Communication Through Smartwatches in Chinese Primary School Students: Case Study of Primary School Affiliated to Yunnan Normal University

Fang Yingying, Prapas Nualnetr, and Supanna Phatarametravorakul

Faculty of Communication Arts, Bangkokthonburi University, Thailand
Email: fyy135535@qq.com, ORCID ID: https://orcid.org/0009-0003-3548-0876
Email: prapas9@yahoo.com, ORCID ID: https://orcid.org/0009-0009-0048-4563
Email: supanna6838@gmail.com, ORCID ID: https://orcid.org/0009-0000-8895-5503

Abstract

Background and Aim: In China, the prohibition of mobile phones in schools has led parents to turn to smartwatches, which can track location, monitor health, and facilitate communication. The children's smartwatch market in China is rapidly growing and holds the largest global market share. However, excessive use of smartwatches may impact children's social behavior, health, and privacy. Research on the impact of smartwatch use is crucial to promote responsible digital media usage, improve parent-child communication, and develop appropriate policies for safe and balanced smartwatch usage, supporting children's development in the digital age.

The objective is to: (1) explore the general situation of smartwatch usage among Chinese primary school students. (2) To study the communication through smartwatches among Chinese primary school students. (3) To find out the development of communication based on smartwatches in Chinese Primary School Students in a case study of a primary school affiliated with Yunnan Normal University.

Materials and Methods: This study adopted a mixed research method combining quantitative and qualitative approaches. Firstly, through a literature review, we sorted out relevant theories and research findings on smartwatch media and its impact on media use and the physical and mental health of Chinese primary school students. Secondly, we designed and distributed a survey questionnaire to collect quantitative data on the use of smartwatches among 400 Chinese primary school students. At the same time, in-depth interviews and focus group discussions were conducted in six groups to obtain detailed feedback and opinions from primary school students, parents, and teachers on the use of smartwatches. Finally, the collected data underwent statistical analysis and qualitative analysis to comprehensively understand the impact of smartwatches on the communication patterns of primary school students.

Results: (1) The usage overview of smartwatches among Chinese primary school students is as follows: Smartwatches have a high penetration rate among Chinese primary school students, with 72% of students using them for non-academic purposes for over an hour daily, primarily for socializing, location tracking, and entertainment. Parents recognize their safety monitoring functions, but they are concerned about privacy risks (such as location data leakage) and technological dependency (such as social addiction). (2) The communication mode of smartwatches among primary school students is as follows: 67% of students convey emotions through preset emoticons, leading to "instrumentalization" of emotional expression; face-to-face communication still dominates (58%). There is a significant contradiction between parental supervision measures (85% limit communication) and student acceptance (only 23%), and the device may exacerbate social exclusion (15% of marginalized students are isolated). (3) The case study of the Primary School Affiliated to Yunnan Normal University shows that smartwatches enhance parental security (92%) and increase learning assistance usage (+40%), but they lead to a decrease in face-to-face communication vocabulary for 35% of students and an increase in classroom distractions by 17%. By implementing "time-based disabling" and "digital literacy courses," the negative impact of the device is reduced by 28%. This study can provide replicable management solutions for schools and parents.

Conclusion: Smartwatches play a role far beyond that of a mere communication device for elementary school students in China. They deeply influence social structures, learning processes, and family relationships. Technology has transformed children's communication patterns from traditional face-to-face interactions to the use of symbols, voice messages, and quantitative data, potentially leading to a reduction in emotional depth during communication. Moreover, daily use of these devices reveals ongoing negotiations of power between children and adults, contextual adaptation, and children's efforts to maintain privacy under digital surveillance.

Keywords: Communication; Smartwatches; Chinese Primary School Student
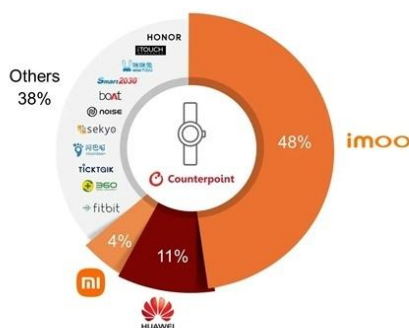
Introduction

In Chinese primary and secondary schools, minors are usually prohibited from bringing mobile phones onto the campus. According to the Ministry of Education of China (2023), over 90% of primary

schools enforce this policy to minimize distractions and ensure a focused learning environment. As a result, Chinese children typically cannot own their mobile phones in their daily lives. However, parents need to communicate with their children promptly to monitor their physical condition, safety status, and location. Consequently, they opt for smart wearable devices, such as smartwatches, which are recognized and permitted by schools. In China, due to the popularization and development of the Internet, children's smartwatches can monitor children's location, health, and even stress, mood, and many other factors that parents are concerned about. Moreover, schools generally do not prohibit smartwatches, so this industry has also gained tremendous development space due to the above factors.

Smartwatches tailored for children integrate various functions such as calling, positioning, health monitoring, stress monitoring, mood monitoring, learning, and entertainment, catering to the communication, safety monitoring, and entertainment learning needs of both children and parents. With technological advancements, product functions are constantly evolving and expanding, and children in China are spending more time on the applications and entertainment of smartwatch media.

Currently, the number of children aged 5 to 12 in China is approximately 170 million. (The Seventh Population Census of China，2024), With a penetration rate of children's smartwatches at about 30%, and a higher wearing rate in urban areas (People's Daily Online，2024）. The market size of children's smartwatches in China continues to expand, reaching 10.879 billion yuan in 2021, with shipments growing rapidly. In the first quarter of 2024, shipments reached 4.04 million units, a year-on-year increase of 44.4%. China holds a dominant position in the global children's smartwatch market, with a market share of 64%. "Xiaotiancai (imoo)" leads with a market share of 48%, while "Huawei" and "Xiaomi(mi)" rank second and third, respectively (Analysis Report on the Development Status and Supply and Demand Pattern of the Children's Smartwatch Market from 2023 to 2028, 2024).

Figure 1 Market share of smartwatch brands

In recent years, with the continuous advancement of technology, children's smartwatches have undergone significant innovations in both technology and materials. Numerous brands have emerged in the market, such as Huawei, Xiaomi, and Little Talent, which continuously introduce new products through technological innovation and functional optimization, enhancing market competitiveness. At the same time, some brands have also created closed and exclusive social systems for their brands. If you don't purchase a smartwatch of the same brand, you won't be able to see your child's social "circle of friends" on new media. This also makes the watch a new platform for children to avoid parents and interact with each other socially, further enhancing the attractiveness of the product and its market share.

The functions of smartwatches are increasingly diverse, but they have also directly altered the social interactions of some Chinese children. Many parents and teachers have observed that children are spending an increasing amount of time using smartwatches, which may lead to media dependence in their early years and a reluctance to communicate directly with classmates in real life, preferring electronic media

communication. Even pediatricians in China have found that smartwatches are currently the primary contributing factor to myopia among Chinese children. This also directly affects the health of Chinese children. Coupled with children's lack of media literacy and adults' psychological adjustment mechanisms, excessive use of smartwatches may bring risks such as privacy leakage, adult-like social interactions, and psychological problems. Parents, schools, and society all need to pay attention to this issue.

The latest report released by the international market research institution Counterpoint Research points out that the global children's smartwatch market grew by 4% in the second quarter of 2024 compared to the same period last year, becoming the only major smartwatch type to achieve growth in that quarter. The institution predicts that the children's smartwatch market is expected to grow by more than 7% for the whole year, while the overall smartwatch market may decline by 4%. This growth trend will be driven by the performance of Chinese brands and the expansion of the North American market, indicating that the demand for children's smartwatches among Chinese families is still on the rise. (Counterpoint Research, 2024).

Figure 2 Market share of national brands in countries with high purchase rates of smartwatches

China urgently needs a survey and study to understand the specific situation of children's smartwatch usage in China and the potential impact it may have on children, to help parents, schools, and users themselves use this emerging media more reasonably, scientifically, and healthily. This can not only enhance the convenience and safety brought by smartwatches but also better adapt to some new intergenerational communication methods while avoiding the negative impact of smartwatch functions on children as much as possible.

The study on the impact of smartwatches on social interaction behaviors of Chinese primary school students is profound and multifaceted. It not only involves the application level of education and media technology development but also touches upon multiple aspects such as children's growth, family relationships, and social behaviors. Here are several key points of significance:

Promoting children to use new media more scientifically and healthily: An important function of smartwatches is to monitor children's physical health. However, the unscientific use of new media may directly affect children's physical and mental health. If continued research is conducted, it may even be discovered that years later, the improper use of new media may have a more significant impact on children. Therefore, researching the more scientific use of smartwatch media will provide schools and families with more reasonable and precise media usage and management plans for children, thereby helping primary school students develop good media usage habits, enhance media literacy, and prevent and reduce health problems caused by incorrect media usage.

Revolution in social interaction and communication: Smartwatches have provided primary school students with a brand-new channel for social interaction and communication. Studying its impact on primary school students' social behavior and communication skills helps us understand how technology shapes children's social interaction patterns and how to guide them to establish healthy interpersonal relationships while protecting their privacy and safety.

Reflection on family education and parent-child relationships: The widespread use of smartwatches also reflects the current application status of technology in family education. Studying how smartwatches affect the communication methods and monitoring patterns between parents and children can help parents and educators reflect on and optimize family education strategies, promoting effective communication and mutual understanding between parents and children.

Digital literacy and cybersecurity education: With the widespread use of smart devices such as smartwatches, primary school students have gained more opportunities to interact with the digital world. Investigating the cybersecurity issues and digital literacy education needs arising from the use of smartwatches can help enhance the cybersecurity awareness and self-protection abilities of primary school students, providing strong safeguards for their healthy growth in the digital age.

Exploring the integration of education and technology: Smartwatches, as representatives of wearable devices, integrate multiple functions such as information acquisition, communication, and health monitoring. Studying their usage among primary school students can help explore new models of integrating educational technology, such as using smartwatches to assist learning (e.g., reminding of homework and course schedules) and enhancing classroom interaction, thereby promoting innovation and modernization in education and teaching.

Policy formulation and guidance: The research on the use of smartwatches by primary school students and their impact can provide a scientific basis for the government and education departments to formulate relevant policies and regulations. For instance, establishing norms for the use of smartwatches on campus, strengthening guidance and education for students using smartwatches, and so on, in order to protect the rights and safety of students.

In summary, studying the impact of smartwatches on Chinese primary school students holds significant importance, as it not only pertains to the healthy growth and educational quality of children but also relates to the future development of educational technology and societal progress. We aim to establish rules for media usage to assist children, parents, and schools in using smartwatches in a more scientific and healthy manner. This research is significant as it addresses the urgent need in China to assess and understand the usage of smartwatches among primary school students, a rapidly growing trend with potentially wide-ranging effects on young users. By studying smartwatch use among students at the Primary School Affiliated to Yunnan Normal University, the research aims to provide valuable insights into how these devices influence children's social interactions, learning, safety, and overall well-being. The findings are expected to guide parents, educators, and policymakers in fostering safe, effective, and balanced smartwatch usage that supports children's development. Furthermore, the study will explore the potential of smartwatches to facilitate intergenerational communication, bridging the gap between digital-native children and their parents or guardians. By identifying both the positive impacts and potential risks associated with smartwatch use, this research can also inform strategies to mitigate issues such as overreliance on technology, distraction, or exposure to inappropriate content, ultimately contributing to a healthier digital ecosystem for children in China.

Objectives

(1) To explore the general situation of smartwatch usage among Chinese primary school students.

(2) To study the communication through smartwatches among Chinese primary school students.

(3) To find out the development of communication based on smartwatches in Chinese Primary School Students in a case study of a primary school affiliated with Yunnan Normal University.

Literature review

In today's China, there are more and more primary school students who own smart watches, and they are exposed to wearable smart products earlier and more than any previous generation. Whether it is communication with parents, communication with classmates, or even communication with strangers, smart watches can be relied on. Whether this has a long-term impact on children under 12 years old and whether it will change their social interaction patterns is worth our long-term observation and research. This chapter reviews key theories and research related to smartwatch usage among young children. The first section explores theories such as Development Communication, Media Influence, Social Interaction, New Media, and Audience Behavior, along with foundational knowledge on smartwatches and the behavioral characteristics of children aged 6-12.

Communication theory is an interdisciplinary field that examines the transmission, interaction, and impact of information within social systems. It focuses on how communicative behaviors, mediated by symbols, technologies, and channels, influence individual cognition, group dynamics, and sociocultural structures. The theoretical framework emerged in the 20th century through contributions from scholars across various disciplines:

Linear Models: Lasswell (1948) introduced the "5W" model of communication, which consists of five elements: "Who → Says What → Through Which Channel → To Whom → With What Effect." This model laid the foundation for the systematic study of communication processes. Shannon and Weaver (1949) developed a mathematical model of communication, which framed communication as a technical process involving a source, encoding, channel, decoding, and receiver, along with concepts like "entropy" and "channel capacity" that influenced digital communication technologies.

Interactivity and Social Networks: Schramm (1950s) expanded on linear models by emphasizing bidirectional communication and the "overlap of experiential fields" between communicators. Paul Lazarsfeld's "Two-Step Flow" theory (1944) revealed how mass media messages first influence opinion leaders and then spread to the broader public through interpersonal networks. Lewin (1947) introduced the "Gatekeeper Theory," highlighting the role of media and opinion leaders in controlling information flow.

Media Technology and Cultural Critique: McLuhan (1964), in Understanding Media: The Extensions of Man, argued that "The Medium is the Message," suggesting that media technologies reshape sensory experiences and social organization. McLuhan's concept of the "global village" foresaw the media's ability to dissolve geographical and temporal boundaries. Lippmann (1922), in Public Opinion, theorized the "Pseudo-environment," where the media constructs a symbolic reality, influencing public perception and political decision-making.

Attitude Change and Persuasion: Hovland (1950s) used experimental psychology to study how source credibility, message structure, and audience traits influence persuasion, laying the groundwork for attitude-change theories used in advertising and political communication.

SMCR Model: Berlo (1960) developed the SMCR model, which identifies four key elements of communication: Source, Message, Channel, and Receiver. It is foundational for understanding communication but has been criticized for being overly simplistic and linear, as it does not fully capture the complexity of modern communication processes.

SMCRE Model: Harold Lasswell expanded the SMCR model to include "Effect," which represents the outcomes of communication, such as changes in attitudes, behavior, or perceptions. The SMCRE model provides a more comprehensive framework by considering how each element of the communication process interacts and impacts the outcome.

The theory of media influence is a foundational concept in communication studies that explains how the media shapes the attitudes, behaviors, and perceptions of individuals and groups. This theory has evolved through various stages, each offering insight into the relationship between media and its audience. Initially, the Bullet Theory (also known as the Hypodermic Needle Theory) proposed that media messages are injected directly into the minds of passive audiences, resulting in immediate and uniform effects.

Although now considered oversimplified, this theory was crucial in initiating research into the media's impact, particularly on children.

Later, the Limited Effects Theory, introduced by Paul Lazarsfeld, emphasized that media influence is not direct or universal but instead shaped by personal background and social environment. This shifted the focus to more nuanced, audience-centered studies. Agenda-Setting Theory, as introduced by Walter Lippmann, argued that the media may not dictate what people think, but it significantly influences what people think about by highlighting certain topics more prominently. Cultivation Theory, developed by George Gerbner, explored how prolonged media exposure, especially television, gradually cultivates specific worldviews, social norms, and values in audiences. Encoding/Decoding Theory by Stuart Hall stressed that communication is not a one-way process. Audiences actively interpret media messages based on their personal experiences, leading to multiple possible readings of the same content, preferred, negotiated, or oppositional. Social Learning Theory and Social Cognitive Theory by Albert Bandura underlined the importance of observational learning, showing that individuals, especially children, learn behaviors by watching others, including media characters. These behaviors are influenced by a combination of personal, environmental, and media-related factors.

Finally, Cross-Cultural Communication Theory helps explain how individuals from different cultural backgrounds interpret media differently. It offers valuable insights into audience diversity and the importance of cultural sensitivity in media messaging.

Overall, media influence theory offers a comprehensive framework for understanding how modern media affects public opinion, decision-making, and social behavior. It also highlights the responsibility of media producers to present information ethically and accurately to support social well-being and informed citizenship.

The study of media influence on children, particularly those aged 6–12, requires a thorough understanding through the lens of communication theories. Two key frameworks that help explain this influence are the Theory of Audience Behavior and the Cultivation Theory.

The Theory of Audience Behavior emphasizes that audiences, including children, are not passive recipients of media messages. Rather, they actively choose and engage with media content based on personal interests, experiences, and individual motivations (Rubin, 2009). In the case of children, their media choices are often influenced by external factors such as peers, family environment, or the entertainment value of modern technologies like smartwatches. Children may select communication features or games on these devices without fully understanding their potential impacts.

Moreover, the use of smartwatches as communication tools can alter children's communication habits. For example, some children may prefer typing messages rather than engaging in direct face-to-face conversations, which could potentially weaken their social interaction skills in the long term.

The Cultivation Theory, proposed by Gerbner and colleagues, asserts that prolonged and repeated exposure to media content gradually shapes the audience's perceptions, beliefs, and behaviors, especially among impressionable groups like children (Gerbner et al., 2002). In the context of smartwatch use, if children are frequently exposed to content that promotes violence, imitation of inappropriate behaviors, or unrealistic expectations, it may lead to distorted perceptions of reality. For instance, children who frequently use chat apps may begin to view texting as a more acceptable form of communication than speaking directly, potentially diminishing their real-world interpersonal communication skills.

These two theories collectively provide a comprehensive explanation of how children, as media consumers, are influenced not only in terms of behavior but also in cognition and attitude. They illustrate that media and smartwatches, as a form of interactive media, do not merely produce immediate effects but can also lead to long-term changes in children's behaviors, beliefs, and attitudes, especially in the absence of proper guidance or supervision.

Therefore, it is essential to promote media literacy among children and ensure active involvement from parents and teachers in monitoring and guiding children's use of technology.

A smartwatch is a wearable device that integrates computer systems, sensors (such as GPS and heart rate sensors), and wireless connectivity. Its main functions include time display, health monitoring, activity tracking, and smart features such as message notifications and voice assistants. The technology behind smartwatches has evolved from early prototypes in the 1980s to modern devices that focus on health and smart usage. Smartwatches for youth can be developed in various directions to better meet their needs and enhance their usage. The following are potential areas for future development: Smartwatches for youth can evolve into tools that support learning, such as Educational apps with fun features: Integrating educational games, math exercises, science activities, or reading challenges to make learning enjoyable. Connection with online courses: Enabling synchronization with online learning platforms, allowing kids to access lessons, take quizzes, and interact with educational content through their smartwatches. Skill development: Introducing features that teach new skills like coding, creativity-building activities, or social skills training. Smartwatches can play a bigger role in supporting physical and mental health for youth: Exercise tracking: Tracking physical activities such as running, sports, or daily movements, and setting personalized goals to encourage healthy habits. Sleep monitoring: Monitoring sleep quality, setting bedtime reminders, and tracking sleep patterns to ensure adequate rest. Mental health monitoring: Adding features that track mood, stress levels, or mental well-being, helping both parents and kids to recognize emotional needs and manage stress.

Safety is a top priority in developing technology for youth, and smartwatches can be designed to enhance safety: Location tracking and safe zones: Providing real-time GPS tracking and notifying parents if a child leaves a designated safe zone. Emergency contact features: Allowing children to easily contact parents in case of emergencies, or sending alerts when a child is in a potentially dangerous situation. Content restriction features: Incorporating tools to block inappropriate websites or apps, ensuring that the content children access is age-appropriate.

By evolving in these directions, smartwatches for youth can become even more valuable tools that contribute to learning, health, safety, social interaction, and overall personal development in the digital age.

The design of smartwatches is based on theories of human-computer interaction, health behavior, and IoT architecture. Smartwatches are generally categorized into four types: health-oriented, sport-professional, fashion-oriented, and child safety models. The study of smartwatch usage among primary school students in China is particularly interesting in several aspects, including communication, social skill development, learning, health monitoring, and the impact of technology on children. This research is crucial in shaping the direction of future technological development and its integration into educational contexts.

Conceptual Framework

This study focuses on Communication Through Smartwatches in Chinese Primary School Students: Case Study of Primary School Affiliated to Yunnan Normal University, with the details following the research framework as outlined below.
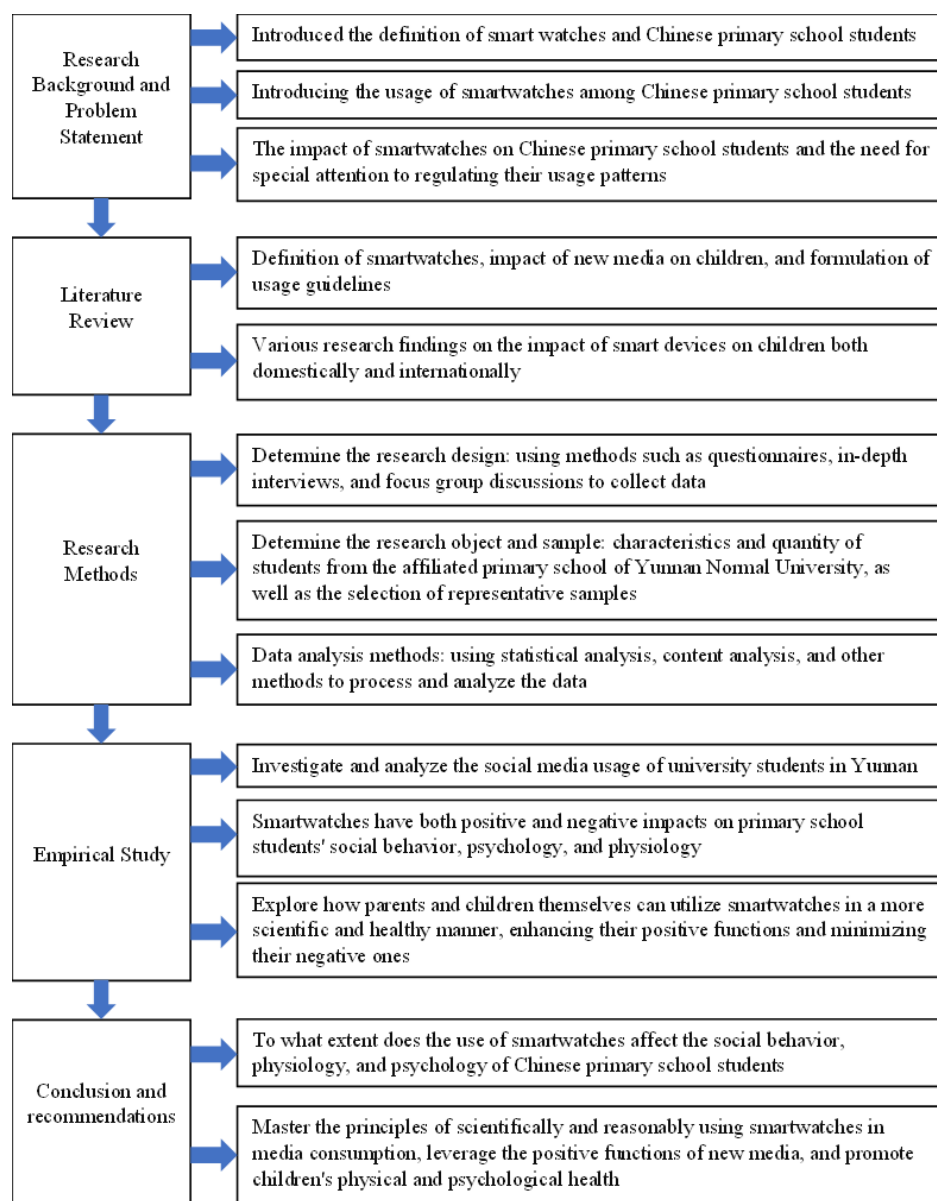
Research Background and Problem Statement	→	Introduced the definition of smart watches and Chinese primary school students
	→	Introducing the usage of smartwatches among Chinese primary school students
	→	The impact of smartwatches on Chinese primary school students and the need for special attention to regulating their usage patterns

| Literature Review | → | Definition of smartwatches, impact of new media on children, and formulation of usage guidelines |
| | → | Various research findings on the impact of smart devices on children both domestically and internationally |

Research Methods	→	Determine the research design: using methods such as questionnaires, in-depth interviews, and focus group discussions to collect data
	→	Determine the research object and sample: characteristics and quantity of students from the affiliated primary school of Yunnan Normal University, as well as the selection of representative samples
	→	Data analysis methods: using statistical analysis, content analysis, and other methods to process and analyze the data

Empirical Study	→	Investigate and analyze the social media usage of university students in Yunnan
	→	Smartwatches have both positive and negative impacts on primary school students' social behavior, psychology, and physiology
	→	Explore how parents and children themselves can utilize smartwatches in a more scientific and healthy manner, enhancing their positive functions and minimizing their negative ones

| Conclusion and recommendations | → | To what extent does the use of smartwatches affect the social behavior, physiology, and psychology of Chinese primary school students |
| | → | Master the principles of scientifically and reasonably using smartwatches in media consumption, leverage the positive functions of new media, and promote children's physical and psychological health |

Figure 3 Conceptual framework

Methodology
  Population and sample
  Population: According to China's 2024 census, Kunming City in Yunnan Province has about 8.68 million residents, including approximately 600,000 primary school students. Around 30% of children use smartwatches, with usage in Kunming exceeding 50%. This study targets students aged 6–12 from the Affiliated Primary School of Yunnan Normal University (about 10,000 students), using online questionnaires for convenience and higher response rates.
  Sample: The sample size was determined using Yamane's formula (1967), with a total population of 600,000 and an acceptable margin of error of 5%. This resulted in a sample size of approximately 400 participants. The online questionnaire was distributed to children aged 6–12, which effectively reflects the target population and ensures that the sample appropriately represents the group being studied.

Research instruments
Phase 1: Preliminary Research Phase
In the initial phase, data is collected using the following instruments:
Questionnaire Survey: The survey is administered to 400 primary school students at the Affiliated Primary School of Yunnan Normal University. The purpose of the survey is to explore current smartwatch usage patterns and examine how students incorporate smartwatches into their daily routines.
In-depth Interviews: Interviews are conducted with key stakeholders, including: (1) Smartwatch users (students), (2) Primary school teachers, (3) Parents of students, (4) Communication scholars, and (4) Psychologists
Pediatricians
The objective of these interviews is to explore the critical factors influencing smartwatch usage among students and to develop a preliminary conceptual framework for further research.
Phase 2: Post-Research Phase
The second phase builds upon the findings of the first phase by using the following methods:
Focus Group Discussions: A focus group consisting of 40 students, selected from the 400 respondents in the preliminary survey, will be conducted. These students will be selected based on shared interests or similar backgrounds. The focus group discussion aims to provide insights into how smartwatch usage differs across various age groups and whether the initial research model aligns with students' experiences.
Follow-up Interviews: Follow-up interviews will be conducted with participants from the focus group to further validate the findings and to gather additional insights on the factors affecting smartwatch usage and its impact on communication among students.
Research tools: In this study, various research tools are employed to collect data in both quantitative and qualitative forms. These tools are specifically designed to answer research questions and ensure comprehensive data collection from different perspectives. Below are the key research tools used in the study (1). **Questionnaire Survey:** The questionnaire survey is used to gather quantitative data on the smartwatch usage patterns among primary school students. The study aims to gather data on the frequency of smartwatch usage among students, the specific functions utilized, and their overall communication behaviors with peers and teachers. The survey will include 400 primary school students from the Affiliated Primary School of Yunnan Normal University. The questionnaire includes both closed-ended and open-ended questions. Closed-ended questions assess frequency, functions used, and other demographic information, while open-ended questions explore students' perceptions and experiences with smartwatches. The survey is administered in paper or digital format to ensure wide accessibility and ease of completion for the students. **(2) In-depth Interviews:** In-depth interviews are used to gather qualitative insights from key stakeholders. The interviews aim to explore the factors influencing smartwatch usage among primary school students and the broader impact on communication and learning. To understand students' firsthand experiences and challenges with using smartwatches. To examine how smartwatches influence students' behavior, communication, and classroom dynamics. To gain insights into how parents perceive the role of smartwatches in their children's communication and development. Communication scholars, psychologists, and pediatricians: To understand the broader psychological and developmental impacts of technology on young children. Semi-structured interviews will be conducted with each participant, allowing for flexibility in exploring relevant themes while maintaining focus on the study's objectives. **(3) Focus Group Discussions:** Focus group discussions are used to explore students' collective experiences and perceptions of smartwatch usage. This tool enables students to discuss how smartwatches affect their communication with peers, teachers, and family members. Students will be chosen from the 400 survey respondents based on shared interests, experiences, or age groups to examine differences in smartwatch usage across demographics. The focus group will be conducted in a comfortable, guided discussion environment. A moderator will facilitate the conversation, ensuring that all students have an opportunity to share their experiences and ideas. **(4). Follow-up Interviews:** Follow-up interviews will be conducted to validate and expand on the findings from the previous phases. The goal is to delve deeper into the insights provided in the focus group discussions and interviews, to refine the understanding of how smartwatches influence students' communication skills and development. Selected participants from the focus group discussions will be invited for follow-up interviews to provide additional clarity and depth to the themes identified in the previous stages. These interviews will be semi-structured, allowing for open-ended questions that encourage participants to elaborate on their responses and clarify any ambiguities.

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Data Collection: The literature review method systematically collects, screens, and analyzes existing academic resources to analyze how Chinese primary school students use smartwatches for communication. Firstly, the research topic is clarified, and relevant literature is searched in domestic and international academic databases and library resources using keywords such as "communication," "smartwatch usage," and "primary school students." Then, literature highly relevant to the research topic is selected, with special attention paid to regional studies or literature with similar backgrounds. Key information, such as theoretical frameworks, research methods, and results, is extracted. Finally, through comprehensive analysis, trends, consensuses, and research gaps are identified, laying a theoretical foundation for this study and providing support for subsequent empirical research.

Data analysis: In the context of data analysis, the literature review method serves as a systematic approach for identifying, evaluating, and synthesizing existing academic sources relevant to the research topic. The process begins with the careful selection of scholarly literature based on keywords closely aligned with the research objectives, while simultaneously excluding irrelevant or duplicated materials. Key elements such as theoretical frameworks, research methodologies, and principal findings are then extracted from the selected studies. Particular attention is given to the variables used and the analytical techniques employed. By comparing results across different studies, the researcher can identify consistencies, divergences, and contradictions, thereby uncovering prevailing academic trends and reaching an understanding of the broader scholarly consensus.

Furthermore, this analytical process helps to pinpoint existing research gaps—areas that remain underexplored or insufficiently addressed—thus highlighting the unique contribution of the present study. Ultimately, the synthesized information contributes to the establishment of a solid theoretical foundation, which not only supports current research but also guides the design and implementation of subsequent empirical investigations.

Results

(1) The usage overview of smartwatches among Chinese primary school students is as follows: Smartwatches have a high penetration rate among Chinese primary school students, with 72% of students using them for non-academic purposes for over an hour daily, primarily for socializing, location tracking, and entertainment. Parents recognize their safety monitoring functions, but they are concerned about privacy risks (such as location data leakage) and technological dependency (such as social addiction).

(2) The communication mode of smartwatches among primary school students is as follows: 67% of students convey emotions through preset emoticons, leading to "instrumentalization" of emotional expression; face-to-face communication still dominates (58%). There is a significant contradiction between parental supervision measures (85% limit communication) and student acceptance (only 23%), and the device may exacerbate social exclusion (15% of marginalized students are isolated).

(3). The case study of the Primary School Affiliated to Yunnan Normal University shows that smartwatches enhance parental security (92%) and increase learning assistance usage (+40%), but they lead to a decrease in face-to-face communication vocabulary for 35% of students and an increase in classroom distractions by 17%. By implementing "time-based disabling" and "digital literacy courses," the negative impact of the device is reduced by 28%. This study can provide replicable management solutions for schools and parents.

Discussion

Objective 1: To explore the general situation of smartwatch usage among Chinese primary school students.

The high rate of non-academic smartwatch usage (72% of students using smartwatches for over an hour per day) highlights their function as more than just tracking devices. They are increasingly used for social interaction, entertainment, and real-time location sharing. This aligns with Oldenburg's (1989) notion of the "third place," where smartwatches mediate between home and school environments to create a new, hybrid social space. Moreover, parental recognition of smartwatches' safety benefits contrasts with rising concerns over digital dependence and privacy risks, a dynamic consistent with Livingstone and Byrne's (2015) findings on parental ambivalence toward digital media.

Objective 2: To study the communication through smartwatches among Chinese primary school students.

Communication via smartwatches among students reflects a shift in how emotions and social presence are conveyed. The use of preset emoticons by 67% of students indicates a growing instrumentalization of emotional expression. This echoes Turkle's (2011) concern about the superficiality of mediated communication. Although face-to-face interaction remains dominant (58%), the increase in digital communication may weaken the depth and authenticity of emotional exchanges over time. Additionally, the significant disparity between parental restrictions (85%) and student acceptance (23%) underscores an intergenerational digital gap (Clark, 2013). Furthermore, the isolation of 15% of marginalized students raises concerns that smartwatch-based networks may exacerbate digital exclusion, aligning with Livingstone and Helsper's (2007) research on the stratifying effects of technology on social inclusion.

Objective 3: To find out the development of communication based on smartwatches in Chinese primary school students in a case study of the Primary School Affiliated to Yunnan Normal University.

The case study offers specific insights into how smartwatch-mediated communication is evolving in a real educational context. While smartwatch use enhanced parental confidence in student safety (92%) and increased educational support (by 40%), it also led to a 35% decrease in vocabulary used in face-to-face communication and a 17% rise in classroom distractions. These effects support Przybylski and Weinstein's (2017) findings on the negative cognitive impacts of screen exposure. However, the successful implementation of interventions such as time-based disabling and digital literacy instruction resulted in a 28% reduction in negative impacts, emphasizing the value of well-structured digital media policies. This is consistent with Buckingham's (2007) advocacy for media literacy education as a key strategy in mitigating risks and empowering young users.

Conclusion

The study effectively meets its objectives by illustrating the widespread integration of smartwatches into children's daily lives, unpacking the new modes of digital communication they foster, and offering a clear picture of their developmental implications through a focused case study. These findings stress the importance of collaborative efforts between schools, parents, and policymakers to guide children's digital development and ensure technology enhances rather than undermines their social, emotional, and educational growth.

Recommendation

In response to the growing impact of smartwatches on children's lives, this research offers practical recommendations for multiple stakeholders to ensure balanced, ethical, and educational use of this technology:

1. Governments should develop fair tech policies that ensure equal access to core smartwatch functions. Regulations should promote ethical design, protect children's privacy, and involve children in policymaking. Schools should teach students to critically reflect on how digital tools shape social inequality and emotions.

2. Schools should create clear rules for smartwatch use in different settings, promote direct vs. digital communication awareness, and schedule regular tech breaks. The curriculum should include media literacy and teach students how wearable tech affects human interaction.

3. Society should support ethical standards for children's digital devices, such as global certifications and rights to data ownership. Communities should hold workshops to raise awareness of surveillance risks and build shared responsibility for children's digital well-being.

4. Smart device companies should design child-friendly features that reward learning and avoid manipulative algorithms. Features like "learning-unlocks-play" systems, educational tools, and transparent data practices should replace invasive monitoring or emotion-based predictions.

5. Parents should guide children using a balance of control and trust, set time limits, encourage offline family time, and gradually hand over responsibility. Devices should be used to strengthen relationships, not just monitor them. Emotional understanding should be intuitive, not just data-driven.

6. Children should learn to use smartwatches responsibly. They can set personal tech boundaries, protect their privacy, and turn digital prompts into creative real-world experiences. By questioning algorithms and speaking up, they can shape a healthier digital world.

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