students in Macau had a higher chance of facing Internet addiction than those in mainland China. Higher Internet addiction correlates with lower quality of life, as reported by the students. Also, it was revealed that poor academic performance and higher depression correlate with internet addiction. When observing the student's self-perceived body image, academic performance, and stress, the results show that these values differ among the two groups (higher level of internet addiction and the lower level). The same was observed for the values of self-reported family income status and parental marital status. The authors recommended that regular screening and effective interventions should be undertaken for young Internet users.

Erdem and Uzun (2022) assessed the effect of smartphone addiction on personality traits. The authors focused on extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience traits. The authors collected information about the amount of daily smartphone and internet use from almost 500 university students in Turkey. The author's analysis of the data revealed that personality traits can predict smartphone addiction. A negative correlation was found between agreeableness, as well conscientiousness, and smartphone addiction. On the other hand, neuroticism had a positive correlation. There is no correlation between smartphone addiction and extraversion or openness to experience. The authors recommended policymakers and practitioners design awareness campaigns to raise awareness for students.

Akbaş and İşleyen (2024) examined game addiction and aggression levels of almost 600 students from two high schools in Turkey. The researchers assessed the gaming habits of adolescents. The results showed that the participants played war games the most, with 35%. A moderate addiction to gaming was found among the participants. The researchers reported a positive correlation between aggression and game addiction, especially among the male participants.

Sema and Varik-Maasik (2023) presented a study on the relation between screen time and learning difficulty. The authors collected data from over 8,400 teenagers in Estonia during 2022. The age of the students were from 11 to 20 years. Data analysis shows positive correlations between learning difficulties, digital addiction, and screen time.

Table 1 shows a summary and comparison between the related work and this paper. The comparison is based on the number of participants, location of the study, targeted users, type of data collected, and collection method.

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Table 1. A comparison between different studies

	Number of Participants	Location	Targeted Population	Collection method	Data collected
Wang <i>et al.</i> (2019)	~ 1000	USA	No specific group	Survey	-Psychological traits: multitasking, familiarity with technology, need for gratification. -Smartphone usage -Social media usage
Gavurova <i>et al.</i> (2022)	~ 3000	Czech Republic and Slovakia	University Students	Survey	-Personal: age, gender, family -Academic: major, whether in university housing -Psychological issues such as stress and anxiety -Internet usage
Bertocchi <i>et al.</i> (2022)	~ 650	Brazil	Older adults with low-income	Survey	-Sleep quality -Smartphone usage -Internet usage
Xu <i>et al.</i> (2022)	~ 2900	China	Secondary students	Survey	-Academic: grades -Personal: age, gender, family -Internet usage
Erdem and Uzun (2022)	~ 500	Turkey	University Students	Survey	-Personality traits: extraversion, agreeableness, conscientiousness, neuroticism, and openness -Smartphone usage
Akbaş and İşleyen (2024)	~ 600	Turkey	adolescents	Survey	-Gaming habits -Aggression level
Sema and Varik-Maasik (2023)	~ 8400	Estonia	School and university students	Survey	-Time spent on digital devices -Academic: learning abilities
This paper	~ 100	Global	No specific group	App data logs	- Personality traits - smartphone usage

The primary objective of this research is to conduct a comprehensive and detailed examination of smartphone usage in response to identified limitations. Unlike previous studies, a key focus is placed on evaluating a diverse array of apps, including communication and gaming apps utilized by participants. Additionally, our study aims to surpass the reliance on self-reported data by incorporating authentic secondary data, enhancing the robustness of analysis and interpretation. Through these methodological enhancements, we seek to enhance the accuracy and reliability of our findings and contribute to a deeper understanding of the intricate relationships between demographic characteristics and trends in communication and gaming apps usage.

3. METHODOLOGY

3.1 Datasets

The dataset for this study was sourced from the SPACE app, a third-party software accessible on Google Play, designed to monitor smartphone activity. The collected information included the initiation and termination times of each app session, along with the corresponding app names. Users registering on the app were obligated to provide demographic details such as age, gender, and country of residence. All users explicitly agreed to the app's privacy policy, which outlined the anonymous sharing of acquired data for research purposes. It's essential to note that the study's dataset exclusively comprised users who provided explicit consent through a dedicated app interface. To incentivize voluntary participation, users were offered an enhanced version of the app. The data collection period spanned from June to September 2019.

3.2 Data Processing

For this study, Python 3.0 was employed for data pre-processing, while JASP 0.14.1 was utilized for statistical analysis (JASP, 2021; Python, 2021). The initial steps involved removing duplicate entries, correcting missing demographic data, calculating screen time, and merging fragmented app usage sessions. Additionally, data formats and languages were standardized, considering the diverse regional backgrounds of the users. All participants used Android devices, and the program initially measured app usage without classification. Google's app classification system was then used to categorize apps into social networking, communication, and gaming categories. Misclassified apps were manually reclassified using the Google Play API. The authors collaborated to ensure accuracy by considering each app's primary function. The survey included 161 participants from ten prominent countries. Age distribution followed U.N. and UNICEF guidelines, dividing participants into five groups to balance the dataset. To minimize potential age-related biases (UNICEF, 2021), the study differentiated between younger individuals (under 25 years) and grownups (those 25 years of age and older).

3.3 Evaluation Metrics

This research utilized objective metrics extracted from metadata, encompassing timestamps for both app usage and survey completion duration. The initial app classification relied on Android Google Play classifications, subsequently verified by the authors to ensure accuracy. Analysis of smartphone usage patterns involved key metrics, including average daily screen time, daily total app launches, and average daily time spent on communication, social media, and gaming apps. The calculation of average daily screen time was based on seven days of usage, while daily total app launches were determined by the count of all app sessions over the same seven-day period.

3.4 Analytical Approaches

In this study, we employed descriptive statistical methods for an extensive analysis. For continuous data, we calculated measures of central tendency, such as medians, along with dispersion indicators including the interquartile range (IQR), minimum, and maximum values. Categorical data were examined through frequency distributions. The normality of the data was tested using the Shapiro–Wilk test. Each distinct timeframe was individually assessed in terms of demographics. Due to the non-normal distribution of the data, we utilized the Mann–Whitney U test for continuous variables and the Chi-Square test, coupled with Phi-coefficients, for nominal variables, maintaining a significance level of 0.05. This analytical approach aimed to gain insights into the characteristics and distribution of the data, particularly exploring variations in smartphone, communication, and gaming app usage during the specified period. The examination also included daily app launches across various communication and gaming apps, providing a detailed snapshot of smartphone usage patterns.

4. RESULTS AND ANALYSIS

Table 2. An overview of daily smartphone usage time

	Average Daily Screen Time (min)	Average Daily Time Spent on Communication Apps (min)	Average Daily Time Spent on Social Media Apps (min)	Average Daily Time Spent on Gaming Apps (min)
Valid	161	161	133	69
Median	233.21	33.30	51.27	22.47
IQR	156.70	40.26	75.32	49.80
Minimum	29.64	0.42	0.05	0.02
Maximum	687.12	288.66	414.46	144.40

The total amount of daily screen time, including time spent on social media, gaming, and communication apps, is presented in Table 2. The total amount of daily app launches among social media platforms, gaming, and communication apps is presented in Table 3. The statistics for social networking, gaming, and communication app usage are based on the total number of users who used the respective applications during the specified time period; they do not include users who did not use the apps at all.

Table 2 shows the distribution of the middle 50% of the data, with an average daily screen time of 161 minutes, a median of 233.21 minutes, and an interquartile range of 156.70 minutes. Apps for communication have a 161-minute daily average usage, a 33.30-minute median, and a 40.26-minute interquartile range (IQR). With a median of 51.27 minutes and an interquartile range of 75.32 minutes, social networking app usage is 133 minutes on average every day. The average daily usage of gaming apps is 69 minutes, with an interquartile range of 49.80 minutes and a median of 22.47 minutes. With regard to each category, the table also provides the lowest and maximum recorded times, providing a thorough overview of the patterns in smartphone usage. People spent an average of 29.64 to 687.12 minutes in front of a screen, according to Table 2.

A median of 182 indicates that half of the respondents launched fewer applications per day than the acceptable mean of 161 for the daily total app launches in Table 3. The spread of the middle 50% of the data is revealed by the interquartile range (IQR) for all app launches, which is 117. The average, median, and IQR for the daily communication app releases are 161, 42.29, and 48.86, respectively. With a median of 23.86 and an IQR of 38.14, social media app launches occur on average 133 times a day. There are 69 gaming app launches on average every day, with a median of 5.67 and an IQR of 6. In addition, the table presents the minimum and maximum recorded values for every category, providing a thorough understanding of the variation in daily app launch patterns among the survey participants. People launched apps ranged from 19 to 716 times per day, according to Table 3.

Table 3. An overview of the average number of apps launched per day

	Daily Total App Launches	Daily Communication App Launches	Daily Social Media App Launches	Daily Gaming App Launches
Valid	161	161	133	69
Median	182	42.29	23.86	5.67
IQR	117	48.86	38.14	6
Minimum	19	4	1	1
Maximum	716	262.57	191.43	28.29

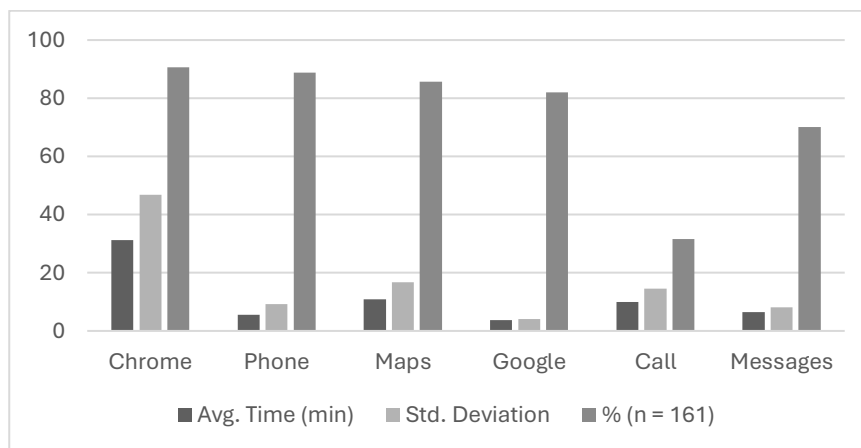


Figure 1. Top apps ranked according to the duration of time spent

Figure 1 provides an overview of the most popular apps based on minutes spent using them. It includes the average amount of time, standard deviation, and the proportion of users (n = 161) who used each app. With an average duration of 31.2 minutes and a high standard deviation of 46.83, which indicates significant variety among users, Chrome is the most time-consuming program. With an average duration of 5.63 minutes and a standard deviation of 9.14, the Phone app comes in second, attracting the interest of 88.82% of users. With average times of 10.8 and 3.73 minutes, respectively, and user engagement percentages of 85.71% and 81.99%, Maps and Google are both highly visible. The "Call" app showed significant variability, with an average

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usage time of 9.93 minutes and a standard deviation of 14.6 minutes. 31.68% of users were seen to be engaged with the app. The "Messages" app, on the other hand, had a higher user engagement rate of 70.19% and a lower average usage time of 6.4 minutes, indicating more consistent usage with a standard deviation of 8.12 minutes. These findings provide important information for comprehending app usage trends by illuminating the differing levels of user interaction with various apps.

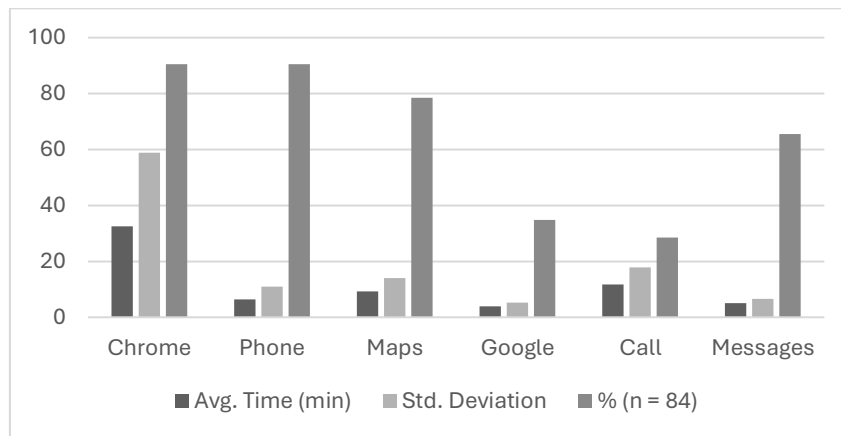


Figure 2. Top apps used by male users ranked by time spent in minutes

Figure 2 presents the top applications that male users used most frequently and includes information on each app's average usage duration, standard deviation, and percentage of users (n = 84) that used it. Interestingly, Chrome is the longest-running software, taking an average of 32.44 minutes. Its large standard deviation of 58.93 indicates that male user engagement is highly variable. With an average duration of 6.39 minutes and a standard deviation of 10.9, the Phone app comes in second, with a high user engagement rate of 90.48%. Google and Maps are particularly notable; they both show clear patterns of use, with average durations of 3.84 minutes and 9.19 minutes and user engagement percentages of 34.78% and 78.57%, respectively. The Call app had an average usage length of 11.81 minutes, with significant variability (SD = 17.81) and a user engagement rate of 28.57%. With an average duration of 5.07 minutes, a smaller standard deviation (SD = 6.62), and a higher user engagement rate of 65.48%, the Messages app also had more consistent usage patterns.

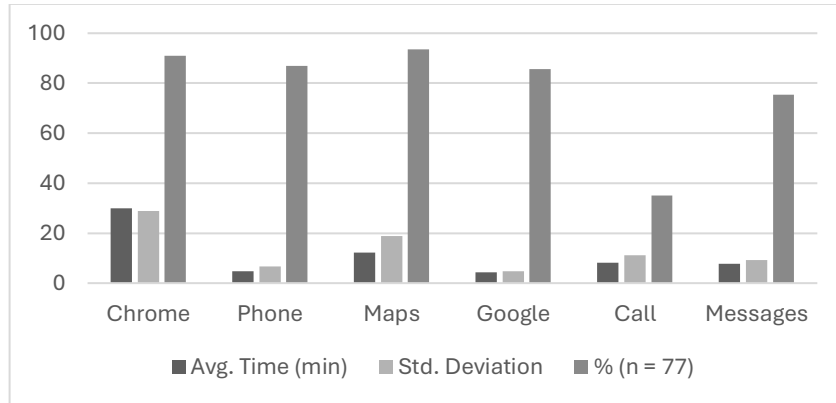


Figure 3. Top apps used by female users ranked by time spent in minutes

The top six apps that female users downloaded are shown in Figure 3, along with information about their average usage duration, standard deviation, and the proportion of users ($n = 77$) who actually utilized each app. With an average duration of 29.85 minutes and a moderate standard deviation of 28.81, Chrome stands out as the most time-consuming application. These results indicate consistent usage patterns among female users. With an average duration of 4.77 minutes and a standard deviation of 6.59, the Phone app comes in second, attracting the interest of 87.01% of female users. Google and Maps have longer average times—12.27 and 4.33 minutes, respectively—and Maps has a higher user engagement rate—93.51%. The "Call" app engaged 35.06% of female users and had an average usage duration of 8.26 minutes, with a moderate standard deviation of 11.1. The "Messages" app also showed a higher user engagement rate of 75.32%, an average duration of 7.66 minutes, and a standard deviation of 9.21, highlighting its significant and regular usage among female users.

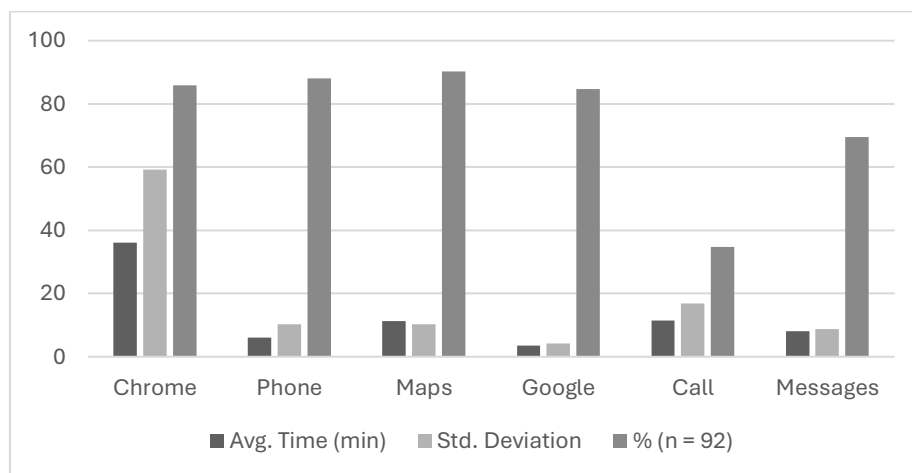


Figure 4. Top apps used by grownup users ranked by time spent in minutes

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Figure 4 presents the top six apps that grownup users downloaded and includes important statistics like the average usage time, standard deviation, and the proportion of active users (n = 92) for each app. With an average duration of 36.11 minutes and a noteworthy standard deviation of 59.2, Chrome is the most time-consuming software. This suggests that grown-up user engagement is highly variable. With an average duration of 6.12 minutes and a standard deviation of 10.26, the Phone app comes in second, attracting the interest of 88.04% of grownup users. Google and Maps are particularly notable; they both show distinct patterns of use, with average durations of 3.57 and 11.31 minutes and user engagement rates of 84.78% and 90.22%, respectively. With an average usage duration of 11.47 minutes and a standard deviation of 16.79, the "Call" app was used by 34.78% of grownup users. The "Messages" app was also found to be frequently and consistently used by grownup users, as seen by its 8.04-minute average, 8.77 standard deviations, and 69.57% user engagement rate.

Figure 5 provides insights into the top six apps predominantly used by youngsters, offering key metrics such as average usage time, standard deviation, and the percentage of users (n = 92) engaged with each app. Chrome emerges as the most time-consuming app among youngsters, with an average duration of 25.4 minutes and a relatively low standard deviation of 24.75, indicating consistent usage patterns. The Phone app follows with an average time of 4.99 minutes and a standard deviation of 7.48, capturing the attention of 89.86% of youngsters. Maps and Google also stand out, each exhibiting distinct usage patterns with average times of 10.03 and 3.96 minutes and user engagement percentages of 79.71% and 78.26%, respectively. The "Call" app engaged 33.57% of youngsters and had an average usage time of 10.89 minutes with a standard deviation of 15.67 minutes. In addition, the "Messages" app demonstrated a 4.25-minute average duration, a 6.67 standard deviation, and a high 71.01% user engagement rate, indicating that this group uses it frequently and reliably.

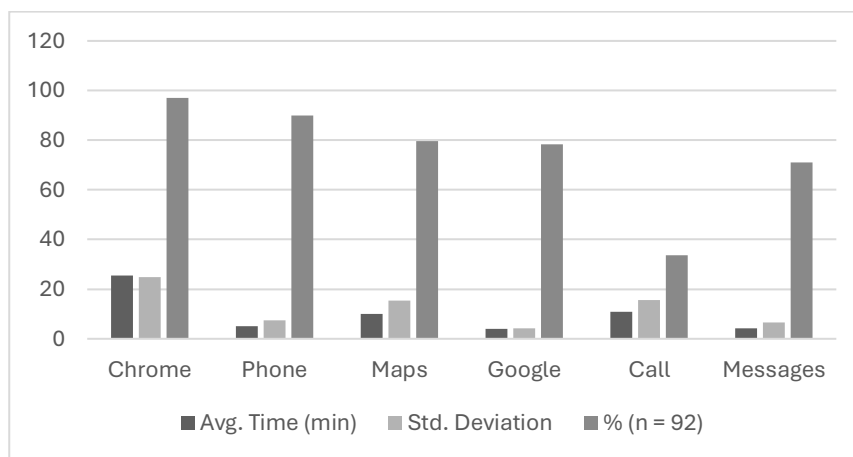


Figure 5. Top apps used by youngsters users ranked by time spent in minutes

4.1 Analysis

4.1.1 Impact of Gender and Age on Daily Usage of Gaming Apps

There were no discernible differences between age and the frequency of gaming app launches according to the analysis of the impact of gender and age on daily gaming app usage. The Mann-Whitney U test, with a U statistic of 3791, a p-value of 0.02, and $|r| = 0.19$, showed that youngsters (Mdn = 0.10, n = 69) spent more time on gaming apps than grownups (Mdn = 0, n = 92), when those who did not use gaming apps were taken into account as having zero usage. A box plot was generated to compare the daily usage of gaming apps between youngsters and grownups is depicted in Figure 6, emphasizing statistical significance and effect magnitude. In a similar vein, with a U statistic of 3761, a p-value of 0.03, and $|r| = 0.18$, youngsters (Mdn = 1.0, n = 69) launched more gaming applications in a day than grownups (Mdn = 0, n = 92). A box plot was generated to compare the daily launch of gaming apps between youngsters and grownups is depicted in Figure 7, emphasizing statistical significance and effect magnitude. There was no gender-related statistically significant differences in the amount of time spent on gaming applications or the frequency with which they were launched. While gender did not have a significant impact on daily gaming app usage, our analysis highlights age-related differences in gaming app engagement, especially among youngsters.

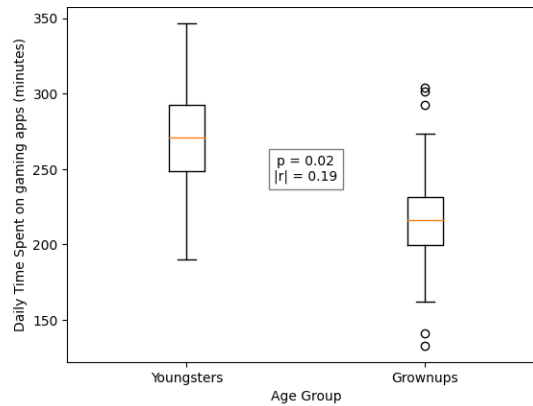


Figure 6. Comparison of daily gaming apps usage between youngsters and grownups

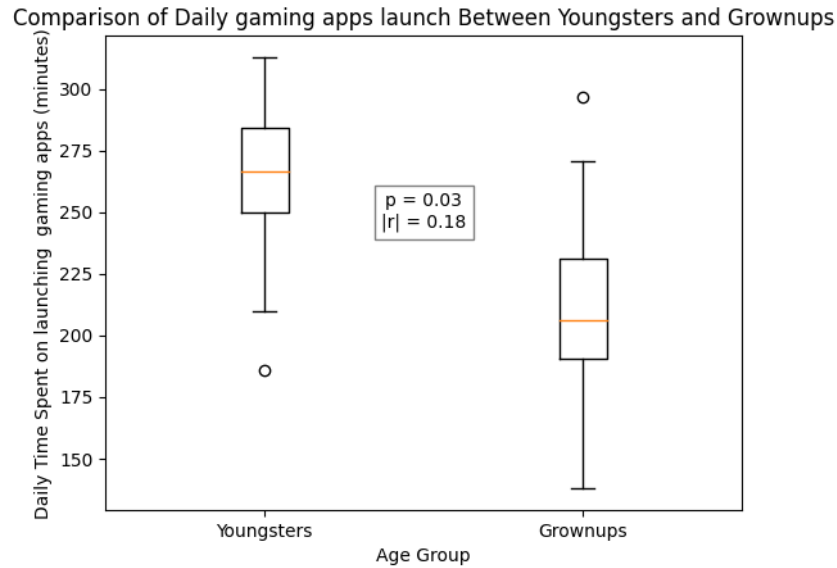


Figure 7. Comparison of daily gaming apps launch between youngsters and grownups

4.1.2 Impact of Gender and Age on Daily Usage of Communication Apps

The examination of the impact of age and gender on the daily usage of communication apps revealed that as per the Mann–Whitney U test, there were no statistically significant differences concerning age and the frequency of communication app launches. Moreover, no significant variations were identified in terms of time spent on communication apps when considering both age and gender. Additionally, there was no notable difference in the frequency of daily communication app launches based on gender. This analysis emphasizes that neither age nor gender played a significant role in influencing the daily usage patterns of communication apps.

4.2 Discussion

The main topic of discussion is the methodological novelty that our work brought to the field of smartphone usage research by using an objectively gathered and monitored dataset instead of traditional self-reported data. This innovative method makes it possible to comprehend smartphone usage patterns more thoroughly and precisely. In terms of communication app usage, our results highlight the universality of communication app engagement by showing that neither gender nor age significantly affects the number of daily launches or the amount of time spent. On the other hand, there are age-related differences in the use of gaming apps; youngsters use them more frequently than grownups do, and they also spend more time using them. Furthermore, the thorough study sheds light on app-specific behaviors among users of different ages and genders. This level of detail is essential for customizing design approaches or interventions to certain user groups, guaranteeing that technology solutions better suit the varied tastes and behaviors of its users. Overall, our research offers insightful viewpoints that will direct future investigations and offer a comprehensive picture of the dynamics of smartphone and app usage.

5. CONCLUSION

In conclusion, our comprehensive study of smartphone usage, focusing on communication and gaming apps, has revealed significant insights into the behaviors of users across different ages and genders. By using a unique dataset from the SPACE app, which objectively recorded user activities, we addressed the limitations of self-reported data prevalent in prior research. The Mann-Whitney U test enabled robust inferential analysis, yielding detailed findings. Notably, the use of communication apps was found to be universally high, regardless of gender or age, indicating their widespread appeal. However, age-related differences were prominent in gaming app usage, with younger individuals exhibiting higher engagement in terms of both frequency and duration compared to adults. The study also examined the impact of gender and age on the usage of communication and gaming apps, revealing relatively minor variations in usage patterns. This granularity is crucial for tailoring design strategies or interventions to specific user groups, ensuring that technological solutions better align with diverse user preferences and behaviors. Our research enriches the existing body of knowledge on smartphone usage and establishes a foundation for future studies aimed at exploring and understanding the evolving landscape of app-specific behaviors. This will enable a more targeted and user-centric approach in the rapidly changing digital era.

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