

Preschool Children and Screen Exposure: A literature review comparing Spanish and International research

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ABSTRACT

Today, technology surrounds our lives and for most families and schools, digital screens have become essential. At the same time, young children are being exposed to these screens at an earlier age. In almost every region exists organisms that investigate the possible harmful effects of overexposure to screen-time during early childhood. Despite this, most Spanish studies either exclude young children (0-6 years). As a result of COVID-19 pandemic, several new articles have been produced with the aim of analyzing the situation, anticipating possible consequences and providing action strategies and healthy routines for families and schools.

Throughout this study, we will analyze the current literature on the issue from three different fields of study with the aim to compare Spanish (national) and international research. Once the keywords were established (preschool, early childhood, young children, screen, ITC and guidelines) a systematic literature research was done in two databases: Google Scholar and Scopus. The results were filtered to return only journal articles published in the last 10 years.

Articles found in Google Scholar by December 2021 with keywords in the title: in English n= 264; in Spanish n = 2. Articles found in Scopus with keywords anywhere in the text: International n = 45.865; National n= 2.875. Many of these studies are focused only on analyzing screen-time from a health perspective. Fewer studies approach the problem from a holistic perspective or show the importance of the problem but don't offer alternatives and solutions. "Educación infantil" and "TIC" are the most frequently used terms in Spanish research, while in English research are "preschool" and "screen".

KEY WORDS:

Young children, preschool, screen-time exposure, literature review

1. Introduction and status of the issue

Today, technology surrounds our lives in so many ways and, for most families and schools, digital devices have become essential. At the same time, young children are being exposed to these devices at an earlier age (Castro-Zubizarreta et al., 2018). In fact, screen-based activities take a significant part of young children's daily routine. Rideout and Robb (2020) found that children aged from 0 to 8 spend an average of two and a half hours a day in front of a digital screen. Such activities include watching television, playing video games, watching online videos or video chatting.

In this context, parents, teachers and health experts are concerned about the increasing time that young children spend using digital technology at school or at home. Digital devices have become improvised babysitters, especially in low-income families many young children use those devices without any supervision (Lozano et al., 2020).

On the international scene there is a significant concern about the negative effects of a high screen-time exposure on young children. The American Academy of Pediatrics (Council On Communications And Media, 2016) and the Canadian Paediatric Society (Canadian Paediatric Society, 2017) have established guidelines to help manage the families' screen-time. Other research explores the issue from different perspectives, for example, Zabatiero et al., (2018) includes parents' and teachers' perceptions about the use of digital devices.

In Spain there is an increasing concern about screen-time but mostly on primary or secondary students. For example, the AIMC (2018) survey about the media consumption habits of children from 8 to 13 years old, offers a general perspective about the situation in Spain. Also, Bartau-Rojas et al., (2018) offers a good reference about digital parenting and the difficulties that parents have to afford dealing with the media use of their primary-aged children. In contrast, the use of technology at home and in classrooms has increased significantly. In addition, a wide range of organizations (educational organizations, corporations, governmental organizations), both public and private, are promoting the use of digital screens in education.

1.1. Digital parenting

Nowadays children interact with digital devices like smartphones or game consoles more often than their reference adults. That situation highlights the need to create some strategies in order to supervise and support children's media use (Montoya et al., 2018).

Parental mediation strategies can be defined as "the diverse practices through which parents try to manage and regulate their children's experiences with the media" (Livingstone et al., 2015, p.7). Blum-Ross and Livingstone (2016) describe four main strategies in order to mediate between digital devices and children: active mediation, to talk about media, their risks and possibilities; monitoring, use Apps to geolocate the children, follow them in their social media or review children's browsing history; rules, establish rules for the use of digital devices and the Internet; parental controls, use Apps for parental control, block certain contents, hide the devices, etc. Other authors differentiate two more strategies: shared use, parents use the technology with their children, view the TV

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or play video games together (Altun, 2019), unconcerned and permissive, not to give importance to the type of use that their children do with the media and having a poor knowledge of these uses (Torrecillas-Lacave et al., 2017). By using these different parental mediation strategies, parents and caregivers aim to protect children from harmful digital behaviors and promote their potential benefits (Livingstone, et al., 2015).

1.2. Teaching in the digital age

In the last decade the use of touchscreen digital devices such as tablets and IWB (interactive whiteboard) has increased significantly in preschool classrooms. Also, teachers are including in their daily lesson digital activities such as programming games, digital literacy activities, educational robots and computational thinking tasks in order to improve the teaching and learning process (Otterborn et al. 2019). However, according to García Aretio (2019), the simple fact of equipping the classroom with digital devices is not enough to promote a useful use of the digital media. Being in contact with digital devices doesn't by itself change or innovate the methods and practices of teaching and learning. To achieve this purpose, it's necessary to support the use of digital devices with actions focused on scaffolding children's learning process and digital literacy.

As a result of the increase of devices in the classroom, new studies are emerging in recent years, not only general approaches but also specific case studies. For example, Otterborn et al. (2020) discusses the concrete programming activities and digital practices of Swedish preschool teachers. In addition, many studies highlight the benefits of diverse educational apps to improve children's skills at an early age, especially those related to STEAM (science, technology, engineering, art and mathematics) areas (Griffith et al. 2020).

1.3. Health expert's concerns and recommendations

In almost every region exist some organisms that are investigating the possible harmful effects of overexposure to screen-time during early childhood. For example, in Spain the Ministerio de Sanidad, Servicios Sociales e Igualdad (2015) have established some recommendations based on different health evidence. In Nord America, the Canadian Paediatric Society (2017) and the Council on Communications and Media (2016), have been investigating the use of digital devices by young children during the last decades. Another example of the growing global concern about screen-time can be found in the article by Wong et al. (2021), which analyzes the relationship between sleep duration, physical activity, and screen-time in children and adolescents of Hong Kong.

These research studies suggest that digital devices may involve a number of risks related to physical, cognitive and social well-being of young children. Despite these possible negative effects, digital devices can be a useful tool to support the development of some skills and abilities.

Following the risks and opportunities established by the organizations listed above, we have settled on common guidelines (see table 1).

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Table 1. Screen-time recommendations by Pediatric Society (2017) and Council on Communications and Media (2016)

General recommendations	Concrete recommendations
Minimize screen-time	<p>0 - 18 months: Avoid any use of digital devices except video-chatting</p> <p>18 - 24 months: Avoid individual media use and provide quality apps and TV programs to coview with children</p> <p>2 - 5 years: Not use digital devices for more than 1 hour a day and choose appropriate content</p> <p>Avoid the use of media during mealtimes, family time or during outdoor play times</p> <p>Remove devices from bedrooms 1 hour before bedtime and avoid their use during this time</p>
Mitigate the risks associated with screen-time	<p>Avoid fast-paced programs, apps with lots of ads and any violent content</p> <p>Don't use digital devices to calm children except in specific situations (e.g., long trips)</p> <p>Supervise the content children watch, test the apps and use the devices with them</p>
Create family healthy routines	<p>Turn off TVs and other devices when not in use</p> <p>Reserve some time during the day for other activities such as playing, going to the playground or doing arts and crafts</p> <p>Turn off the devices during family time</p> <p>Establish a family media use plan with screen-time rules</p>

1.4. International research

Research about experts' recommendations, health concerns and the benefits of educational Apps can be easily found on the international scene (see table 2). Recently, qualitative case studies focusing on adults' management on young children's use of digital devices have also begun to emerge (Zabatiero et al., 2018). However, there remains a gap in quantitative research on parents' and teachers' perceptions of the appropriate use of digital screens. This fact makes it difficult to find out the needs of caregivers and educators in terms of their skills and conceptions about parenting or digital education.

Table 2. Review of international research

Topic	Brief description of the research	Reference
Describing the household use of digital devices	USA research about media use by children under 8 years old	Rideout, V., & Robb, M. B (2020)
	EU research about digital behavior of primary and secondary students from different countries	Smahel et al. (2020)
Digital parenting	British research focused on how parents manage children's media use and some recommendations	Blum-Ross & Livingstone (2016)
	Review of research evidence about media, parent-child interaction and socio-emotional development during early childhood	Radesky & Rosenblum (2019)
	Longitudinal case study about a child's media use over a two-year period (from 6 to 27 months)	Bar Lev et al. (2018)
Describing the scholar use of digital devices	Australian research that offers the perspectives of educators, school principals, parents and other professionals on young children's use of digital devices	Zabatiero et al. (2018)
	Research focused on preschool teachers' strategies when using interactive whiteboards	Bourbour et al. (2020)
Experts' recommendations and health concerns	AAP media use recommendations for Infants, toddlers, and preschoolers	Council on Communications and Media (2016)
	Examines potential benefits and risks of the use of digital devices and provides guidance to help families	Canadian Paediatric Society (2017)
	Describes the potential risks of digital devices over-exposure during childhood and adolescence	Wolf et al. (2018)

1.5. Spanish research

In the last few years there has been an increase in the number of studies focused on analyzing the use of digital devices in Spanish children (see table 3). Despite this, most of these studies either exclude young children (0-6 years) or focus on only a narrow part of the problem.

Table 3. Review of Spanish research

Topic	Brief description of the research	Reference
Describing the household use of digital devices	A transversal study on digital media consumption habits in children	Asociación para la Investigación de Medios de Comunicación (2018)
	A study that analyzes the digital devices exposure of Spanish children and adolescents to identify possible relationships with their lifestyles	García-Soidán et al. (2020)
Digital parenting	A qualitative study focusing on parents' practices, perspectives and difficulties in dealing with media use with their children	Bartau-Rojas et al. (2018)
	This study analyzes the relationship between families' socioeconomic status (from now onwards SES) and children's media use	Jiménez-Morales et al. (2020)
Describing the scholar use of digital devices	This article is focused on the digital gap and the role of education to overcome it	Granado Palma (2019)
	An article based on a review of the literature on the inclusion of digital devices in educational practices with groups of students with Attention-Deficit Hyperactivity Disorder	Latorre-Coscolluela et al. (2018)
Experts' recommendations and health concerns	A study focused on establishing the impact of the use of digital devices by children and young people, especially on their mental and physical well-being	Ortega-Mohedano Pinto-Hernández (2021)
	A literature review on the inclusion of digital devices at homes and their impact on children's development.	Nogueira & Ceinos (2015)
	This study establishes an association between screen-time and sleep duration among Spanish children between 1 and 14 years old.	Cartanyà Hueso et al., (2021)

1.6. Influence of the COVID-19 pandemic on digital screen-time

The COVID-19 pandemic and their associated restrictions like the confinement suffered during 2020 or teleworking, have had a significant impact on adult's and children's digital habits. The digital media use has become an essential element of families' daily routines as a consequence of the need to socialize, work, study or play while respecting social distancing policies. In this exceptional situation it is particularly necessary to establish a family media use plan (Nagata et al., 2020).

In Spain, the pandemic has increased children's sedentary behaviors and has aggravated the problem of overexposure to digital devices. Before confinement 61% of children already spent more time than recommended by using digital devices, during the pandemic 95% spent more than recommended (Rius, 2020).

As a result of this situation, a large number of new articles have been produced with the aim of analyzing the situation, anticipating possible consequences and providing action strategies and healthy routines for families and schools (see Table 4).

Table 4. Review of new research as a result of COVID-19 pandemic

Topic	Brief description of the research	Reference
International research	A literature review of the recent research on screen-time, suggesting that this problem has become a public health issue.	Sultana, A., Tasnim, S., Hossain, M. M., Bhattacharya, S., & Purohit, N. (2021).
	This research studies the effects of the pandemic on screen-time and parental mediation strategies in Turkish families with children aged (6-13)	Eyimaya, A. O., & Irmak, A. Y. (2021).
	This study compares post confinement physical activity, screen-time and sleep of preschoolers (3-5) from 14 countries with pre-confinement data.	Okely, A. D., Kariippanon, K. E., Guan, H., Taylor, E. K., Suesse, T., Cross, P. L., ... & Draper, C. E. (2021).
	This study analyzes parental perceptions of physical activity and sedentary activity by Canadian minors (5-17) using a transversal survey.	McCormack, G. R., Doyle-Baker, P. K., Petersen, J. A., & Ghoneim, D. (2020).
National research	This study provides a general overview of screen-time, work-family conciliation and parental mediation strategies during confinement. Age not specified.	Michavila, N., Abad, M. J., & García, P. (2018).
	This article examines the situation of workers during confinement and the difficulties and benefits of reconciling work and family life with telework.	Muñoz, A. R. (2021). (2019)
	This article analyzes the perceptions of educators and child psychologists from 23 different countries on the problem of educational equity during confinement.	Cáceres-Muñoz, J., Jiménez Hernández, A. S., & Martín-Sánchez, M. (2020).

2. Method

For the present study we will analyze the current literature on the issue from three different fields of study: health sciences, social sciences and family policy, and education. We are comparing the differences between international literature -mostly written in English- and national literature. The objective is to identify the current state of the art and to detect those ambits that require further research in Spain.

To identify the keywords used during the systematic search, we have analyzed the most common words found in Byrne's (2021) systematic review references. This article has been chosen as a reference due to its recent publication date and the fact that the topic and keywords fit perfectly with our research. The results of the previous analysis have been reflected on table 5.

Table 5. Results of the previous analysis

Topic	Keywords	Number of results
Age group	Preschool	168
	Young children	54
	Early childhood	47
	Infant	47
	Kids	10
Exposure of interest	Screen	122
	Digital + device/media	9
Final product	Guidelines	24
	Recommendations	9

The initial idea was to only preserve those words included on ERIC or UNESCO Thesaurus but none of the words in reference to the exposure of interest have been found on it. Also, the terms “young children” and “guideline” weren’t included on thesaurus but they are commonly used words in this research field. So finally, the selected keywords were the most used in every topic.

For the Spanish search, the keywords have been translated as follows:

Preschool → *Educación Infantil

Young children → Niños pequeños

Early childhood → Primera infancia

Infant → **Infante/bebé

screen-time → Tiempo de pantalla

Guidelines → ***Recomendaciones

* Although the literal translation in the thesaurus is “preescolar”, we have selected “educación infantil” because in Spanish this term is more common.

** This word has been excluded because in Spanish they report too few search results.

***Although the literal translation is “directrices”, we have selected “recomendaciones” because in Spain this term is more common.

Once the keywords were established, systematic literature research was done in two databases: Google Scholar and Scopus.

The keywords were combined as follow:

- preschool AND screen/ “educación infantil” AND pantalla
_preschool AND screen AND guidelines / “educación infantil” AND pantalla AND recomendaciones
- “early childhood” AND screen AND guidelines / “educación infantil” AND TIC
_“early childhood” AND screen AND guidelines / “educación infantil” AND TIC AND recomendaciones
- “young children” AND screen/ “niños pequeños” AND pantalla
_“young children” AND screen AND guidelines / “niños pequeños” AND pantalla AND recomendaciones
- preschool AND ICT AND guidelines / “educación infantil” AND TIC
_preschool AND ICT AND guidelines / “educación infantil” AND TIC AND recomendaciones
- “early childhood” AND ICT/ “primera infancia” AND TIC
_“early childhood” AND ICT AND guidelines/ “primera infancia” AND TIC AND recomendaciones
- “young children” AND ICT/ “niños pequeños” AND TIC
_“young children” AND ICT AND guidelines / “niños pequeños” AND TIC AND recomendaciones

The results were filtered to return only journal articles published in the last 10 years (from 2011 to 2021), mostly written in Spanish or English. Considering the large number of results obtained in Google scholar, we selected those articles that contained the keywords in the title. In Scopus we selected all the articles that contained the keywords anywhere in the text. Due to the lack of results in Spanish, “TIC” (Information and Communication Technology) has been added as a keyword.

3. Results

The results of the literature review are presented below, organized according to the database of origin and the language/country of the articles. The total number of documents found in both search databases and languages for each keyword combination is also listed. Finally, some graphics are presented to illustrate different aspects related to the evolution and distribution of articles published in Scopus according to the criteria mentioned above in the method.

RESULTS IN ENGLISH FOUND IN GOOGLE SCHOLAR by December 2021 = 264 results

- preschool AND screen → 72 results
 __preschool AND screen AND guidelines → 0 results
- “young children” AND screen → 70 result
 __“young children” AND screen AND guidelines → 0 results
- “early childhood” AND screen → 33
 __early childhood” AND screen AND guidelines → 1 result
- preschool AND ICT → 38 results
 __preschool AND ICT AND guidelines → 0 results
- “young children” AND ICT → 8
 __“young children” AND ICT AND guidelines → 0
- “early childhood” AND ICT → 43
 __“early childhood” AND ICT AND guidelines → 0 results

RESULTS IN SPANISH FOUND IN GOOGLE SCHOLAR by December 2021 = 2 results

- “educación infantil” AND pantalla → 0 results
- “niños pequeños” AND pantalla → 0 results
- “primera infancia” AND pantalla → 0 results
- “educación infantil” AND TIC → 2 results
 __“educación infantil” AND TIC AND recomendaciones → 0 results
- “niños pequeños” AND TIC → 0 results
- “primera infancia” AND TIC → 0 results

RESULTS OF INTERNATIONAL ARTICLES FOUND IN SCOPUS by December 2021 = 45.865 results

ENGLISH = 45.729 results

- preschool AND screen → 14.940 results
 __preschool AND screen AND guidelines → 4.700 results
- “young children” AND screen → 13.310 results
 __“young children” AND screen AND guidelines → 4.129 results
- “early childhood” AND screen → 8.798
 __early childhood” AND screen AND guidelines → 2.702 results
- preschool AND ICT → results 2.437 results
 __preschool AND ICT AND guidelines → 456 results
- “young children” AND ICT → 2.967 results
 __“young children” AND ICT AND guidelines → 550 results
- “early childhood” AND ICT → 3.277 results
 __“early childhood” AND ICT AND guidelines → 510 results

SPANISH = 136 results

- “educación infantil” AND pantalla → 5 results
 __“educación infantil” AND pantalla AND recomendaciones → 0 results
- “niños pequeños” AND pantalla → 1 results
 __“niños pequeños” AND pantalla AND recomendaciones → 1 results
- “primera infancia” AND pantalla → 3 results
 __“primera infancia” AND pantalla AND recomendaciones → 1 results
- “educación infantil” AND TIC → 79 results
 __“educación infantil” AND TIC AND recomendaciones → 3 results
- “niños pequeños” AND TIC → 24 results
 __“niños pequeños” AND TIC AND recomendaciones → 1 results
- “primera infancia” AND TIC → 24 results
 __“primera infancia” AND TIC AND recomendaciones → 2 results

RESULTS OF NATIONAL ARTICLES FOUND IN SCOPUS by December 2021 = 2.875 results

ENGLISH = 2.418 results

- preschool AND screen → 651 results
 __preschool AND screen AND guidelines → 216 results

- “young children” AND screen → 560 results
 _ “young children” AND screen AND guidelines → 189 results
- “early childhood” AND screen → 371
 _ “early childhood” AND screen AND guidelines → 120 result
- preschool AND ICT → 223 results
 _ preschool AND ICT AND guidelines → 41 results
- “young children” AND ICT → 230
 _ “young children” AND ICT AND guidelines → 50 results
- “early childhood” AND ICT → 383 results
 _ “early childhood” AND ICT AND guidelines → 64 results

SPANISH = 457 results

- “educación infantil” AND pantalla → 23 results
 _ “educación infantil” AND pantalla AND recomendaciones → 2 results
- “niños pequeños” AND pantalla → 1 results
 _ “niños pequeños” AND pantalla AND recomendaciones → 0 results
- “primera infancia” AND pantalla → 6 results
 _ “primera infancia” AND pantalla AND recomendaciones → 0 results
- “educación infantil” AND TIC → 414 results
 _ “educación infantil” AND TIC AND recomendaciones → 10 results
- “niños pequeños” AND TIC → 5 results
 _ “niños pequeños” AND TIC AND recomendaciones → 0 results
- “primera infancia” AND TIC → 8 results
 _ “primera infancia” AND TIC AND recomendaciones → 0 results

Combinations ordered from higher to lower performance:

- preschool AND screen/ “educación infantil” AND pantalla = 15.691 results
- “young children” AND screen/ “niños pequeños” AND pantalla = 13.942 results
- “early childhood” AND screen/ “educación infantil” AND TIC = 9.211 results
- “early childhood” AND ICT/ “primera infancia” AND TIC = 3.735 results
- “young children” AND ICT/ “niños pequeños” AND TIC = 3.234 results
- preschool AND ICT/ “educación infantil” AND TIC = 3.193 results

Analysis of Scopus search results of the top-performing combination: preschool AND screen

Figure 1. Distribution of International articles by field of study

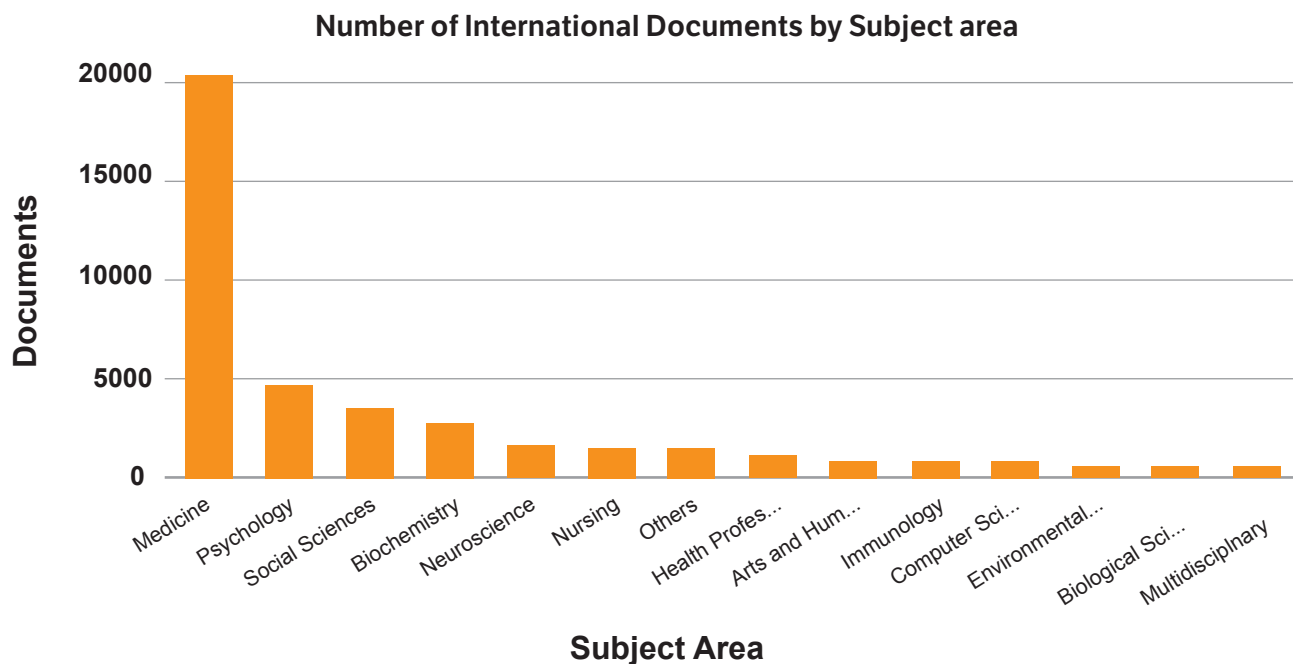


Figure 2. Distribution of National articles by field of study

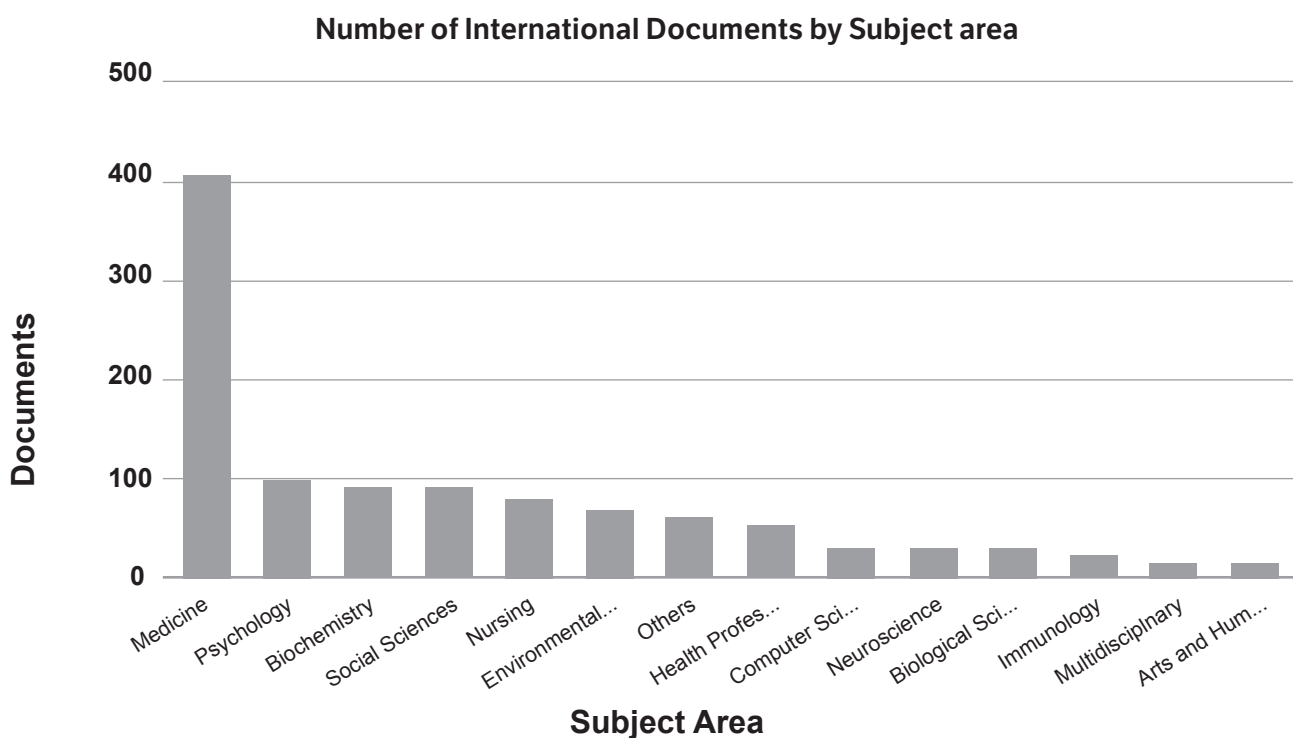


Figure 3. Geographical distribution of articles

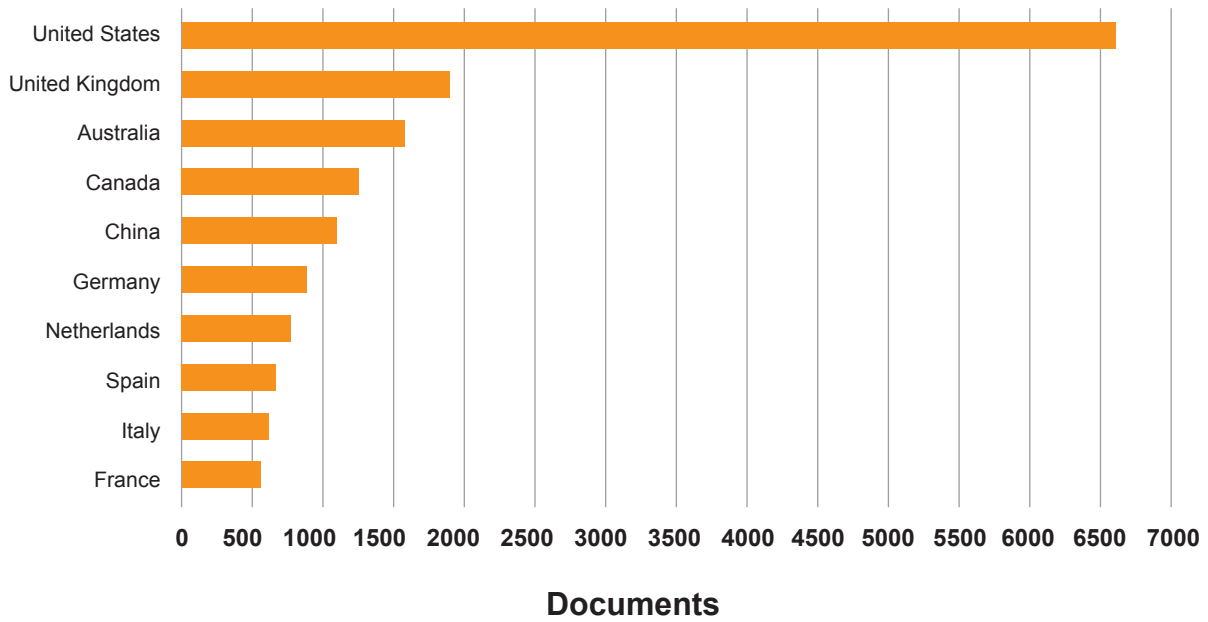
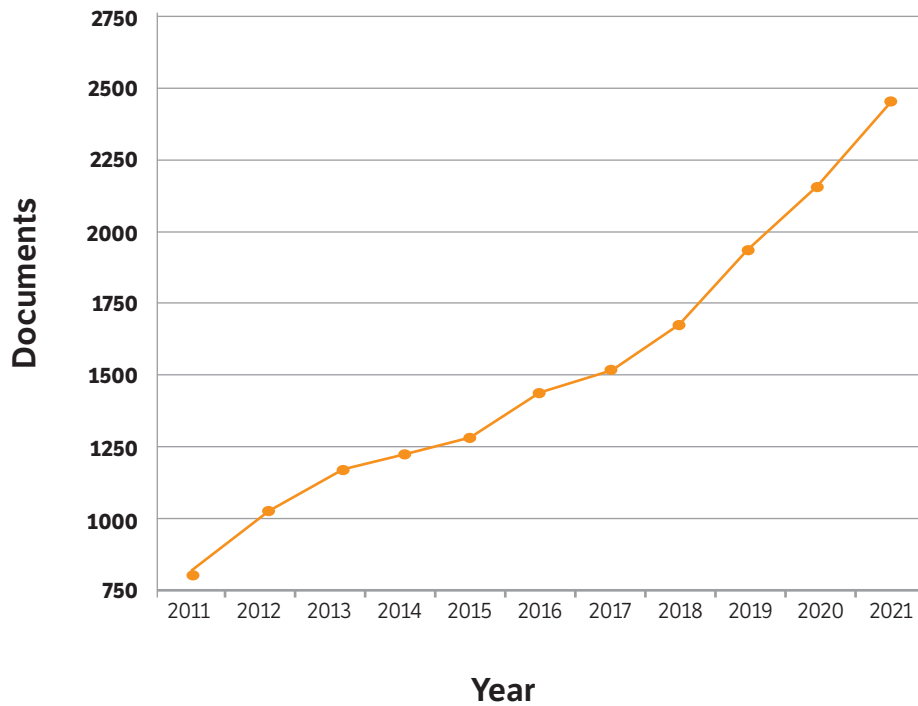


Figure 4. Number of articles in the last 10 years



4. Discussion and conclusion

As shown in figures 1 and 2, many national and international studies are focused only on analyzing screen-time from a health perspective. Fewer studies approach the problem from a holistic perspective, including the social and educational component. On the other hand, many studies show the importance of the growing problem but don't offer realistic alternatives for dealing with it.

In Spanish research, compared with other European or English-speaking countries, there is a lack of studies on the risks and benefits of screen-time and device management in preschoolers (Figure 3). There seems to be much greater concern about the use of screens by primary school children and, especially, adolescents. In contrast, international research shows a more consolidated concern regarding this age group.

Overall, existing studies focus mainly on risks rather than opportunities of digital screen devices or don't consider that screen-time can be active and pedagogical. Consequently, more flexible solutions would be desirable, especially in the current context where family work-family reconciliation is a problem faced by many families.

From Figure 4, we can see a progressive increase in the number of articles on preschoolers and screens published in the last 10 years. From 2020 to 2021 there has been a slightly higher increase than in previous years. This fact is probably caused by the increased exposure of screen-time during the confinement. This exceptional situation has resulted in a growing interest in the issue over the last two years and in a large number of articles being published. Many of these articles show the situation during the pandemic, compare it with the current situation and try to offer possible solutions.

The results also show that the most frequently used terms in this field are “*educación infantil*” and “TIC” in Spanish research and “preschool” and “screen” in English research. This result provides a good baseline for future research that requires searching for articles using keywords.

The main limitation of this review is that the two databases, SCOPUS and Google Scholar, offer different options for filtering the information, so it was not possible to conduct a consistent comparative search. For example, Google Scholar doesn't have a direct option to filter the results by country so the search has been sorted by language (English or Spanish). On the contrary, Scopus allows filtering by country, language or by both, which facilitates a more accurate distinction between national and international articles. Moreover, due to the large number of articles resulting from the search, some possible duplicates have not been excluded.

Many studies are focused on analyzing screen-time from a health perspective. Fewer studies approach the problem from a holistic perspective, including the social and educational component

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