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Conceptual Paper

The Use of Algorithms to Target Children while Advertising on YouTube Kids Platform: A reflection and analysis of the existing regulation

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ABSTRACT

This paper examines how the YouTube Kids application uses children's data and behaviors to publish advertising and to recommend videos through algorithms. The use of internet environments by children is a subject that has been widely discussed. The European data protection law defined a digital age of 16 years in the last revision, with the possibility of adjusting for up to 13 depending on each country's decision. However, it does not discuss specific rules about the use of algorithms and predictive models with users below the 'digital age'. The minimum age for using conventional YouTube is 13 years, and YouTube Kids' privacy policy makes clear the use of data and behavior for content display. Based on this context and supported by important references in social studies, this article seeks to understand and discuss this topic and analyses the risks of using children's data by companies, whether for advertising or service purposes and to open a relevant discussion about state participation in regulation and control when this target is involved.

Keywords: Children; marketing; advertising; YouTube Kids; YouTube, algorithms; data

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1. INTRODUCTION

When studying the fundamental items that compose communication strategies for children, we identify several points adapted for this specific approach. An example of that is how preschool teachers have completely different learning techniques comparing with high school teachers. This also happens when we analyze music, games, words used in conversation, facial expressions, and other situations directed to that specific public.

Advertising wouldn't be any different. However, when we talk about how an advertisement can influence a child on making decisions, and how fragile it is when this 'influenced decision' involves a purchase, the discussion rises to another level and reaches besides a simple adaptation of language. It is necessary to watch, follow, and respect the cognitive steps of human development and the capability owned by this interlocutor to differentiate what happens in a marketing campaign from what happens in the real world.

Simultaneously, we are living a new moment of advertising technologies, through intelligent algorithms that learn from human behavior and "humanize" marketing, making recommendations appear "magical", or natural. In this scenario, advertisements do not look like marketing actions anymore but seem to be a customization concern from companies. An adult person feels great on being treated as unique by a company, but, is a child capable to differentiate this kind of approach?

Besides the musical recommendations from Spotify, the posts we see on Instagram, and, last but not the least, the videos recommended by YouTube, a new advertisement tool appears: "The Influencers". On their channels, they make these recommendations appear personal tips based on their own experience. An example of that is the toy review channels, clearly sponsored by the toy industries, with 1 million views daily,

which has as their main public, the infant audience (Burroughs, 2017). This is the moment of advertising that is not easy even for adult people to distinguish between publicity and reality in many cases (Lou & Yuan, 2018), then how can we expect this from children?

This work is focused on analyzing how data-driven marketing strategies are using children's internet behavior to advertise and how they could influence children's health on the internet unless they are protected by privacy policies. Considering the significant process, since the cultural and social building of children as consumers and advertisement targets until this moment, when they became data, this article will probe on tree main study points that will base its narrative. The first one is a look at advertising changes for children audiences after the arrival of new technologies. In a second topic, we aim to understand the video recommendation system and the algorithms used on the YouTube platform. In a third moment, we will discuss the current scenario of YouTube and children's data. Finally, we will contextualize these three points with the regulatory policies on Europe.

The goal of this work is to provide a relevant discussion and food for thought about how children's data has been used to compose algorithmic recommendations on YouTube and in which ways privacy policies in Europe are dealing with that. The choice for analyzing YouTube's recommendations is related to the highly participative relation between this platform and the young children public, and the economic relevance of that relation for YouTube's profitability (Smith, Toor, & Kessel, 2018).

To pursue such objective, the paper presents an extensive literature review that examines a series of previous studies that contextualize the relationship between children and the advertising market before and after the internet, and understand what is been discussed about children's data in the scientific branch. Besides that, it will help to understand how advertisement and recommendation machine works through Google's description of the neural networks for YouTube's recommendations.

After that, a critical analysis of official documents is promoted, such as the General Data Protection Regulation (GDPR), to understand how regulation consider or not the use of children's data in recommendation algorithms, and the UNICEF documents about children's protection on internet and YouTube's privacy actions and policies.

Also, the recommendation analysis purposefully does not separate YouTube from

YouTube Kids, firstly because YouTube still has a representative infant public and infant channels currently making millions of views inside the platform, and secondly because the "motor" system for recommendation is the same for both platforms.

2. STUDIES IN CHILDHOOD, ADVERTISEMENT, AND DATA

The concern about an advertisement for children's audiences is not a new topic. These open discussion that used to go until the broadcast media (and how television would or would not transmit toys advertisement, for example) is now raising to another level, when the internet is the main tool used by children, and they have their mobile device fully independent from parent's supervision (Walker, 2018). It happens because childhood is a fragment of a lifetime in which different moments and theories must be considered (John, 1999).

Starting with the definition of what is children and childhood, classic studies in infant psychology offer several kinds of sub-classification of childhood, depending on if they are been analyzed upon social or cognitive aspects. John's research (1999) had finally analyzed children as consumers, and proposed a new classification based on consumer socialization. His study defined the age of 3 to 7 as the age of perceptual stage, when children became capable to distinguish an advertisement from a program, then starts the age of analytical stage, that happens from 7 to 11 years old and are defined by the capacity of understanding a selling intent, finally, they begin the reflective stage, from 11 to 16 years old, with the capability to figure out a persuasive intent (John, 1999).

In terms of advertisement, numerous authors have been discussing children-advertisement relations and the right ways it would or would not be made for them. The Nairn & Fine reflection (2008) brings different points of view together and challenges them. According to their paper, some researchers believe that advertisements for children must be adapted for each moment of consumer socialization steps, as mentioned above (Nairn & Fine, 2008), other believes that there is no difference on children's capability to defend themselves from advertisement influence among the ages (Nairn & Fine, 2008). But recent studies found out that the marketing adaptation for each moment of cognitive evolution is worse for children because, the most companies adapt their communication, the most implicit will be the advertise and children will not be able to identify it, and make a rational decision about that (Nairn & Fine, 2008). That is exactly what happens when children are exposed to YouTube's influencer "tip", or YouTube's recommended content with implicit advertisement added, as we will see in

the following topics.

Bringing the advertisement and childhood concepts to the internet world, researchers diverge about the children's place on the internet. Some theorists assume that childhood is a vulnerable moment of life and children need to be protected from the internet risks, other studies have another view in which children could be competent and creative. (Livingstone, 2011). For Buckingham (2000) children have been constantly underestimated and controlled by adults, and that is why they seem to be incompetent. The author also says that if children could be encouraged as competent individuals they would be so. (Buckingham, 2000).

When we identify and consider the changes that the internet brought for children's daily life and the new marketing strategies based on targeted communication, the discussion may consider the dispositive and technological changes: from broadcast to the internet, from the internet to mobile(Campbell, 2016). Campbell worked on a comparison between the traditional broadcast media and the internet, her study defines the capturing of user's digital behavior information, and its recording in a database, as one of the most crucial changes brought by internet and social media (Campbell, 2016). Everything became trackable, since the location, login information, websites visited, and lots of other information that is constantly used to locate and analyze users by companies (Tallow-Golden, 2016), and, of course, to advertise. This is a new scenario for all audiences, that arises new concerns related to the privacy of every user audience and become more serious when we talk about children.

Studying the persuasive content for children on YouTube, Walker (2018) analyses exactly this change, from the analysis of television advertising to the new more complex scenario of the internet advertisement. According to her analysis, the concern about advertising is growing up in the same proportion that emerges new kinds of online promotional content, with internet and social media platforms (Walker, 2018).

> "This includes, but is not limited to, videos posted and viewed on social media networks such as Facebook, Instagram, Twitter, and YouTube. Social network platforms like these are both easily accessible and filled with content that may not be suitable for preschool-aged children. (Walker, 2018)

One of these new ways to advertise is called "programmatic advertising"(Silveira &

Morisso, 2018), and allows companies to run advertising campaigns using captured information of the client's behavior on the internet, with the support of technology (algorithmic analysis and data segmentation, for instance). Silveira & Morisso (2018) defines the programmatic advertisement as an intersection of user data through which advertisements will be automatically shown (Silveira & Morisso, 2018). The authors also complement that the sources of these data can be purchased from a kind of "data commerce" (Silveira & Morisso, 2018). The consequence of that is an optimization of companies' marketing budget, by calculating the right target for their campaigns (Silveira & Morisso, 2018), which means the right people at the right time, with no control about target's age.

The mobile 'age' of the internet brought another moment and new concerns about the children's relation with that (Mascheroni & Cuman, 2014). The report "Net Children Go Mobile", shows that the diffusion of mobile media diversified locations and devices, and children accumulated the mobile as a new kind of technology (Mascheroni & Cuman, 2014). Besides that, children opened their range of communicative possibilities, and the type of people they could establish engagement and sharing (Mascheroni & Cuman, 2014). In other words, they associate the communication by a mobile device with a rise of opportunities for communication, making them believe that the smartphone can make them more sociable (Mascheroni & Cuman, 2014).

The prominence of social networks influenced the rise of the "Social Influencer" character. Lou & Yuan (2018) defines the "influencers" as personalities across social media platforms, such as Instagram or YouTube, that influence a large number of followers, with no ties to the great media and communication channels, and who share matters of their interest.

> "Contrary to celebrities or public figures who are well-known via traditional media, social media influencers are "regular people" who have become "online celebrities" by creating and posting content on social media" (Lou & Yuan, 2018).

Among children, social media is even more diversified than among adults (Mascheroni & Cuman, 2014), and they are open to be influenced by their friends (Costa, 2014). Costa (2014) explains, through her research, that the relationship of the younger with the internet is connected by two main aspects: the first one is identity and the second one is familiarity, which means that they choose the social network influenced by their

friends or friends of their friends (Costa, 2014).

So, what could happen if an "influencer", that seems to be his/her followers' friend, suggests a brand or a product? The Social Influencer unites all concepts mentioned until now: 1) the implicit advertisement for children, 2) the internet tools, and 3) the influence of friends. Using that, the influencers became an advertisement tool, and opened an even more personalized way to target and advertise for companies.

According to Campbell (2016), a digital influencer has enormous persuasive power and credibility from the public. Their 'authentic' behavior allows an advertisement to seem like a simple personal 'opinion' or 'tip'. Google itself shows results that put the 'YouTubers' as interlocutors with more credibility than traditional celebrities (O'Neil-Hart & Blumenstein, 2016), and openly encourages companies to invest in YouTube digital influencers, justifying with their high increasing sales power.

As we are going to detail in the following analysis, despite that encouragement to influencers sponsoring, YouTube does not consider influencers as advertising on its privacy policy (Google, 2019c), which means that even if parents pay the premium subscription, hoping to protect their children from ads while watching videos on YouTube Kids, they could not avoid advertisement inside the influencers' videos, for which YouTube is not responsible, according to its privacy policy (Burroughs, 2017).

We are living exactly this moment when privacy rights on internet are being discussed and regulated around the world, willing to ensure a healthy and respectful treatment of the consumers' data, captured by companies and regulate how they should work (or delete) people's data, especially when the target is a child, which until the age of 12 years does not have the same cognitive ability to identify what is information and what is an implicit advertisement (Tatlow-Golden, 2016).

The Smith and Shade's (2018) work defines as "digital playgrounds", these digital places where children are virtually interacted, through which children's data collecting and processing grows, and contributes for a commercially relevant children's information set building (Smith & Shade, 2018). According to their research, since advertisement joined these "playgrounds" apps, they began to be shaped by Big Data strategies "configuring family dynamics, escalating marketing techniques via data-driven advertising techniques like programmatic advertising" and children's privacy rights started to decrease (Smith & Shade, 2018).They also describe five issues related

to the use of children's data which deserves to be fully cited here:

> "First, parents are tasked to act as data proxies and supervisors for their children. Second, personalization of interactive experiences is positioned as a benefit for children and parents as end-users who disclose data. Third, promotional culture and advertising are tied to data disclosure in digital playgrounds. Fourth, the algorithms that power digital playgrounds remain opaque for parents. Fifth, there are patterns in data stewardship for digital playgrounds that parents, or other interested parties, may wish to examine." (Smith & Shade, 2018)

All these options of data captured from internet users configure the Big Data, which Montgomery (2015) defined as a "fire hose of data", through which all actions of users, online and offline are stored. That happens because Big Data unites digital sources, such as social media, transactions, surveys, and Internet Of Things (IoT) sources, from the physical technologies, such as mobile phones, sensors, or chips for example (Opher, Chou, Onda, & Sounderrajan, 2016).

Going from a more optimistic point of view, Montgomery (2015), analyzed the good consequences of using children's data with Big Data analysis, such as personalized learning and opening cultural experiences, providing for children greater sense of responsibility, more engagement and free growth, far away from the traditional media (Montgomery, 2015). According to her study (2015), Big Data is changing the way media and other areas of a child's life seem. "For example, a mobile phone is already a personal viewing device, a gaming platform, and a link to a child's social world." (Montgomery, 2015)

All these new options of media on the internet, when brought to the discussion about children's advertising, changes how it should be monitored and regulated. It is not anymore just about a child seeing or not an advertisement, it's about targeting, analyzing, predicting and suggesting products for kids, based on their behavior on the internet, and without being sure if there is or not an adult supervising their navigation (Smith & Shade, 2018).

3. HOW YOUTUBE'S RECOMMENDATION WORKS AND THE CONSEQUENCES ON CHILDREN'S INTERNET EXPERIENCE

Burroughs (2017) defines advertising on YouTube basically through two strategies: the first one is introducing little ads pauses inside the videos, commissioning the video creators for each visualization, and the second one is a system to promote these videos, through automatic recommendation, using behavior and rank algorithms (Burroughs, 2017). According to his study (2017), algorithms are social-technical formulas or codes inside an infrastructure, that combines data information and processes user's preferences. The author features a high level of truth associated with an algorithm result:

> "Much faith is placed on the validity and legitimacy of algorithms to impact the decision making of audiences and consumers. Scholars speak of "power through the algorithm" (Beer, 2009; Lash, 2007), especially through recommendation algorithms and social networking sites." (Burroughs, 2017)

These recommendations seem to work above a positive feedback model (Rosa, 2016). As specified by Rosa (2016), positive feedback is a principle of circular causality according to which "the cause" and "the effect" of some behavior inside a system become one unique whole. In other words, "the cause" become de "the effect" of which was before its "effect" and now became its "cause". That concept can be used to illustrate YouTube's strategy of recommending the videos that are most popular already (Smith et al., 2018), increasing the audience of ads and consequently their profitability.

The Pew Research Center's (2018) team analyzed precisely how the YouTube recommendation system uses algorithms to improve advertising results. They found out that its, system encourages users to progressively watch longer and more popular content. The figure shows how the recommended video duration grows progressively (Smith et al., 2018).

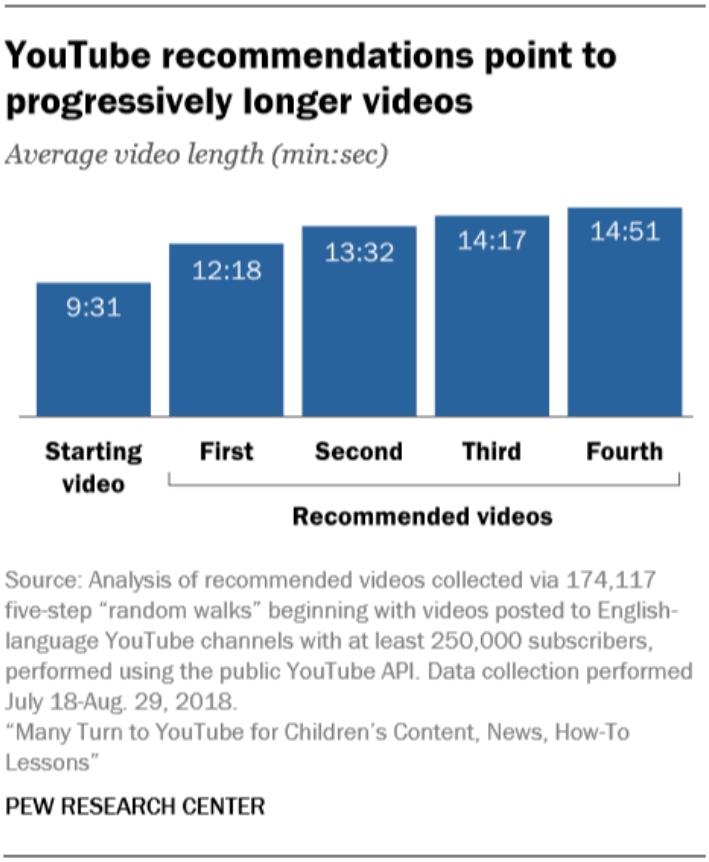

Figure 1 - YouTube recommended videos per order of recommendation (Smith et al., 2018)

Another inference from the survey, that shows the importance of the algorithm system, is that these recommended videos by YouTube's algorithms represent 70% of the time spent on the platform. Also, among the 50 more recommended videos analyzed by the survey, 11 were content directed for younger children. In other words, more than 20% of the most recommended videos from the YouTube algorithm were made for the children's audience (Smith et al., 2018).

> "These "up next" videos are selected by the site's algorithm and appear alongside or below the video viewers are currently watching. Some 81% of YouTube users say they at least occasionally watch the videos suggested by the platform's recommendation algorithm, including 15% who say they do this regularly, according to the survey." (Smith et al., 2018)

The Pew Research Center's (2018) team also identified that most videos for children's audiences used in their titles optimization techniques to have a better selection by

YouTube's recommendation system. They observed that "in some cases, it appears that the titles of these videos may also change over time, suggesting attempts at search optimization that are intended to attract more recommendations or views" (Smith et al., 2018).

Among diversified recommendation processes, YouTube uses an algorithmic system based on two neural networks, one to generate the video recommendation, and another one to generate a rank from this recommendation (Covington, Adams, & Sargin, 2016). Using a shallow definition, Neural Networks are computing systems that try to reproduce the same human's neural network behavior, in other words, its architectures "learn" progressively according to some information received (Covington et al., 2016).

The first indicator they consider is the user's activity path, such as watches, demographic information, and searches. Then, the system analyses the filters used by other users with a similar profile, and composes the recommendation ranking. Finally, the video features are analyzed, such as metrics and visualization time, for example. With all this information put together, the algorithm runs performance tests to see if the algorithmic model is effective or not. If these results are positive for the algorithm's effectiveness (the user completing a recommended video, for example) the recommendation line can be showed (Covington et al., 2016). The picture below illustrates exactly how the system works (Covington et al., 2016).

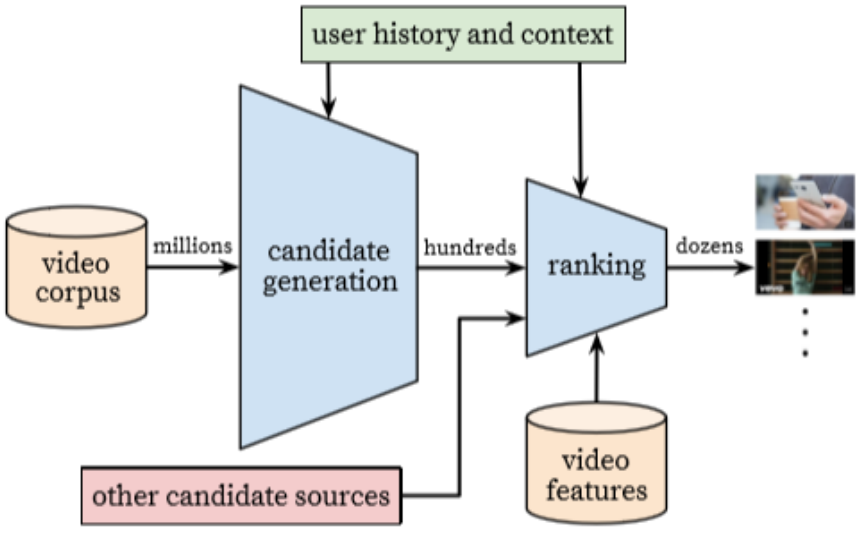

Figure 2 - YouTube recommendation system (Covington et al., 2016)

Defined by Google's team as an "extreme multiclass classification", this YouTube's recommendation system uses, as main strategy, the embedding of untied user's and video's information into a neural network that is meant to "learn" something from that and find the implicit meaning among that (Covington et al., 2016). In other words, a user's information set is put together to another information set, such as candidate videos and other users, to find implicit information, considering the following indicators: the audience from a specific video (W), on a time (t), among millions of videos categories (i), on a corpus (V), and a context (C), for a user (U). The result is the function below (Covington et al., 2016).

$$P(w_t = i|U, C) = \frac{e^{v_i u}}{\sum_{j \in V} e^{v_j u}}$$

Figure 3 - YouTube's Recommendation Function (Covington et al., 2016)

They keep using user's explicit information and another kind of algorithms, not exactly based on neural networks to recommendation goals, such as scream scrolling or surveys' abandonment (Covington et al., 2016), but the high diversified automatization of the neural process allows the prediction and influence of user's next behavior, and benefits a more profitable recommendation through the positive feedback (Rosa, 2016), mentioned above. This is how the YouTube and YouTube Kids platform uses content recommendation to run an ads system, promoting more and more visualization for the most popular videos and attracting users to spend more time watching videos and, consequently, to more advertisements (Smith et al., 2018). As the most popular videos are also the most recommended, this process also exposes users to 'indirect' ads made by "digital influencers" or "YouTubers", inside their contents (Burroughs, 2017), which is added to the "official" ads, arranged by YouTube.

The categories 'family' and 'child' were the ones that have grown the most in YouTube's audience in the last few years (Burroughs, 2017). This fact sets the children's audience as an important target with huge potential profitability, but with an important counterpoint to be considered: even though most parents allowed their

children to use the platform, a large part also has concerns about inappropriate content for minors identified on its videos (Smith et al., 2018).

The study from Pew Research Center (2018) identified that 81% of parents of children aged 11 years or younger let their kids watch videos on YouTube, and 34% of these parents reported that this is a regular habit. However, the same research found that 61% of the parents reported having identified inappropriate content for their children on the YouTube platform. The figure below illustrates this affirmation (Smith et al., 2018).

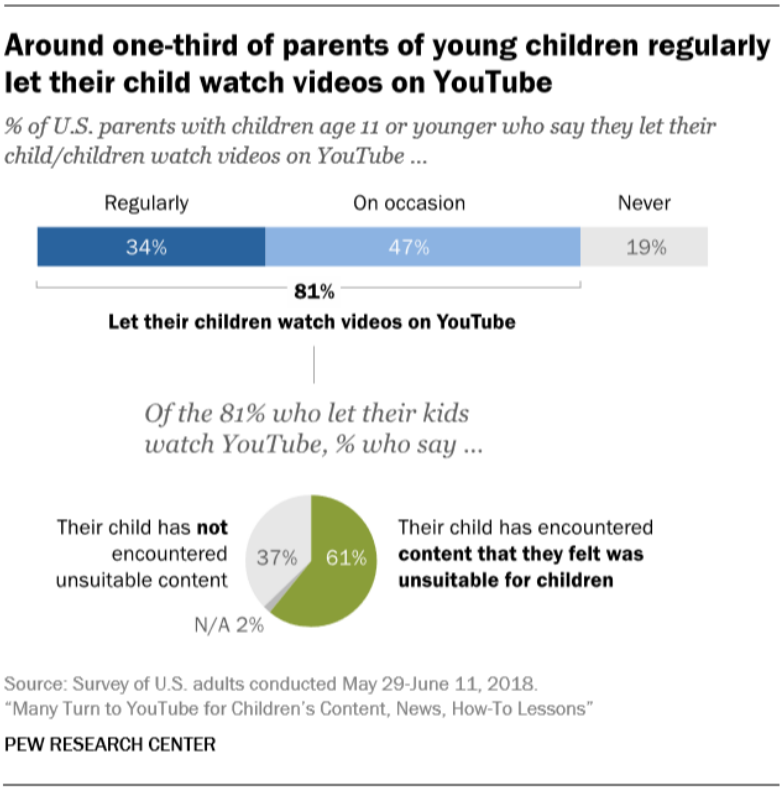

Figure 4 - Parents position regarding their children watching videos on YouTube (Smith et al., 2018)

The research did not ask in their inquiry if the informed access occurred on YouTube Kids or traditional YouTube. Nevertheless, YouTube's 'official' recommendation is that only 13 years old or older people can access the platform and indicates that the appropriate platform for children under this age should be YouTube Kids (Google, 2019c).

When the parents' concern and the financial importance of children's audience for YouTube are put together, it becomes necessary to review the way the platform is dealing with this public and ways to reaffirm parents safety feeling towards their

children's (Burroughs, 2017), while not leaving behind the profits through targeted advertising for them. YouTube Kids comes, therefore, as a solution for that (Burroughs, 2017), bringing a clear sense of security for parents, such as parents' login, guidance for best practices, customizable options of privacy that parents can decide themselves, bringing all the time the feeling that adults' are in charge and they can relax while their child is using the platform.

We can see below the first screens sequence after downloading the YouTube Kids application. There are six initial screens in which they speak exclusively with the parents' child, requesting some information that assures that there is an adult person behind the screen, like date of birth. In addition to that, they give some guidelines about content control and customization options before the child starts using it, as we detail in the next paragraph.

The first screen is a welcome page that immediately talks with "the responsible". The second screen asks the father's or mother's age of birth, to ensure that it is an adult. The third screen asks if the adult wants to activate or not the search inside the app. The fourth screen is a math question, followed by two instruction screens about the platform's safety, the automatized recommendation system, and orientations for blocking and complaint, in case of finding some unappropriated content. The final screen says, "from now, the control is being transferred to you".

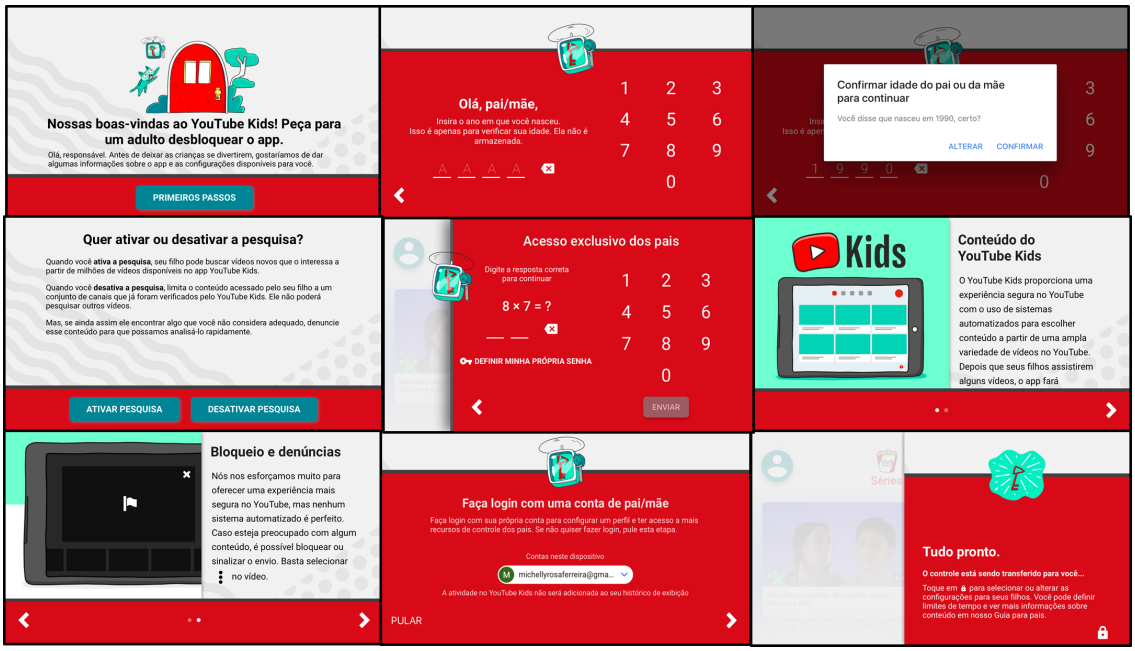

Figure 5 - Initial YouTube Kids screen after downloading the app

At first sight, YouTube Kids is the perfect tool a parent would like to have to feel in peace about the internet concerns. But, when Smith and Shade (2018) compared the YouTube Kids' official information and the families' perception about the clarity of how children's data are being used by the platform, the result was not so free of concerns. They conclude that it's not entirely clear how children's data are being used for personalization, advertisement, and inside algorithms (Smith & Shade, 2018):

> "In addition to potential confusion about advertising, parents may also be unsure of how the algorithms operate in digital playgrounds. The algorithms that offer recommendations for content in YouTube Kids, or enable a toy like the Fisher-Price Smart Toy to function, may remain opaque to parents in various ways." (Smith & Shade, 2018)

a) The changes in YouTube's approach after FTC notifications

On September 4th, 2019, Google (YouTube's owner) was sentenced to pay a record bill of 170 million dollars to settle allegations by The U.S. Federal Trade Commission (FTC) (2019) that the YouTube platform was illegally collecting children's data without parental consent (FTC, 2019). According to the commission, YouTube used its popularity among children to prospect corporate clients: "YouTube earned millions of dollars by using the identifiers, commonly known as cookies, to deliver targeted ads to viewers of these channels, according to the complaint."(FTC, 2019).

In fact, before the FTC's allegations, YouTube used to present some conflicts of interest when talking about advertisements inside the video's content. While they had a published privacy term noticing parents that YouTube is not responsible for users' video content (Google, 2019c), they had also a published article encouraging brands to use YouTube's influencers as an advertisement option (O'Neil-Hart & Blumenstein, 2016). The article also shows attractive results calculated by Google as a positive arguing for companies to put money into influencers' channels as a kind of advertising, and guaranteed that YouTube influencers have more influence power than traditional celebrities, as shown in the picture below (O'Neil-Hart & Blumenstein, 2016).

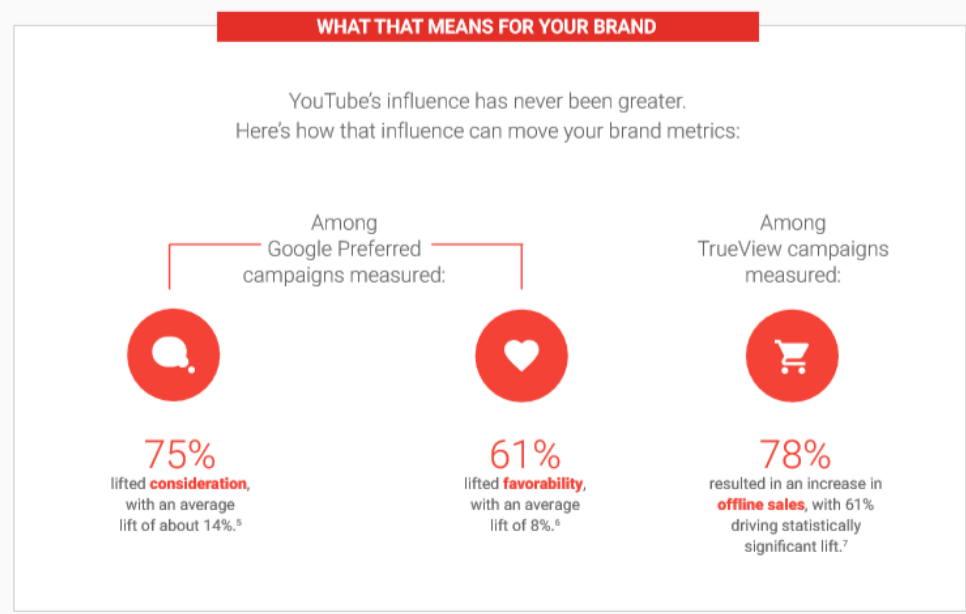

Figure 6 - How Online Video Influences the Audience (O'Neil-Hart & Blumenstein, 2016)

Another important requirement from the FTC's settlement was the providing of a system through which video makers could identify if their content is directed to children or not (FTC, 2019) and, from that, make possible to YouTube's system analyses if the content is fulfilling or not the Children's Online Privacy Protection Act (COPPA) Rule. Besides, according to the settlement, YouTube must provide for their channel owners a notification about the changes, training, and always updated guides, so they could be aware of the obligation to subject their content and business partnerships to the COPPA Rules (FTC, 2019).

The COPPA rule is a federal law in the United States of America that requires websites, online services, and all their third parties to ask for parental consent before collecting under 13 children's personal information (FTC, 2019). On September 4th, the same day of the FTC's settlement final decision, YouTube announced that important changes were upcoming in the next months related to data practices for children's content on YouTube, improvements in YouTube Kids, and investments in video makers and training (Google, 2019b). Although COPPA is an American rule, YouTube decided to apply the same changes worldwide (YouTube, 2020).

Before the FTC requirements, YouTube Kids' privacy policy, at first sight, seemed to comply with the regulation, asking for parents' authorization before starting to use the

platform (Google, 2019c). However, when advertising topics on YouTube Kids platform were analyzed, it was possible to identify much clarity missing points and contradictions about how children's data would be manipulated for recommendation systems and advertisement.

The analysis of the last YouTube announcement allows us to identify that some of these points have been improved (YouTube, 2020). On January 6th, 2020, the platform made public all final decisions about the new practices they already applied, or will apply, related to children's data. The new protecting actions include more clear communication with parents, highlighting and promoting that only YouTube Kids is safe for unsupervised navigation, new ways to identify videos made for children, such as classification of all published videos by creators and machine learning, among other important changes. This work compared the approach before and after these changes, as the following table shows.

Before FTC Notification	After FTC Notification
The metrics used for video recommendations are not clear, the only information about the recommendation system (YouTube, 2019) is "Recommended videos include videos based on watch and search history. They are drawn from all the videos accessible from YouTube Kids and selected by our algorithm without human review."[1]	YouTube did not change the recommendation topic among the last changes, so this point keeps unclear. Also, the topic about this in the Parental Guide assumes that recommendation could use a "mix of algorithms and user input" without making clear for parents which inputs are these (YouTube, 2019).
The privacy policy (Google, 2019b) shows that the platform captures much more personal information than just the child's browsing data, such as hardware information, IP number, and device identifiers.[2]	The platform will treat every data from watching kids' content as children's data, independent of the user's registration age. With that change, they are limiting the data collection, and processing only data "needed for operation processes" on videos made for kids, although they do not present which data is "needed for operations" (YouTube, 2020).
The advertising policy (Google, 2019) is not clear. The parental guide notifies that advertising is needed to make free	YouTube will stop personalized ads on videos classified as videos made for children. As well, they will cancel some features, such as

[1] YouTube Kids Parental Guide https://support.google.com/YouTube Kids/answer/6130531?hl=en-uk&ref_topic=7556083

[2] Privacy Policy YouTube Kids. https://kids.YouTube.com/t/privacynotice

experience possible and presents the premium service as an option to protect children from ads if parents want so. The platform, however, does not consider YouTube's channel owners videos as advertising, not even when these videos are published by companies. So, the premium service does not protect children from this kind of content.	comments and notifications (YouTube, 2020).
Concomitantly with the privacy statement of not consider YouTube's channel owners content as advertising, the same company used to encourage companies to sponsor YouTube influencers on branding actions and to increase advertising revenue (O'Neil-Hart & Blumenstein, 2016).	YouTube asked creators to classify their videos before publication and the platform team launched a 95 pages' field guide "for creating for YouTube kids", through which they make orientations about making content for children under COPPA rules. They also gave four months to creators to make the adaptations according to the new parameters (YouTube, 2020).
YouTube Kids shares the responsibility of improving the platform's quality with parents. The Parental Guide (YouTube, 2019) predicts some several potential questions that parents would have about their service, such as a FAQ, and assume the possibility of some inappropriate content be showed, as it encourages parental complaint attitude if they find any, without giving other solution from the platform's part.	YouTube changed the criteria for videos allowed to be available on YouTube Kids, which reduced the number of channels. They are also making technology changes: the YouTube Kids desktop and the login for parents in other devices, so they could monitor their children's behavior inside the platform from a mobile phone or other devices (YouTube, 2020).

Tabel 1 - The changes in YouTube's approach after FTC notifications

Summarizing the table, YouTube focused on the changes related to adapting the platform to avoid other huge punishment, as happened with the FCT settlement. It is important to highlight that recommendation processes were not changed and keeps unclear as before. As well, the ads inside videos for children are not finished, they just stopped to be personalized, which means that YouTube keeps earning money from recommendation models, and its algorithms keep using children's behavior for choosing the next recommended video.

Google is one of the most powerful companies in the world and, as a company, its main concern is business. Through the analysis, it is evident the YouTube's concern about how video creators should deal with the news. They need to keep creators making

content for children and getting high visualization numbers, in other words, keeping the high profitable advertisement system alive. One example of action to keep this system running is the establishment of a 100 million dollars fund dedicated to creative content creation for children (YouTube, 2020).

So, those changes show a clear improvement in children's data protection from YouTube but do not finishes the discussion. The regulation and protection move should come from authorities, not companies.

b) Authorities' actions about children's data protection from the online advertisement in Europe

A report published by UNICEF in 2016, included the concern about children's privacy on the internet. They call attention to the importance on supporting children about internet security and the creation of a universal regulation having as main subject the privacy and data processing, with respect for each countries' reality, without interfering on children's access to the internet, and remembering the huge benefits of the web platforms to kids growth and cognitive development (Byrne, Kardefelt-Winther, Livingstone, & Stoilova, 2016).

The table below summarizes the United Nations Conventions on the Rights of Children acts related to the digital moment (Byrne et al., 2016).

UN Convention on the Rights of the Child	Relevance to the digital age
Protection against all forms of abuse and neglect (*Art. 19*), including sexual exploitation and sexual abuse (*Art. 34*), and other forms of exploitation prejudicial to the child's welfare (*Art. 36*). *Protection* from 'material injurious to the child's well-being' (*Art. 17e*), 'arbitrary or unlawful interference with his or her privacy, family, or correspondence, nor to unlawful attacks on his or her honour and reputation' (*Art. 16*) and the right of child to preserve his or her identity (*Art. 8*).	Sexual grooming and sexual exploitation; creation and distribution of child abuse images; online dimensions of child trafficking; new threats to privacy, identity and reputation; availability of (diverse, extreme) pornography; personal data exploitation, misuse and tracking; hostility, hate and bullying content and conduct; persuasion re. self-harm, suicide, pro-anorexia, drugs.
Provision to support children's rights to recreation and leisure appropriate to their age (*Art. 31*), an education that will support the development of their full potential (*Art. 28*) and prepare them 'for responsible life in a free society' (*Art. 29*), and to *provide* for 'the important function performed by the mass media' through diverse material of social and cultural benefit to the child (including minorities) to promote children's well-being (*Art. 17*).	Formal and informal learning resources and curricula; wealth of accessible and specialised information; opportunities for creativity, exploration and expression; digital and information skills and literacies; expanded array of entertainment and leisure choices; access to/ representation in own culture and heritage.
Participation: 'In all actions concerning children … the best interests of the child shall be a primary consideration' (*Art. 3*), including the right of children to be consulted in all matters affecting them (*Art. 12*); the child's right to freedom of expression (*Art. 13*) and to freedom of association (*Art. 15*).	Scalable ways of consulting children about governance; user-friendly fora for child/youth voice and expression; child-led initiatives for local and global change; peer-to-peer connections for sharing and collaboration; recognition of child/youth rights and responsibilities.

Figure 7 - United Nations Conventions on the Rights of Children in the digital age (Byrne et al., 2016)

Analyzing this table and the report, it is possible to conclude that the priority on children's internet protection is more about violent situations, education and children's participation on politics and society, which are, with no doubt, the most important problems faced by children on the internet at this moment. But, for this article, it is important to observe that the report does not mention children protection from companies' use of their data on advertisement strategies based on automatized recommendations.

The General Data Protection Regulation of Europe (GDPR) (EU,2016), suggested in 2016, introduces the discussion about the need to protect children data from companies' use, primarily considering this audience as special, as we can see on 38th item from the initial considerations by the following mention:

> "Children merit specific protection with regard to their personal data, as they may be less aware of the risks, consequences, and safeguards concerned and their rights in relation to the processing of personal data. Such specific protection should apply to the use of personal data of children for the purposes of marketing or creating personality or user-profiles and the collection of personal data with regard to children when using services offered directly to a child. The consent of the holder of parental responsibility should not be necessary for the context of preventive or counseling services offered directly to a child." (EU, 2016)

Based on this definition above, the Regulation establishes:

1) The need for transparency in language aimed at children;
2) The children's classification as a vulnerable public, when talking about the risks of data processing;
3) The processing of children data under 16 years in unauthorized without consent from a responsible person;

The regulation also includes an article dedicated to children's audience (eighth) which settles 16 years as the minimum age for digital autonomy and establishes that processing children data under 16 data requires responsible authorization. Also, the article opens for EU member countries the possibility to settle their digital majority, as

bellow as 13 years old (EU, 2016).

The regulation review, applied in 2018, executes a correction about automated decisions using algorithms, intending to highlight a need for attention on avoiding any client's discrimination after profiling based on mathematical and statistical procedures, but does not bring any specific correction directed at children (EU, 2018).

One year after the review, Portugal approved the law[3] to apply the RGPD, which includes, among other definitions, the minimum digital autonomy age of 13 years old, 3 years less than the suggested age by European regulation. In other words, in Portugal, a child who is 13 years old or older can legally authorize companies on processing their data without permission from a guardian.

The main change that GDPR (EU, 2016) brought for companies operating on UE territory is the compulsory clients' consent before capturing their data, including a clear explanation about how customer data will be used after the agreement, and which partners are involved. After the regulation, companies immediately applied on their website consent requirement pages for using cookies, but often preventing the consumer from navigating if they did not accept. This consenting process, when involving children under 16 years, should be given by a guardian (item 2, art. 8)(EU, 2016), but the companies, however, most of the times, do not execute any age verification before the acceptance, allowing a child to authorize it just by clicking a button, even if they cannot read it.

We are right at this moment when the world is learning how to deal with the fact that each move, each word said is going to a data center and is analyzed and transformed in bits. All this amount of information and behaviors can answer questions that advertising for years dreamed of. It is natural and important that children gather benefits from this phenomenon, the same way it occurred with the broadcasting media arrival (educational TV programs), followed by the computer and the Internet (remembering how much the internet and its tools made school research easier, for example).

All these benefits, however, do not change the need to consider and respect the child's cognitive development phases and to clarify the communication according to their stage in life and abilities to distinguish an advertisement from the information. This and other

[3] Lei n.º 58/2019. Diário da República n.º 151/2019, Série I de 2019-08-08. https://dre.pt/application/conteudo/123815982

studies are important to ensure that, at this stage, they will not be used as a target to influence parents' purchases.

4. FINAL CONSIDERATIONS

While children around all globe are now probably delighted with the high personalization of the next recommended video that just showed up for them, the understanding of what motivates a company to provide such a service, and the consequences of that, is a job for adult research and regulation. Automated advertisement profits based on children's data brings together the old concern of parenting control, and the invisibility of data management, and brings new concerns about the fragility of control based on simply trusting on a company approach.

This article puts together important points that contextualize children's exposure to internet advertising so it could be possible to understand the social and technological process that gradually made children's data so relevant and so profitable. From the analysis of child's neural development and advertisement, the automatic recommendation for children, the "digital influencers" character, the European and Portuguese current regulation, and how YouTube Kids is applying the regulation, two insights emerged making even more clear the need to a discussion about children's data management.

1) The first one is that children's data are being used for automated advertisements through personalization and recommendation on YouTube. The personalization, which is the procedure YouTube canceled in recent changes, shows an ad triggered by what is the best product for some specific child. The recommendation can do that too, but also can recommend progressively more popular and longer videos, so the child could spend more time watching videos on the platform and be exposed to more non-personalized ads. That kind of recommendation was not canceled and not even discussed in regulation levels.
2) The second answered question is that European regulatory authorities are still not including children's data management among their priorities. While European data policies are still based on parental consent and digital majority, there is an open field to companies like YouTube act in advance to avoid other regulatory authority to question its privacy approaches.

The importance of this study is to promote a non-interested look to children's data protection and regulation subject, and do not let companies with the free decision of what is the better way to deal with that, based on their beliefs and economic interests. The interesting conflict observed on the YouTube Kids platform is the evidence of how important the discussion is. While YouTube announces that personalized ad is canceled and influencers are being trained, the same platform keeps the video recommendation system, encouraging its children audience to watch the most profitable videos based on algorithms calculation.

The economic interests involved in YouTube's video recommendation and the company's sponsorship for "influencers" reveal a positive feedback process. In other words, YouTube itself encourages its users to watch videos that are already popular and with high advertising visualizations, consequently, raising the commissions they pay for the content producers and, therefore, generating a high profit to YouTube as a corporation. The real motivation of the platform is its financial revenue and, therefore, it has all the incentives to personalize content's recommendations, and to make the platform experience better for its users.

This article does not have a denunciation purpose, instead it encourages a deeper discussion about how the regulation is being applied by companies when children's data is involved with neural mathematical systems and statistics that can make ads not seem like an ad. We hope to see this kind of discussion growing up together with the digital access for children, as they will grow up on a healthier and fairer virtual environment for them, counting and enjoying its benefits, without being used as selling tools.

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