Combining innovative methodological tools to approach digital transformations in leisure among children and young people

DigiGen - working paper series

DigiGen

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The impact of technological transformations on the Digital Generation

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Executive Summary

This deliverable presents the findings from work package 4, where the aim is to understand the interplay between leisure and socialisation among children and young people, as presented through ICT use in everyday life. The findings from this study explore the ways in which ICT is an integral part of children's social everyday life. Children and young people's everyday leisure practices are transformed through ICT usage, exploring the potential benefits of ICT in leisure as well as the harmful elements. This study also provides insights on intergenerational communication.

Comprehensive tools were developed to understand the fusion of digital and material spaces in everyday interactions of children and young people. These tools are Nettskjema bilde and KG-Notes. Different methodologies were applied: interviews, game observations and online diaries.

The main findings of the research conducted within WP4 could be summarised as follows:

- Questions of inequality in terms of access and connectivity were mostly raised by participants in Romania, where some children, especially those from rural or low-income families, who seem to share some of their devices with their siblings. Sharing devices was also reported in other countries, especially with the younger children.
- Smartphones seem to be the most important device for children and young people, around which digital capital revolves, the age of acquiring one's first smartphone is considered a kind of a milestone.
- Communication with friends is through digital media. Children communicate with their friends every day through chatting or calling, using different apps, where the reasons range from practical reasons, such as exchanging information about school or doing homework together, arranging meetings, to social reasons.
- Games are a significant part of all children's lives among the five countries participating in our research.
- Playing online games with strangers is generally experienced as different from playing with friends. There appears to be an agreement on how to behave while playing with strangers: communication while playing is reduced compared to when playing with friends, the content of that communication is restricted to non-personal information.

- Online activities, including gaming, have a strong element of socialisation. Maintenance of friendships, particularly during lockdowns, was made possible thanks to digital media
- Ultimately, *screen time* seems to be an issue for (almost) all families in (almost) all countries. In Norway, however, screen time is less of an issue, as the parents accept it as a way of being social and spending leisure time, while the children report having a perceived entitlement to screen time if they fulfil other obligations, such as schoolwork and participation in other leisure activities.
- In most cases, children describe specific rules, such as no games or content for people above 18 years, not spending too much money on gaming, no cell phone on the table, no cell phone right before going to sleep or right after waking up etc., as well as different amount of screen time according to schooldays and weekends. Another crucial point is parents' monitoring of children's online activities.
- The impact of the pandemic meant that the children and young people had to stay all day in their homes and occupy themselves mainly with ICT instead of getting out to see their friends. ICT was an important social arena.

List of abbreviations:

EU	European Union
ICT	Information and Communication Technology
MMR	Maximal Marginal Relevance
KG-Notes	Knowledge Graph Notes
WP	Work Package

1. Introduction

The aim of work package (WP) 4 was to understand the interplay between *leisure* and *socialisation*, as they manifest through ICT use in everyday life. The main objectives of WP4 were:

- To examine how *everyday practices* linked to the leisure time of children and young people are transformed through ICT usage.
- To develop *comprehensive tools* to understand the *fusion of digital and material spaces* in everyday interactions of children and young people.
- To explore potential alternatives to meaningful ICT use that enhance *social interactions* and *social skills* acquisition among children and young people.
- To provide insights based on research findings and assessments for improved *intergenerational communication*, i.e. between children and parents, children and teachers on the risks and benefits of ICT.

Therefore, the scope of WP4 is not limited to assessing the use of digital technologies during leisure; neither does it aim at contributing to the knowledge around inequalities stemming from differentiated access to digital resources and infrastructure. It primarily aims at contextualising and conceptualising patterns of leisure within the current information society. In this sense, the WP intends to go beyond the digital-divide type of assumptions (Lupac, 2018) in order to explore the ways in which ICT *de facto* constitutes an integral part of children's socialisation.

An additional element that emerged just before the beginning of the fieldwork research was the outbreak of the COVID-19 pandemic. The drastic measures imposed since March 2020 in almost all European countries have created a novel situation regarding the use of digital means in many aspects of everyday life. The issue of children's leisure time, particularly in times of massive mobility restrictions and lockdowns of educational institutions, has been closely linked to the increased use of digital devices and applications. WP4 inevitably investigated the impact of coronavirus-linked restrictions on children's use of digital devices and applications and tried to capture the generated repercussions both in terms of extent and intensity.

This report has a two-fold objective: on the one hand, to present the methodological approach that underpinned the research undertaken in the five countries that participated in WP4, i.e. Austria, Greece, Norway, Romania and the UK; on the other hand, it includes the significant findings from the fieldwork, along with secondary analysis of quantitative data coming from the Children's Worlds database.

This report roughly comprises three parts, corresponding to relevant chapters. Chapter 2 focuses on the methodologies and research tools used within WP4. It describes the main premises and the potential utility of implementing a multi-modal approach, particularly involving children and young people as co-researchers. However, challenges met during the fieldwork in all countries involved resulted in alternative strategies that were deployed. Specific focus is also given to the variety of data that has been collected through different means and methods. More precisely, a specific part of this chapter focuses on the possibilities that can be offered by the *semantic integration of data* based on the development of a specific tool.

Chapter 3 offers an overview on the question of ICT use and children's well-being. Based on

the Children's Worlds database. Chapter 3 investigates how the use of ICT affects children's subjective well-being in Europe, and whether the use of ICT crowds-out other activities, which may have an impact on how satisfied children are with their own lives.

Chapter 4 presents the basic findings of the fieldwork research in the five countries that participate in WP4. Based mainly on the data collected through digital diaries, game observations and interviews with children, our research provides input in the following thematic categories/axes:

- Digital capital
- Everyday communication
- Gaming
- Online/offline socialisation
- Negotiations within families
- The impact of the pandemic on leisure

2. Methodology

Due to its breadth and relative vagueness, the topic of leisure cannot be approached solely through traditional - quantitative and qualitative - research methods. Research within WP4 was based on accounts provided by children and adolescents through interviews, video game session observations, and online diaries enabled by using a smartphone application developed within the DigiGen project (Hyggen et al., 2020).

The overall methodological approach within the DigiGen project follows the traditions of the social sciences, but the endeavour will go beyond the traditional academic rules of producing knowledge. Especially in relation to young people, we may find ourselves in a situation where human action seems inaccessible through the traditional methodological constructions of the social sciences (Summanen & Uski, 2015). For DigiGen, we are fortunate to be conducting research at a time when the field has, by and large, outgrown its squabbles and rigidly contrasting approaches, paradigms and disciplines. Flexibility and the skilful combination of previously unrelated techniques and practices are increasingly accepted as the new order in understanding complex and constantly changing phenomena such as those presented by technological transformations. While quantitative research produces valuable findings, we believe that the use of complementary qualitative methods – with the implied commitment to researching people's experiences from the inside out – offers greater potential to mirror the messiness of the everyday experiences that most people, particularly children and young people, navigate.

2.1. Implementing a multimodal approach amid the pandemic

WP4 follows a multimodal approach. Multimodality is an interdisciplinary approach that understands communication and representation to be more than about language. Over the past decade, it has been developed to systematically address much-debated questions about changes in society, for instance, in relation to new media and technologies (Kress & Sealander, 2012).

Technology, and in particular digitised media, has changed communication patterns and access to information in many ways. It is easier for children and young people today to find factual information and fake news, elaborate their own views on issues, and be in constant connection with each other, using digital media for small talk (chatting). In their leisure time, children and young people are also able to produce music, films and reportages and share these with the

world via Snapchat, YouTube, Instagram, etc. These changes require new ways of thinking in terms of research and data collection.

To this end, DigiGen researchers have used various modes of data collection and they tried to combine them through a semantic integration of data, which can provide an easy-to-use organisation and classification of information existing in different forms, e.g. discourse, visual content etc. More precisely, DigiGen researchers used various modes of data collection in WP4:

- Interviews
- Communication diaries
- Video game observation
- Secondary analysis of statistical data

2.1.1. Semi-structured interviews

Semi-structured interviews, based on an interview guideline developed collectively in English and translated into the different languages were conducted in all five countries participating in WP4. The main aim of the interviews was to investigate to what extent and in what ways everyday practices linked to leisure time are affected/transformed though ICT usage. The interviews were conducted with children from 10 to 15 years old (with some flexibility regarding the lower and the upper limit) with diverse socio-cultural and geographical backgrounds.

The recruitment process was essentially to be based on purposeful sampling procedures, and it would involve the following basic social and institutional 'pools':

a. Schools, primary and lower-high from two-three different districts
b. Sport clubs, study centres, youth centres etc., operating in the areas were to be informed about the research in order to help researchers get in touch with possible participants
c. Parents' associations were to be contacted and used as a pool for potential recruiters

The interviewees were recruited through different sampling strategies. In order to achieve the aim to recruit children and young people of diverse social backgrounds, different groups and organisations were contacted, including gaming groups, high school or vocational training institutions, and individual parents. Participants were thus recruited through different techniques of purposeful sampling, i.e. a combination of *typical case sampling, stratified purposeful sampling and snowball sampling* (Patton, 1990).

However, the COVID-19 condition altered the process completely. Restrictive measures imposed in all participating countries and the reluctance of parents and children towards physical contact, made the initial research design and recruitment strategy impossible to follow. Difficulties and even no access to 'areas of interest', such as schools, sport clubs, youth centres, because of the pandemic restrictions, led all research teams to include in our strategies techniques of convenience sampling as well. This had an impact on the composition of the sample, since this was inevitably relatively homogeneous.

In total, 85 interviews were conducted: 20 in Austria and in the UK, 19 in Greece, 13 in Norway and 13 in Romania. Almost all interviews were conducted online through video conference platforms, which made the work of researchers more difficult. Apart from the difficulties to organise the interviews, in most cases without any face-to-face contact with parents and/or children, during the interviews children tended to give short (yes or no) answers, particularly the youngest ones. It might have been that questions were sometimes straightforward and did not encourage developed answers, but it had also to do with the means of communication that does not provide much room for flexibility.

2.1.2. Online diaries

In order to render children and youth active in the research process and make them co-researchers[1], digital online diaries were used in WP4. The children used the application "Nettskjema Bilde", which was developed by the University of Oslo, in close collaboration with Panteion University of Social and Political Sciences in Athens (see deliverable D4.1) and OsloMet.

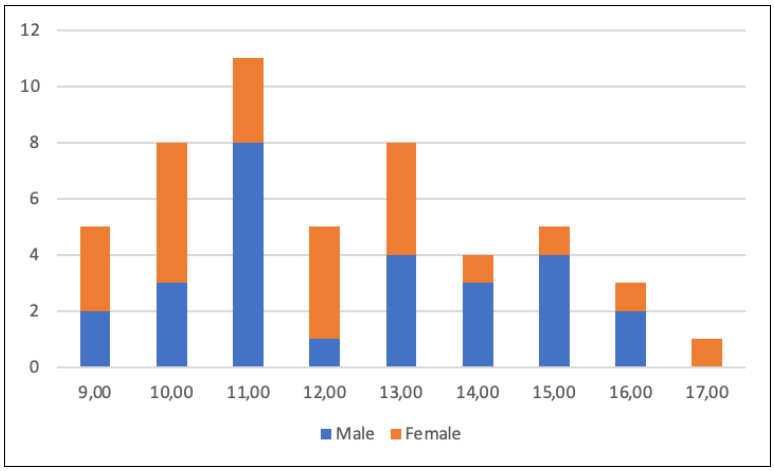
Using a mobile App like Nettskjema Bilde for collecting mixed data we allow data collection and observations on young people's terms – through a device that often is carried and used across educational institutions, the home, in leisure time and in young people's civic participation: the mobile phone. The app was made available for download in apples app-store and the google play store.

Significant problems, however, appeared in implementing research with digital diaries. Apart from practical problems, i.e. for some children it was difficult for children to find the app because of complicated spelling and the fact that there are two apps with similar names, researchers faced severe difficulties to motivate children to participate, even when their parents where behind it, trying to remind them daily to fill in the app. In addition, there was no direct way of communicating with participants through the app, e.g. about possible troubles getting started, need for assistance etc.

It was also difficult to recruit co-researchers through interviews. Although several interviewees had consented, the communication usually faded out in the process or participants tended to withdraw because diaries seemed to require too much involvement from the respondents and, in the end, were not really felt as a participatory process. Without neglecting the complicated procedure due to precaution/ethics measures that required first children/parents to email researchers for access code/personal id and then download the application.

In the limited cases of acceptance, co-researchers were asked to spend a few minutes every day for a period of about 10 days on their reports. Daily reports included brief survey questions and the opportunity to upload images or screenshots containing examples of their digital activities. In total, 50 children and youth aged between 9 and 17 participated as co-researchers from Austria, Norway and the UK. 29 co-researchers were recruited in the UK, 13 in Norway and 8 in Austria. The age distribution is displayed in figure 2.1.1. The sample includes data from a total of 23 girls and 27 boys.

Figure 2.1.1 Age distribution by gender among the co-researchers using the digital diaries



1 https://www.digigen.eu/children-and-young-people-as-co-researchers/

The co-researchers were asked to make entries in their digital diaries across a period of 7–10 days. In total, our co-researchers made 273 diary entries. On average, they made about 5 entries. Some only contributed with 2 entries and the most eager co-researchers made 17 entries. The observations found in the digital diaries are thus not considered representative in any way, and we limit the use of comparisons. Data from the digital diaries are treated as qualitative data and are part of the explorative strategy and nature of the project. For this report, we use the diary entries in the introduction of Chapter 4 as cases to get insight into the complexity of young people's daily digital lives. In some cases, we also present results using the children and young people themselves as cases.

2.1.3. Video game observation

WP4 research teams also conducted fieldwork research using the game Minecraft as a tool. Children recruited for interviews and/or the online diaries were also asked if they wanted to participate in the game observation. The research entailed online participant observation during different sessions in different moments while the gamer is playing online with friends; participants were asked to provide permission to the researcher to record parts or all the session. Observation methods are useful to researchers in a variety of ways. They provide researchers with ways to check for nonverbal expression of feelings, determine who interacts with whom, and grasp how participants communicate with each other. Participant observation allows researchers to check definitions of terms that participants use in interviews, observe events that informants may be unable or unwilling to share when participating in an interview, and observe situations informants have described in interviews, thereby making them aware of distortions or inaccuracies in the description provided by those informants.

DeWalt & DeWalt (2002) believe that "the goal for design of research using participant observation as a method is to develop a holistic understanding of the phenomena under study that is as objective and accurate as possible given the limitations of the method" (p. 92). They suggest that participant observation can be used as a way to increase the validity of the study, as observations may help the researcher have a better understanding of the context and phenomenon under study.

More precisely, participant observation of gameplay generated two-way feedback: on the one hand, it tested and measured research findings and hypotheses stemming from previous research and from research conducted with different methodologies within WP4; on the other hand, it produced primary data based on the actual verification of digital skills and competencies as they were performed by players, or on actual perceptions and aspirations of children and adolescents regarding their "inhabitance in digital spaces" (Booth 2010; Jacobs and Cooper 2018).

In this sense, the game research provided feedback to WP4 by testing and measuring selected hypotheses developed within interviews and communication diaries. More specifically, the researchers observed and suggested specific tasks to participants in order to check and acquire information on the following basic research questions:

- Organisational modalities
- Recurrence, stability, contingency
- Group dynamics
- Online identities
- Socialisation patterns
- Negotiation(s) with families and peers
- Self-perception of usage, intentional abstinence, need for change etc.

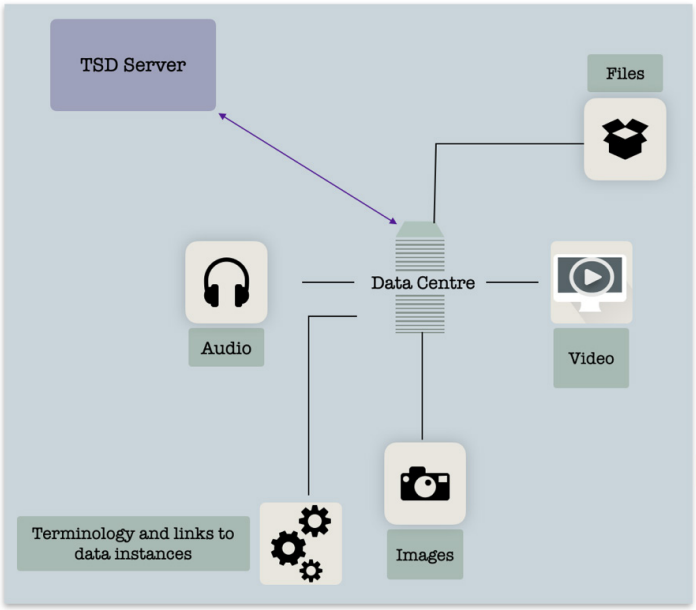
It is important to note that problems appeared during the game observation research. Recruiting from interviewees did not really work since Minecraft does not seem to be a videogame so popular for adolescents; not all children interviewed play Minecraft and those who do play were not necessarily willing to participate in the ethnographic study. Parents also were not very willing to get involved in the research, while children seemed disorientated regarding their digital presence and actions. Most importantly, the pandemic triggered an unprecedented push for almost all people, toward the digital services in domains like the public sector services, education, consumerism (e-shops) and leisure and cultural activities. The result was and still is an overwhelming feeling of 'digital obligations', which resulted in a kind of refusal or a feeling of 'digital fatigue' or 'digital burnout'.

2.2. Dealing with different type(s) of data: Semantic integration

Research conducted in DigiGen aims to collect large amounts of empirical data to gain knowledge concerning ICT use amongst children and young people through direct and indirect observations or measurements. However, it is not the amount that makes us turn to other, more sophisticated methods of data analysis but mainly the fact that data comes in very diverse forms: data collected through interviews (raw data (audio) and transcripts (text), data from communication diaries and Minecraft game sessions, data from mini surveys and Snapshots (i.e., images) via the My View application. To make the most out of the analysis, data should be stored and accessed in a unified way, analysed ideally by combining and comparing information from all sources for a given thematic category. Semantic data integration of data enables the blending of data from disparate sources by employing a data-centric architecture. The ability to easily import and harmonise heterogeneous data from multiple sources and interlink it is essential for knowledge extraction from research data.

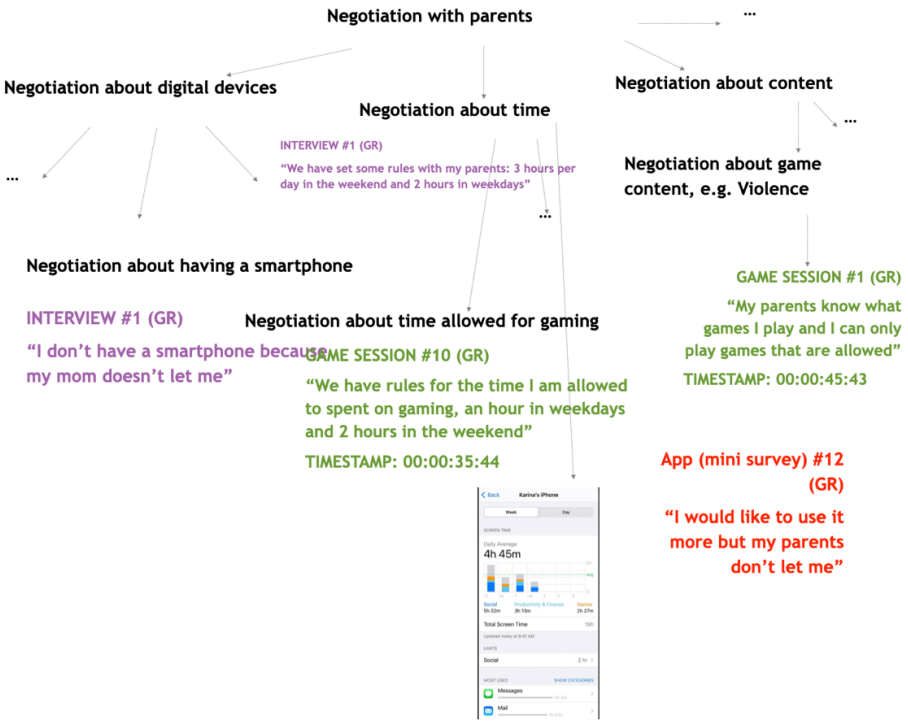
Semantic integration is defined as the process of interrelating information (data) from diverse sources and consolidating it into meaningful and valuable information using formal specifications of domain conceptualisations (taxonomies). Figure 2.2.1 offers a graphical representation of the different kinds of data collected.

Figure 2.2.1 Graphical representation of the different sources of data collected in DigiGen



A short running example is now provided to elucidate the reasoning behind the semantic integration of data. One of the crucial thematic categories in the research conducted in WP3 and WP4 is the “Negotiations within family” category that includes aspects such as parental control, time spent on digital devices, type of devices used, and conflicts that may appear, etc. In this thematic category, we have children negotiating with their parents potentially about the digital devices they use, and there one could find negotiations about owning a smartphone, the time used for each digital device (e.g., negotiations about time allowed for gaming), the content of the games they play, (e.g., negotiations about playing games the parents think are too violent) as subcategories. Figure 2.2.2 supplements this example with instances from the Greek data that match these categories: An interviewed child reports that “I don’t have a smartphone because my mom doesn’t let me”, the child also says that “We have set some rules with my parents: I can play 3 hours per day in the weekend and 2 hours in weekdays”. More information is then added coming from the game sessions about the rules and the content, and potentially an image from the App including information about screen time and a comment saying, “I would like to use it more but me parents don’t let me”. The common feature in these instances is that they all refer to negotiations within the family.

Figure 2.2.2 Instances of Negotiations within the family



If one would like to analyse the empirical data for the thematic category “Negotiations within family” he/she needs to draw relevant data from all data sources to take advantage of all the information provided. Therefore, an ontology is needed to assist researchers in analysing relevant data that appear in different format and in diverse sources.

In an ontology the knowledge designed is structured so that the annotated data can be easily enriched. For example, if an instance belongs simultaneously to the classes *playing Minecraft, quarrelling with a friend*, and *using tablet*, then it is easy to conclude that this child was *playing Minecraft on the tablet while quarrelling with his friend*. This class, i.e., *playing Minecraft on the tablet and quarrelling with friend*, does not exist in the ontology; however, we can easily capture these instances by utilizing the knowledge that exists within the ontology. Similar queries or axioms can be defined for several classes, and on these, automatic reasoning algorithms can be executed, which help us enrich our data.

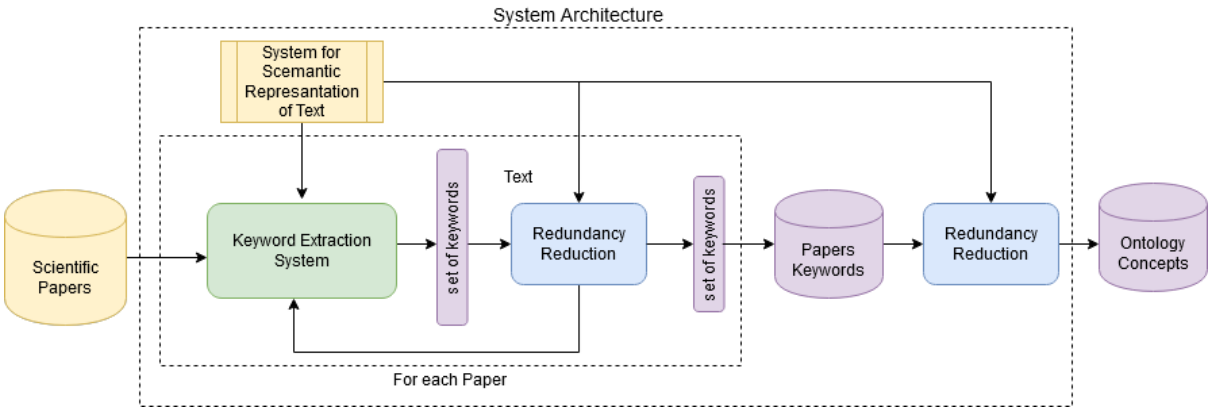
Furthermore, the existence of the ontology provides us with a high-level search mechanism. For example, a researcher can easily search for interviews where it is mentioned that a child is communicating *through a social media app* (such as Facebook), and with a single search, all the instances of the class *communicating through Facebook*, *communicating through Instagram*, etc will be returned. This functionality is feasible because in the ontology, by definition, all individuals that belong to the class *communicating through Facebook, Instagram*, etc., also belong to *communicating through social media apps*.

We can also scale up our search functionality by combining multiple terms in the search. For example, we can search for all individuals that belong to the class *communicating with friends* and *communicating through a social media app*. In this case, if a participant belongs to communication with visual friends, which is a subclass of communication with friends, he/she will appear as a result given that he/she is also communicating through social media app. If we do not use a hierarchy of terms, like the one provided by the ontology, we would have to search for all individuals in each subclass and then combine the results. This problem would be even more difficult if the annotations were made in natural language, such as plain text without any structure. In this case, search performance would decrease as the number of annotations increases.

The ontology is constructed in a semi-automatic way, which is now described. Initially, a large number of scientific papers in this field were collected. These contain the terms of the ontology, which were carefully selected by researchers and experts. In order to alleviate the volume of the work and simultaneously be able to study additional papers, an automatic tool was built to extract important words or phrases from them. This tool was a challenge, as several restrictions arise by its nature. The first and most important is that the tool should not just read the text but should be able to interpret it semantically. For example, suppose a paper refers to the distribution of children's free time. In that case, the expected phrases should be something related to it, such as gaming, communicating with friends, negotiating with parents, etc. To achieve this functionality, the system must be able to understand the semantic content of the text and the role of each word or phrase in it. In the above example, the system must have a correct semantic representation of the word gaming for this specific text and not to be treated the same as any other word. To overcome this difficulty, we experimented with a large number of different artificial intelligence algorithms. Finally, a pre-trained deep neural network was used as the basis of the algorithm. The selected neural network was trained to distinguish whether two texts are a paraphrase of each other. Due to this task, the model has shown great performance in *semantic similarity* and *paraphrase identification*. Therefore, with this tool, we extract words or phrases which are important for a text. At the same time, there is a risk that the returned words are very similar, while on the other hand, not all terms which are important and are mentioned in the text are detected. For example, it could be that the most important phrases detected are online gaming, on-line gaming, game online, gaming online, playing online games, etc, which express the same meaning in different words. To solve this problem, we develop an algorithm that can select the important words while maximising the semantic information contained. In this problem, we want to maximize the distance of the participant's phrases, and at the same time minimize their distance from the text. In this way, the algorithm will return the closest, but also different phrases of each text. Thus, the final method for diversifying our results is *Maximal Marginal Relevance* (MMR). MMR tries to minimize redundancy and maximize the diversity of results in text summarization tasks. Finally, the above procedure was repeated for all texts. However, because several papers had relevant content, the MMR algorithm was applied to all words to reduce redundancy. One very important aspect of the above methodology is that every concept or term has one or more bibliographic references, which may help researchers by providing extra sources for research. Finally, these references will be helpful to users, but simultaneously they will aid the ontology to be parsed by an automated system.

The following figure shows the algorithm for the automatic extraction of ontology concepts:

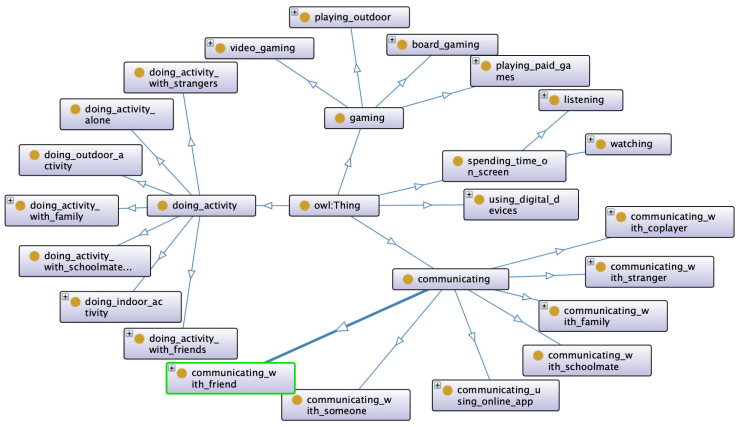
Figure 2.2.3 System architecture for automated ontology concepts' extraction



- Scientific Papers: The database that contains the corpus of scientific papers from which the concepts will be extracted.
- System for semantic Representation of Text: A pretrained machine learning network with the ability to represent a paper into a space that contains its semantic information.
- Keyword Extraction System: An algorithm that uses the above system in order to calculate the significance of each word or phrase in the text that contains them. This system takes as input a paper together with a set of words or phrases and returns a subset of them to be considered as keywords or key-phrases of the text.
- Redundancy Reduction: An algorithm that takes a set of words as an input and, with the help of the text representation system, keeps only these words that have a unique semantic interpretation in order to reduce redundancy.
- Paper Keywords: A database that contains all the words of the paper, storing the terms that have been extracted from all the papers. These terms are not the final concepts returned by the algorithm, since between different papers there may be terms with common semantic interpretation.
- Ontology Concepts: A database that contains the final concepts returned by the algorithm. These terms were studied by researchers and ontology engineers in order to produce the final concepts of the ontology. Following this process, new tools may be made available to further automate the whole process.

The following figure shows a part of the hierarchy of the constructed ontology:

Figure 2.2.4 A part of the hierarchy of the constructed ontology



2.2.1 Description of KG-Notes development and possibilities

KG-notes offers researchers the ability to organize and analyse their data in an easy and systematic way. This system facilitates the communication of both users with each other and with the computer, making it easier to draw complex conclusions and relationships from the data.

The operation of this tool is based on the existence of a large, predefined ontology, which has been produced in a semi-supervised way, with the collaboration of DigiGen's researchers and an algorithm to extract content from a large number of scientific papers (Section 2.2.1).

From a practical point of view through KG-Notes users can study the project data and add annotations, along with comments. These annotations must refer to ontology's terms. Each term is also linked with one or more bibliographic references. Thus, researchers acquire a common terminology or dictionary with each word containing a plethora of information about its source and use. This makes this tool necessary for the correct and accurate study and analysis of project data. In addition, KG-Notes provides high-level functionalities and data analysis tools. Through KG-Notes we can easily inspect all the instances, of any data type either video, text, mp3, which refer to a term as well as all its descendants. For example, for the term gaming KG-Notes will return all the instances that belong to at least one of the categories online gaming, offline gaming, playing Minecraft, playing among us, etc. It is pointed out that if the modelling of the terms in an ontology did not exist, this functionality would be impossible. KG-Notes also provides for each annotated sample a list of semantically close instances based on their labels using the knowledge graph analysis tools. These instances may be of a different type (video, text, mp3). This functionality, which is very limited if one uses other ways for data analysis, is possible due to the existence of a well-structured ontology. Without this organised structure of terms, finding semantic similarities between data of different type is a very difficult problem described in the literature as a problem with limited solutions and poor results.

KG-Notes screen is divided into two parts (Figure 2.2.5). On the left-hand side, the imported data is revealed, while on the right-hand side the researcher sees the concepts of the ontology. Depending on the extension of the file selected (pointing to different kinds of data), the working interface of the tool changes. If the text is coloured (left-hand side) this means that these specific parts of the input data have already been annotated by other users. If we want to add external annotations to the same text, we can just right-click on it and then press ***More Options***. Annotations can be added or removed by adding a comment on the more options box (Figure 2.2.6).

Figure 2.2.5 KG-Notes interface

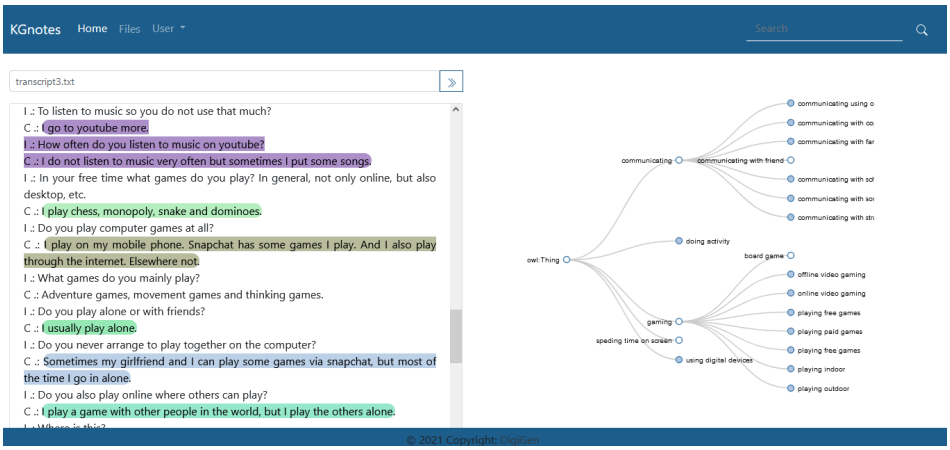
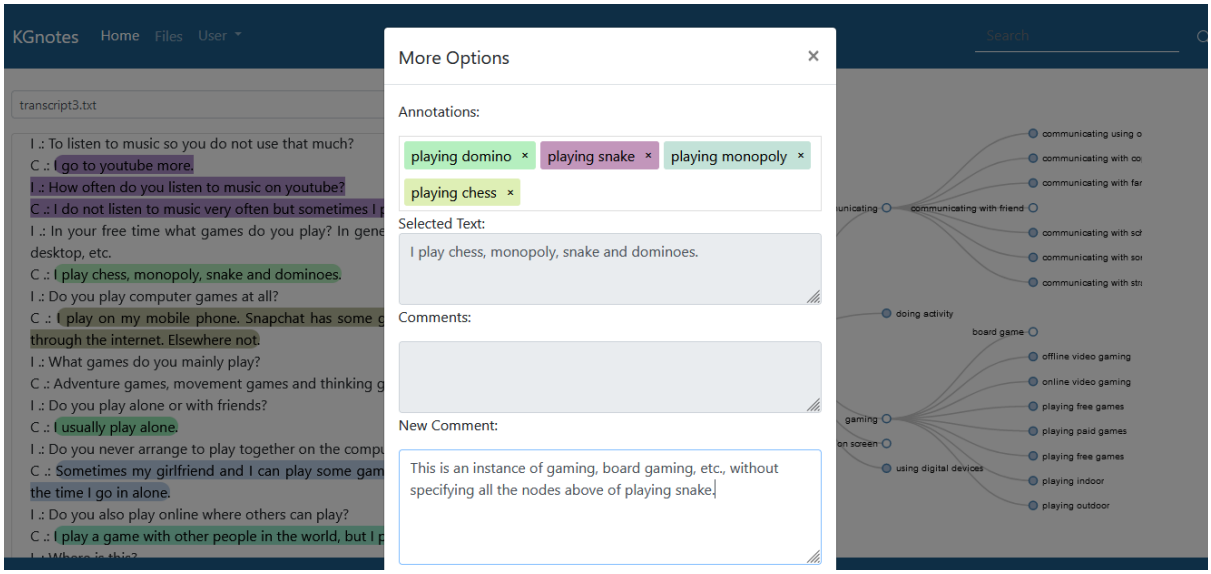


Figure 2.2.6 Add external annotations with More Options



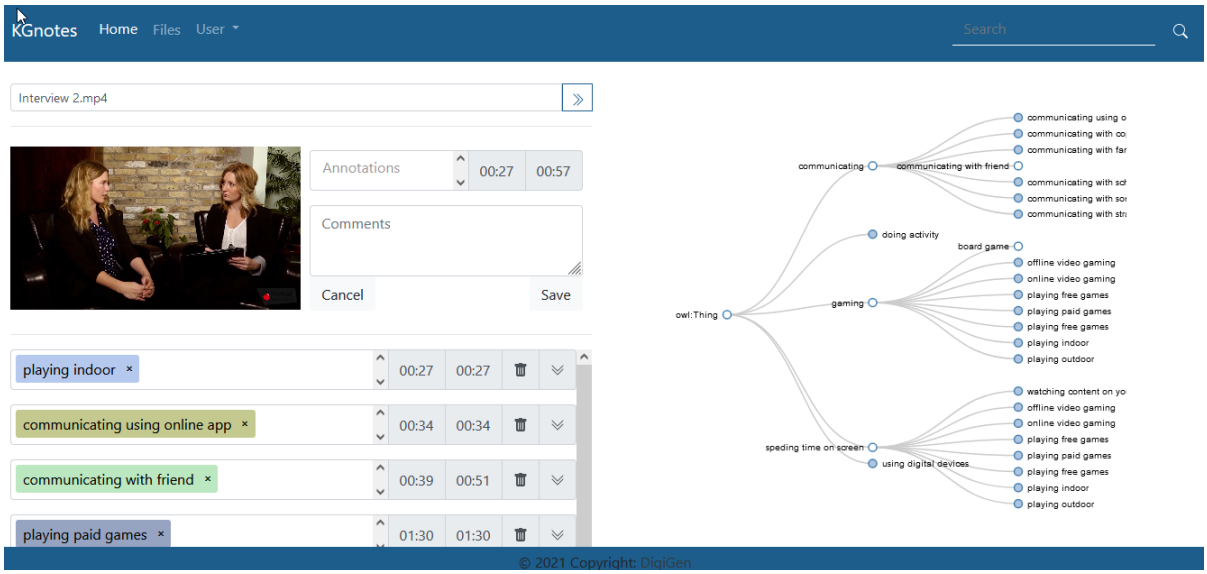
If a file with a ***.mp4*** extension is selected, then the working environment changes, and it appears as depicted in Figure 2.2.7.

The users can select the appropriate concepts of the ontology and type their comments.

Then they can add this annotation only for a timestamp by pressing ***Save*** at the fitting time.

This annotation can be associated with an excerpt of the input data by pressing on the ***Start Time*** button and then the ***Time End*** button, in order to select the start and the end time respectively.

Figure 2.2.7 KG-Notes environment when a video (.mp4 extension) is selected

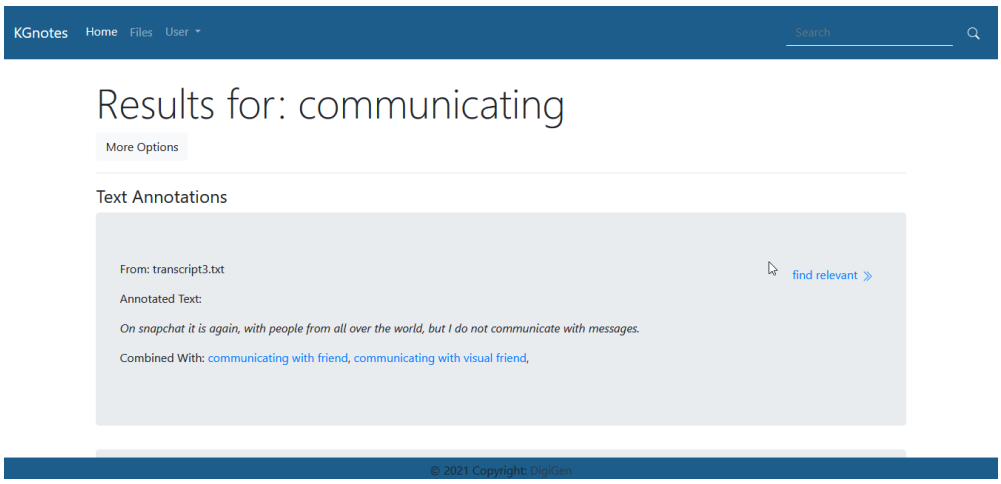


The excerpt between 00:27 - 00:57 is selected for the annotation in Figure 2.2.7. In order to select the start and the end time, we have first to press the start button (00:27 button) and then at 00:57 timestamp of video on the corresponding end button (00:57).

At any time, the ontology is displayed on the right side of the screen, and the user can search for a node's subclasses or a concept. Moreover, every text input supports the auto-complete function to improve the user experience.

As already mentioned, KG-Notes provides data analysis tools. Firstly, there is a possibility to search for terms provided in the ontology. In this case, the user can search for instances in the database that belong to a class. The search can be done simply by clicking on the search bar and typing the term. Figure 2.2.8 shows the search result for the term 'communicating'. On this page, the instances that have been highlighted with this term are shown. It is worth noting that this list also shows all the parts that belong to subcategories of the original. In Figure 2.2.8, we can see that there are also instances that have not been explicitly declared as communication, but to a subclass of it, such as communication with friends. KG-Notes easily captures this relation and shows it to the user due to the existence of the predefined ontology.

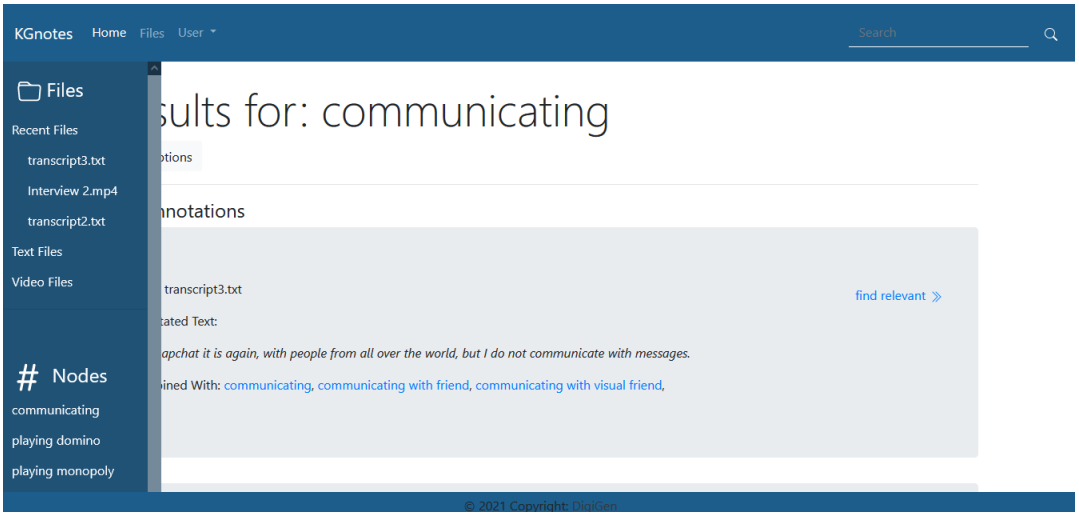
Figure 2.2.8 Search results for 'communicating'



In addition to the search for simple ontology terms, data search is also provided. For example, it is possible to return semantically similar instances on the content of an annotated part. Similar samples include objects regardless of their type (text, video, audio). Comparing sample content between different data types is a challenging open problem in the literature. Nevertheless, KG-Notes achieves this functionality by using the knowledge provided by the ontology structure. The similarity of the content is defined by the similarity of their annotation. Their relative distance in the hierarchy determines how close the two annotations are. In this way, the process of searching for nearby content is fast, while at the same time it has excellent accuracy.

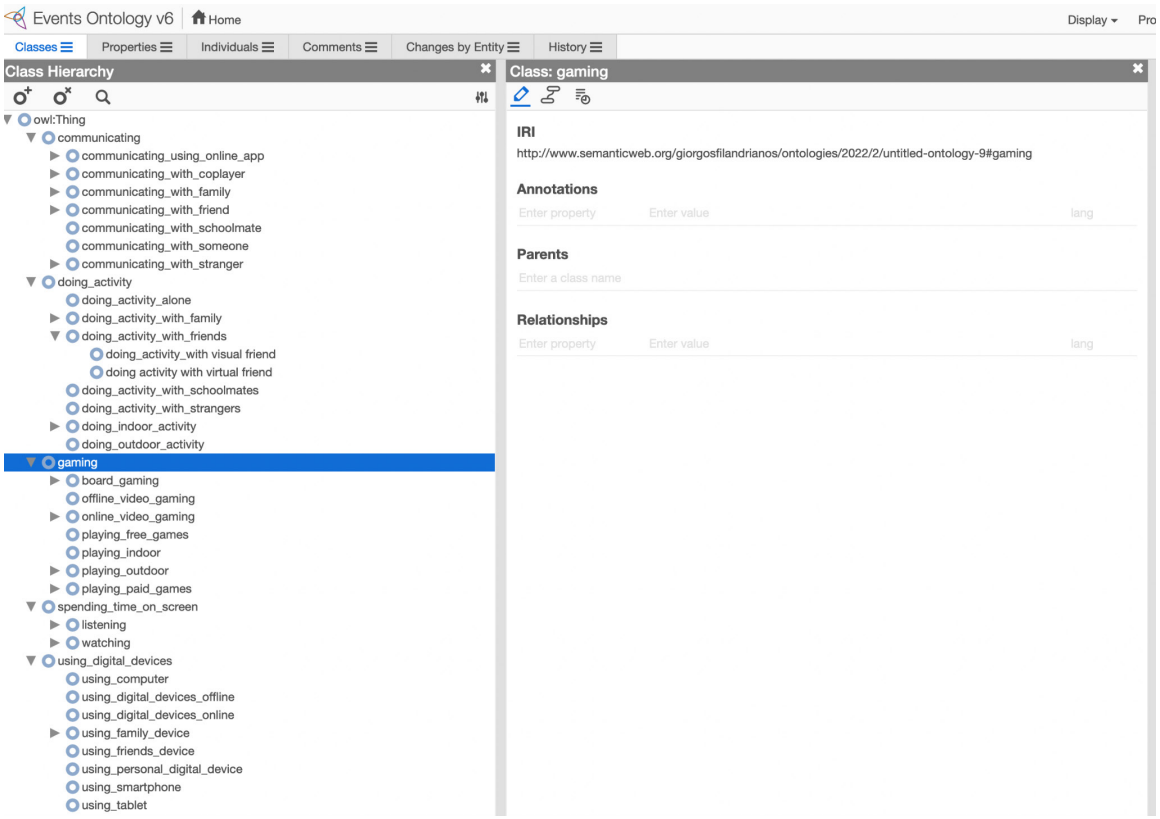
Finally, the tool provides features for easy access to files or terms (Figure 2.2.9). In this way, the user has a practical and user-friendly interface that, at the same time, provides high-level functionalities.

Figure 2.2.9 Access to files and/or terms



The environment where the ontology is built (Figure 2.2.10), where the concepts, roles, actions, etc of the ontology are refined and finalized is a free, open-source ontology editor and framework for building intelligent systems called Protege[2] that is developed by Stanford University and is free to download.

Figure 2.2.10 The environment where the ontology is built, where concepts, roles, and actions are refined and finalized (Protégé)



3. Measuring satisfaction with leisure and ICT use among children in Europe

In this chapter, we use the Children's World database to investigate how the use of ICT affects children's subjective well-being in Europe, and whether the use of ICT crowds-out other activities, which may have an impact on how satisfied children are with their own lives. First, we find that higher frequencies of playing electronic games, using social media, and having internet access and/or a mobile phone are positively associated with overall subjective well-being. Second, we do not find evidence of crowd-out effects – i.e., children who spend more time using digital devices do not report dedicating less time to other activities. Finally, we document that the use of digital technologies is positively related to free time satisfaction and satisfaction with the use of time.

3.1. ICT and children's well-being

Studies exploring the causal effects of new technologies on children's well-being are relatively scarce. One exception is McDool et al. (2020), which investigates the extent to which access to faster broadband speed has had a causal impact on British children's feelings in different

2 https://protege.stanford.edu/

life domains. Like many studies in this strand of literature, the authors assume that broadband speed proxies internet time use. Using an IV estimation, they find that more intensive internet use harms subjective well-being, particularly so, in relation to feelings about own appearance. However, they do not find an effect on how children feel about life as a whole.

In another study for the UK, McNamee et al. (2021) combine fixed effects and matching to find similar evidence for the prolonged use of social media: they show that using social media for more than four hours per day yields poorer emotional health and more behavioural difficulties among children. Moreover, they also document that an intense use of social media is particularly harmful in terms of self-perception. However, their results suggest that a limited use of social media (less than 3 hours per day) not only does not deteriorate well-being but indeed has some positive effect on socialisation with friends – we discuss this finding below, when reviewing the crowd-out effects of new technologies. Recent descriptive studies also seem to support the idea that children and adolescents who spend long periods of time on social networks tend to show lower levels of well-being and have a higher risk of suffering depressive symptoms (see, for instance, Frith, 2017; Gunnell, 2018; Kelly et al., 2018; Woods & Scott, 2016). Intense use of social media in early adolescence is also associated with lower levels of well-being in later adolescence, particularly for females (Booker et al., 2018).

Further evidence on the causal impact of social media on well-being comes from Braghieri et al. (2021), which studies how the staggered introduction of Facebook across U.S. colleges in the mid-2000s affected the mental health of adolescents and young adults. They show that the roll-out of Facebook triggered a decline in the mental health conditions of those college students exposed to the introduction of Facebook. Furthermore, it fostered the utilization of depression-related mental healthcare services and also negatively affected the academic performance of students exposed to the roll-out. Their study also sheds some light on why social media might deteriorate mental health. The main mechanism behind their findings seems to be consistent with the idea that Facebook enhances people's abilities to engage in unfavourable social comparisons. Experimental evidence for adolescents and young women (Fardouly et al., 2015; Kleemans et al., 2018) and descriptive evidence for students (Chou & Edge, 2012; Tandoc et al., 2015) also supports this explanation.

3.2. ICT and crowd-out effects

In what follows, we cover existing evidence on crowd-out effects. The "crowding out" hypothesis can help to explain why extensive use of new technologies might hamper children's well-being. This hypothesis suggests that intense internet use reduces the time spent on other beneficial activities positively related to subjective well-being, such as the time children spend with their families or friends, learning or enjoying non-digital entertainment. In this section, we provide an overview of the existing causal evidence of new technologies crowding out other activities for children. We begin by discussing McDool et al. (2020), which offers a great introduction to the topic, as they discuss how new technologies affect a vast number of well-being domains. We then move to quasi-experimental studies exploring crowd-out effects on education, which is the well-being domain that concentrates the bulk of the evidence on crowd-out effects. Finally, we close this section by covering causal evidence on new technologies crowding out socialisation for children.

McDool et al. (2020) investigate whether more intense internet use (proxied by broadband speed) led children from the UK to substitute part of their time devoted to other activities. They find that, as internet use increases, children feel on average worse about their schoolwork, appearance, friends and the school they attend. Effects are particularly large for how children feel about their own appearance and schoolwork. In addition, more internet use is found to crowd-out face-to-face social interactions. In particular, more time spent online reduces the

total number of activities that the child undertakes per week, including playing sports, engaging in face-to-face interaction with friends and family, attending classes out of school, going to organised events or volunteering. No effect is found on how children feel about their families. Their results are generally consistent with prior descriptive studies (see, Helliwell & Huang, 2013; Moreno et al., 2013; Sabatini & Sarracino, 2017; Wallsten, 2013).

Several causal studies have explored whether more intense use of new technologies crowds-out education and time spent doing homework. Suziedelyte (2015) tests the effect of electronic games on learning. She uses data from the Child Development Supplement of the US Panel Study of Income Dynamics. Her fixed effects estimates suggest that gaming improved, on average, children's problem-solving ability. It is however important to stress that the estimated effect decreases with the number of hours played. She also finds evidence of the complementarity between video games and other sources of learning, as the estimated effect is larger in families that invest more resources in children. Descriptive studies tend to show a positive relationship between heavy gaming and poor academic performance (Fiorini 2010; Rideout et al., 2010).

Further evidence on this matter comes from the "one laptop per child" program. Studies evaluating this intervention tend to show that it increases computer and internet proficiency (Angrist & Lavy, 2002; Malamud & Pop-Eleches, 2011, Malamud et al., 2019; Mo et al., 2013). Evidence on student academic performance is, however, more mixed, especially in developing countries (see, for instance, Angrist & Lavy, 2002; Malamud et al. 2019; De Melo et al., 2014; Mo et al., 2013). In Europe, Mora et al. (2018) combine fixed effects estimation and matching and find a negative impact on language proficiency and mathematics among Spanish students. Similarly, Malamud and Pop-Eleches (2011) use a regression discontinuity design to evaluate the program in Romania. They find that students that were just entitled to the program have significantly lower grades at school than just ineligible children. Moreover, they find that the computer voucher also reduces the time spent doing homework and reading. As for the mechanisms behind these results, Vigdor et al. (2014) point out that access to home computers is associated with academic achievement only in households with more effective parental monitoring. Monitoring styles might however compromise some of the gains of the program. Concretely, Malamud and Pop-Eleches (2011) show that rules regarding computer use mitigate the positive effects on computer skills without improving academic achievement. Finally, Malamud et al. (2019) also show that there is a pronounced drop in the use of subsidised computers over time and also that the largest category of computer use is entertainment.

We close the discussion of studies on the crowd-out effects of new technologies on education by reviewing existing causal evidence on the effect of internet access on children's educational achievement. Sanchis-Guarner et al. (2021) evaluate the effect of home high-speed internet on national test scores of 14-year-old British students. Their results show that increasing broadband speed by 1Mbit/s raises test scores by 1.37 percentile ranks. They interpret the former as the net effect of internet speed on education, arguing that the positive impact of higher internet speed comes in the form of higher productivity, better education opportunities and learning improvements, that exceed the negative impact of unproductivity and distraction. Their study cannot however explain the mechanisms driving this positive relationship between broadband speed and higher test grades.

Finally, a group of studies have looked at the crowd-out effects of new technologies on socialisation. McNamee et al. (2021) find that limited use of social media is found to have a positive effect on children's socialisation skills. In a large experimental study that subsidised home computers in the US, Fairlie and Kalil (2017) also find evidence pointing to the same direction. Their results show slight positive effects of computers on children's social development: children in the treatment group were more likely to spend time on social media, but also communicating and interacting with their friends in person.

3.3. Data

We use the third wave of the Children's Worlds database[3] to explore how the use of ICT affects children's subjective well-being in Europe, and whether the use of ICT crowds-out other activities with a potential impact on how satisfied children feel about their own life. The Children's Worlds database is an international survey designed to study children's well-being, covering 35 countries/federal regions across four continents in three different waves (2011-12, 2013-14 and 2016-19). The survey questionnaire asks 8-, 10- and 12-years old children about their daily lives and activities, their use of time, their agreement with several statements and events, their socio-demographic and economic characteristics and, most importantly for the DigiGen project, their opinion about their own well-being and the use of ICT – see Table A1.1 in the Appendix for more information about the questionnaire topics.

Our analysis is based solely on the third wave of the Children's Worlds. Several reasons stand behind such choice. First, it should be noted that the Children's Worlds survey is not very well suited for exploring changes over time in how ICT affects children's subjective well-being. Many of the questionnaire items regarding the use of ICT have changed from wave to wave. For instance, the second and third waves solely asked children about how often they spend time using a computer, while in the third wave children are also asked about how often they spent time playing electronic games and using social media. Second, inconsistencies across waves also affect questions regarding the time spent on other activities – which, for the purpose of our analysis, is required in order to be able to explore crowd-out effects. The first and second waves, for example, do not ask children about the amount of time they spent with their family or friends. Finally, the pool of European countries that have participated in the Children's Worlds survey has also varied across waves. Half of the European countries that participated in the survey have only joined in the third wave and only three of them have been participating since the beginning. We thus restrict our analysis to the latest wave, which allows us to explore the relationship between ICT and children's well-being with the most recent information available.

In all waves, three separate questionnaires are used, one for each age group, to take into account the age of the children being surveyed. This allows adapting the questionnaires to the age of the child. The 10 years-old and the 12 years-old questionnaires are thus longer and more comprehensive than the 8 years-old questionnaire. In addition to their length, they also differ in the wording and format of the questions. For example, in the 8 years-old version, a scale of emoticons is used to gather information from children on their satisfaction and happiness items (Casas, n.d.). Finally, questionnaires also vary in their rate of non-response. For instance, about half of the 8 years-old kids do not answer most of the questions regarding the use of ICT. We thus opted to focus our analysis on the two oldest cohorts which enquiry children at the age of 10 or 12 – other studies using the Children's Worlds survey have also followed this approach (see for example Savahl et al., 2021).

Finally, it is worth noting that in many of the participating countries, results are not representative of the entire national territory, as surveys are only conducted in specific regions. Table A1.2 in the Appendix shows country/federal region participation and the number of children surveyed by wave.

Therefore, our final sample includes 10- and 12-year-old children living in the European Union and the United Kingdom participating in the third wave – i.e., 32,179 children.[4] Table 1 presents our sample summary statistics. As indicated, 49.9% of the sample are boys. Regarding access to the internet and technological devices, 96.7% and 84.4% report having internet at home

3 For more information, visit: https://isciweb.org/

4 The list of countries that our sample includes is the following: Belgium (Flanders), Croatia, Estonia, Finland, France, Germany, Greece, Hungary, Italy (Liguria), Malta, Poland, Romania, Spain (Catalonia) and the United Kingdom (England and Wales).

and their own mobile phone, respectively. Moreover, 65.1% have more than two computers at home, while 32.9% have one or two and 2% have none; 88.5% live in a household with one or two bathrooms; and 6.8% declare that their families lack a car. Regarding children's use of time, 35.8% of children play electronic games every day and 45.2% use social media with the same frequency; 10.2% declare that they never spend time with their family and 25.4% say the same about time spent with their friends. Only 24.2% help around the house and 26.5% practise sports on a daily basis.

In terms of subjective well-being, the questionnaire includes one single question regarding overall life satisfaction (OLS): "How satisfied are you with your life as a whole?", where children can answer from "0" (not at all satisfied) to "10" (totally satisfied). Such a measure of life satisfaction is often used as a proxy for the overall concept of children's subjective well-being (Savahl et al., 2021). Many large-scale surveys such as the Programme for International Students' Assessment (PISA) include OLS measures in their questionnaires. The recent psychometric literature, however, considers children's subjective well-being as a three-dimensional concept, that is better captured through multiple-item scales measuring the different components of subjective well-being (Casas, 2017; Savahl et al., 2021).[5] The third wave of the Children Worlds's survey allows researchers to build such multiple-item scales and we thus later on include them in our analysis. In our sample, 80.8% of children report being "almost totally" or "totally" satisfied with their life (9 or 10 on the OLS measure).

We proceed by computing an index of ICT use that summarizes the use of new technologies. We obtain this index by applying a Principal Component Analysis (PCA) technique.[6] In our application, we take the four variables referring to the use of new technologies (how often the child plays electronic games, how often she uses social media, whether she owns a mobile phone and whether she has access to the internet) and apply principal components. We keep the first component, which explains most of the information.[7] We transform the obtained component into a categorical variable, increasing in terms of the use of ICT[8]. As shown in Table 1, 1.2% of the children have a very low score on the ICT use index. All children in this category lack a mobile phone and internet access, and the vast majority of them never spend time playing computer games or using social media. Notice also from Table 1 that most of the children have high ICT use scores: 80.0% of the children have either a high or a very high ICT use index. This is consistent with the descriptive statistics of each new technology.

5 This literature has operationalised children's subjective well-being building upon conceptualisations, which are based on three main components (Diener et al., 1999). The first two refer to cognitive aspects of life satisfaction. Context-free life satisfaction is the first of these cognitive components, which includes aspects such as satisfaction with life as a whole. Domain-based life satisfaction definitions instead capture other aspects of life satisfaction that are more domain-specific, such as satisfaction with people that one lives with, or safety in the area where one lives. The last component is affective in nature and measures positive and negative effects as, for example, how often a child feels happy or stressed. While our results in the main text refer to overall satisfaction with life, all results regarding the rest of the definitions can be found in the Appendix A2 and A3.

6 Principal Component Analysis (PCA) is a powerful statistical technique developed to summarise the most important features and relations of several variables. PCA reduces the dimensionality of the original dataset by computing a new set of variables, the principal components, as a linear combination of the original variables, ordered in terms of variance. In other words, PCA rearranges our variables in an information-equivalent, but more convenient, layout where the variables are sorted according to the amount of information they can explain. For the interested reader, our implementation of PCA takes advantage of the ordinal structure of the variables we seek to summarize (see Kolenikov & Angeles, 2009).

7 The correlation between the ICT use index and each new technology is remarkably high.

8 Children with very low ICT use (the lowest category of the ICT use index).

Table 3.1 Summary statistics

Variable	Mean	Std. dev.	Min	Max
Boys	0.499	0.500	0	1
Has internet access	0.967	0.178	0	1
Has mobile phone	0.844	0.362	0	1
Family number of computers				
None	0.020	0.141	0	1
One	0.125	0.331	0	1
Two	0.204	0.403	0	1
More than two	0.651	0.477	0	1
Number of bathrooms				
None	0.053	0.072	0	1
One	0.519	0.499	0	1
Two	0.366	0.482	0	1
More than two	0.108	0.310	0	1
Number of cars				
None	0.068	0.068	0	1
One	0.325	0.325	0	1
Two	0.456	0.456	0	1
More than two	0.150	0.150	0	1
How often: Play electronic games				
Never	0.219	0.413	0	1
Once or twice a week	0.142	0.349	0	1
Three or four days a week	0.152	0.359	0	1
Five or six days a week	0.130	0.336	0	1
Every day	0.358	0.479	0	1
How often: Social media				
Never	0.199	0.399	0	1
Once or twice a week	0.094	0.292	0	1
Three or four days a week	0.144	0.351	0	1
Five or six days a week	0.109	0.312	0	1
Every day	0.452	0.498	0	1
Frequency: Time with family				
Never	0.102	0.303	0	1
Once or twice a week	0.154	0.361	0	1
Three or four days a week	0.188	0.390	0	1
Five or six days a week	0.136	0.343	0	1
Every day	0.420	0.494	0	1

Frequency: See friends				
Never	0.254	0.435	0	1
Once or twice a week	0.260	0.438	0	1
Three or four days a week	0.179	0.383	0	1
Five or six days a week	0.124	0.329	0	1
Every day	0.184	0.387	0	1
Frequency: Do homework				
Never	0.077	0.266	0	1
Once or twice a week	0.106	0.308	0	1
Three or four days a week	0.144	0.351	0	1
Five or six days a week	0.165	0.371	0	1
Every day	0.507	0.500	0	1
Frequency: Help around the house				
Never	0.182	0.385	0	1
Once or twice a week	0.257	0.437	0	1
Three or four days a week	0.215	0.411	0	1
Five or six days a week	0.104	0.606	0	1
Every day	0.242	0.428	0	1
Frequency: Play sports/ do exercise				
Never	0.141	0.348	0	1
Once or twice a week	0.218	0.413	0	1
Three or four days a week	0.249	0.433	0	1
Five or six days a week	0.125	0.331	0	1
Every day	0.265	0.441	0	1
ICT use index				
Very low ICT use	0.012	0.108	0	1
Low ICT use	0.058	0.234	0	1
Medium ICT use	0.131	0.337	0	1
High ICT use	0.375	0.484	0	1
Very high ICT use	0.425	0.494	0	1
OLS	9.109	1.746	0	10

Source: Authors' computation using data from the Children's Worlds survey, third wave (2016-2019).

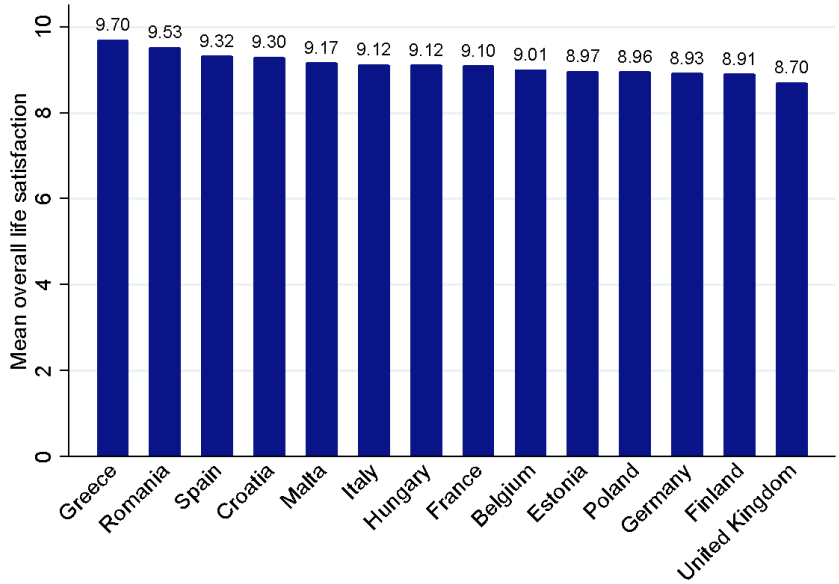
3.4. Results

In this section, we provide the most important findings of our analysis. As mentioned above, our results refer to children in the second and third age cohorts. First, we discuss results regarding children's overall subjective well-being by presenting, in the first place, how this indicator varies across European countries. We then move on to discussing our results on the association between the use of new technological devices and OLS, devoting special attention to exploring such relationship across European country clusters.[9] Second, we explore whether the use of ICT crowds-out other activities that could potentially bring more life satisfaction to children. Finally, we close this section by examining the effect of the use of different new technologies on children's satisfaction with their free time and time use.

3.4.1. Children's use of new technologies and overall subjective well-being

Figure 1 shows the overall levels of subjective well-being across the European countries in our sample and the United Kingdom. As the graph shows, children tend to report very high levels of overall life satisfaction across Europe. The average value for the set of countries covered by the database is 9.13. More interestingly, Figure 3.2 shows the percentage of children who report having low overall life satisfaction – i.e., children with an OLS score below five. In the United Kingdom, 6.7% of children declare to have low levels of life satisfaction, while in Greece such percentage is 0.48%. Poland, Finland, France and Estonia have percentages around 3% and Malta, Hungary, Croatia, Italy and Germany, around 2%. In Spain and Romania, these percentages are relatively small: almost all children report medium-high levels of overall life satisfaction.

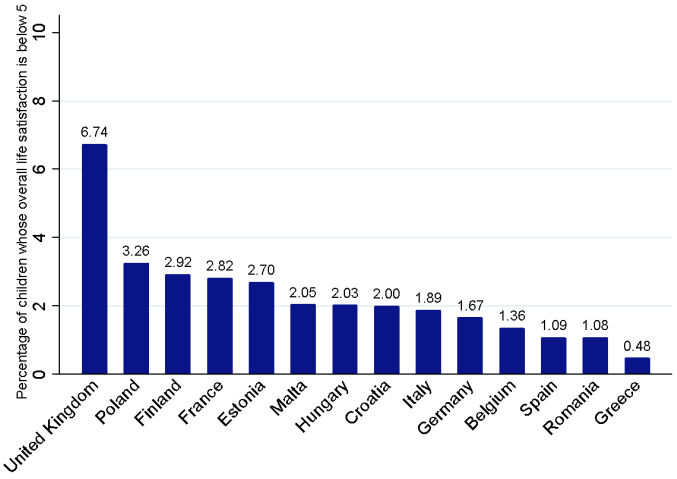
Figure 3. 1 Mean levels of children's overall life satisfaction in a scale from 0 to 10, Europe



Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

9 Since we lack data from several European countries, we consider four relatively large country clusters: Southern European countries (Greece, Italy, Malta, and Spain), Eastern and Baltic European countries (Croatia, Estonia, Hungary, Poland, and Romania), Northern and Continental European countries (Belgium, Finland. France, and Germany) and the UK.

Figure 3.2 Percentage of children whose overall life satisfaction is below five in a scale from 0 to 10, Europe



Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

In what follows, we discuss our results on the association between the use of new technologies and OLS. In particular, results are the outcome of a series of linear regressions where standardised overall satisfaction with life is regressed against the index of ICT use and then on each new technology. Standard errors are clustered at the school level. The effect of new technologies on other indicators of subjective well-being is provided in Tables A2.1, A2.2, A2.3 and A2.4 in the Appendix.

As shown in Table 3.2, we first include a baseline specification that only considers country and questionnaire fixed effects. We then add a set of covariates that seek to control for the gender and the socio-economic background of the child (which might confound the effect of ICT use on well-being) such as the number of bathrooms, cars, and computers (as reported by children themselves). We start by discussing the overall effect of ICT use on OLS for children, which is shown in the first two columns of Table 3.2. For the ICT use index, we find that higher frequencies of ICT use are positively associated with overall well-being. In particular, we find that as children use new technologies more often, their overall well-being increases vis-à-vis those that have very low ICT use scores.[10] For the ICT use index, this is illustrated in the second column, which expands the specification by controlling for socioeconomic background. Once we include them in the regression, the estimated association decreases by around 15%. This is due to the fact that, in our application, socioeconomic indicators are positively correlated with both the outcome and the variable of interest. Noticeably, the shape of the association remains even if we introduce the socio-economic variables as controls.

In the remaining four columns of Table 3.2, we explore the effect of each technology on OLS. All the models include country and questionnaire fixed effects and control for the gender and the socio-economic background of the child. For both time spent at playing electronic games and using social media, we find that higher frequencies of use are positively associated with overall well-being, with diminishing returns for everyday users. Their well-being seems to reach the maximum at five or six uses per week when the overall satisfaction with life is about 0.096 (0.117) standard deviations higher than for those than never play electronic games (use social media). Everyday users do however report the lowest levels of overall well-being.[11] The last two

10 The former results should however be read with caution as they cannot be interpreted, by any means, as causal given that we are not successfully conditioning on other unobserved factors that might affect the true effect of ICT use on children's well-being.

11 While the point estimate decreases, we cannot nonetheless reject that the estimated effect is statistically different from the other levels of frequency use playing electronic games.

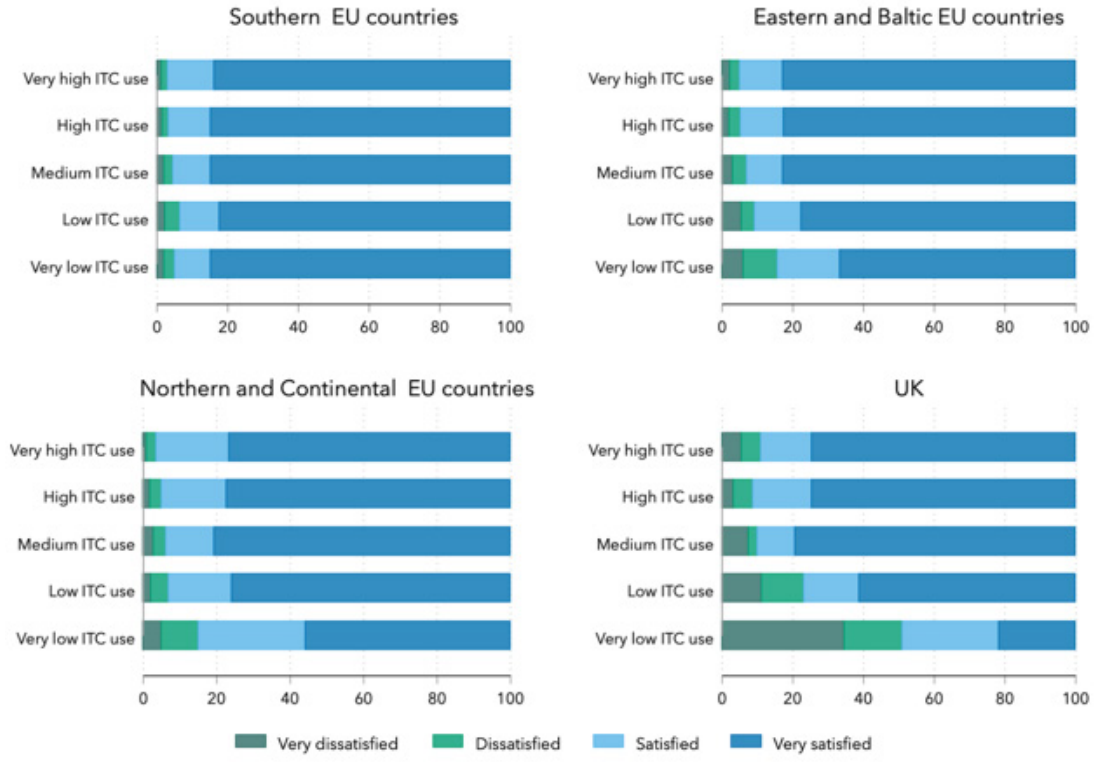
columns of Table 2 provide the effect of the two other indicators on new technologies present in the Children's Worlds survey: 1) having a mobile phone and 2) having internet access at home. Notice that for these two indicators, the database does not register time use but whether the children have or do not have the item. We find that owning a mobile phone or having internet access is positively associated with children's overall well-being. In particular, children that have a mobile phone have on average OLS scores 0.068 standard deviations higher than those that do not have this device. In a similar vein, having access to the internet at home is associated with a quite substantial increase in children's well-being, by about 0.380 standard deviations. The effect found for each new technology is consistent with other indicators of subjective well-being – see Tables A2.1, A2.2, A2.3 and A2.4 in the Appendix.

Table 3.2 Use of new technologies and overall well-being

	(1)	(2)	(3)	(4)	(5)	(6)
ICT use index						
Low ICT use	0.386^{xxx} (0.141)	0.338^{xx} (0.134)				
Medium ICT use	0.509^{xxx} (0.144)	0.431^{xxx} (0.134)				
High ICT use	0.592^{xxx} (0.143)	0.494^{xxx} (0.131)				
Very high ICT use	0.616^{xxx} (0.144)	0.513^{xxx} (0.133)				
How often: electronic games						
Once or twice a week			0.081^{xxx} (0.023)			
Three or four days a week			0.092^{xxx} (0.026)			
Five or six days a week			0.096^{xxx} (0.026)			
Every day			0.077^{xxx} (0.025)			
How often: social media						
Once or twice a week				0.066^{xx} (0.027)		
Three or four days a week				0.107^{xxx} (0.026)		
Five or six days a week				0.117^{xxx} (0.026)		
Every day				0.055^{xx} (0.023)		
Has a mobile phone						
Yes					0.068^{xxx} (0.024)	
Has internet access						
Yes						0.380^{xxx} (0.067)
Constant		6.940^{xxx}	-0.809^{xxx} (0.206)	-0.815^{xxx} (0.205)	-0.991^{xxx} (0.214)	
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Questionnaire fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes
Observations	27,342	21,748	22,204	22,179	24,407	24,384

Notes: Standard errors in parentheses, clustered at the school level. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Figure 3.3 ICT use index and overall well-being, European clusters



Source: Authors' computations, using data from Children's Worlds survey, third wave (2016-2019).

We close this section by exploring the relationship between the ICT use index and OLS across European clusters (see Figure 3.3). Eastern, Baltic, Northern and Continental European countries show a stronger relationship between the use of ICT and overall subjective well-being. In these two clusters, about 15% of those children that have very low ICT use scores report being "very dissatisfied" or "dissatisfied" with life in general. Conversely, in these two clusters, more than 95% of those children that have very high ICT use scores report being "very satisfied" or "satisfied" with life in general. For Southern European countries, however, there is a less pronounced association between the use of new technologies and overall subjective well-being for children, driven by the composition of subjective well-being on the lowest levels of ICT use (see Figure 3.3). In particular, while children in the Southern EU cluster that have very high or high ICT use scores tend to show levels of subjective well-being which are consistent with those from Eastern, Baltic, Northern, and Continental European countries, a different picture emerges for low and very low ICT users. In the Southern EU cluster, only 5.12% of those children that have very low ICT use scores report being very dissatisfied or dissatisfied with life in general. In other words, among children with very low ICT use, the proportion of children with poor subjective well-being is three times smaller in Southern European countries than in the rest of Europe. Finally, the UK shows a distinct path in the relationship between the ICT use index and OLS. Concretely, children in the UK with very high ICT use report being less satisfied with life in general than those with medium ICT use scores.

3.4.2. Does children's ICT use crowd-out other activities?

In this section, we explore whether the use of new technologies crowds-out other activities. Results are obtained by regressing each activity, such as time spent relaxing with family members, or seeing the child's friends on the ICT use index. There would be evidence of crowd-out effects if there is a negative association between higher use of new technology and time allocated to other activities. To keep the discussion concise, all results provided below already account for the set of covariates considered in previous tables. Standard errors are clustered at the school level. The crowd-out effects of each separate technology are available in Tables A3.1, A3.2, A3.3 and A3.4 in the Appendix.

Table 3 provides the main results. In general, they reject the hypothesis of substitution effects. There is no evidence that children who use ICT more intensively then spend less time on other activities. For both, time spent relaxing, talking or having fun with their families and seeing their friends, we find a significantly positive association. The more intense use of new technologies, the more time children spend with their family or seeing friends. This would suggest no crowd-out effects on these activities. Moreover, notice that heavy ICT users report allocating remarkably more time to their families or friends than those that have very low ICT use scores (0.712 standard deviations larger). A similar (yet weaker) pattern is observed for time spent playing sports or doing exercise. For the time spent doing homework, there seems to be no difference across the different levels of electronic game use. Finally, estimated coefficients for time spent helping around the house are negative and small yet inconsistent. These patterns are generally consistent with the one obtained from considering each separate technology in Tables A3.1 to A3.4. A worth-mentioning exception is that we do find evidence of crowd-out effects on helping around the house for children that play computer games every day.

Table 3.3 ICT use and crowd-out effects

	(1)	(2)	(3)	(4)	(5)
	Relaxing etc. with family	See your friends	Doing homework	Helping around the house	Playing sports/ doing exercise
ICT use index					
Low ICT use	0.149 (0.145)	0.127 (0.125)	0.057 (0.100)	-0.037 (0.128)	0.184 (0.122)
Medium ICT use	0.331^{xx} (0.134)	0.267^{xx} (0.121)	0.117 (0.096)	-0.012 (0.130)	0.194 (0.121)
High ICT use	0.462^{xxx} (0.137)	0.398^{xxx} (0.121)	0.149 (0.095)	0.003 (0.129)	0.290^{xx} (0.121)
Very high ICT use	0.712^{xxx} (0.137)	0.638^{xxx} (0.121)	0.160 (0.097)	-0.001 (0.130)	0.476^{xxx} (0.124)
Constant	2.147^{xxx} (0.226)	0.953^{xxx} (0.254)	2.474^{xxx} (0.174)	2.374^{xxx} (0.230)	1.172^{xxx} (0.214)
Observations	21,704	19,597	21,718	21,909	21,742

Notes: Standard errors in parentheses, clustered at the school level. All specifications include country and questionnaire fixed effects and controls. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

3.4.3. Children's ICT use and satisfaction with their free time and use of time

We now explore how using different new technologies influences children's satisfaction with their free time and the way their time is used. Results are shown in Table 4, where we look at the effect of the index of ICT use on each outcome. All models include controls. In the first model, we observe that using new technologies is positively associated with being satisfied with how much free time one has: children who on average use new technologies more often are more satisfied with how much free time they have. That would imply that children enjoy using ICT in their free time. This association also holds across each of the ICT use levels. The largest associations are found for having access to the internet and playing electronic games. Conversely, the effect of owning a mobile phone on children's satisfaction with free time is rather small (results available in Table A4.1 in the Appendix).

Table 3.4 ICT use and satisfaction with free time

	(1)	(2)
	Satisfaction with: How much time you have	Satisfaction with: How you use your time
ICT use index		
Low ICT use	0.478^{x} (0.286)	0.456^{xx} (0.223)
Medium ICT use	0.808^{xxx} (0.269)	0.650^{xxx} (0.212)
High ICT use	0.924^{xxx} (0.270)	0.739^{xxx} (0.215)
Very high ICT use	1.219^{xxx} (0.269)	0.854^{xxx} (0.214)
Constant	7.026^{xxx} (0.519)	7.524^{xxx} (0.419)
Observations	19,012	21,617

Notes: Standard errors in parentheses, clustered at the school level. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

The second model in Table 3.4 provides the effect of using new technologies on children's satisfaction with how they use their time. We find that higher levels of ICT use is positively associated with children's satisfaction with time use as well. Notice, however, that the effect of the ICT intensity index on children's satisfaction with their time use is relatively weaker than the effect on free time. This pattern is consistent with effects found for each ICT, which also show that higher intensity of use or access to ICT devices are associated with higher levels of satisfaction with time use – see Table A4.1. Caveats on the causal interpretation of the reported coefficients still remain.

3.5. Concluding remarks

In this chapter, we have used the third wave of the Children's Worlds database to investigate how the use of ICT affects children's subjective well-being in Europe, whether the use of ICT crowds-out other activities, and how the use of such technologies affects children's satisfaction with how much free time they have and their use of time. First, we find that there is a positive association between the use of new technologies and children's well-being: as children use new technologies more often, their overall well-being increases relative to those that do not use technology that often. We also find that such association holds across different technologies and for all European clusters. Second, we do not find evidence of crowd-out effects – i.e., children who spend more time using digital devices do not report dedicating less time to other activities. Finally, we document that ICT is positively related to free time satisfaction as well as satisfaction with time use.

Discussing whether these results are aligned with those from causal studies is challenging since there are some important methodological differences between our study and the current literature. First and foremost, our database directly asks children about their subjective well-being. This is in sharp contrast with most of the causal studies reviewed. Hence, we are studying a dimension of children's well-being for which there is no direct well-defined reference point. Second, when studying crowd-out effects, directly asking children might raise questions on whether children are consistent with their time organisation. Third, our intensity measures of ICT use are not very granular. That is, asking children how many days a week do they play electronic games or use social media might not be enough to detect prolonged use or addiction to new technologies. For instance, a given child might well play computer games every day yet use them for a short period of time.

With these caveats in mind, we find that the first two findings of this study are generally not consistent with the main takeaways from the causal studies reviewed. To the best of our knowledge, is not possible to assess the validity of our third result from existing causal studies. We start with our first finding. Only McDool et al. (2020) has explored the impact of new technologies on overall subjective well-being. Their study shows that more internet use does not affect overall subjective well-being. Although we do not have a measure of internet intensity use, their results would indirectly invalidate ours since internet use ultimately relates to social media and some forms of gaming. Second, most of the existing causal studies cover tend to contradict our findings on crowd-out effects. One exception is Sanchis-Guarner et al. (2021) who finds that better internet access positively impacts test scores. For time with family, friends and doing sports, however, existing causal studies tend to show that new technologies do substitute such activities. McDool et al. (2020) for instance show that more intense internet use reduces the total number of activities that the child undertakes per week, including the three mentioned before. This would be against the results found in our study. One possible explanation would be that our intensity measure is not very granular, as already stated. Indeed, McNamee et al. (2021) find that the crowd-out effect of social media on time with friends depends on how intensively children use social media. Finally, for the crowd-out effect on education, McDool et al. (2020) also find that as internet use increases, children tend to feel on average worse about their schoolwork and the school they attend. Their study also reports that more time on the internet reduces the time children spent taking classes outside school, thus affecting the positive spillovers on learning that children are expected to experience from such activities. Again, the time devoted to new technologies seems to be key to crowd-out education. Suziedelyte (2015), for instance, finds that moderate video game playing improves children's problem-solving ability. Similarly, causal studies evaluating the one-laptop-per child program points to parental monitoring and time limits on the use of new technologies as the key drivers for overcoming poorer education performance.

4. Case studies: basic findings from the fieldwork

Our qualitative research covers several aspects of leisure and ICT use by children. Categories that shaped interview guides were discussed among participating institutions and led to a common interview guideline. This choice was made for practical reasons, but also for reasons of comparability of data that would provide the possibility of a common analysis, where points of convergence and divergence could be highlighted. The major findings of our qualitative research are presented below, following the commonly decided thematic axes of the interviews. More specifically, our analysis involves the following topics:

- *Digital capital*, i.e. the devices owned and used, the possibilities of connectivity, existing inequalities that might verify a kind of digital divide on the grounds of socio-economic background
- *Everyday communication*, i.e. both means of communication and social meanings of communication including means and ways of entertainment and information
- *Gaming*, both as a main activity and as a main space of social interaction among children and adolescents
- *Online/offline socialisation*, seen both as a dichotomy where different types of identities and behaviours might occur, and as interchangeable spaces where boundaries might be overcome
- *Negotiations within families*, i.e. rules imposed or commonly decided setting a framework that might be followed or partially bypassed
- *The impact of the pandemic* on almost all of the above-mentioned aspects, and particularly on communication, socialisation and negotiation within families

4.1. Data from digital diaries

4.1.1. Digital capital (devices used/owned/access to)

Data from the diaries indicates 45 of our 50 co-researchers who filled in diaries have their own mobile phone. The average age for getting their first mobile-phone among the co-researchers is 9,6 years ranging from 4 to 14. Most of the children in our sample got their first mobile phone at age 10 or 11. They all report having internet access at home and they all report using the internet for homework. The majority of our co-researchers live in a household with at least one available computer and 40 of the 50 kids live in a household where they can access a gaming console.

Prior to filling out the online diaries our co-researchers were asked to estimate the frequency of online gaming and chatting with friends. As shown in Figure 4.1 and Figure 4.2 the majority of children play games or chat online with friends every day.

Figure 4.1 Frequency of online gaming (n=50)

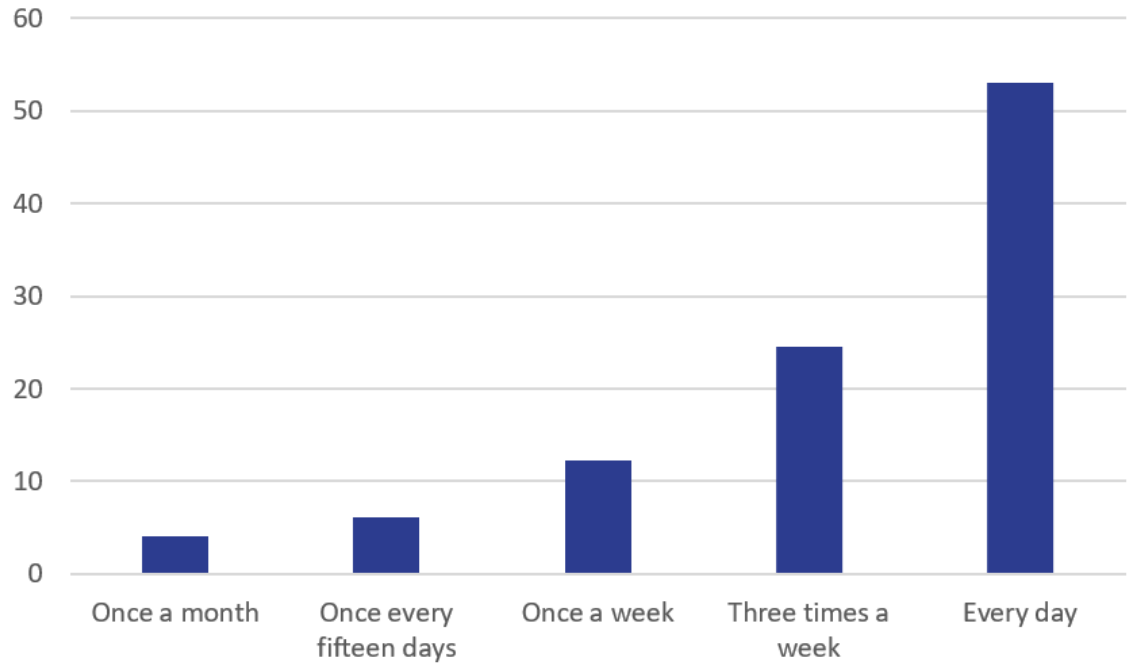
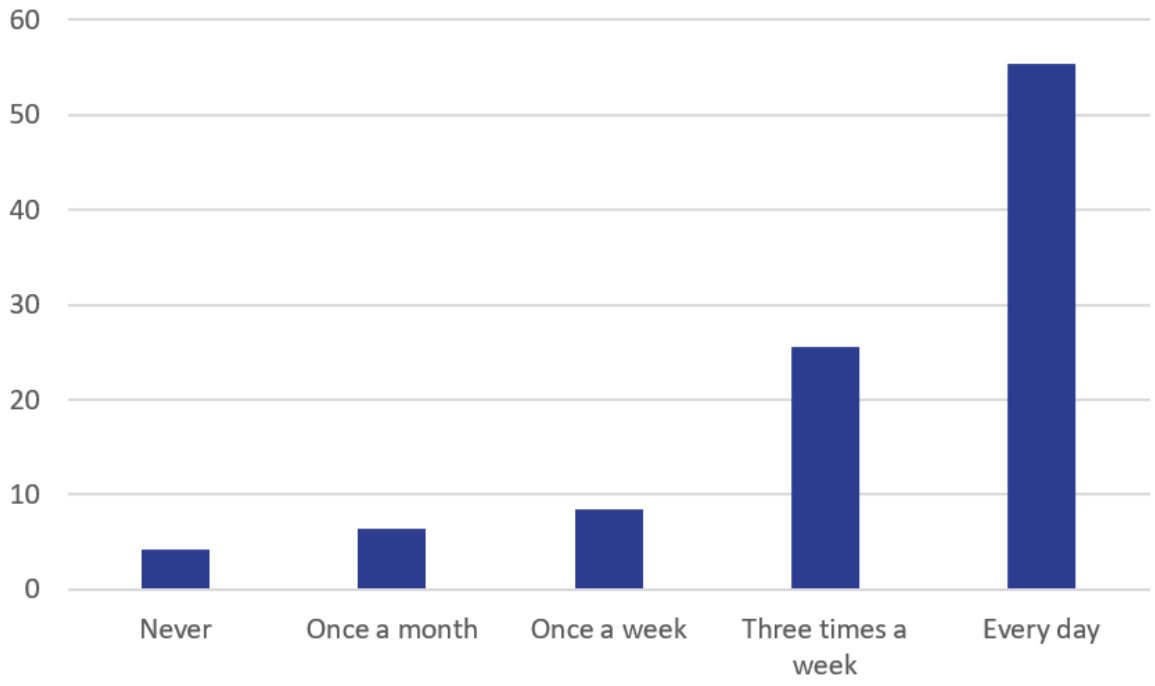


Figure 4.2 Frequency of chatting online with friends



The co-researchers made a total of 273 diary entries reporting from their daily digital lives. Every day the children were asked to report whether they had used any digital devices and what types of digital devices they used that day. The co-researchers made a total of 273 diary entries reporting from their daily digital lives.

In only 7 (2.6%) of the diary entries there were no reports on using digital devices.

Figure 4.3 Number of diary entries mentioning different digital devices

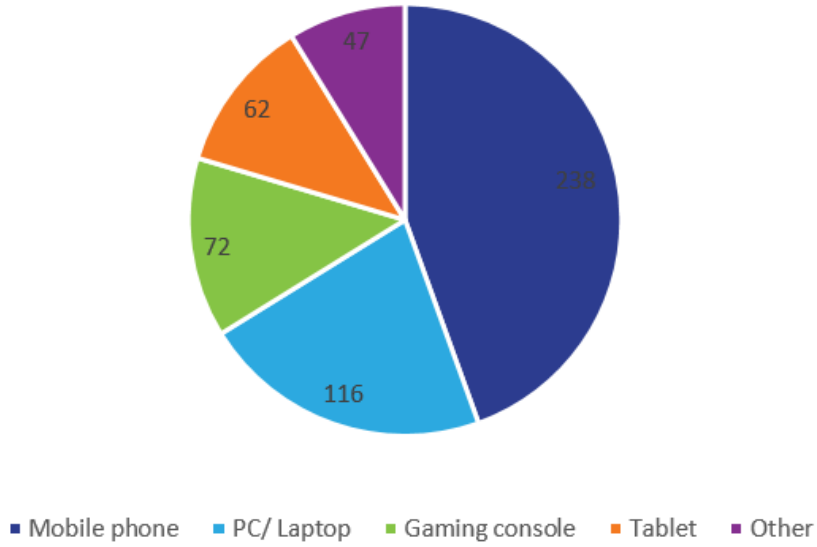


Figure 4.4 shows the number of diary entries mentioning the use of different types of digital devices. The total number does not add up to 273, as many mention using several types of digital devices each day. Mobile phones are most frequently mentioned followed by PC/ laptops, gaming consoles and tablets. 47 entries mention “other” digital devices. Most of these entries mention using TVs or specific types of computers (“My macbook”, “my chromebook” etc.). In addition, some entries mention the use of other types of smart-devices such as “Google home” and “Alexa”.

Figure 4.4 Number of diary entries mentioning different locations for use of digital devices

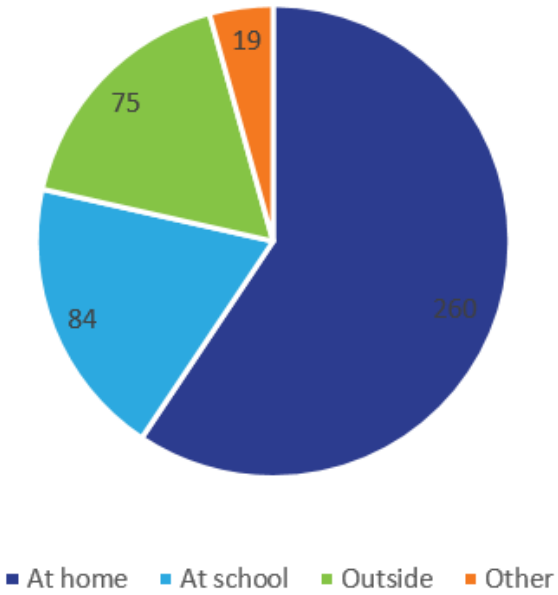
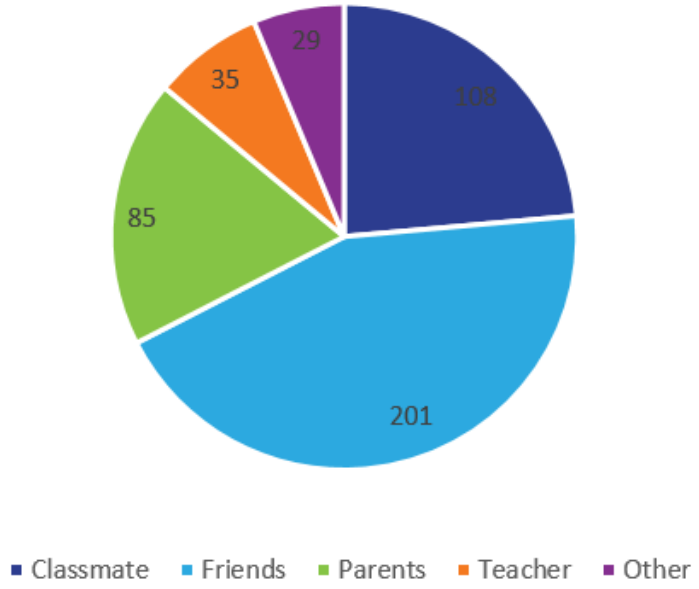


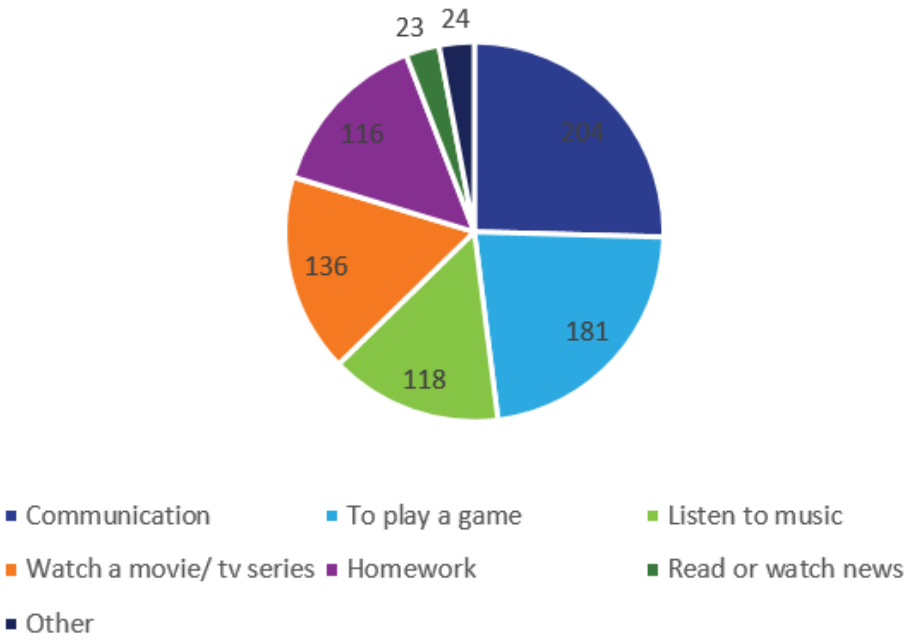
Figure 4.4 shows that most of the use of digital devices take place at home. In addition, there is some use of digital devices in a school setting as well as outside. Examples of “other” locations are at “a friend’s house” or at “grandma’s house”. 232 (86.2%) entries mention engagement with someone using digital devices.

Figure 4.5 Number of entries mentioning different groups of people engaged with using digital devices



Most of the engagement with others using digital devices are with peers, either classmates or friends. However, there are also a number of entries mentioning communication and engagement with parents and teachers. Most of the "other" communication are with other members of the family, such as siblings or grandparents. In addition, a few entries mention engagement with other anonymous online players.

Figure 4.6 Purpose for using digital device



The single most frequently mentioned purpose for using digital devices among the co-researchers is *communication*. However, from the figure 4.6 we see that the use of digital devices in most cases include some sort of entertainment, either through playing games watching movies/ tv-series or listening to music. A relatively large proportion of the entries mention using digital devices related to doing homework.

Figure 4.7 Word cloud of most frequently used apps

To get a first impression of the variety of digital activities among children and young people we asked the co-researchers each day to report the three most used apps on their phone. Figure 4.7 shows a simple word cloud based on this reporting. The size of the words in the cloud represents the number of entries mentioning each app.

4.1.2. Time spent using digital devices

Our co-researchers using the Nettskjema-bilde app were asked to report their time spent using digital devices each day. For mobile phones and tablets they were asked to report the registered time on their devices using for instance the built-in time-tracker apps in apple and android devices. The co-researchers reported time using devices such as mobile phone, PC/ laptop, gaming-console and tablet. They did not report time spent using other types of digital devices such as TV and smart devices such as smart-watches or smart-speakers. The total estimated time is thus relatively conservative. First, we use all the daily observation to get an impression on time using digital devices (table 4.1).

Table 4.1 Hours spent daily using digital devices

	N	Minimum	Maximum	Mean	Std. Deviation
Mobile phone	273	0,0	12,9	1,9	2,1
PC	273	0,0	11,9	1,1	2,6
Gaming console	273	0,0	5,2	0,2	0,6
Tablet	273	0,0	7,9	0,2	0,9
Total across devices	273	0,0	21,8	3,5	4,0

Time use varies widely between users and across the observation period. Some of the daily observations include no time at all and in the most extreme observations almost 22 hours of digital device use is reported. In total the mean number of time spent using digital devices in a is 3,5 hours. This number includes however also those spending no time on a particular device. Looking exclusively at those observations that report use of a particular device (table 4.2) we find that our co-researchers on average spend almost 4 hours using a PC or laptop, about 3 hours using their mobile phones and about 2 hours on their gaming console or tablet.

Table 4.2 Hours spent daily using digital devices (daily observations)

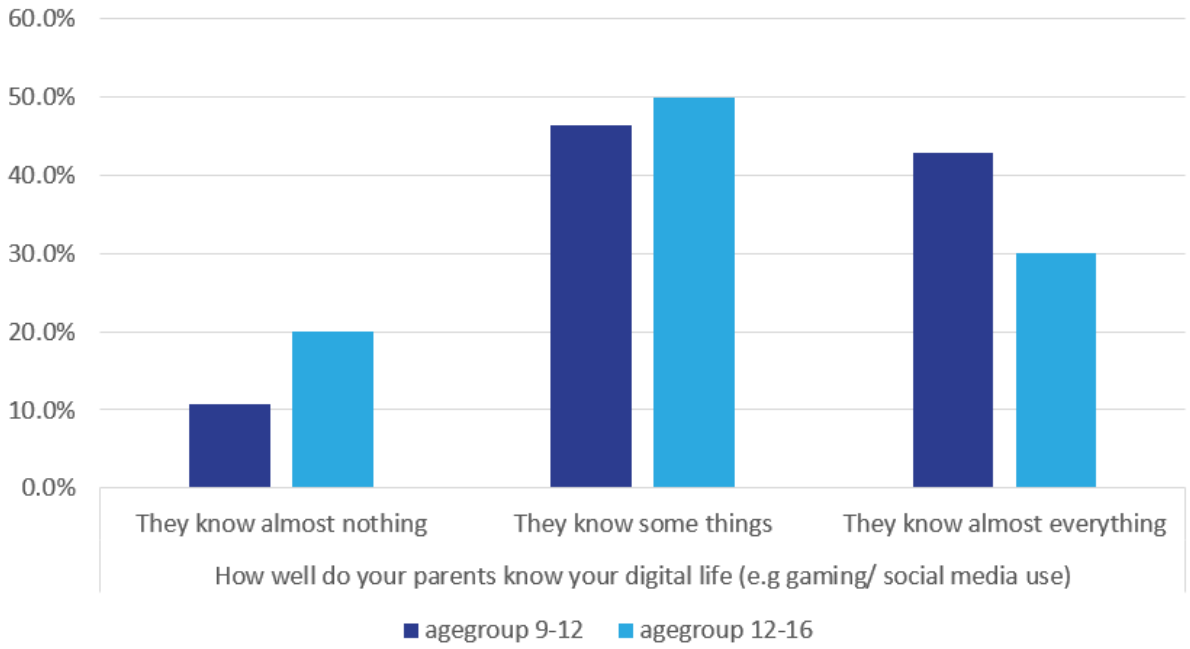
	N	Minimum	Maximum	Mean	Std. Deviation
Mobile phone	190	0,1	12,9	3,1	2,0
PC	87	0,1	11,9	4,0	3,5
Gaming console	40	0,1	5,2	2,2	1,4
Tablet	39	0,0	7,9	2,1	1,7

4.1.3. Negotiations within the family

When looking at negotiations and use of digital devices in a family setting, we split the sample in two in order to see if there are any differences in how parents are involved in the digital lives of our co-researchers of either young children aged 9 – 12 or older children and young people aged 13 - 17.

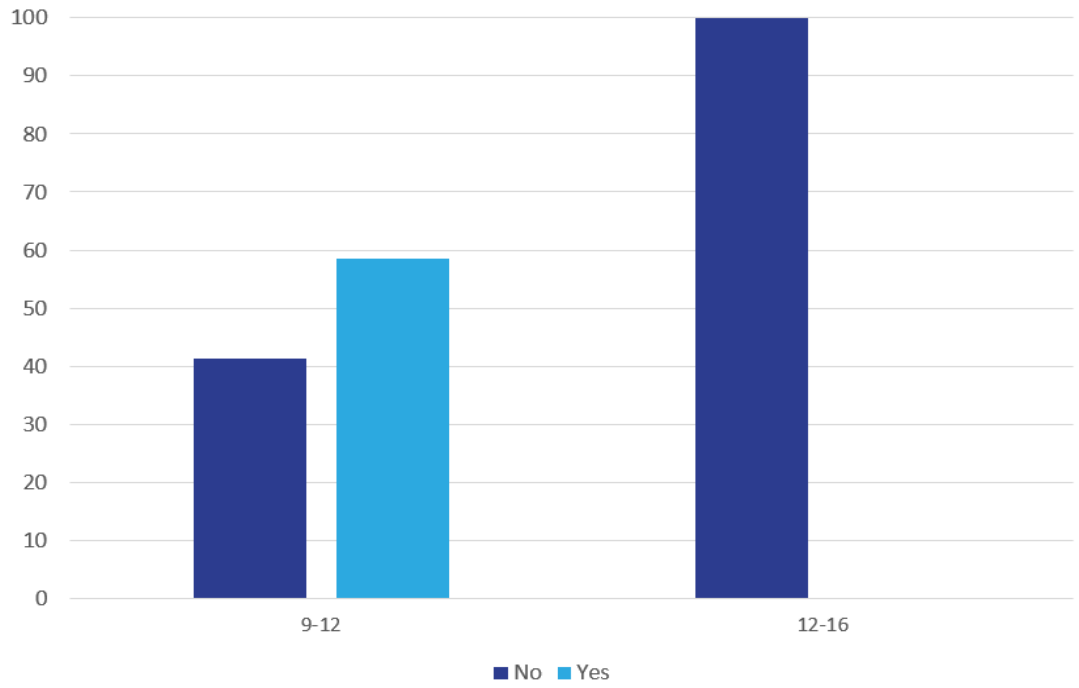
By using data from the Nettskjema-bilde app we can get some insight into the involvement of parents in the digital lives of children and young people.

Figure 4.8 Parents knowledge of the digital lives of their children (e.g. gaming/ social media use) by age group (n=50).



From figure 4.8 we see that most of our co-researchers feel their parents have some insight into their daily digital lives, including for instance their gaming and social media use. It seems that parents' insight into their children's digital lives are reduced as the children get older.

Figure 4.9 Number of children playing games with their parents



Another indication of parents' involvement in their children's digital lives is whether they play digital games together. We see that a relatively large proportion of the younger children report playing digital games with their parents. However, at the age of 12 none of our co-researchers report playing digital games with their parents.

Figure 4.10 and n shows the number of children in our sample of co-researchers who report that their parents have made some sort of restrictions on their digital activities such as gaming and use of social media. A relatively large proportion of the kids are subject to some sort of restrictions on their gaming. This is more widespread among the younger than among the older children. The children also report being subject to some sort of restrictions on their use of digital social media.

Figure 4.10 Parental restrictions on gaming by age group (n=50)

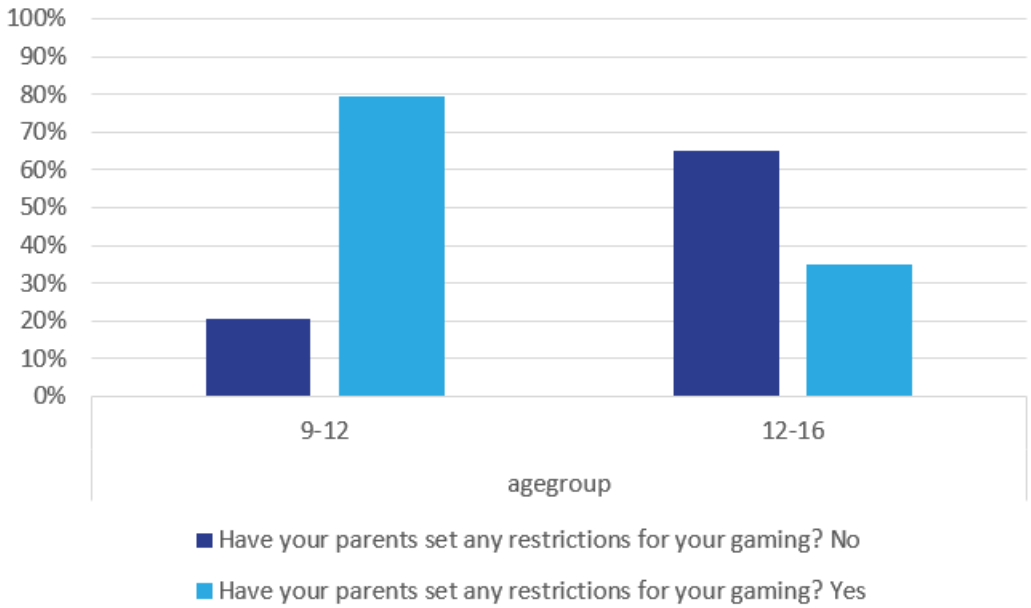
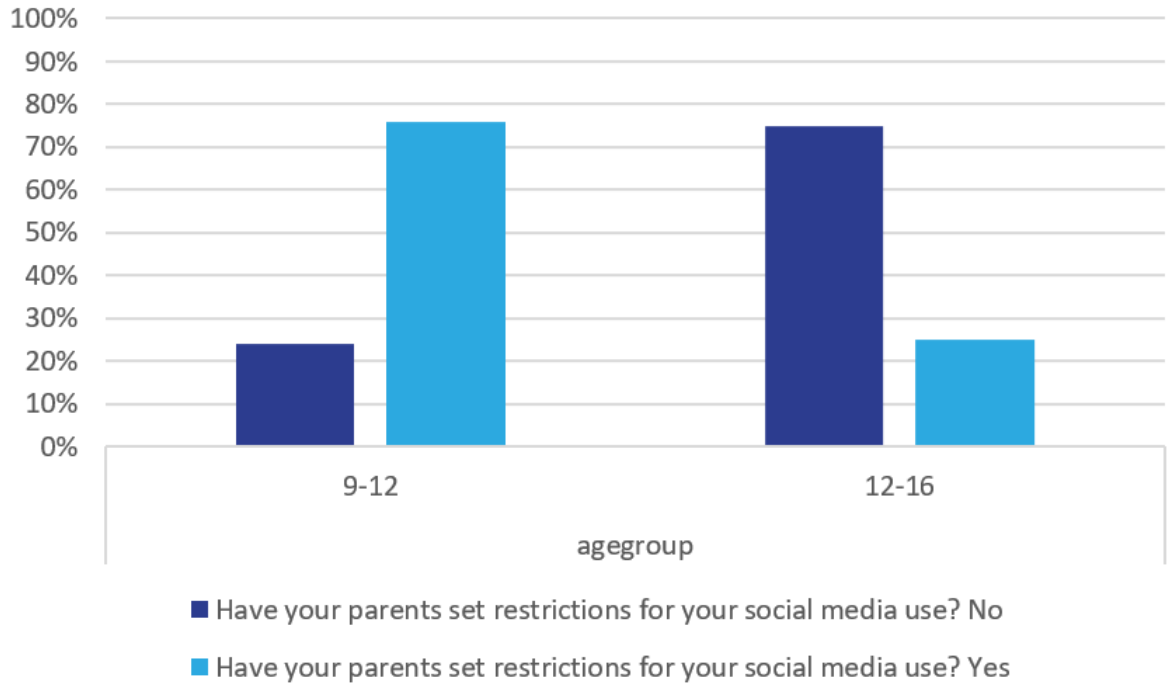
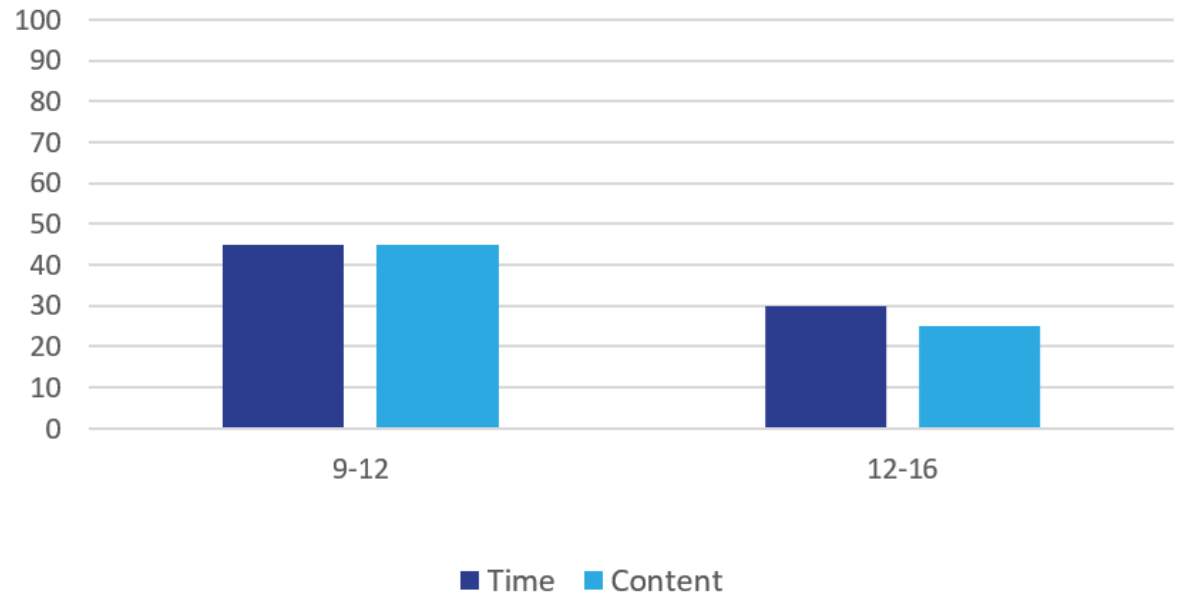


Figure 4.11 Parental restrictions on the use of social media by age group (n=50)



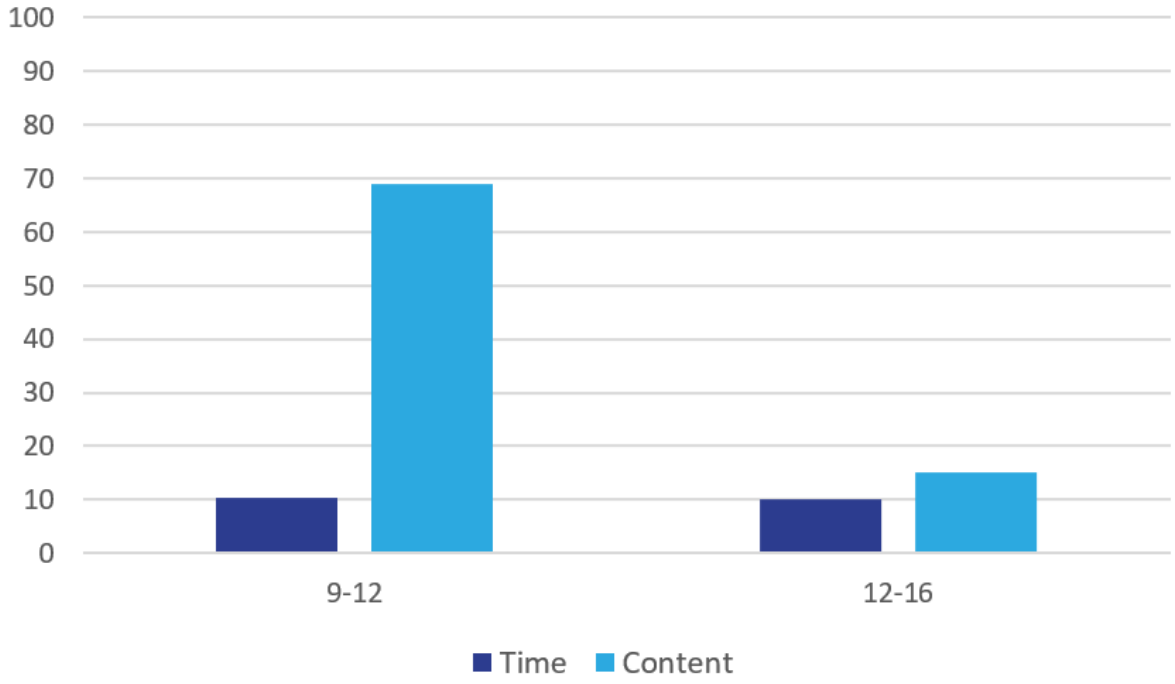
We asked the co-researchers to report on two main types of restrictions on their gaming anduse of social media used by their parents, time-restrictions and restrictions regarding content. The results are displayed in figure 4.10 and figure 4.11.

Figure 4.12 Type of parental restrictions on gaming by age



About 45 percent of the children in the younger age group report parental restrictions regarding both time and content. In the alder age group about 30 percent of the children report time-constraints and about 25 percent report restrictions regarding the content of the game.

Figure 4.13 Type of parental restrictions on social media by age.



From Figure 4.13 we see that the restrictions on social media use among young children in most cases are restrictions regarding content.

4.2. Data from the interviews[12]

4.2.1. Digital capital

Digital capital is certainly not just about ownership of and access to devices and applications; it is mostly about "an individual user's digital technology ecosystem that shapes and guides how the user engages with digital technologies" (Park 2017: 1). However, as data from European surveys such as EU-SILC demonstrate, there is a significant proportion of school-aged children in Europe who are digitally deprived (5.3%), while large differences occur among countries ranging from 0.4% in Iceland to 23.1% in Romania. Moreover, even among the five countries participating in WP4 research, differences are important, ranging from the highest score in Romania to 1.1% in Norway, with Greece reaching the European mean with 5.1%. Similar is the situation concerning children living in households that cannot afford a computer (from 1.1% in Norway to 17.3% in Romania) or in households that cannot afford an internet connection (from 0.0% in Norway and in Austria to 16% in Romania (Ayllón, Holmarsdottir & Lado 2021).

It is revealing that questions of inequality in terms of access and connectivity were mostly raised by participants in Romania, where some children, especially those from rural or low-income families, who seem to share some of their devices with their siblings: "The phone is only mine; I share the laptop and the console with him [brother] and the headphones are also mine" (RO_M_13). Sharing devices was also reported in other countries, e.g. in the UK where children might have their own mobile phones, but they might share other devices such as computers, or in Greece where apart from the devices that the children own and use themselves, some devices are declared "family property" (usually a common tablet or laptop). In some cases, reported by participants in Norway, there is access to two mobile devices (tablets), one private and one

12 In interview quotes 'I' stands for Interviewer, while 'C' stands for Child.

school owned. They reported using the tablets for different purposes – the school owned ones for school-related work, and the private-owned ones for communicating with friends and for gaming or social media:

> "C: No, but I use my school iPad to do homework and stuff then.
> I: Ah, you got a tablet from school?
> C: Oh, that I can do my homework and stuff.
> I: Do you use it for anything else, too?
> C: Yes, I can go to Safari, and there are also fun games on Spillespill and *læggit." (NO_M_08)

In most cases across countries, most interviewees own digital devices and have Internet access. Interestingly enough, they do not regard the possession of a device, e.g. a smartphone, as an indication of social inclusion or exclusion. Inequality is experienced in some cases when a child feels dispossessed in front of her/his peers:

> "Since I got into the new school because my mom didn't want me to start so early, the teacher said that you don't need one [a phone], but the others had one, they laughed at me, I was ashamed, thought it was embarrassing, that I don't have a cell phone." (AT_F_12)

Most children in all countries seem to own or have access to several devices, such as computers (desktop or laptop), game consoles, mp3 players, smartwatches etc. However, smartphones seem to be for them the most important device, around which digital capital revolves. In fact, due to the wide preference for smartphones, most children are familiar with popular applications on this device, especially social networks, e.g. TikTok, Instagram and much less Facebook that is considered old-fashioned, as well as content-consumption apps, e.g. YouTube and Spotify. The adolescents are using the apps from smartphones, yet this usage is not exclusive as some also use computer-based software's, particularly when it comes to gaming where they opt for combinations of devices and apps, e.g. using the Discord on a computer.

In any case, the age of acquiring one's first smartphone is considered a kind of a milestone. There is variety as far as the age of getting the first phone is concerned, ranging from 8 to 14 years old, where in Norway and Austria parents seem to provide their children with a mobile phone at a relatively earlier stage, i.e. from the age of 8-9 years old, than in the other three countries. In some cases, this is a gift for moving from primary to secondary education, which differs among the countries. In some cases younger siblings benefit from the fact that their older siblings get a phone and for reasons of equal treatment, they also get one at the same point of time, even though they are younger.

Going back to where we started speaking about digital capital, and expanding its notion as part of one's social capital, it seems that most children, regardless of their socioeconomic background, are familiar with digital devices - at least some types of them - and they possess digital competencies. The latter, however, seems to be influenced by two factors: first, is the socio-economic status and geographic divergences, i.e. urban-rural areas seem to play an important role in digital competencies and in knowledge related to gaming, as it has been shown particularly in the Romanian case; the second has to do with the restrictions imposed mainly by parents that can lead to limited competences of using several apps and games either because of a lack of understanding or because they are not allowed to do these things, e.g. playing multiplayer games online (AT_M_12).

4.2.2. Everyday communication

A significant part of ICT use by children and young people is everyday communication with others. As we saw from the data collected through the digital diaries, for most participants in

our research of online communication, particularly chatting with friends, is an everyday activity.

This can also be seen through the interviews, where respondents verify that a great part of every day – particularly on weekdays – communication with friends takes place through digital media. Children communicate with their friends every day through chatting or calling, using Snapchat, messenger, WhatsApp, facetime, Skype, Zoom, Microsoft teams, Apple music, Amazon prime, TikTok, Telonym (Austria), Discord, Pinterest, Instagram, Twitter, Facebook, WhatsApp, Reddit. Generally, the children and young people report preferring to chat rather than calls or videocalls.

There is a variety of purposes of communication, ranging from practical reasons, such as exchange of information about school or doing homework together, arrange meetings, to social reasons (just hanging out or kidding around, stay connected with friends):

> "Yes, if I, for example, if I don't know what's homework, I can ask what the homework is. And also when we have questions, and sometimes we just chat for fun." (AT_M_10)

> "Yeah, doing memes and things like that, that's not me. I don't send videos or anything around. I have to say that it varies. So there are a few people with whom I really write about everything, so if we just can't talk to each other or something, then we just write. It started three years ago during the summer vacation, when I didn't see [a] few people, that is, because I was on vacation somewhere. And that's still the case now during lockdown that I just write about everything. But I don't really write in groups, so only with individuals. Yes." (AT_M_16)

It is important to note, however, that communication as part of leisure is under pressure during weekdays and because of increased obligations, particularly in the case of participants from Greece:

> "I used to communicate online but now, I don't have time because I have a lot of homework and tennis." (EL_M_11)

Interesting are the findings when it comes to social media. First of all, there seems to be a common preference, in the sense that unlike platforms such as Facebook and WhatsApp that adults are familiar with, in digital communication children are more inclined to use newer application like Instagram and TikTok in maintaining connections:

> "Less often on Facebook, mostly on Instagram and TikTok." (RO_F_14)

Secondly, there are children who do not show any interest in social media, thinking that "nothing can be found [in social media], so I'm not very social when I'm at home" (UK_M_10). There is also a kind of mistrust of social media and avoidance of exposure. Social media are used mostly for consumption or sharing of others' content and less actively for posts or sharing content of oneself:

> "I: Okay. But you don't post yourself, for example?
> C: I used to, but only on vacation, so I think my last post was three years ago or something. That was, so always only on vacations, when I was just somewhere or something. But I have my, my Instagram account also set to private, which means only my friends see it. So because of that, so I have six photos or so I have up." (AT_M_16)

Thirdly, there are cases where a certain pressure for conformity is exerted by peers. In other words, the longing to conform to what peers do is observed in many different contexts. This might have to do with how often children post things on social media, what they post on social media, their priority for getting likes, the importance to have followers, to play certain games

and even bullying if a child does not have/is not allowed to have a certain social media account. However, it is also apparent that some children feel the need to conform more strongly than other children, resulting in social media practices within groups being rather homogeneous. An interesting aspect in this regard was brought up by a fifteen-year-old girl from Austria, who appeared to connect her identity/self-perception with her opposition to 'stereotypical' behaviour: *"So with those who are exactly these stereotypes, they are on TikTok and put on make-up, or something"* (AT__F_15).

Finally, digital platforms seem to be the main medium for entertainment and information. All children use digital applications, such as Spotify, YouTube, or Netflix to listen to the music or watch videos. The younger ones use their parents' accounts in Spotify or Netflix, but they create their own playlists.

4.2.3. Gaming

Online gaming is considered very often to be the main reason of ICT use by children and young people. Around this issue negotiations within families are developed, while concerns about excessive amount of time spending on online gaming are common among parents and teachers. This issue will be further elaborated in a relevant chapter that will be published in the DigiGen collective volume. In this part of the report we will outline some basic findings that highlight how children themselves perceive gaming.

First, games are a significant part of all children's lives among the five countries participating in our research. They report playing board games, such as Monopoly, with their parents and other members of their families and online games with their friends or even strangers. Parents seem much more eager to play board games with their children than digital games:

> "I usually play [board games] with my mom and then I beat her in monopoly." (NO_M_10)

Playing online games with strangers is generally experienced as different from playing with friends. There appears to be an agreement on how to behave while playing with strangers: communication while playing is reduced compared to when playing with friends, the content of that communication is restricted to non-personal information. However, some children stated that they do not play with strangers at all (AT_M_15, AT_M_11). Others report to have found either recurring acquaintances or even online friendships to varying degrees. In between that spectrum are children who spend their time purposefully playing with strangers online but without any interest in getting to know these persons better. Most of the interviewees in all countries play mainly with their friends and siblings.

There are cases, however, where children play alone. The reasons behind this vary and come either from their parents or from themselves. In some cases, they are not allowed to play with others; in other cases, there is a lack of interest, mood or willingness to invest thought and time into playing with others. In other cases, some might not have friends currently available to play with. It has to be pointed out that children sometimes equate "playing alone" with "playing with strangers". In these cases, the sensation of being on a server with unknown co-players (which oftentimes means that no, or at least less, information is exchanged through the attached communication channels compared to playing with friends) feels similar to just playing alone. There are, finally, cases where younger children report a form of parallel gaming:

> "I: Do you play these games alone or with others?
> C: I play alone, but me and Kristian are in the same room then.
> I: So you're sitting alone?
> C: No, I'm not sitting alone.

I: You sit next to each other?
C: Also, we have a dividing board between the screens." (NO_M_08)

There are convergences regarding the games preferred by the participants in all countries: most children know and some play Minecraft, but also other games, such as Among US, Fortnite, Roblox, Brawl Stars etc. The devices they use are mobile phone (theirs or their parents'), Xbox, laptop, desktop, or tablet. One issue raised by children in all countries is the question of cost. There is a preference for free games, they rarely – if not ever –buy games; to give an example from participants in Greece, they prefer – by necessity – to play Craftsman than Minecraft. Rare are the cases that children will and selectively buy one game:

"I play Minecraft, Cs go, Roblox several; Among us is the only game I bought, the rest are free." (RO_F_12)

As far as the incentives are concerned, interviewees stated many different things as their motivation to either play online games at all, or to play certain games. A significant feature that makes games appealing is the multiplayer mode and the possibility to play with friends, also as a measure to purposefully bridge lockdown times where contact was otherwise not possible. Here, it was also mentioned that multiplayer games can serve as a way to bridge otherwise awkward situations in common video calls, i.e. it is preferred to have the conversation "on the side" while playing together over having a conversation alone.

Another thing is the multiple possibilities that some games offer. This refers to a large map, many tactical/strategic situations that can emerge, or simply the range of vehicles one can use. Some children seem to specifically enjoy the thrill of getting rewards, either in the form of (currency to buy) new items, or points. One rather important motivation (mentioned by several children in different countries) seems to be the challenge that some games pose. To some children, the aspiration to beat a game or to become better in a game seems to be an important attraction point for playing it. This also includes children who stated winning as a primary motivation. However, for some this might be discouraging, so they might not like games that are too hard and challenging.

There are cases, however, of children and young people who reported having gotten bored with online games:

"I used to play, online games, in the past, nowadays I don't play. Offline games, such as board games, I play sometimes." (EL_M_15)

"I had games, but they became boring, I don't like games, I am not a Fortnite fan, gaming, like Brawl Stars, Among Us, I don't like it, it is a waste of time, most in my class have it, my friend doesn't." (AT_F_11)

4.2.4. Online/offline socialisation

One of the questions that we raised from the beginning of the DigiGen project was whether the distinction between online and offline, digital and material makes sense for children and young people of the digital generation. Online activities, including gaming, have a strong element of socialisation. Maintenance of friendships, particularly during lockdowns, was made possible thanks to digital media. Regarding the locality of communication and/or gaming children before Covid-19 were meeting in houses and played online games. During the lockdowns and even afterwards, they stay each one home and play online or they meet outdoors:

"Before Covid we were changing houses. Now, we are staying in our houses. We used to

play hunting, hide, and seek and volley." (EL_F_12)

"More online because of lockdown. Monopoly, Cluedo drafts, Minecraft with other children. Siblings, friends, other family members, friends of friends, people you meet online." (UK_19_M_10)

Some children talk about online communication as a substitute for (lacking) offline contacts. When it is not possible to meet peers because there are none in close proximity of residence, no friends nearby in times of vacation, or when one is missing his/her friends because of the lockdown restrictions:

"Well, I think I'm in front of the computer a lot, because there are almost no other children in my place, or at the moment actually none at all. Or wait, if they are, then they are much younger than me, or older, or live somewhere else. And that's why I think I'm in front of the computer a lot. Because I cannot actually meet with anyone. And then they say yes that it is just unhealthy. So, mostly that, actually. Or [they say] when I'm in front of the computer too much that I'm just not doing my other things, sometimes. But, I almost always do it. (AT_F_15)

The dynamics and the interactions within online communication is a very interesting area that is often neglected by adults. Even when playing, children and young people do communicate, and not only about things relevant to the game. Sometimes, conflicts appear to be primarily about what is happening in a game:

"I: Do you have quarrels of disagreements when you play?
C: Yes, but not for long, it happens while we are playing." (EL_M_13)

"I: When you usually talk when you play. Have you and your friend ever argued about something? Has anyone been excluded? or have you had any disagreements while playing?
C: Not much. There are some disagreements about what looks good and what doesn't, but really everything is going well." (NO_M_16)

"I: Have you ever quarrelled with someone – or argued with someone online? For example while playing Minecraft or something?
C: Yes, with my friends. Well, especially with one friend, because we are so similar that we kind of quarrel all the time, and that's when we argue. For example, if she thinks she is doing it right and I say, 'that's wrong', because it's just wrong. And she worsens the performance of our team, that's when I say: 'Try to do this and that better.' But she won't listen. And that's when we are disputing." (AT_F_13)

The question of whether people act differently when they interact online, responses vary from those who believe that there is no significant difference between online and offline behaviours or 'selves', and those who have experienced different – and mainly more aggressive – behaviours during online communication:

"On the phone, online, some people speak ugly things but when it is face to face, nothing!" (RO_F_14)

"Well, apart from in Minecraft, you can attack each other and in real life we don't attack each other." (UK_M_10)

"Online they dare more and say worse things because in school they are checked or admonished by the teacher." (AT_15_F_11/70)

"I: What I was really wondering about this is, do you really find that someone behaves differently when online than when they're not online?

C: In some ways, because it's much easier to say no to people, be a little more direct online, than if you stand and meet someone and say something up in their face. And that's something I experienced then, also, in that if I wanted to confront one of them, then it wasn't a good idea to do it online because then it's much easier to throw shit up in one's face than if they were, like, face to face, then." (NO_F_14)

4.2.5. Negotiations within families

As mentioned above, time spent online and in front of a screen in general is an issue of negotiation, sometimes even conflict, between family members. The following are some indicative statements of the significance that this matter has in parents-children relationship:

"[They tell me] Not to spend so much time online." (EL_M_13)
"I: Your parents encourage you do other things other than laptop, mobile? C: To play with my brother board games and to read books." (EL_F_14)
"My parents think I should spend more time outside and less on the phone and the internet when I don't have school or homework." (RO_F_12)
"They send me to music (classes), to other activities like: mediations, school, anywhere." (RO_F_14)
"They sometimes say, oh, come on, it's time to stop playing. Now, you've played a lot and usually I agree, but sometimes as though I need to do my homework or something else like that. And I've only played like half an hour or so." (UK_M_12)
"I think my mom encourages me to do reading. I think my dad really encouraged me to do like running squash. Hmm." (UK_M_11)

Generally, parents do not seem to want their children to spend so much time online. They encourage children to see their friends outdoors and not to use digital devices so much. Moreover, they encourage children to play with their brothers or sisters (if they have) board games and to read books. Some parents care of the eyes of their children in front of monitor and encourage them to read books, to paint, or to gym, to play volleyball, etc.

Therefore, screen time seems to be an issue for (almost) all families in (almost) all countries. In Norway, however, screen time is less of an issue, as the parents accept it as a way of being social and spending leisure time, while the children report having a perceived entitlement to screen time if they fulfil other obligations, such as schoolwork and participation in other leisure activities. So, playtime is something the children can earn, if they fulfil other obligations or keep a balance between digital playtime and non-digital playtime and activities:

"C: I suppose children should be allowed to play if they deserve to play.
I: What do you mean by that?
C: If they've been effective with homework, they've done what they need to do quickly in order to have more time to play and have fun. Then he should be allowed to." (NO_M_14)

In most cases, children describe specific rules, such as not spending too much money on gaming, no cell phone on the table, no cell phone right before going to sleep or right after waking up etc., as well as different amount of screen time according to schooldays and weekends. Another crucial point is parents' monitoring of children's online activities. In some cases, clear restrictions are imposed, either through the use of 'out-sourced' parental control or by respecting age limitations regarding specific games:

> "I: Do you have rules with your parents regarding internet?
> C: I wanted to download Snapchat, but they told me that I do not need it.
> I: Do your parents control your mobile?
> C: Yes, when I got my mobile, my dad put on its family link. Family link will be there until my 15 years." (EL_F_14)

> "I: Ok, ok. And how is it with the family? Do you have certain rules? For example, when you are allowed to be on the PlayStation or the computer, or when you are not allowed to use it, or regarding certain content that you are not allowed to play?
> C: Yeah, actually, I am of course not allowed to play infinitely, and also only until half past seven.
> I: Mhm. [affirmative]
> C: And, also the age restrictions for games, just as written on the package." (AT_M_15)

In some other cases, interdictions are imposed as to online contact with unknown persons:

> "They [parents] don't let me talk to strangers, that is, he only lets me talk to girls, with boys they don't let me talk especially my father." (RO_F_14)

Rules, however, are not always rigid, but they are subject to circumstances, e.g. imposed on special occasions, such as having bad grades in school or having done something considered dangerous. On the other, rules tend loosen as children get older, while a certain inconsistency in rules is reported by some children:

> "Well I do believe that something will change, but not that it will get stricter. Maybe it will be like this: "You have to go outside for that long on a day". But I don't think that so much will change. It is actually always more like a phase that I have specific rules. For example, a few months ago, I had rules and then it actually loosened up. Something like that. I do not know." (AT_F_15)

It is important to note here that generally, most of the children do not do things 'behind the back' of their parents. Instead, there are some children who admitted that they had seen or done things on internet without telling their parents. One child from Greece said that he created Facebook, because he wanted messenger, without telling his parents; finally, they had a problem with that and, after negotiations, he kept only Messenger. Moreover, the same child said that he had seen a video that should not have seen. This was recurrent in several interviews from different countries: some children have seen photos that scared them or watched a thriller or have played games that they themselves find violent.

Regardless how strict are the rules and how conflictual might be the negotiations around those rules, there seems to be a perceived lack of interest and competence on parents' part to share online activities, and particularly games with their children, since there is no common ground in interests:

> "Dad only watches TV all day, so I don't think he could care less. And mom's okay with that. She just doesn't get it, but she understands why I like it. But she doesn't want to know why. Or she understands why, but she's okay with it. Unless it's something very bloody or something." (NO_M_10)

> "And I don't play with them at all because my parents don't care either. Well, my father, when he's at home because he's a police officer, he likes to work on his old motorcycles in his free time. And my mother, too, when she has time, she wants to cook every now and then. Then she's also very fond of reading. Well, my parents don't care about computers. Although, funnily enough, my father has two tablets, an Apple Watch, an iPhone and Air

Pods. My mother looks at things on the table if anything. But then these are not games, just ... out of interest, Wikipedia or YouTube or something. I think. I honestly do not know. But they definitely don't play. Well, they don't do that. Well, they don't care." (AT_M_13)

4.2.6. The impact of the pandemic

WP4 fieldwork research coincided with the outbreak of the COVID-19 crisis. Even though we tried to avoid rendering our research a pandemic-centred one, we could not neglect the experience of COVID-19, and particularly of restrictive measures imposed in all participating countries. All countries experienced lockdowns and all participants in the research experienced distance learning and increased use of ICT for educational purposes.

The pandemic had a significant impact on leisure in both ways, since time spent 'outside' was dramatically reduced due to lockdowns, but time spent 'inside' was dramatically increased. It seems that pandemic affected children in different ways regarding leisure time. Some children referred that they had more leisure time, and they were playing more. While, some others, told us that they had less leisure time during pandemic because they had to be all the time in front of a computer, and this was very tiring for them. Almost all children had their leisure time changed due to lockdowns. The fact that they had to stay all day in their homes, make them occupy themselves mostly with ICT instead of getting out seeing their friends. Moreover, they stopped their activities such as football, volleyball, walking, riding their bikes:

"Yes [the pandemic affected me], before I seemed to go out more with friends, now not much; The first year was very difficult, last year, because I didn't do school at all, that is, from March to July I didn't do school just like that, he told us to copy, but now this year I was calmer to say so, because they started the activities and it was ok. I went back to physical school and it's better. But last year, I wasn't going out and I wasn't playing much. I was doing absolutely nothing." (RO_F_13)

"I: Do you feel that the lockdown affected your leisure time?
C: Yes, I was playing more." (EL_M_10)

"It feels like we get more homework. We probably don't, but it feels like we have less time to play." (UK_M_12)

"Yeah, because I wasn't actually able to take off as much or as much as I usually would say that kind of change that. And then I was spending much more time online because, um, school was on there and all these other things which made like me a headache because of all the radiation. So, yeah." (UK_F_9)

"Now in the Corona time – [before] there was a little more sport involved. For example, playing table tennis in a club, which is currently not possible, going out with friends, playing football, going swimming. It is just difficult." (AT_M_14)

"I: And you watch things on your cell phone. Is it only now because it is Corona and you are not allowed to go out that often? Or is that even if it wasn't for Corona, that you would do exactly the same?
C: No, I would go out with my friends if it was not for Corona… playing soccer because [it's] my hobby." (AT_M_12)

The pandemic had a significant impact also on negotiations within families. Lockdowns triggered new realities in the households leading to renegotiations of time spent online and ICT use in general. Almost all parents had to deal with the fact that children did not have much to do, while

online schooling also altered significantly screen time of children. Therefore, there was some flexibility regarding rules:

> "Well [the rules are not applied anymore lately], since I started online school already and as I was sitting in front of the computer for 5-6 hours, I don't know if you needed to take something out, or if you had to send something. We had to stay longer." (RO_M_13)

> "Mom: After Corona, you're allowed to sit online more and chat with friends. I: Since you can't meet them so for you to play more than before? C: Yes. At Team meetings." (NO_M_08)

In some cases, children themselves tried to show self-discipline, feeling that they would have difficulties in readjusting when everything would go back to normal:

> "I sort of try to stick to the rules no matter what was going on lockdown or anything, because it sort of helps you keep at least a little bit of stability. So it goes on a bit of routine because whoever knew who knew when we were going to be going back, it could have been a stop on the finger and or going back in. So we had to keep a bit of routine." (UK_M_10)

It is obvious that children spend more time with ICT due to the pandemic. This includes playing games alone or online with friends as well as spending more time watching TV or using the tablet or mobile phone. Whereas some children highlight the negative effect of increased ICT use, such as discontentment or sleeping in late, others do not think that anything has changed in regard to their ICT use or time spent with ICT. Moreover, some children point out that school before the pandemic did not prepare them very well to use laptops or computers and that during the pandemic their parents had to explain more new things to them in this regard. Others highlight their increased gaming skills due to playing a wide range of new games. In this respect, the pandemic might have for some a positive impact, since they have improved their digital competencies and skills:

> "But I have also discovered a lot of new games that I had never played before and I have certainly gotten better in it, too. But, in a negative sense, I think nothing really changed. At least in regard to gaming." (AT_17_M_14/552)

> "Well, Minecraft? Yeah, definitely done a lot better. And it also helped that I figured out how to do a lot more stuff with Minecraft, like installing mods and stuff." (UK_M_12)

> "I: Has the whole Coronavirus experience changed your overall relation with ICT?
> C: I think yes. I think I learned computers better. My mother doesn't know many things on computers so, I had never the chance to learn. This situation made me learn alone and now I am more capable with computers." (EL_M_13)

Finally, there are several statements concerning the changes in relationships with friends and acquaintances induced by the pandemic. It is interesting to note that existing friendships could deepen during the lockdown specifically due to the playing of online games or texting with each other on a regular basis, which seem to have taken an important role in their leisure time. Some children state that playing games together is used explicitly for meeting friends online, while others stress the need to meet close friends offline to maintain a healthy relationship. Therefore, the experience of the pandemic can be considered as a transformative one, but also as contradictory since it combined difficulties, anxieties, but also hopeful outcomes for children's socialisation. As a teenage girl from Romania points out, when reflecting on any possible positive aspects of the pandemic:

> "I: Did the pandemic have any good parts? C: Yes, I even managed to get close to people's waves during this time. I mean, I got closer to the girls I play with every day. I didn't talk so often before, maybe only once a month. But the pandemic united us in a way." (RO_F_13)

5. Conclusion

The aim of this report was two-fold: on the one hand, to advocate a multimodal approach that entails a combination of research methods; on the other hand, to present some basic findings that stem from the material collected from fieldwork research, but also from secondary analysis of available statistical data.

Starting from the methodological outcomes, one could say that interview settings seem to be more static in comparison to conversations during game play, which seem to be more dynamic: children in game observation sessions seemed to be more talkative than in interviews. Game observations functioned as small focus group discussions, where the researcher kept a much more discrete position than in the interviews. Besides being able to observe children interacting with each other, e.g. helping each other out, dividing tasks, talking strategy etc., game observation gave children the lead, while in interviews there was a different dynamic. In other words, children seemed to feel appreciated as experts in game sessions and were more excited to share their knowledge and perspectives.

The involvement of children and young people as co-researchers proved to be more challenging than expected. Apart from the obstacles posed by the pandemic and described in the Methodology chapter, the use of a smartphone application, in our case the Nettskjema Bilde app, is not necessarily or 'naturally' interesting and exciting for people who are digital natives. This might explain the fact that even with incentives and pressure from the parents, children in most countries did not use it, feeling that instead of giving them the opportunity to express themselves in a lucrative way, they were burdened with an additional 'digital task'. Rendering children and young people co-researchers seems to require more participatory methods that could involve them from the stage of research design and the formulation of research questions to the implementation of the research.

Coming to the findings and starting from the quantitative analysis, we should stress that seeing ICT use mainly as a threat to children's well-being does not seem relevant. As is shown from the analysis, as children use new technologies more often, their overall well-being increases relative to those that do not use technology that often. Moreover, children who spend more time using digital devices do not report dedicating less time to other activities. In general, it seems that ICT is positively related to free time satisfaction as well as satisfaction with time use.

In a similar vein, the findings from our fieldwork research show that for children and young people ICT use is strongly linked to their social capital. Everyday communication with peers and friends, including exchange of information about school issues, which is performed through digital media. Even gaming, which is perceived by parents as an excessive and potentially harmful way to spend leisure time, includes strong elements of socialisation and even learning. Here, one can easily find a kind of 'generation gap' between children and parents, since the latter – according to children – are not able or even wiling to understand what gaming is all about.

In this framework, negotiations within families seem to be perceived in most cases as a 'necessary evil' or sometimes as a performative act that entail a certain lack or difficulty of communication. Even when children admit that they might overdo it with ICT and screen time, they feel that their parents are not willing to even understand the life of the digital generation (or digital natives). The old distinction between 'digital natives' and 'digital immigrants' (Prensky,

2001) seems to be extremely relevant even today. It also seems to underpin the barriers of communication between children and parents and – from what can be implicitly understood from our informants – between children and teachers.

Therefore, a more nuanced perspective of what could or should be done in order to alleviate potential harmful effects of ICT predominance in children's and young people's leisure time – pointed out in some cases by children and young people themselves – should be adopted, by taking into account children's perspectives. Even if we did not manage to completely achieve children's participation in our research as co-researchers, we hope that we have managed to assess and give prominence to their perspectives. If this is the case, this report has a certain validity and utility for both further avenues of research and policy considerations.

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7. Appendix

A1. Data

Table A1.1: Questionnaire topics

You	Age, gender, place of living
Your home and the people you live with	Sleeping place, the home you live in, the people you live with
Money and things you have	4 pocket money, 9 things you have, 1 satisfaction with things you have
Your friends and other people	2 agreement, 3 satisfaction, 3 activities
The area where you live	3 agreement, 4 satisfaction
School	4 agreements, 2 bullying, 6 satisfaction
How you use your time	List of 10 activities
More about you	10 satisfaction, 5 changes
How you feel about yourself	4 satisfaction, 1 happiness
Your life and your future	5 items of the Student Life Satisfaction Scale, 3 children's rights, 8 values aspired, 6 positive effects, 2 evaluation items on the questionnaire

Source: Casas (n.d.).

Table A1.2: Country/federal region participation and number of children surveyed by wave

Wave	Country/Federal region	12yo	10yo	8yo	Total
Wave I	Algeria (Western)	428	435	587	1,450
	Brazil (Rio Grande do sul)	1,005	1,293	1,151	3,449
	Canada (Manitoba)	0	144	239	383
	Chile	827	693	1,038	2,558
	Israel	998	992	983	2,973
	Nepal	0	253	0	253
	Romania	1,354	927	1,015	3,296
	Rwanda (Capital)	0	295	0	295
	South Africa (Western Cape)	1,002	0	0	1,002
	South Korea	2,602	2,652	2,719	7,973
	Spain (Catalonia)	5,727	0	0	5,727
	Uganda (Eastern)	1,035	1,000	0	2,035
	United Kingdom (England)	1,141	0	0	1,141
	United States (South Dakota)	784	502	513	1,799
Wave II	Algeria (Western)	1283	1149	1244	3676
	Columbia (Antioquia)	975	939	902	2816
	Estonia	1029	1013	1076	3118
	Ethiopia	980	944	953	2877
	Germany	852	1101	1056	3009
	Israel	926	988	886	2800
	Malta	942	840	802	2584
	Nepal	995	983	975	2953
	Norway	974	960	930	2864
	Poland (Wielkopolska)	1017	1119	1021	3157
	Romania	1507	1355	1242	4104
	South Africa (Western Cape)	1131	1061	996	3188
	South Korea	2597	2438	2432	7467
	Spain (Catalonia)	1667	1057	1032	3756
	Turkey (Istanbul)	1018	1047	959	3024
	United Kingdom (England)	1319	989	990	3298

Wave III	Albania	1163	1176	0	2339
	Algeria (Western)	1054	1137	1185	3376
	Bangladesh	1012	946	790	2748
	Belgium (Flanders)	1076	1112	1134	3322
	Brazil (Rio Grade do sul)	901	886	887	2674
	Chile	1016	913	916	2845
	Croatia	1155	1240	1117	3512
	Estonia	1079	1013	1058	3150
	Finland	1075	1067	1112	3254
	France	0	2184	0	2184
	Germany	1524	829	945	3298
	Greece	0	822	0	822
	Hong Kong	816	709	0	1525
	Hungary	994	1035	1016	3045
	India (Kolkata)	977	946	994	2917
	Indonesia (West Java)	8038	7680	7684	23402
	Israel	1465	1637	1487	4589
	Italy (Liguria)	1181	1074	1044	3299
	Malaysia	0	992	967	1959
	Malta	752	630	567	1949
	Namibia (Khomas)	1099	1065	0	2164
	Nepal	1041	1005	0	2046
	Norway	817	801	0	1618
	Poland	1156	1192	964	3312
	Romania	1145	1241	1082	3468
	Russia (Tyumen)	951	953	0	1904
	South Africa	3699	3415	0	7114
	South Korea	3395	3174	3170	9739
	Spain (Catalonia)	2088	2209	2329	6626
	Sri Lanka	1221	1156	0	2377
	Switzerland	0	1229	0	1229
	Taiwan	1511	1337	1230	4078
	United Kingdom (England)	0	717	0	717
	United Kingdom (Wales)	1668	959	0	2627
	Vietnam	1080	946	930	2956

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019)

A2. Children's use of new technologies and overall subjective well-being

Table A2.1: Electronic games and well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	SWBS	SWBS	DBWS	DBWS	PA	PA	NA	NA
Once or twice a week	0.126^{xxx} (0.021)	0.081^{xxx} (0.023)	0.141^{xxx} (0.020)	0.112^{xxx} (0.025)	0.110^{xxx} (0.022)	0.099^{xxx} (0.027)	0.093^{xxx} (0.019)	0.105^{xxx} (0.024)	-0.092^{xxx} (0.021)	-0.043^{x} (0.026)
Three or four days a week	0.127^{xxx} (0.023)	0.092^{xxx} (0.026)	0.141^{xxx} (0.022)	0.123^{xxx} (0.027)	0.131^{xxx} (0.023)	0.142^{xxx} (0.028)	0.121^{xxx} (0.020)	0.132^{xxx} (0.024)	-0.077^{xxx} (0.020)	-0.024 (0.024)
Five or six days a week	0.145^{xxx} (0.024)	0.096^{xxx} (0.026)	0.158^{xxx} (0.023)	0.124^{xxx} (0.029)	0.141^{xxx} (0.023)	0.145^{xxx} (0.028)	0.123^{xxx} (0.020)	0.103^{xxx} (0.024)	-0.056^{xxx} (0.020)	0.024 (0.026)
Every day	0.111^{xxx} (0.022)	0.077^{xxx} (0.025)	0.089^{xxx} (0.019)	0.043^{x} (0.024)	0.068^{xxx} (0.019)	0.085^{xxx} (0.024)	0.130^{xxx} (0.017)	0.133^{xxx} (0.022)	-0.022 (0.017)	0.053^{xx} (0.023)
Constant	-0.046 (0.032)	-0.892^{xxx} (0.216)	-0.274^{xxx} (0.042)	-1.120^{xxx} (0.227)	-0.224^{xxx} (0.039)	-1.407^{xxx} (0.248)	-0.218^{xxx} (0.031)	-0.398^{xxx} (0.124)	0.013 (0.031)	0.576^{xxx} (0.132)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	27,986	22,204	33,569	22,481	34,733	22,581	34,184	22,259	33,757	22,188

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). OLS: Overall Subjective Well-Being. SWBS: Children's Worlds Subjective Well-Being Scale. DBWS: Children's Worlds Domain Based Subjective Well-Being Scale. PA: Positive affect. NA: Negative affect. * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A2.2: Social media and well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	SWBS	SWBS	DBWS	DBWS	PA	PA	NA	NA
Once or twice a week	0.074^{xxx} (0.026)	0.066^{xx} (0.027)	0.108^{xxx} (0.024)	0.102^{xxx} (0.026)	0.089^{xxx} (0.024)	0.091^{xxx} (0.029)	0.044^{xx} (0.021)	0.060^{xx} (0.025)	-0.025 (0.024)	-0.008 (0.030)
Three or four days a week	0.112^{xxx} (0.022)	0.107^{xxx} (0.026)	0.122^{xxx} (0.021)	0.112^{xxx} (0.025)	0.117^{xxx} (0.022)	0.123^{xxx} (0.027)	0.071^{xxx} (0.019)	0.061^{xx} (0.024)	-0.082^{xxx} (0.023)	-0.049^{x} (0.028)
Five or six days a week	0.138^{xxx} (0.024)	0.117^{xxx} (0.026)	0.185^{xxx} (0.022)	0.138^{xxx} (0.026)	0.186^{xxx} (0.022)	0.164^{xxx} (0.027)	0.130^{xxx} (0.020)	0.122^{xxx} (0.022)	-0.029 (0.025)	0.016 (0.029)
Every day	0.059^{xxx}	0.055^{xx}	0.062^{xxx}	0.032	0.085^{xxx}	0.071^{xxx}	0.074^{xxx}	0.071^{xxx}	0.079^{xxx}	0.115^{xxx}
Constant	(0.021) -0.005 (0.031)	(0.023) -0.901^{xxx} (0.214)	(0.018) -0.251^{xxx} (0.041)	(0.022) -1.141^{xxx} (0.229)	(0.019) -0.223^{xxx} (0.038)	(0.023) -1.395^{xxx} (0.248)	(0.016) -0.180^{xxx} (0.030)	(0.019) -0.367^{xxx} (0.123)	(0.018) -0.035 (0.032)	(0.023) 0.580^{xxx} (0.131)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	27,927	22,179	33,482	22,462	34,639	22,563	34,087	22,235	33,662	22,163

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). OLS: Overall Subjective Well-Being. SWBS: Children's Worlds Subjective Well-Being Scale. DBWS: Children's Worlds Domain Based Subjective Well-Being Scale. PA: Positive affect. NA: Negative affect. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A2.3: Owning a mobile phone and overall wellbeing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	SWBS	SWBS	DBWS	DBWS	PA	PA	NA	NA
Yes	0.096^{xxx} (0.024)	0.068^{xxx} (0.024)	0.101^{xxx} (0.021)	0.073^{xxx} (0.026)	0.104^{xxx} (0.021)	0.074^{xxx} (0.026)	0.111^{xxx} (0.016)	0.096^{xxx} (0.018)	-0.039^{xx} (0.018)	-0.020 (0.024)
Constant	0.009 (0.030)	-0.991^{xxx} (0.214)	-0.241^{xxx} (0.037)	-1.107^{xxx} (0.203)	-0.192^{xxx} (0.034)	-1.368^{xxx} (0.236)	-0.190^{xxx} (0.027)	-0.393^{xxx} (0.119)	-0.020 (0.027)	0.615^{xxx} (0.125)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	30,241	24,407	39,419	25,077	41,503	25,191	39,616	24,483	38,980	24,397

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). OLS: Overall Subjective Well-Being. SWBS: Children's Worlds Subjective Well-Being Scale. DBWS: Children's Worlds Domain Based Subjective Well-Being Scale. PA: Positive affect. NA: Negative affect. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A2.4: Internet access and well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	SWBS	SWBS	DBWS	DBWS	PA	PA	NA	NA
Yes	0.447^{xxx} (0.066)	0.380^{xxx} (0.067)	0.469^{xxx} (0.043)	0.412^{xxx} (0.062)	0.558^{xxx} (0.044)	0.507^{xxx} (0.067)	0.240^{xxx} (0.032)	0.219^{xxx} (0.045)	-0.230^{xxx} (0.032)	-0.200^{xxx} (0.051)
Constant	-0.365^{xxx} (0.070)	-1.189^{xxx} (0.217)	-0.619^{xxx} (0.055)	-1.327^{xxx} (0.210)	-0.648^{xxx} (0.053)	-1.657^{xxx} (0.240)	-0.349^{xxx} (0.040)	-0.480^{xxx} (0.123)	0.168^{xxx} (0.040)	0.730^{xxx} (0.127)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	30,209	243,84	39,420	25,065	41,531	25,180	39,589	24,460	38,950	24,374

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). OLS: Overall Subjective Well-Being. SWBS: Children's Worlds Subjective Well-Being Scale. DBWS: Children's Worlds Domain Based Subjective Well-Being Scale. PA: Positive affect. NA: Negative affect. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

A.3. Does children's ICT use crowd-out other activities?

Table A3.1: Electronic games and crowd-out effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Relaxing, etc. with family	Relaxing, etc with family	See your friends	See your friends	Doing homework /studying	Doing homework /studying	Helping around the house	Helping around the house	Playing sports/ doing exercise	Playing sports/ doing exercise
Once or twice a week	0.065^{xx} (0.032)	0.126^{xxx} (0.036)	0.057^{x} (0.031)	0.021 (0.036)	-0.042^{x} (0.024)	-0.022 (0.029)	-0.121^{xxx} (0.029)	-0.056 (0.036)	0.100^{xxx} (0.027)	0.022 (0.033)
Three or four days a week	0.135^{xxx} (0.028)	0.205^{xxx} (0.034)	0.162^{xxx} (0.029)	0.115^{xxx} (0.037)	-0.090^{xxx} (0.022)	-0.048^{x} (0.027)	-0.091^{xxx} (0.027)	-0.003 (0.034)	0.198^{xxx} (0.028)	0.084^{xx} (0.036)
Five or six days a week	0.208^{xxx} (0.029)	0.260^{xxx} (0.036)	0.178^{xxx} (0.034)	0.121^{xxx} (0.042)	-0.062^{xx} (0.026)	-0.035 (0.032)	-0.125^{xxx} (0.030)	-0.028 (0.038)	0.182^{xxx} (0.032)	0.061 (0.040)
Every day	0.386^{xxx} (0.028)	0.491^{xxx} (0.032)	0.328^{xxx} (0.026)	0.256^{xxx} (0.033)	-0.057^{xx} (0.022)	-0.007 (0.029)	-0.137^{xxx} (0.026)	-0.076^{xx} (0.034)	0.261^{xxx} (0.027)	0.093^{xxx} (0.035)
Constant	2.676^{xxx} (0.046)	2.250^{xxx} (0.198)	1.287^{xxx} (0.057)	1.113^{xxx} (0.244)	2.715^{xxx} (0.076)	2.595^{xxx} (0.163)	2.260^{xxx} (0.056)	2.384^{xxx} (0.194)	1.882^{xxx} (0.050)	1.315^{xxx} (0.188)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	31,752	22,154	30,914	20,042	32,852	22,154	34,232	22,359	34,070	22,198

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A3.2: Social media and crowd-out effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Relaxing, etc. with family	Relaxing, etc with family	See your friends	See your friends	Doing homework /studying	Doing homework /studying	Helping around the house	Helping around the house	Playing sports/ doing exercise	Playing sports/ doing exercise
Once or twice a week	-0.006 (0.034)	-0.009 (0.039)	0.113^{xxx} (0.034)	0.085^{xx} (0.037)	-0.011 (0.028)	-0.023 (0.030)	0.038 (0.034)	0.064 (0.040)	0.122^{xxx} (0.030)	0.164^{xxx} (0.036)
Three or four days a week	0.101^{xxx} (0.029)	0.106^{xxx} (0.037)	0.241^{xxx} (0.030)	0.189^{xxx} (0.034)	-0.010 (0.026)	-0.046 (0.031)	0.066^{xx} (0.032)	0.081^{xx} (0.041)	0.246^{xxx} (0.030)	0.259^{xxx} (0.036)
Five or six days a week	0.217^{xxx} (0.032)	0.185^{xxx} (0.038)	0.315^{xxx} (0.032)	0.324^{xxx} (0.038)	0.040 (0.028)	-0.012 (0.035)	0.103^{xxx} (0.036)	0.089^{xx} (0.045)	0.278^{xxx} (0.033)	0.239^{xxx} (0.038)
Every day	0.418^{xxx} (0.027)	0.411^{xxx} (0.032)	0.440^{xxx} (0.028)	0.424^{xxx} (0.032)	0.057^{xx} (0.024)	0.036 (0.030)	0.090^{xxx} (0.028)	0.070^{xx} (0.035)	0.385^{xxx} (0.026)	0.375^{xxx} (0.031)
Constant	2.711^{xxx} (0.044)	2.340^{xxx} (0.197)	1.250^{xxx} (0.055)	1.072^{xxx} (0.248)	2.645^{xxx} (0.077)	2.582^{xxx} (0.164)	2.115^{xxx} (0.054)	2.339^{xxx} (0.198)	1.856^{xxx} (0.048)	1.228^{xxx} (0.187)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	31,681	22,140	30,839	20,021	32,763	22,136	34,145	22,342	33,990	22,185

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A3.3: Owning a mobile phone and crowd-out effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Relaxing, etc. with family	Relaxing, etc. with family	See your friends	See your friends	Doing homework/ studying	Doing homework/ studying	Helping around the house	Helping around the house	Playing sports/ doing exercise	Playing sports/ doing exercise
Yes	0.179^{xxx} (0.027)	0.168^{xxx} (0.031)	0.359^{xxx} (0.026)	0.313^{xxx} (0.032)	0.094^{xxx} (0.027)	0.052^{x} (0.032)	0.104^{xxx} (0.025)	0.025 (0.030)	0.262^{xxx} (0.027)	0.184^{xxx} (0.031)
Constant	2.812^{xxx} (0.042)	2.316^{xxx} (0.191)	1.320^{xxx} (0.052)	1.190^{xxx} (0.235)	2.624^{xxx} (0.076)	2.573^{xxx} (0.160)	2.115^{xxx} (0.053)	2.359^{xxx} (0.195)	1.906^{xxx} (0.046)	1.412^{xxx} (0.181)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	34,978	24,273	34,723	22,607	33,167	22,361	34,602	22,594	36,293	23,319

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

Table A4.4: Internet access and crowd-out effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Relaxing, etc. with family	Relaxing, etc. with family	See your friends	See your friends	Doing homework/ studying	Doing homework/ studying	Helping around the house	Helping around the house	Playing sports/ doing exercise	Playing sports/ doing exercise
Yes	0.316^{xxx} (0.047)	0.321^{xxx} (0.068)	0.084^{x} (0.047)	0.086 (0,064)	0.213^{xxx} (0.043)	0.135^{xx} (0.054)	-0.064 (0.050)	-0.031 (0.068)	0.290^{xxx} (0.043)	0.183^{xxx} (0.070)
Constant	2.616^{xxx} (0.060)	2.197^{xxx} (0.198)	1.415^{xxx} (0.069)	1.269^{xxx} (0.236)	2.475^{xxx} (0.083)	2.511^{xxx} (0.164)	2.216^{xxx} (0.068)	2.394^{xxx} (0.205)	1.761^{xxx} (0.059)	1.385^{xxx} (0.185)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	34,960	24,257	34,708	22,588	33,135	22,337	34,567	22,567	36,266	23,296

Notes: Standard errors in parentheses, clustered at the school level. All columns include country and questionnaire fixed effects. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

A.4. Children's ICT use and satisfaction with their free time and their use of time

Table A4.1: ICT use and satisfaction with free time and time use

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Satisfaction with: How much free time you have				Satisfaction with: How you use your time			
How often: electronic games								
Once or twice a week	0.303xxx (0.066)				0.131xxx (0.046)			
Three or four days a week	0.405xxx (0.067)				0.183xxx (0.047)			
Five or six days a week	0.545xxx (0.061)				0.149xxx (0.048)			
Every day	0.598xxx (0.057)				0.266xxx (0.041)			
How often: social media								
Once or twice a week		0.092 (0.071)				0.156xxx (0.053)		
Three or four days a week		0.286xxx (0.061)				0.226xxx (0.046)		
Five or six days a week		0.320xxx (0.066)				0.194xxx (0.051)		
Every day		0.371xxx (0.050)				0.198xxx (0.043)		
Has a mobile phone								
Yes			0.257xxx (0.054)				0.171xxx (0.041)	
Has internet access								
Yes				0.672xxx (0.153)				0.591xxx (0.103)
Constant	7.379xxx (0.427)	7.524xxx (0.425)	7.569xxx (0.420)	7.224xxx (0.437)	7.971xxx (0.312)	7.945xxx (0.310)	7.928xxx (0.292)	7.654xxx (0.319)
Observations	19,409	19,395	19,802	19,775	22,055	22,042	24,591	24,583

Notes: Standard errors in parentheses, clustered at the school level. Controls: gender, country and questionnaire fixed effects, and SES variables (number of bathrooms, cars, and computers). * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: Authors' computations using data from the Children's Worlds survey, third wave (2016-2019).

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