

Wisdom of the Masses? Users and Educators Contrasting Perspectives on the Data Privacy and Safety of Early Years' Apps

¿Sabiduría de las Masas? Usuarios y Educadores Contrastan Perspectivas sobre la Privacidad de los Datos y la Seguridad de las Aplicaciones para la Primera Infancia

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KEYWORDS:

Apps
Early childhood
Education
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ABSTRACT:

A key focus is assessing children's apps, emphasising informational clarity, safety, and data ethics. The present study employs a structured database for app evaluation, by categorising 30 apps into edutainment, education, instruction, and training based on various criteria, including educational value and user ratings. Moreover, a comparative evaluation between the public ratings and the educator's evaluation was carried out. The findings underscore the challenges in app evaluation due to the proliferation of unregulated and untested applications. It highlights the discrepancies between public app evaluations and those conducted by experienced educators, pointing out the difficulties in obtaining relevant information for accurate app assessment. The study also addresses the aesthetic appeal of apps and how they influence parental choices, often overshadowing concerns about user security and privacy. In conclusion, the study calls for heightened parental awareness in selecting apps for their children. It stresses the importance of considering learning value, educational value, information clarity, security, and ethical data use.

DESCRIPTORES:

Apps
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Calidad

RESUMEN:

Un enfoque clave es evaluar las aplicaciones para niños, enfatizando la claridad informativa, la seguridad y la ética de los datos. Para ello se emplea una base de datos para la evaluación de aplicaciones categorizando 30 aplicaciones en entretenimiento educativo, educación, instrucción y capacitación en función de varios criterios, incluido el valor educativo y las calificaciones de los usuarios. Se realizó una evaluación comparativa entre las calificaciones públicas y la evaluación del educador. Los hallazgos subrayan los desafíos en la evaluación de aplicaciones debido a la proliferación de aplicaciones no reguladas y no probadas. Destaca las discrepancias entre las evaluaciones de aplicaciones públicas y las realizadas por educadores experimentados señalando las dificultades para obtener información relevante para una evaluación precisa de las aplicaciones. El estudio también aborda el atractivo estético de las aplicaciones y cómo influyen en las elecciones de los padres, eclipsando a menudo las preocupaciones sobre la seguridad y privacidad del usuario. En conclusión, el estudio exige una mayor conciencia de los padres a la hora de seleccionar aplicaciones para sus hijos.

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1. Introducción

Have you ever considered public ratings on apps to select your preferred one? The adoption of mobile phones has progressively shaped all sorts of human activity (Li et al., 2022). Therefore, commercial apps and “Store” platforms drive the user's attention along the way (Van Dijck et al., 2018). In an increasing literature relating platform studies applied to education, it has been already identified the type of relevant issues posed by the utilisation of social media and private ed-tech applications, either web or digital (Jacovkis et al., 2022; van Dijck et al., 2018; Williamson, 2019). The aforementioned reasoning has also permeated educational methodologies, influencing the perception of educators and learners about the process of teaching and learning by gradually embracing the complimentary services and attributes offered by various platforms, including those that are Artificial Intelligence (AI) driven (Williamson et al., 2023). Aligning with such a critique, some scholars have focused on the problem of data extraction and monetisation in early years, with the pervasive usage of platforms also at home (Barassi, 2020; Pangrazio & Mavoa, 2023). According to several studies, in this particular group of ages, parental digital exposure and decisions about the children's digital footprint is crucial (Jibb et al., 2022; Pimienta et al., 2023). Most importantly, there is a clear relationship between the safeguarding of children's rights and the provision of high-quality educational environments, as education is inherently recognised as a fundamental right (Restiglian et al., 2023; Swist & Collin, 2017).

In this context, one cannot neglect the dimensions of the technology impact on children across homes and schools. Children are exposed to technology constantly even with this awareness, particularly when it comes to using digital applications (Rocha & Nunes, 2020). In France, a parents' survey (N=486) highlighted that 0-6 screen exposure had reported about half an hour to one hour during the weekdays and more than one hour to nearly two hours during the weekend (Akbayin et al., 2023). According to a study adopting objective measures (beyond self-report by parents) carried out in Australia, with 207 children 0-24 months, the children were exposed to about two hours a day. More importantly, children from families with higher education levels were exposed much less than toddlers in lower-educated households (Brushe et al., 2023). After the pandemic, technology use demonstrated to have significant impact on children's life and their psychological, physical, and social well-being (OECD, 2023).

In early education and care (ECEC) the liaisons between home technology usage and the ECEC system become apparent. However, there's much less attention on educational support to babies' and toddlers' families: all relate to a private space that might be nonetheless modulated easily by platforms commercial strategies (Barassi, 2019). Also, educators' views when utilising social media and educational platforms tend to be influenced by the families aspirations (Darnau et al., 2023) and medical discourse (Lupton & Williamson, 2017). Educators overall perceive themselves as being involved in a system that they may not necessarily align with, but they feel the pressure to implement technology-mediated “effective learning” (Jacovkis et al., 2022; Raffaghelli, 2022). In ECEC, specific individuals may exhibit enthusiasm and disregard for privacy concerns or data justice. Others experience a sense of being overwhelmed by datafication and platformisation (Restiglian et al., 2023). In this juncture, educators' professionalism can be deemed crucial to contrast the inequities and issues in screens' exposure, together with families (OECD, 2017).

This article aims to reveal the issues relating to quality, privacy, and data ethics in 30 frequently downloaded apps for toddlers. The study compares educational evaluation with public evaluation of such apps. We dig into educators' judgements on the actual quality of an app beyond its high usage and good evaluation. The findings are discussed in the light of parents' roles in shaping their children's media consumption and the educational response in this regard.

2. Background

The increasing prevalence and utilisation of applications designed for children between 0-6 is a noteworthy concern within the contemporary study domain (Barassi, 2019). This topic has garnered considerable attention at the local, national, and global levels, prompting extensive contemplation from pedagogical and educational standpoints (Jibb et al., 2022; Swist & Collin, 2017). Apps aimed at early childhood can be distinguished into several macro-categories based on their usage specificities and type of users (Bellacchi, 2021; Papadakis & Kalogiannakis, 2020).

Regarding the first conceptual node, the apps present a series of constitutive characteristics that pervasively shape childrens' experiences from early childhood onwards. It is to be considered that in an "onlife" society (Floridi, 2014), also toddlers' fundamental developmental activities, such as learning and playing, are going through a profound transformation, indissociably connected to familiarity with mobile devices and the availability of digital resources for learning through exploration, manipulation, and, above all, play. The widespread adoption and attraction towards these devices are related to distinctive concepts that characterize them, such as portability, convergence, and, above all, the possibility of an immersive experience in a responsive environment for both play and learning. This is made possible by touchscreen technology, which «enables direct manipulation of objects on the screen through the fingers of the hand, without intermediaries such as a mouse or keyboard (Dini & Ferlino, 2016, p. 148). It is a virtual space of experience characterized by immediacy, where a complex literacy process is not required to learn how to navigate it. Instead, acquiring a few "almost natural" manual inputs is sufficient to obtain stimuli and responses (Carbotti, 2015).

The effects have been considered initially extremely powerful. The direct manipulation of App content, convergence of action and perception at the same point on the screen has been viewed by some as a key driver of interaction and participation into key moments of the entire play and learning experience, promoting a personal construction of knowledge. This even includes computer thinking fluency, among other advanced cognitive skills (Papadakis, 2022). Nonetheless, the literature progressively moved to consider the relevance of educational support in such interactions (Jibb et al., 2022). In contrast to the creation of tangible games thoughtfully created and designed for the 0-3 age group, the amount of digital content of contestable quality already intended for use in early infancy is expanding gradually, as it has been demonstrated in the European context through a large transnational study (Livingstone, 2022).

For example, Antrilli and Wang (2023) comparatively explored the discursive-orientative stance of parents' and children's spatial reasoning in both a tangible material play context and a digital ludic framework. The findings supported a differentiated perspective, particularly highlighting the reduced parental involvement in digital experiences, including in linguistic terms, with a more reductionist-deictic shift in the discursive style. Parents' presence, the second node, is particularly entangled with the babies' and toddlers' digital safety and wellbeing, beyond their cognitive development. Extractive data practices carried out by several popular apps are more the norm than

the exception (Barassi, 2019; Jibb et al., 2022; Pimienta et al., 2023). Through a traffic analysis of data sharing practices among children's mobile iOS apps (N=25), Pimienta et al. (2023, p. 943) demonstrated that "shared user data with varying degrees of sensitivity outside the app (table 1). Almost half of the apps (44%, 11/25) transmitted at least one piece of data to third parties considered personal information under the European Union's General Data Protection Rules". Of particular concern is the fact that for 12 third parties contacted by the original child's apps, the Freemium models take the companies (to) "retain the right to collect, aggregate and commercialise de-identified end-user data; these software integrations allow developers to analyse how users navigate an app, features users find most engaging and provide push notifications to increase user engagement" (Pimienta et al., p. 944). Accordingly, an evaluation of 137 apps "expert-approved" showed that the apps were not sufficiently supported for the children to exercise their privacy rights (Ekambaranathan et al., 2022). Rigorously assessing the quality of Apps is hence emphasised by several studies, reflecting on the actual effectiveness of their educational potential and referring to the structural aspect of design (Radesky et al., 2022). Of particular interest in this regard is the research conducted by Crescenti-Lanna et al. (2019), which, through systematic observation of 200 apps used in the Catalan context for children aged 0-8, emphasises the inadequacy of a concept of child protection in technology use that is limited to reducing exposure to harmful content. According to the authors, there is a need to broaden the understanding of protection in a multidimensional, critical, and ethical manner, focusing on relevant topics such as the education and inclusion of digital resources and providing concrete tools for implementation.

In this perspective of the emerging need to cultivate responsible awareness of data privacy in the early stages of life, a bridge of convergence is created with the second conceptual node concerning adult figures. Parenting guides emphasize the need for guidance and support to caregivers in an environment that has been profoundly and rapidly transformed digitally, for their practices influence the children's safety (Beamish et al., 2019; Mascheroni & Siibak, 2021). In the specific field of Apps, as in the case where the focus is on the child, some studies target cognitive and socio-emotional processes, while others investigate caregiver's experiences in specific life experiences, such as pregnancy and motherhood (Barassi, 2017; Jibb et al., 2022). Common issues are data sharing practices and third-party information recipients in children's mobile apps (Barassi, 2020). Therefore, a particularly relevant topic from an educational standpoint is the debate on parental awareness in selecting Apps for their children. The literature emphasises caution in this regard, as the motivation behind such choices often stems from distraction, posing a risk of insufficient attention to the timing and content to which children are exposed. This situation started with social media usage and is still developing along with the increasing offer of Apps of all sorts (Ante-Contreras, 2016; Beamish et al., 2019). It is also relevant to point out that Apps can also encompass the phenomenon of sharenting, more commonly associated with social media and parenting (Barassi, 2019).

Finally, critical problematization also concerns the professional educational field. The debate on the value and effectiveness of new digital technologies integrated into nursery or early childhood education is a highly topical issue involving various professional figures, each contributing with their specific training (Ferranti, 2018). Apps can be adopted not only at home but also in early education settings (Restiglian et al., 2023). In this regard, the convergent understanding of problems and the concurrent collaboration between families and educators appears crucial.

3. Method

This article introduces empirical research carried out on a sample of thirty applications found in the *Google Play Store* frequently used by Italian households.

The main research questions were:

RQ1 - Which are the most frequent and appreciated apps adopted in early years (0-3) in the Italian context?

RQ2 - What is the observed educational quality of 0-3 apps that were positively evaluated by a public audience?

The questions were formulated within *Data Child Map* research project (<https://atachild.fisppa.it/>). This project aims at mapping datafication and platformisation in early years in Italy, bridging families and educational practices. Within this context, analysing or “benchmarking” the educational quality and privacy protection of 0-3 apps was considered a preliminary approach to actual practices and concerns by both educators (Restiglian et al., 2023) and families (ongoing study). The project unfolds around the educator’s role, whose professionalism is crucial to the development processes of formulating policies and regulations to control the negative impacts of technologies.

Data was collected on thirty apps within the Google Italian store. The choice of apps was based on the number of downloads, which had to be at least more than 100 and had to have 50 significant ratings. The apps selected included the possibility of being used by the children themselves and could easily be found in the category “children” in the age group “up to 5 years”. The exclusion criteria to sample the apps and narrow down the selection were:

- Oriented towards the care, learning, education, or edutainment of children;
- N of significant downloads (more than 100);
- N of significant evaluations (more than 50);
- Not oriented to work with disabilities;
- Apps used by the child/children themselves.

Two senior researchers, two doctoral researchers, and two student collaborators (MSc Level) worked on the instrument validation through three meetings of progressive analysis of the instrument’s dimensions. The empirical validation was carried out using interrater’s agreement, and a reliability analysis is introduced in the results. Annex 1 presents the instrument adopted, which has also been published as open data (Restiglian et al., 2023). The instrument was structured as a database where each app was placed as a case. Some relevant information on the apps was collected in columns 1 to 4 (Name of the application; Link to the online store, Downloads, and Public evaluation in terms of the ratings received from users, within a voting range from a minimum of one star to a maximum of five stars). Columns Fifth to Sixth analysed dimensions that fall under the competence of the educator’s evaluation. The value of learning, the educational value, the clarity of the information provided to the user on the app, the safety, the ethical use of collected data. Finally, the apps were “labelled” considering the type of application according to the analysis carried out: Edutainment, Education, Instruction, and Training. Apart from Table 1, examples of analysis and scoring can be found in Sartori (2023).

From the fifth to the ninth column, a Likert scale score from 1 to 5 was inserted, focusing on the assessor/researcher's agreement with the presentation of the dimension. It provides for entering: 1 to express total disagreement; 2 to express disagreement; 3 to express neither agreement or disagreement; 4 to express agreement; and 5 to express total agreement. Regarding the eighth and ninth columns, it is also necessary to read the privacy policy and terms of service, which can be found on the developer's website of each application, to identify the correct responses.

The applications collected from Google Play Store rankings in the 'up to 5 years old' category were downloaded, studied, and coded using the tool described above and used within the Data Child Map research project and built through researchers' co-design.

Data analysis was based on quantitative elaboration through descriptive and inferential statistics. The analysis was carried out using RStudio, which has been published as open data (Restiglian et al., 2023).

4. Results

In this section, we introduce the results of the analysis conducted on the thirty selected applications, according to the research questions.

4.1. Which are the most frequent and appreciated apps adopted in early years (0-3) in the Italian context?

Table 1 displays the mapped Apps. As the reader can observe, considering Figure 1 (Apps monitored per number of downloads), some specific Apps concentrated most attention and hence collected a higher number of public ratings.

Figure 1 shows that the caregivers download and assess more Training concerning Edutainment, Education, and Instruction apps. A Spearman's rank-order correlation was conducted to assess the relationship between the number of downloads and the number of public app evaluations. There was a strong, positive correlation between the two variables, $r_{(30)}=0.73$, $p<0.001$, suggesting that apps with a higher number of downloads tend to have a higher number of public evaluations.

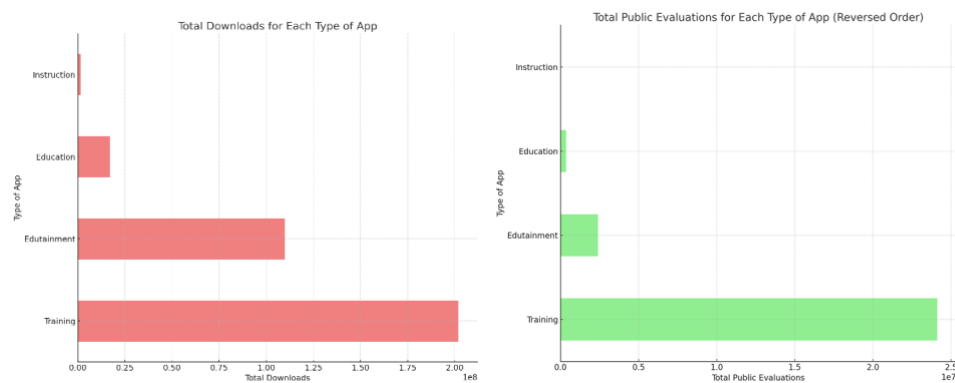
Nonetheless, we observe in Table 1 that the two applications with a high number of downloads (1 and 2) have quite different approaches to public evaluation. The hugely downloaded edutainment app (2) is relatively much more evaluated than the training ones. The effect phenomenon repeats for the edutainment apps 19, 21 and 22. In addition, the ten apps with more evaluations are the training ones, highlighting the different behaviour of caregivers that download these types of apps and the edutainment ones. Also, these last are mostly connected to videos and cartoons, so they are presumably more superficial and require less intervention from the adult to run. A Kruskal-Wallis test comparing the Type of Apps with the Number of Public Evaluations resulted in a statistic of approximately 9.57 with a p-value below the cutoff (<0.05), indicating that there are statistically significant differences in the number of public evaluations ("N_PublicEval") across different types of apps ("Type of App"). Digging deeper into the relationships that provoke this result, we observe that Edutainment and Training might influence the result, but no significant results were found through post-hoc analysis. In any case, there is a general effect where some apps get more evaluated than others, and the descriptive statistics confirm this element.

Table 1
Sampled apps

Name	Type	Download	N_PublicEval
Learn & play by Fisher - Price	T	5 Mln +	22.900.000
YouTube kids	EdT	100 Mln +	2.380.000
Pianoforte per bambini Musica	T	100 Mln +	609.000
BetterSleep: Sleep tracker	E	10 Mln +	334.000
Giochi da bambini di 2-4 anni	T	10 Mln +	222.000
Baby phone for Toddlers Games	T	10 Mln +	118.000
Baby Games for 1+ Toddlers	T	1 Mln +	69.600
Coloring Games: Color & Paint	T	50 Mln +	61.700
Easy games for kids 2,3,4 year	T	1 Mln +	28.300
Giochi per bambini da 1 - 5 anni	T	10 Mln +	28.100
Forme & Colori per bambini	T	5 Mln +	24.000
Balloon Pop: gioco per bambini	T	1 Mln +	21.300
Giochi Prescolari per bambini	T	5 Mln +	15.600
Miffy's World	E	5 Mln +	14.800
Prime parole per il bambino	T	1 Mln +	13.500
Sogni d'oro	E	1 Mln +	11.700
LEGO DUPLO Connected Train	T	1 Mln +	6.800
Kids paint	E	1 Mln +	5.740
BabyBus TV	EdT	5 Mln +	4.706
La fantafattoria	T	500.000 +	4.292
RaiPlay Yoyo	EdT	1 Mln +	3.360
Cartoonito App serie e giochi	EdT	1 Mln +	2.842
Giochi per l'asilo	T	500.000 +	2.280
Pinkfong 123 Numbers	I	1 Mln +	2.180
Dolce Negozio di Baby Panda	E	1 Mln +	1.530
Finger Paint Coloring Book	E	1 Mln +	1.300
Squishy slime DIY per bambini	E	500.000 +	1.260
My 1st Xylophone and Piano	E	500.000 +	1.250
Sago Mini Apartment Adventure	I	500.000 +	1.080
Giochi educativi per bambini	T	1 Mln +	599

Note. E=Education / T=Training / EdT= Edutainment / I=Instruction

Figure 1
Types of App monitored by number of downloads and number of public evaluations



Applications with a high number of downloads do not always display high public ratings. Therefore, although applications have a high number of downloads, they are not always considered the best in the market. We converted the variable of Downloads into a categorical variable of three (3) levels: Low (0 to 1 mln downloads), Medium (1 mln to 50 mln) and High (above 50 mln). A Kruskal Wallis considering these levels did not yield significant differences between such levels and the public rating. This is also relevant information, which signals that rating occurs randomly, independently of the initial interest that leads users to download the apps.

4.2. What is the observed educational quality of 0-3 apps that were positively evaluated by a public audience?

This research question led us to delve into the categories of quality, considering problems in searching for information relating to security and ethical use of data. To answer this question, we compared the public evaluation (as scores given by the public) and the educational evaluation. Later, we also explored the specificities of the educators’ perspective by comparing internally the educational evaluation of several apps. Table 2 introduces the descriptive statistics for public and educational evaluation. As a note, and delving into the open data, we can observe that apps with the highest number of downloads did not display easily accessible information on privacy and data handling within the Store or on the developer’s site, getting relatively low scores. The developers, hence, on purpose or not, do not offer the possibility to parents who deem it necessary to understand how their own data and those of their children are handled. Table 2 and the successive Figure 2 and Figure 3 show quite evidently that the public evaluation differed from the educators’ evaluation. Regarding the educational evaluation, it is observable that the lower values on categories such as Safety and Data Ethics compared with the importance given to the apps to learn (most training apps) and promote education (more connected to educational apps).

Table 2
Statistics

Variable	Mean	SD	Min	25%	Median	75%	Max	Skew	Kurtosis
Public evaluation									
Public_evalscore	4.27	0.42	3.45	4.08	4.35	4.55	5.0	-0.52	-0.37
Educators evaluation									
Total	3,35	1,02	1,74	2,69	3,34	4,14	4,98	-0,03	-0,49
ValueLearn	3.8	1.03	2.0	3.0	4.0	5.0	5.0	-0.38	-0.95
ValueEd	3.53	1.11	2.0	3.0	4.0	4.0	5.0	-0.09	-1.29
InfoClear	4.27	0.78	3.0	4.0	4.0	5.0	5.0	-0.52	-1.15
Safety	2.43	1.1	1.0	2.0	2.0	3.0	5.0	1.17	1.06
Data_Ethics	3.03	1.03	1.0	3.0	3.0	4.0	5.0	-0.27	0.08
ValueLearn2Ed	4.22	0.67	2.19	3.95	4.26	4.69	5.0	-1.00	1.43
ValueEd2Ed	3.44	0.94	1.83	2.85	3.31	3.98	5.0	0.24	-0.83
InfoClear2Ed	3.6	0.65	2.36	3.07	3.64	4.04	5.0	0.02	-0.41
Safety2Ed	2.64	1.45	1.0	1.04	2.5	3.91	5.0	0.31	-1.31
Data_Ethics2Ed	2.58	1.43	1.0	1.0	2.7	3.75	4.75	0.19	-1.51
Cohen’s Kappa	ValueLearn and ValueLearn2Ed: 0.211								
	ValueEd and ValueEd2Ed: 0.444								
	InfoClear and InfoClear2Ed: 0.615								
	Safety and Safety2Ed: -0.111								
	Data_Ethics and Data_Ethics2Ed: 0.643								

We analysed reliability since we collected data from two educators assessing the apps. We considered two measures in this regard. The Kappa scores represent the agreement between the original and second evaluation for a sample of apps (6 over 30). The scores suggest a moderate to substantial agreement for most variables, except for Safety, which indicates a slight disagreement between the two raters. Cronbach’s alpha for the variables ValueLearn, ValueEd, InfoClear, Safety, and Data_Ethics is approximately 0.687. This suggests a moderate level of internal consistency among these items on the scale.

Figure 2

Comparison of public evaluation scores and educators evaluation

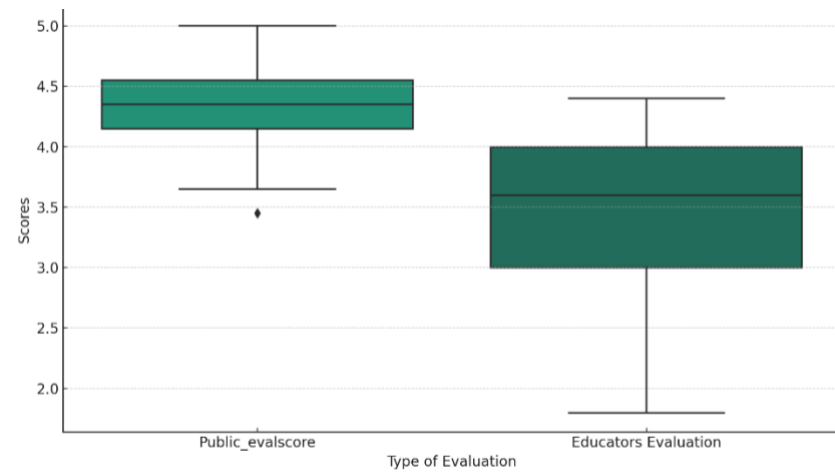
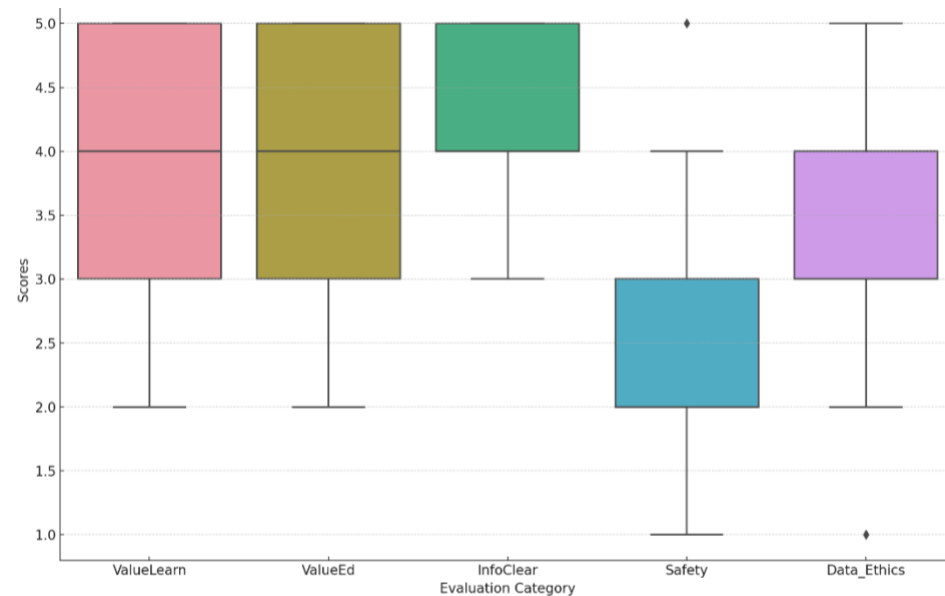


Figura 3

Comparison of evaluation scores by category



A Wilcoxon signed-rank test indicated that the scores for "Educators Evaluation" (Mdn=3.6) and "Public_evalscore" (Mdn=4.35) were significantly different, $T=20.5$, $p<0.001$.

We followed this analysis with a Friedman test to compare the median scores of ValueLearn, ValueEd, InfoClear, Safety, and Data_Ethics. The test revealed a statistically significant difference in the scores, $2(4)=43.06$, $\chi^2<0.001$ $\chi^2(4)=43.06$, $p<0.001$, indicating that at least one of the variables differed significantly in terms of

median score. Post-hoc analyses using Wilcoxon signed-rank tests with Bonferroni corrections revealed significant differences between the Safety scores and both ValueLearn scores ($p=0.0061$) and InfoClear scores ($p<0.001$). Additionally, InfoClear scores were significantly different from Data_Ethics scores ($p=0.0012$). This allows us to affirm that despite the value assigned for learning or achieving skills, and even in cases of more or less accurate information on the app's functionality, Safety is disregarded. Also, the information, mostly connected to motivational aspects to catch the caregivers' attention, can be given, but Data Ethics is not particularly curated or informed.

5. Discussion

Our analysis yielded two relevant effects in response to the RQ1 and 2. Firstly, it was observed that caregivers' preferences went toward apps related to skills development and, in second place, to edutainment. Though this could be interpreted as a focus on child development, it might also signal a significant concern about "skilling" kids into lifelong learners. As Biesta already pointed out, there is a political idea of lifelong learning and the individual effort to upgrade skills continuously. As he puts "[...] the language of learning is not an innocent language but actually, a language that exerts a powerful influence on what we can be and how we can be, one that tends to domesticate rather than to emancipate" (Biesta, 2015, p. 64). In addition, we got results that point to somewhat arbitrary behaviour when rating the apps. One could interpret this result as a huge motivation to provide advanced training to raise skilled babies using interfaces, dashboards, and analytics provided by Training apps. But later on, no clear appraising of such apps occurs. One cannot but recall Lupton and Williamson (2017) claims on the deep connection between "evidence-based" statements on child development through an operation of "biocodification" that is further strengthened by quantification and digital analytics. Several studies report that parents are concerned about their children's development. Children's development through digital technologies into early life to improve skills is a consolidated strand of literature (Papadakis, 2022). The apparent science of child development could dazzle parents, for they simply respond to a "politics of learning". Apps that support training and skills development might have relevant levels of acceptance given the fact that they stick to a myth of technology as a source of a good future for kids (Suárez-Guerrero et al., 2023).

Adults' low critical data literacy is also a concern. Barassi (2017, 2019) highlighted the lack of deep understanding by the adults of problems connected to data as a first issue. However, a rather distracted and sometimes selfish (for example, in the practices of sharenting) approach of parents/caregivers regarding the newborns, babies, and toddler's digital footprint cannot be neglected, as Barassi elucidates (2017). This result is not particularly supported by Mulcahy and Savage (2016) in their interpretative phenomenological study over 15 deep interviews. They found that mothers are behind growth or development problems (Mulcahy & Savage, 2016, p. 335). However, uncertainty follows while trying to make sense of their children's problematic experiences or outcomes. On these bases, we assumed that the high public rating given to an application could be deemed questionable. However, ratings have a positive effect on parents' willingness to adopt an app. Our findings highlight at this juncture that digital technologies are being selected with little guidance and probably unawareness of the possible outcomes over their own child's future life. Nonetheless, we did not directly observe the parental control or decision-making process. Therefore,

our data must be taken *cum grano salis* as a potential situation that requires further investigation.

As for the second question, we observed that the public evaluation was discordant with the evaluation conducted by professional educators. This result stems from comparing overall public evaluation, which elements we don't know but infer, given the data raised. Rating an App can occur in several situations, being the type of judgement extremely superficial or based on good evidence collected from the GooglePlay Store and the App information. Instead, the educational evaluation was based on an analysis of four relevant dimensions explicitly supporting the final rating. The reliability was acceptable but not exceptional, displaying the difficulty of getting the relevant information on the Apps selected to proceed with the evaluation. Although the categories were ambiguous, they were discussed and analysed in practice (Sartori, 2023). This approach could be criticised given the different types of dimensions connected to the rating provided by caregivers and educators. Nonetheless, the massive number of cases collected as ratings for the apps supports the possibility of including and representing the several parental/adult approaches to rating the Apps.

Out of this exercise, and considering RQ1 results too, we observe that the parents/caregivers selections might not be rational. The educators' systematic ratings demonstrated how a reasonable evaluation spots safety and data ethics from one side and relatively low informational clarity from the other.

The safety dimension is related to advertisements or pop-up messages that may prompt children to proceed with inappropriate online financial transactions without parental supervision. Or intrusive systems that encourage the child to use the device excessively, such as, for example, the use of too bright colours or lively music that makes the child entertain themselves for a long time in front of the screen and become almost addicted to it. Our finding on digital safety is consistent with the literature (Jibb et al., 2022; Pimienta et al., 2023). Our focus on Italian apps makes clear that, at least in Western societies, the parental approach and problems relating to children's safety and privacy have common ground.

Regarding the ethical use of the collected data, applications received low marks when there were difficulties in identifying clear information regarding the safety of children, how the data are stored, and how they are used once collected. Some apps even claimed openly to collect user data to share with third parties but did not specify who these third parties are, as there are no references to them. This is what Pimienta (2023, pp. 943-44) found in the study with a higher number of apps (>200) in Spain. We could expect that despite the GDPR, the public audiences are still not well-educated enough to protect their children from the widespread usage of apps, particularly entertainment videos. If we consider that the market is also pushing for the overall use of AI-based toys (Su & Yang, 2022), the concern about children's data collection and monetisation in the early phases of life increases (Barassi, 2019).

Our response to RQ1 and RQ2 altogether allows us to argue that though most apps claim to bring educational, training, and skill-building benefits to children, the lack of clear statements and information around safety, data collection, and processing is a concern. This is even more troubling in light of parental erratic behaviour regarding apps and digital resources their children consume. Becoming a digital citizen in such a context is highly problematic, for the youngest people never control or decide the type of data circulated to third parties that might be used in the future (Gruber et al., 2022).

In such a situation, parents cannot be left alone. Apps' developers should be regulated, and each app should make clear statements on data collection and safety. This would ensure a safe user experience for kids in their early years. Nonetheless, the responsibility for app usage cannot be put solely on developers. Parental education and prompt educational intervention are crucial. Educators have better resources to assess apps, though it is not easy even for professionals to reach the key information, as we observed through our data.

6. Conclusion

Our research, based on the analysis of apps, brought to light some critical issues regarding the use of technology consumption within families. Specifically, our focus was on the use of digital apps by parents, which was subsequently proposed to children in early childhood. Applying a tool created in the context of our project, the team of researchers carried out a thorough analysis of 30 applications available in the Google Play Store and dedicated to pre-school children. The main characteristics of the apps were analysed by the experts, who subsequently gave them a score from 1 to 5 relating to: value for learning in pre-schooling years (0-6), educational value, clarity of general information, security, and ethical use of collected data. For the selection of the apps to be analysed, the number of downloads and the ratings received from users were considered, to examine the apps that are currently most used by parents and children.

Consistently with the international literature, we highlighted how, in the Italian context, technological development is exposing early childhood to considerable risks mainly related to tracking, data collection, and violation of children's privacy by companies and developers of these tools. The results of the research address the issue of the unconscious use of technology, highlighting how there is still little knowledge at the societal level concerning both the actual use of personal data in apps and the negative effects that the use of technology can cause in children, especially in the 0-6 age group.

Technology usage in the early stages of life has been deemed important in the academic space, but only recently at a social level (OECD, 2017). Only the pandemic has raised concerns and led the research to focus on the entanglements between parents' education, media consumption, and early childhood screen exposure (Ante-Contreras, 2016; Mascheroni & Siibak, 2021). The results of our research, relating to the public evaluation of apps, point to a focus from parents/caregivers that is placed on entertainment and probably on the aesthetic and interaction elements. This behaviour feeds the platformisation and monetisation of children's data, with unintended consequences. Safety and privacy, we argue through our study, are elements that are neglected and most often communicated in an unclear manner. This results in adults unknowingly handing over their data, especially their children's biometric and sensitive data, to applications (Barassi, 2019).

Moreover, the announced educational or edutainment goal gets contested. Meyer et al. (2021) report that apps are often marketed as 'educational' within online stores and thus advertise learning about a wide range of basic skills, including counting, reading, and object recognition. However, these apps contain advertisements that convince children to watch videos in exchange for 'gifts' (Sartori, 2023).

These kinds of messages can sometimes create discomfort for the child watching them because they cannot respond appropriately to their situation (Khalaf et al., 2022). Suppose parents base their choice of apps on the appearance or casual opportunity provided by an app and do not focus entirely on understanding and even participating

in the apps' quality (through rating, in our study). In that case, we cannot expect an excellent panorama to evolve for the digital citizenship of very young children and adults. Research on parental-child interaction and overall adults' data literacy needs to be investigated to understand how families are "protecting themselves" and resisting in the case of a baby/toddler at home.

Not surprisingly, we observed that the app's superficial information, focused on attractive aesthetics, says little about the security and privacy of its users. Aesthetically beautiful apps entice parents to download and submit them to their children. These apps, however, once downloaded, have almost obligatory terms and conditions to accept upon registration. Otherwise, they cannot be used. According to Barassi, the adult caregiver is not always able to read or comprehend these terms fully. This is a severe problem since it is precisely at this stage that the fundamental information on data processing is given. Individuals indeed fail to recognise or feel helpless about the fact that they are being subjected to profiling, as data is gathered covertly without the user's conscious acknowledgment.

Moreover, it is not only a matter of understanding the terms and conditions of use. As Meyer et al. (2021) stated, the number of apps that spring up daily in online stores is unreasonable, and consequently, there is intense competition between developers. This leads, also on the part of experts, to a lack of control and a lack of possibilities in evaluating apps and their quality. It is, therefore, essential to pay close attention to the application one downloads because, within the stores, one can also find unregulated and untested applications. Indeed, as demonstrated by the conducted research, applications garnering a large number of downloads fail to perform optimally and do not consistently receive favourable evaluations from the general public.

The importance of the role of specific professional figures emerges from this panorama. Educators, for example, are specialised professionals who accompany children towards progressive democratic participation and the acquisition of awareness of being bearers of rights. Due to the technological world we live in, their role is crucial for creating educational action. The research results revealed essential elements regarding educational needs and children's right to protection from the use of apps. This means that education professionals can support parental action by offering advice and good practices for developing technology education. It is essential to start from the beginning to create technological awareness, involving children and families to using technological devices correctly. Fundamentally, educators, as professionals, must feel competent to understand how platformisation and datafication can be interwoven into school documentation, thus protecting children's rights (Restiglian et al., 2023).

Initial and continuous training of educators on privacy can lead educational and school teams to develop a greater awareness of freedom and respect for the child. As of 2018, in Italy, regulations exist to define the initial training of nursery educators (0-3 years' old children) through a Bachelor's degree with a substantial number of credits in early childhood-related subjects and a mandatory internship. Unfortunately, this type of education rarely touches on the issues of data privacy, monetisation, algorithmic injustice, and so on. As this project focuses on the Veneto Region, it is not yet common for specific courses to link technology and paperwork about the European document GDPR, or General Data Protection Regulation (Restiglian et al., 2023) to be taught.

Educators demand policies, guidelines, and adequate training to best perform their tasks as mediators between the technological world and the world of children. It is, therefore, necessary to work at the government to generate spaces for educators' reflections on privacy issues and the proper use of technology. On one side,

universities could include these issues in the Bachelor's degree, but this should be sustained by joint work with the regional government to generate spaces for in-service educators' reflections on privacy issues and the proper use of technology. Through systemic policymaking and practice within the ECEC system, educators might encounter and support families' decisions instead of being overwhelmed by them as "customers". Parents and education professionals facilitate children's understanding and self-control to promote digital well-being in later life. However, their focus might be frequently focused on the "techno-enthusiastic" approach to app usage. It may be time to incorporate a critical perspective on the potential hazards of improper technology use concerning ethical concerns, security, and privacy. Families with lower education and potentially lower digital literacies particularly need support. The effort must go toward acknowledging quality by design around the child's rights to privacy.

In addition, attention should be paid to the formulation of regulations to be made mandatory for developers and companies that collect children's data, and then checking whether the rules are respected by carrying out checks with qualified personnel. Only through a joint, participatory effort from all as digital citizens will we cherish the children's future digital citizenship beyond datafication and platformisation.

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Annex 1. Instrument adopted for data collection

Variable	Description	Assigned Values
Downloads	N of downloads reported in the app store.	Number
Public Evaluation	Score given by the app store against the app.	Score [as per site]
Type of App	Type of App Edutainment – Amusement and joyful distraction with some educational or instructional purpose Education – Supporting daily habits, good mood, collaboration, self-control Instruction – Achieving literacy or numeracy. Training – Developing cognitive skills	Select Category
Learning Value	Promotes cognitive development (memory, attention, thinking, language) or motor development (prehensile skills, fine motor skills, walking, etc.); may include aspects related to the development of individual creative skills or through collaboration with adults	
Educational value	It promotes the development of awareness about the quality of life and self-care as children, as parents, as educational professionals; about the environment, participation, and social relations, as well as cultural and human values (promotion of a culture of childhood).	Likert scale 1-5 focused on the assessor's agreement with the presence of the dimension
Informational Clarity	It includes general indications congruent with the proposed functionalities and displayed in tutorials. The presentation is pleasant and appropriately underpinned by text or scientific materials.	
Safety	Children can use the app without adult guidance. It does not urge the child to proceed with online financial transactions (of any kind). It does not contain elements interrupting the flow (e.g., pop-up messages, advertisements). Does not use invasive recommendation systems to entertain the child or encourage them to use the app abusively (too much exposure time).	1 - Totally disagree 2 - Disagree 3 - Neither agree nor disagree 4 - Agree 5 - Totally agree
Data Ethics	Provides advice to parents/caregivers on using the app in contexts or at times that might be inappropriate or even risky for the child. Informs parents about the child's progress (e.g., via e-mail). Does not use intrusive recommender systems to entertain the adult or lead them to use the app abusively (too much exposure time). It has systems to alert or block notifications or information	

perceived by the user as intrusive or stressful. Also, the application explicitly states to parents/educators the policy for handling personal data. Data does not go to third parties whose use is unclear (profiling for commercial purposes). It does not allow the export of private information (files, photos, images, etc., including via screenshots) or use of connections with external apps (mainly social media) where data could circulate without user control.

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