



Digital Distraction, Attention Regulation, and Inequality

Kaisa Kärki¹

Received: 29 August 2023 / Accepted: 3 January 2024 / Published online: 12 January 2024
© The Author(s) 2024

Abstract

In the popular and academic literature on the problems of the so-called *attention economy*, the cost of attention grabbing, sustaining, and immersing digital medias has been addressed as if it touched all people equally. In this paper I ask whether everyone has the same resources to respond to the recent changes in their stimulus environments caused by the attention economy. I argue that there are not only differences but disparities between people in their responses to the recent, significant increase in the degree and persuasiveness of digital distraction. I point toward individual variance in an agent's top-down and bottom-up attention regulation, and to further inequality-exacerbating variance in active participation on the internet and in regulating reward-seeking behaviors on the internet. Individual differences in these areas amount to disparities because they have been found to be connected to socio-economic background factors. I argue that disparities in responding to digital distraction threaten fair equality of opportunity when it comes to digital distraction in the classroom and that they may lead to an unequal contribution of achievements that require complex cognition by people from lower socioeconomic backgrounds.

Keywords Attention economy · Ethics of distraction · Digital distraction · Attention regulation · Achievement gap

✉ Kaisa Kärki
kaisa.karki@helsinki.fi

¹ Practical Philosophy, University of Helsinki, Helsinki, Finland

1 Introduction

In the popular and the academic literature on the so-called *attention economy*, the cost of attention grabbing, sustaining, and immersing¹ digital medias has been talked about as if it touched all people equally. In this paper, I ask whether everyone has the same resources to respond to technological change regarding what I call stimulus environments,² here focusing especially to the changes that follow from a significant increase in the availability and persuasiveness of digital distraction. *Who* is especially vulnerable to the effects of digital distraction, — *why*, and precisely *how*?

In the following, I argue that there are not only differences but disparities between people in responding to the recent, significant increase in the degree and persuasiveness of digital distraction. This is because there is individual variance in an agent's top-down and bottom-up attention regulation, and further inequality-exacerbating variance in an agent's active participation on the internet and in regulating reward-seeking behaviors on the internet. It is argued that individual differences in these areas amount to disparities because they have been found to be connected to socio-economic background factors. Furthermore, I argue that disparities in responding to digital distraction threaten fair equality of opportunity, the idea that everyone should have the same fair chances at gaining positions in society, when it comes to digital distraction in the classroom and that they may lead to an unequal contribution of achievements that require complex cognition by people from lower socioeconomic groups.

The paper shows that digital distraction risks exacerbating inequalities, especially in executive functioning and academic achievement. This means that the unequal effects of attention manipulating technologies should be brought to collective ethical deliberation because immediate policy intervention is needed if technological change amounts to creating novel inequalities or enforcing pre-existing inequalities. Further empirically informed understanding of how digital distraction relates to pre-existing inequalities and multifaceted digital divides seems to be needed.

¹ I talk about attention grabbing, immersing, and sustaining technologies because attention *grab*, that is, for instance, a smartphone beeping, is not the only attention manipulation technique currently used by digital technologies. Hanin (2021), for instance, distinguishes *prolonged immersion* from *frequent distraction*. This paper focuses on the effects of digital *distraction*, but I do not mean to argue that other ways of affecting a person's attention are not equally relevant to a structurally sensitive analysis of the attention economy.

² By *stimulus environment* I mean the agent's whole immediate attentional environment, not only a distraction arising from a specific digital device. Talk about stimulus environments allows us to address philosophical and empirical questions not only about the agent's relation to digital devices but also to other stimuli in her environment, such as a caretaker's relation to a child requiring her attention. This is important for an analysis of the attention economy, because it allows us, for instance, to address *the displacement thesis* – by which social scientists refer to the problems that arise from an agent attending to technology instead of other things in her life.

2 Individual variance in attention regulation

Let us first look at how people differ in relating to distraction. Individuals differ in resisting any, not only digital, distraction. This is because there are individual differences in people's *top-down* and *bottom-up* attention regulation.

By individual differences in top-down attention regulation, I mean individual differences in executive functions that regulate how much the agent can resist distraction *by mere will*. Executive functioning is usually seen as consisting in inhibition, working memory, and cognitive flexibility (for an overview on the empirical literature, see Diamond, 2013). The ability to resist distraction by will is the hallmark of several features that are considered central parts of healthy executive functioning. It pertains especially to the inhibitory control of attention, but it plays a role in other executive functions as well. Some researchers even define executive functions *through* top-down attention regulation. For instance, Diamond (2013, 136) defines executive functions as a family of top-down mental processes needed when the agent needs to 'concentrate and pay attention'.

Executive functioning differs significantly between individuals. A considerable number of studies has studied individual variance in working memory (see e.g., classic work on comparisons between different theories of working memory variance in Conway et al., 2008) but other components of executive functioning demonstrate significant degree of individual variation as well. Furthermore, differences in executive functions amount to differences in how much people can internally resist distraction; declining inhibitory control, for instance, has been seen to explain why older people are more vulnerable to being distracted (Diamond, 2013, 148).

Why is it important for a person to be able to resist distraction? The ability to resist distraction is needed especially in executing cognitively challenging tasks that require working memory resources (see e.g., Diamond, 2013). Executive functioning underlies a person's ability to perform tasks requiring complex cognition. These are tasks that require, for instance, mathematical and abstract thinking, critical thinking, or flexible problem solving. Mathematics has been studied particularly in connection to executive functioning because it requires holding information in working memory, shifting attention, ignoring distracting information, and inhibiting prepotent responses – all of which arise from executive functions.³

In addition to individual differences in top-down attention regulation, there are also individual differences in regulating bottom-up attention. Whereas top-down attention regulation stems from a person's executive functioning, *bottom-up* attention is regulated by the stimuli in the agent's environment (Diamond, 2013, 137). A salient stimulus, such as a loud noise, grabs a person's attention automatically, regardless of her will.

Even though bottom-up attention is not directly affected by the agent's choice, it can be regulated by her. This just needs to happen indirectly — by regulating her stimulus environment. I can close the window to protect my attention from being

³ A large body of research has found executive functions, especially working memory and inhibitory control, to predict mathematical skills. For reviews, see Cragg & Gilmore, 2014 and Bull & Lee, 2014,

grabbed by bothersome noises from outside or a student can reserve a room for quiet studying so that other family members will not bother her while she is doing homework.

However, people have limited power over their own immediate stimulus environments. For instance, crowded homes⁴ have been found to have a negative effect on learning outcomes and the overall cognitive development of children (see e.g., Evans et al., 1998). One reason why crowded homes are associated with poor learning outcomes is that children in such homes lack a place to study and have problems getting away from their family members to focus on schoolwork. Crowded homes tend to be noisier and more chaotic⁵ (Evans, 2006). Household chaos is characterized by a high level of background stimulation (Marsh et al., 2020, 2). Fewer cognitive effects follow from crowded homes in which children have a place to study or where they can withdraw from others (see e.g., Wachs, 1979).⁶

Because bottom-up attention is regulated indirectly, the agent's material resources for regulating her stimulus environment matter a great deal in determining whether she has the means to regulate her attention. Such resources can include the amount of space available in an agent's apartment or financial resources to pay for less distracting versions of digital medias. An agent who has a bigger apartment can regulate her attention by regulating her immediate stimulus environment in a way that an agent who lives in a shared room cannot. So in addition to individual differences in top-down attention, there are individual differences in bottom-up attention regulation due to differences in how much power people have over their stimulus environments.

3 From differences to disparities

In this section, I show that individual differences in resisting distraction are not only a matter of individual difference but a matter of inequality. In short, this is because the individual differences in resisting distraction have been found to be associated with socioeconomic background factors.⁷

⁴ The level of crowding is measured through *residential density*, which is the ratio of the number of people to the household number of rooms (Evans et al., 2006).

⁵ Chaotic living arrangements are measured by the CHAOS long form and CHAOS short form questionnaires, which include statements such as "It's a real zoo in our home", "In our home we can talk to each other without being interrupted", "You cannot hear yourself think in our home", "I often get drawn into other people's arguments at home", "There is usually a television on somewhere in our home", several of which measure the degree of unavoidable distractions in the home environment.

⁶ Crowded homes have also been found to predict problems in children's language diversity because parents in crowded homes speak in less complex ways to their children and are less responsive to them (e.g., Evans et al., 2010). This may be because people cope with unwanted social interaction by withdrawing (Evans, 2006, 429).

⁷ Unlike poverty, which refers to lack of economic resources below a certain threshold, socioeconomic status is a multifaceted concept that is used to refer to a person's access to economic and social resources, privileges, prestige, and positioning in society (see e.g., Blakey et al., 2020). It is usually measured through household income, education, and occupation (e.g., in Sirin, 2005) but neighborhood is also often included in measuring it.

Several longitudinal and cross-sectional studies have shown that there is an association between socioeconomic factors and academic achievement (for a review of studies in the United States, see Sirin, 2005; for a recent review across the world, see Liu et al., 2022; and for a review of studies in higher education, see Rodríguez-Hernández et al., 2020). According to Sirin's (2005) meta-analysis, family socioeconomic status is one of the strongest correlates of a student's academic performance, and school socioeconomic status has an even stronger correlation. The correlation between lower socioeconomic background and lower academic achievement is often called *the academic achievement gap*.

How does the academic achievement gap relate to resisting distraction? Academic achievement and the ability and resources to resist distraction are connected because both the inner ability as well as the external resources to resist distraction have been found to mediate the correlation between socioeconomic status and academic achievement.

First, differences in executive functions have been found to mediate the relationship between socioeconomic status and the academic achievement gap (see e.g., Blakey et al., 2020; Lawson & Farah, 2015; Hackman et al., 2014; Sarsour et al., 2011). On a review of studies on the cognitive aspects of poverty, Sheehy-Skeffington and Rea (2017) argue that there seems to be something about growing up in low socioeconomic circumstances that harms a person's attention regulation. Even brain structure has been found to vary with socioeconomic status (see Noble et al., 2015).

Socioeconomic differences in academic performance across cultures have been found especially in tasks with higher executive function demands (see e.g., Hackman & Farah, 2009). In Sirin's review (2005), the correlations between socioeconomic status and academic achievement were strongest with achievement in mathematics, which is deemed to be especially demanding of executive functions. Thus, the mediating role of executive functions may lead to an achievement gap that is steepest in tasks that require complex cognition – which is where executive functions are most needed.

Secondly, indirect or external means of attention regulation are also governed by financial resources. As discussed in the previous section, this is because, for instance, it is easier to focus on schoolwork in a bigger house where it is possible to reserve one room for studying. Not only do people with higher socioeconomic status have better executive functioning, but they also live in less distracting environments. The level of crowding in the home environment is one of the factors through which socioeconomic status negatively affects children's academic achievement.

4 Further exacerbating factors

How does the achievement gap, which was established well before the wide-spread use of digital media, relate to digital distraction? How do people vary when it comes to responding to precisely *digital* distraction? In this section, I show that there is reason to think that there is socioeconomic variance also in relating to *digital* distraction. This means that there are disparities in responding to persuasive and omnipresent digital distractions for at least four reasons; because people's digital skills vary

partly according to socioeconomic status; because a person's active participation on the internet varies according to socioeconomic status; because people's reward-seeking behavior on the internet varies according to socioeconomic status; and because increased screen time, which is, to some extent correlated with lower socioeconomic status, can erode a person's attentional capacities even further.

First, there is individual variance in how resilient people are to *individual targeting* of distraction on the internet. There are at least two reasons for this. First, advertisement is targeted toward individual vulnerabilities. A person profiled as liable to gambling, for instance, is likely to see more gambling related ads (see Bhargava & Velasquez, 2021 on the analysis of the attention economy as exploiting individual vulnerabilities). Second, not only are people's vulnerabilities different but so is their knowledge about them and its targeting. To be resilient toward individually tailored targeting of advertisements, at least for many people,⁸ a person needs not only to know to what extent digital companies use individual targeting and how, but also be aware of their own vulnerabilities — whatever they are. Information about targeting of ads, however, is not currently publicly available to users.

Knowledge about targeting, at least as much as it is linked with digital skill, is associated with socioeconomic factors. There is a connection between digital literacy and socioeconomic background (see e.g., Neter & Brainin, 2012). Targeting vulnerabilities in digital environments can exacerbate inequalities because it hits those who already have the greatest pre-existing vulnerabilities to begin with, those who do not know what their individual vulnerabilities are, and those who are not aware of precisely how they are being exploited. If digital skill is linked with a lower likelihood of getting manipulated on the internet, socioeconomic differences in digital skill can further exacerbate problems with relating to individually tailored digital distraction for those of lower socioeconomic status.

Secondly, there is socioeconomic variance in how actively and creatively people behave on the internet (for reviews, see Robinson et al., 2015, Brake, 2014, and Hargittai & Jennrich, 2016). The internet is not an egalitarian public space: elite voices have been found to dominate online discussion, especially when it comes to participating in political discussion (on online activism see e.g., Schradie, 2018). The socioeconomic gap in the goal-oriented and the creative use of digital platforms is called *the participation gap* in internet use. Even though socioeconomic variance in active participation may arise from the individual differences in executive functioning noted above, the participation gap can further exacerbate already existing inequalities. Active participation on online platforms has been linked with benefiting from them and the passive use of online media has in itself been linked with their detrimental effects (see e.g., Fu et al., 2017).

Thirdly, there is socioeconomic variance in people's ability to govern their own reward-seeking behaviors on the internet. Reward-seeking behavior can amount to the overuse of porn or gambling sites, for instance, or an overall internet addiction. Individual variance in people's abilities to regulate reward-seeking behavior on the

⁸ Perhaps some people are not vulnerable to manipulation of attention on the internet through individual targeting of ads. Thanks to an anonymous reviewer for pointing this out.

internet has also been connected to socioeconomic background factors. For instance, lower socioeconomic status is associated with higher risk of internet addiction (see e.g., Lee & McKenzie, 2015). Even though this variance may also arise from pre-existing disparities in executive functioning, it is nevertheless linked with the detrimental effects of digital media, and points toward digital distraction posing the risk of further exacerbating already existing inequalities.

Fourthly, digital distraction may increase already existing inequalities through the effects of increased screen time on executive functioning. Increased screen time has been linked with decreased executive functioning in children and youth by several longitudinal and cross-sectional studies (for a recent review, see Vedeckina & Borgonovi, 2021). In a review of psychological studies related to children's exposure to digital media, Howard-Jones (2014) point out that excessive use, violent content, and late-night use lead to detrimental effects to the developing brain. Screen time seems to correlate, to some degree, with socioeconomic background. For instance, according to Bohnert and Gracia's (2023) data from Ireland, screen time increased from mid-childhood to adolescence more in lower socioeconomic groups than higher socioeconomic groups. Excessive screen time was found to lead to decreased well-being, and the researchers warn about digital worlds perpetuating already existing inequalities in adolescent well-being. Nevertheless, increased screen time is time away from other activities that, for children, are deemed to support the development, practice, and strengthening of executive functioning skills (see e.g., Calvert & Wilson, 2011). Thus, the socioeconomic differences in screen time may exacerbate already existing inequalities in executive functioning.

5 Why is this an ethical problem?

Why precisely are the links between individual differences in attention regulation, individual differences in digital media use, and socioeconomic background factors an ethical problem? Next, I will provide further conceptual tools to talk about these disparities and clarify why they are ethically problematic. I argue that disparities in responding to digital distraction threaten fair equality of opportunity when it comes to digital distraction in the classroom. Furthermore, I argue that disparities in responding to digital distraction may lead to unequal contribution of achievements that require complex cognition by people from lower socioeconomic groups.

First, it is useful to make a distinction between two gaps.

The Executive Functioning Gap consists of individual differences in executive functions, inhibition, working memory and cognitive flexibility, when such differences arise from socioeconomic background factors.

The Academic Achievement Gap consists of individual differences in the end results of tasks requiring complex cognition that are made possible by the executive functions, e.g., mathematical achievements, artistic, and scientific innovations, when such differences arise from socioeconomic background factors.

As discussed, these gaps have been found to be connected to each other. For the agent, an unequal opportunity to develop executive functions translates to a lack of opportunity to attain various academic achievements. Digital distractions, especially in developmentally integral moments, can exacerbate this problem. Next, I will further clarify why it is so by focusing on digital distraction in education.

Why is education so important when it comes to understanding the problems of an unequal response to digital distraction? Education is a central place for providing equal opportunities to people. A good educational system rewards skill and effort, instead of enforcing pre-existing inequalities between groups of people. However, digital distraction in the classroom may threaten this goal of equal education if it ends up exacerbating pre-existing inequalities in achievement and executive functioning.

Perhaps because of this threat, there is increasing discussion in educational research on the role of digital technologies in the classroom, especially in early education. Saarinen (2020), for instance, found that the increased use of digital technologies in Finnish classrooms predicted poor learning outcomes, especially for children coming from at-risk backgrounds – such as lower socioeconomic family backgrounds. The association between digital learning materials and weaker learning outcomes was, according to Saarinen (2020, 99), explained by working memory overload because of the frequent task-switching and disruptions to concentration arising from digital technologies. Especially strong effects were found in declining mathematics skills because, as discussed, learning mathematics is made possible by the executive functions as it requires significant working memory resources and is especially vulnerable to distractions.⁹

Let us think about the following case:

Law School An agent, who was born into a family of low socioeconomic status, is not able to pass a test to get into law school because her mathematics skills are not at the level needed after she has been exposed to unregulated digital distraction at school.

Fair equality of opportunity, the idea that everyone should have the same fair chances at gaining positions in society, is threatened here in Law School because the agent has diminished opportunities in life, that is, to succeed in a test that measures cognitive skills, following the unregulated digital distraction at school. This is wrong because what the agent has not chosen — in this case her family's socioeconomic background — should not affect her opportunities in life: to express oneself, to succeed, or to have an opportunity for social mobility. The agent has been preoccupied by persuasive digital distraction arising from her smartphone at school. Here, even though what she attends to at school is self-chosen to some extent, her lack of learning is not her own fault in the sense that she has not chosen her background factors

⁹ The mediating role of executive functions between socioeconomic background factors and learning mathematics is supported by a significant number of studies (see e.g., Dilworth-Bart, 2012; Nesbitt et al., 2013; Fitzpatrick et al., 2014; Lawson & Farah, 2015; Waters et al., 2021).

or the digital stimulus environment that affects her distractibility from learning in class. Nor is she aware of the extent of the cost of distraction in these settings.¹⁰

What Law School shows is that if a person's abilities and resources to resist distraction arise from her socioeconomic background features, and such disparities are further exacerbated by digital distraction in the classroom, what can follow is a situation in which the academic achievements of people from lower socioeconomic backgrounds suffer disproportionately. This is because of the established link between The Executive Functioning Gap and The Academic Achievement Gap.

5.1 Which equality of opportunity?

Which understanding of equality of opportunity does Law School threaten?¹¹ Here I focus especially on equality of *educational* opportunity: first, because it is one of the most glaring examples of the problems of inequality in responding to digital distraction, and second, because the inequalities are quite new, and there is limited knowledge on how digital distraction affects different groups, yet we do have recent evidence on how digital distraction affects learning outcomes. Another reason for the focus on educational inequality is its close connection to equality of opportunity in general. Brighouse and Swift (2014), for instance, point out that modern societies are structured so that many rewards are distributed unequally but education is a vital gateway to these rewards.¹²

I rely here on what John Rawls has called 'fair equality of opportunity' (1999, 63). It is satisfied in a society in which everyone who has the same native talent and ambition has the same prospects of success.¹³ In Law School, the agent does not have fair equal opportunities to develop her skills in education, so the best and most talented candidates regardless of their background end up being not chosen. Even though the competition by the law school is itself fair, the agent did not have a fair opportunity to develop her native talents at school.¹⁴

¹⁰ Her lack of opportunities may also create an overall sense of unfairness to people like her and to people around her. No matter what a person suffering from The Academic Achievement Gap does, she cannot get the same opportunities in life as someone who was exposed to a more favorable learning environment. Regardless of the person's skills or efforts, her pre-existing features prevent her from obtaining the same resources as others. Especially when connected to early educational inequalities, there is a risk of an increasing sense of hopelessness, that can also translate to decreasing trust in institutions, when such disparities are strengthened and when they lead to a lack of social mobility.

¹¹ Thank you to anonymous reviewer for posing this question.

¹² See Brighouse & Swift, 2014 for further arguments on the value of educational equality.

¹³ According to Rawls (1999, 63), "[t]he thought here is that positions are to be not only open in a formal sense, but that all should have a fair chance to attain them. Offhand it is not clear what is meant, but we might say that those with similar abilities and skills should have similar life chances. More specifically, assuming that there is a distribution of natural assets, those who are at the same level of talent and ability, and have the same willingness to use them, should have the same prospects of success regardless of their initial place in the social system. In all sectors of society there should be roughly equal prospects of culture and achievement for everyone similarly motivated and endowed. The expectations of those with the same abilities and aspirations should not be affected by their social class."

¹⁴ Rawls (1999, 63) also focuses on the school system, when he says that "[c]hances to acquire cultural knowledge and skills should not depend upon one's class position, and so the school system, whether public or private, should be designed to even out class barriers."

I focus especially on the fair competition between candidates in Law School because the focus is on educational opportunity, but I do not mean to imply that other areas of inequality in responding to digital distraction are not as important. Also, it must be pointed out that even though the focus here is on inequalities that follow from socioeconomic background (this is also the focus in Rawls, 1999), I do not mean to claim that other features of a person's background *should* affect her chances in life. On the contrary, digital distraction also poses several questions of inequality when it comes to ethnicity, gender, differences in cognitive makeup of the person, etc., and these should all be included in a full analysis of inequality and digital distraction, which, however, is beyond the scope of this article and requires further empirically informed understanding of how different groups respond to digital distraction.

If fair equality of opportunity is threatened, is discrimination involved? In Law School, no one is discriminating against the candidates unfairly. However, novel discriminatory practices may arise from unregulated use of digital media such that they end up increasing inequality between people.

In Law School, does digital distraction threaten formal or substantial equality of opportunity? Formal equality of opportunity means that applicants are assessed solely by criteria that are relevant to the post and that it is offered to the most qualified candidate. Substantial equality of opportunity means that the people have in some sense *genuinely* equal opportunities, for instance, to participate in fair selections of the best candidates for posts.

In Law School, digital distraction does not threaten formal equality of opportunity in the sense that the admission decisions to the school in question are not unfairly biased toward people of high socioeconomic background. Other candidates apart from the agent in Law School were not treated preferentially in the application process. An example of such a process would be a case in which a candidate is excluded from applying, for instance, if her application is destroyed by the administrators of the exam because she is judged as having a lower socioeconomic background based on the style of her hair. Here in Law School, however, this is not the case. The candidate is not ruled out of the competition by virtue of the fact that she is deemed to belong to a lower-ranked group in society, but her background factors still unfairly affect her opportunities in life. The attentional harm happened much earlier, at school when she could not focus on mathematics sufficiently due to the presence of digital distraction in the classroom.

This also means that in this imaginary example of an admission test in Law School, there is nothing wrong with the law school admission procedures in themselves.¹⁵ What needs to be changed in order for fair equality of opportunity to be attained are the policies related to digital distraction in earlier education. When evaluating whether a person has had substantial equal opportunities, what needs to be asked is: did she have equal chances to develop her skills? In Law School, the answer is no. The agent suffered from

¹⁵ This only applies to this thought experiment of a person being wronged through digital distraction at school. In reality it is very difficult if not impossible to design admission exams that have absolutely no amount of bias. Thank you to an anonymous reviewer for pointing this out.

aspects in her background that were not self-chosen and that affected her chances to develop her skills in school – to benefit from education equally. Substantive equality of opportunity would mean that she has had a genuine opportunity to become qualified for the test. In Law School, however, she does not have an equal chance to compete in an otherwise fair competition.

Even though I focus here on how digital distraction affects substantial fair equality of opportunity, I do not want to claim that it could not threaten formal equality of opportunity as well. This could happen in an exam in which there are unavoidable distractions, to the degree that distractibility becomes the dividing factor between candidates – in a situation in which there are socioeconomic differences in distractibility. I use a relatively thick version of formal equality of opportunity here (see Elford, 2023 for the distinction between thick and thin versions of formal equality of opportunity). Here formal equality of opportunity is achieved only if not only the admittance procedures are nondiscriminatory, but also if there are no hidden discriminatory practices in place, such as an unfair degree of distraction.

5.2 Digital distraction and achievement

Jennings and Tabatabaieian (2023) have argued that creative achievement suffers from digital distraction because actual creative achievements are not only about *arriving at* ideas, which can even be facilitated by distraction, but also about *making use* of those ideas. Bringing one idea to fruition requires long bouts of focused, sustained attention. In their view, the *exploitation* of ideas is what suffers under distracting circumstances whereas *exploration* of new ideas can even benefit from distraction. Thus, if we follow their analysis of distraction, and the established link between socioeconomic differences, executive functioning, and academic achievement, not only does the academic achievement of people with lower socioeconomic backgrounds suffer under digital distraction, so does their creative achievement.

Interestingly, the problems of The Academic Achievement Gap are not only connected to incidences of human suffering. Often, efforts to decrease inequality focus on the most glaring examples of human suffering. The United Nations (2020), for instance, in their policy on inequality, focuses on the idea that no one should be left behind, that is, marginalized groups should not suffer from further exclusion. The Academic Achievement Gap, however, is also about inequalities that concern the highest achievements of human potential, that is, furthering artistic and scientific innovation. As discussed, achievements requiring complex cognition, due to being dependent on executive functions, are especially vulnerable to distraction. As there seem to be socioeconomic differences in people's ability to resist distraction, increased digital distraction – especially in the classroom – can lead to people from vulnerable backgrounds achieving less, creatively and cognitively, and their academic and creative achievements altogether ending up lacking.

5.3 Repercussions for understanding digital divides

What does this mean for our current understanding of the digital divide¹⁶? There are currently three levels in the digital divide discussion: inequalities in *access* to technologies, which is called the first level digital divide; inequalities in *the motivations, skills, and use* of digital technologies, which is called the second level digital divide; and inequalities in *benefiting* from opportunities provided by digital technologies, which is called the third level digital divide (Ragnedda & Ruii, 2017; Ragnedda, 2019; van Dijk, 2020).

Inequalities in responding to digital distraction work at the level of use as well as benefiting from digital technologies. However, to fully understand inequalities in responding to digital distraction, a better understanding of how digital inequalities and digital divides interact with other pre-existing inequalities is needed. Digital technologies arrive in societies with already existing inequalities between people in several areas of life. If digital technologies, for instance, deepen the already existing executive functioning gap, they affect inequalities in areas beyond the person's proper relation to technology: her relation to other things requiring her attention, for instance, and in the development of her cognitive makeup as a whole. Further empirically informed understanding and conceptual resources for addressing the interactions between the digital divides and inequalities in, for instance, health and well-being, as well as in executive functioning and academic achievement, are needed. In general, a better understanding of inequalities in the cognitive capacities and achievements that these capacities make possible would have to be developed to secure an equal digital environment for everyone.

6 Objections

Next, I will answer some potential objections to what has been argued.

6.1 Self-chosen inequalities are justified

It could be argued that because disparities in responding to digital distraction are, at least to a significant degree, about what one attends to or does not attend to, or that they are about deficiencies that follow from at least partly voluntary distractions, they cannot present a genuine question of injustice. Perhaps people should be able to attend freely to digital medias if that is what they want. If further inequalities are created or enforced, so be it, no one should be paternalized to act otherwise.

However, as discussed, inequality is often seen as a problem (at least in the educational inequality discussion) because a person's arbitrary background features should not affect her opportunities in life. In the United Nations equality policy, for instance, it is deemed that even though they should not, 'circumstances beyond an

¹⁶ Thank you to an anonymous reviewer for pressing me to think about the implications of these findings on understanding digital divides.

individual's control, such as gender, race, ethnicity, migrant status and, for children, the socioeconomic status of their parents, continue to affect one's chances of succeeding in life' (2020, 20). Achievements that require complex cognition are central to several ways in which a person can succeed in life, even more so when so-called *knowledge work* – work that is about processing knowledge – has become a widespread way of producing income. Furthermore, accessibility and equality in learning is an important value for societies. *Law School* demonstrates that not everyone has access to information about the central role of well-developed executive functioning in a person's life nor an understanding of the importance of resisting distraction to higher cognitive achievements. Moreover, even if some attention-related choices of an agent are self-chosen, not all events of digital distraction, especially in early education, are chosen by a well-informed adult. Children are not able to make completely autonomous choices on how to develop their executive functions. A student at school, for instance, browsing the internet while listening to a lecture, may not understand how making such decisions repeatedly can affect her future opportunities in life.

6.2 Diginatives are not vulnerable to the detrimental effects of digital distraction

It could also be argued that the so-called *diginatives*, the generation that, having been born after 1990, has grown to use internet and digital media fluently, have such a high degree of online skills that they are unaffected by disparities in responding to digital distraction.

In digital education research, however, the myth of the diginative has been proven wrong several times (for a review, see Kirschner & De Bruyckere, 2017). Instead of the generation, it has been found that the socioeconomic status of an internet user's parents predicts her level of online skills. In Turkish diginatives, for instance, a significant difference determined by socioeconomic variables was found in internet use for academic and non-academic purposes (Kobul, 2023). Higher income and higher education have been associated with being tech-savvy, instead of the person's generation (Hargittai, 2010; Hargittai & Hinnant, 2008). In general, researchers have concluded that simply being born into a technological environment does not automatically make a person tech-savvy.

Instead, researchers have expressed concern about the use of 'the myth of the diginative' because the myth of there being people who are fundamentally different from other people, even capable of successfully multitasking, can be used to obscure children's need for support in developing digital skills (Livingstone, et al., 2011, 42). This myth is not only mistaken but also harmful, because it can be used to justify policies that do not interfere with the interests of digital companies.

6.3 The loss of achievements is not meaningful

It could also be argued that the higher cognitive achievements that were not attained by people from lower socioeconomic backgrounds due to high degree and

persuasiveness of digital distraction do not matter in the first place. Perhaps this line of argumentation could be justified by saying that some people are happy and content with never achieving the end results of complex cognitions. Not everyone even wants to become a doctor or a lawyer, or contribute to the advancement of science and art.

Let us think about this from the perspective of fair equality of opportunity. Even if a person never wanted to apply to law school or write a novel, they should be free to at least try if they wanted to, at least if it is not impossible for them to learn the skills required. Socioeconomic background should not prevent a person from realizing themselves. If someone's self-expression does require complex cognition, then they should be free to develop such resources, to a certain degree, just in case they are needed.

Even if one did not accept that everyone should have an equal chance at academic achievement, the Executive Functioning Gap in itself affects several other areas of well-being, and it can provide further problems in case it is exacerbated by digital distraction. Executive functions and the ability to regulate one's attention in general is needed in all areas of a person's life — differences in executive functioning have been found to predict, for instance, the person's health and mental health, not only her educational achievement. According to Diamond (2013, 137), for instance, executive functions have been found to be important to just about every aspect of a person's life: not only academic and job achievement, but also health, mental health, quality of life, marital harmony, and public safety. So even if one does not accept fair equality of opportunity or that the Academic Achievement Gap is a problem, the Executive Functioning Gap contributes to inequalities in health, mental health, and well-being, so at least it should be guaranteed that digital distraction does not exacerbate already existing disparities in executive functioning through the effects of screen time on executive functioning, for instance. Furthermore, differences in relating to digital distraction can have immediate negative effects on a person's well-being through damaging ways of using digital media.¹⁷ This can be seen in behaviors such as *doomscrolling*, extensively attending to negative information on social media (see Sharma et al., 2022; Satici et al., 2023), or *phubbing*, ignoring one's companions in order to attend to one's phone (Aagaard, 2020). Here the propensity to be unable to resist digital distraction amounts to behavior that is damaging, to one's mental health, or to a one's relationships, regardless of its effects on academic achievement.

6.4 Differences in cognitive achievements partly arise from genetic differences

It could also be argued that disparities in responding to digital distraction are not a matter of genuine inequality but are due to differences in cognition that partly mirror genetic differences in executive functioning, and that should not, and cannot, be tackled by social policy.

¹⁷ Thank you to an anonymous reviewer for bringing up these examples.

There are genetic components to many areas of cognition. In the Executive Functioning Gap, however, the disparities are not about specific cognitions like intelligence but about the overall functioning of the agent who *makes use* of specific cognitions and skills. Executive functioning skills can be taught and there are several successful interventions on executive functioning deficits that would not work in case if it were impossible to tackle differences in executive functioning through social policy (for an overview of executive functioning interventions, see Diamond, 2014). Moreover, genes interact in an active, complex manner with the environment — some genetic dispositions only come out in certain environments. So even though there are genetic differences in cognition, this does not mean that genetic features would predetermine a person's cognitive achievements, that executive functioning could not be developed in well-designed early education, or that the development of genetic vulnerabilities could not be influenced by guaranteeing good early education for everyone (on discussion of socioeconomic status and brain development, see e.g., Farah, 2017).

6.5 Television was also considered dangerous

It could be further argued that whenever a new technology has appeared, some people have seen major risks involved — for instance, when television was invented. This, however, does not mean that those risks end up being realized.

Major risks have been identified when it comes to the current technological change partly because the changes are so rapid, partly because they are so widespread, and partly because they are so unpredictable. Currently, the long-term effects of technological change on various already vulnerable groups are not known. The United Nations (2020) already has stated that urgent policy intervention is needed at all levels to prevent inequalities from deepening due to technological change. Moreover, socioeconomic background affects how much families and individuals are able to cope with rapid societal change. Poverty is by definition about a lack in a person's financial resources. When a major societal change is happening people with fewer resources are less capable to adapt to this change. This also applies to technological change concerning digital distraction: those with fewer resources have fewer opportunities to adapt to major changes in their attentional environments.

6.6 Distraction is always present

It could also be argued that there is nothing new about problems with distraction: distractions have always been present, also in learning situations, and in people's lives, without causing major problems.

But *digital* distraction in the classroom cannot be compared to normal distractions, by, for instance, the agent's own mind-wandering. Even though distractive stimuli are always present in learning situations, digital distraction brings it to a different level (see e.g., Hembrooke & Gay, 2003). The mere presence of a laptop has been found to be associated with diminished learning (e.g., Carter et al., 2017; Duncan et al., 2012), and multitasking on laptops has been associated with impaired

comprehension of course material and diminished overall performance in learning (Barak et al., 2006; Hembrooke & Gay, 2003; Kraushaar & Novak, 2010). Attempting to attend to lectures and engage in digital technologies for off-task activities at the same time has been found to have a detrimental impact on learning (Wood et al., 2012).

Distraction, however, is not always detrimental to learning — for instance, taking breaks from cognitively challenging tasks to watch dog videos may perhaps even be useful for learning. Different browsing styles are linked to differences in how much internet browsing actually disrupts learning.¹⁸ What kind of breaks are useful and for whom, however, should be better known, as well as how beneficial browsing styles could be taught. Currently educational research points toward utmost care in allowing persuasive and omnipresent digital distraction in learning situations because it hinders the performance of complex cognitions, such as learning new material, to a significant degree, and because it hinders learning, especially for students from at-risk backgrounds, who already suffer from the pre-existing Academic Achievement Gap and Executive Functioning Gap.

7 Conclusion

I have argued that there are pre-existing issues of inequality related to the connection between socioeconomic differences in executive functioning and academic achievement that are in danger of being exacerbated by ever-present and highly persuasive digital distractions. People respond differently to digital distraction due to pre-existing differences in executive functioning, and the differences in executive functioning have been found to correlate with socioeconomic background factors. It was argued that disparities in responding to digital distraction are problematic because they threaten fair equality of opportunity when it comes to digital distraction in the classroom and that they may lead to an unequal contribution of achievements that require complex cognition by people from lower socioeconomic backgrounds. This is important because there are ongoing efforts to develop legal regulation on digital companies, but the inequality-based arguments in connection to digital distraction have so far not been taken into consideration.

Many questions, however, remain to be answered.

Further empirical understanding of how digital distraction contributes to pre-existing Academic Achievement Gap and Executive Functioning Gap would be needed. There is currently limited understanding as to precisely why socioeconomic achievement gaps arise in the first place (see e.g., Blakey et al., 2020). Several mechanisms have been hypothesized as being responsible for the Academic Achievement Gap: parental scaffolding, crowding in the home environment, the role

¹⁸ Hembrooke & Gay (2003) report that off-task browsing is less detrimental to learning, perhaps because it provides a break from concentration. However, they also think that this effect is mediated by the user's ability to monitor their own browsing behavior, that is, executive functions.

of stress in poor families,¹⁹ nutrition, and the effects of an unstable neighborhood have been brought up as probable explanations for it. However, it is important to further study these mechanisms so that their effects could be better controlled and taken into account (e.g., Carter et al., 2017; Duncan et al., 2012).²⁰ Furthermore, the precise mechanisms by which these gaps connect with digital distraction would need to be better known.

Nevertheless, the Academic Achievement Gap is deemed to be a central societal problem by social scientists, and if digital distraction works as an exacerbating factor to it, it is especially urgent to develop policy interventions on it. Even if the precise mechanisms by which inequalities arise are not known, if the Academic Achievement Gap is exacerbated by digital distraction, there is also reason to develop more regulation over digital distraction, especially in situations in which distraction has already been found to be detrimental to performance, such as early education.

The solutions to this complex problem, however, are likely to be multidimensional. Currently, the conceptual tools to address these questions are limited. In policy making, equal access to digital medias is still a baseline goal (see e.g., The United Nations, 2020, 59) even though this issue goes beyond access to digital media, to the proper interaction between the agent, her long-term goals, and her immediate environment. Furthermore, when it comes to inequalities connected to digital skills, increasing digital literacy is often portrayed as the solution. Equal access to digital literacy, however, is not enough to guarantee that the Executive Functioning Gap or the Academic Achievement Gap will be solved, or that their exacerbation by digital distraction will be prevented. In order to provide solutions to an unequal response to digital distraction, people would need to have equal access not only to digital medias and digital literacy, but to executive functioning as well. Perhaps everyone should have the right to be informed about how digital medias have profiled them. Further research on the relations of the multidimensional digital divides and pre-existing inequalities, however, is needed so that questions of inequalities in the agent's relation to what is cognitively possible to her could be better understood.

Ethical discussion may also be useful in responding to these challenges. It has been argued lately that people have a Kantian duty to avoid overexpose to screens (Lo Re, 2022), and that people have a duty to promote digital minimalism, the propensity to view interactions with digital technologies as intentional, not only in ourselves but also in others, as parents and teachers (Aylsworth & Castro, 2022). Further work, however, is needed, for instance, to determine when people *should have* a right to concentrate (on the right to concentrate, see Kärki & Kurki, 2023).

¹⁹ For instance, families exposed to stress have been found to have more conflict and emotional withdrawal instead of the warmth that is central to the developing brain (Farah et al., 2006; Hackman et al., 2014).

²⁰ One challenge in studying digital distraction has been the elusiveness of this area for self-reporting. Learning deficits from distraction happen in the absence of students realizing it themselves; student reports of their own internet or cell phone use do not match actual use. For instance, in Duncan et al. (2012), students reported using mobile phones on average three times during class, but observational studies showed that they used their phones closer to seven times per class.

Responses to climate change are divided into *mitigation* and *adaptation* strategies. Whereas *adaptation* is about making communities more resilient to the upcoming changes, *mitigation* is about trying to stop the processes before they become bigger problems. Digital literacy is a useful solution that teaches people to adapt to rapid technological change, but perhaps here as with climate change, mitigation strategies should also be in use because digital distraction is so widespread, its effects are unknown, and because it is in danger of exacerbating pre-existing inequalities between groups of people.

Acknowledgements I want to thank the audience at GAPI1 in Berlin for discussion, Guido Löhr, Tuukka Kaidesoja, Roope Mokka, Mattias Lehtinen, Jyri Vartiainen, Tarna Kannisto, Lari Hokkanen, Markus Pansar, and Jaakko Kuorikoski for reading and discussing earlier versions of this paper and Sebastian Watzl for earlier discussions. I also want to thank Michael Laakasuo for his encouragement regarding this paper, as well as two anonymous reviewers of this journal for their careful comments and criticisms. I am grateful to Kenneth Quek for checking the language, but any remaining mistakes are mine.

Authors' contributions KK is responsible for all research and writing of this manuscript.

Funding Open Access funding provided by University of Helsinki (including Helsinki University Central Hospital). Kärki's research for this article has been funded by Kone Foundation and Emil Aaltonen Foundation.

Data Availability No data or materials were used.

Declarations

Ethics approval and consent to participate. Not applicable.

Consent for publication Not applicable.

Competing interests The authors have no relevant financial or non-financial interests to disclose.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Aagaard, J. (2020). Digital akrasia: a qualitative study of phubbing. *AI & Society*, *35*, 237–244. <https://doi.org/10.1007/s00146-019-00876-0>
- Aylsworth, T. & Castro, C. (2022). On the duty to be an attention ecologist. *Philosophy & Technology*, *35*(13). <https://doi.org/10.1007/s13347-022-00514-6>
- Barak, M., Lipson, A., & Lerman, S. (2006). Wireless laptops as means for promoting active learning in large lecture halls. *Journal of Research on Technology in Education*, *38*, 245–263.
- Bhargava, V., & Velasquez, M. (2021). Ethics of the attention economy: the problem of social media addiction. *Business Ethics Quarterly*, *31*(3), 321–359. <https://doi.org/10.1017/beq.2020.32>

- Blakey, E., Matthews, D., Cragg, L., Buck, J., Cameron, D., Higgins, B., Pepper, L., Ridley, E., Sullivan, E., & Carroll, D. J. (2020). The role of executive functions in socioeconomic attainment gaps: results from a randomized controlled trial. *Child Development, 91*(5), 1594–1614. <https://doi.org/10.1111/cdev.13358>
- Bohnert, M., & Gracia, P. (2023). Digital use and socioeconomic inequalities in adolescent well-being: Longitudinal evidence on socioemotional and educational outcomes. *Journal of Adolescence, 1*–16. <https://doi.org/10.1002/jad.12193>
- Brake, D. R. (2014). Are we all online content creators now? Web 2.0 and digital divides. *Journal of Computer-Mediated Communication, 19*(3), 591–609.
- Brighouse, H., & Swift, A. (2014). The Place of Educational Equality in Educational Justice. In K. Meyer (Ed.), *Education, Justice and the Human Good* (pp. 14–33). Routledge.
- Bull, R., & Lee, K. (2014). Executive functioning and mathematics achievement. *Child Development Perspectives, 8*, 36–41. <https://doi.org/10.1111/cdep.12059>
- Calvert, S. L., & Wilson, B. J. (Eds.). (2011). *The Handbook of Children, Media, and Development*. West Sussex: Wiley-Blackwell.
- Carter, S. P., Greenberg, K., & Walker, M. S. (2017). The impact of computer usage on academic performance: evidence from a randomized trial at the United States Military Academy. *Economics and Education Review, 56*, 118–132.
- Conway, A., Jarrold, C., Kane, M., Miyake, A., & Towse, J. (Eds.). (2008). *Variation in Working Memory*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195168648.001.0001>
- Cragg, L., & Gilmore, C. (2014). Skills underlying mathematics: the role of executive function in the development of mathematics proficiency. *Trends in Neuroscience and Education, 3*(2), 63–68. <https://doi.org/10.1016/j.tine.2013.12.001>
- Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*, 135–168. <https://doi.org/10.1146/annurev-psych-113011-143750>
- Diamond, A. (2014). Want to optimize executive functions and academic outcomes? Simple, just nourish the human spirit. *Minnesota Symposium for Child Psychology, 37*, 205–235.
- Dilworth-Bart, J. E. (2012). Does executive function mediate SES and home quality associations with academic readiness? *Early Childhood Research Quarterly, 27*(3), 416–425. <https://doi.org/10.1016/j.ecresq.2012.02.000>
- Duncan, D., Hoextra, A., & Wilcox, B. R. (2012). Digital devices, distraction, and student performance: Does in-class cell phone use reduce learning? *Astronomy Education Review 11*. <https://doi.org/10.3847/AER20120111>
- Elford, G. (2023). Equality of opportunity. *The Stanford Encyclopedia of Philosophy* (Fall 2023 Edition), E. N. Zalta, & U. Nodelman (Eds.). Accessed 5th of January 2024. <https://plato.stanford.edu/archives/fall2023/entries/equal-opportunity/>
- Evans, G. W. (2006). Child development and the physical environment. *Annual Review of Psychology, 57*, 423–451. <https://doi.org/10.1146/annurev.psych.57.102904.190057>
- Evans, G. W., Lepore, S. J., Shejwal, B. R., & Palsane, M. N. (1998). Chronic residential crowding and children's well-being: an ecological perspective. *Child Development, 69*(6), 1514–1523. <https://doi.org/10.1111/j.1467-8624.1998.tb06174.x>
- Evans, G. W., Ricciuti, H. N., Hope, S., Schoon, I., Bradley, R. H., Corwyn, R. F., & Hazan, C. (2010). Crowding and cognitive development: the mediating role of maternal responsiveness among 36-month-old children. *Environment and Behavior, 42*(1), 135–148. <https://doi.org/10.1177/0013916509333509>
- Farah, M. J. (2017). The neuroscience of socioeconomic status: correlates, causes, and consequences. *Neuron, 96*(1), 56–71. <https://doi.org/10.1016/j.neuron.2017.08.034>
- Farah, M. J., Shera, D. M., Savage, J. H., Betancourt, L., Giannetta, J. M., Brodsky, N. L., Malmud, E. K., & Hurt, H. (2006). Childhood poverty: Specific associations with neurocognitive development. *Brain Research, 1110*(1), 166–174.
- Fitzpatrick, C., McKinnon, R. D., Blair, C. B., & Willoughby, M. T. (2014). Do preschool executive function skills explain the school readiness gap between advantaged and disadvantaged children? *Learning and Instruction, 30*, 25–31. <https://doi.org/10.1016/j.learninstruc.2013.11.003>
- Fu, K. W., Ho, F. K. W., Rao, N., Jiang, F., Li, S. L., Lee, T. M., Chan, S. H., Yung, A. W., & Ip, P. (2017). Parental restriction reduces the harmful effects of in-bedroom electronic devices. *Archives of Disease in Childhood, 102*(12), 1125–1131. <https://doi.org/10.1136/archdischild-2017-312639>
- Hackman, D. A., & Farah, M. J. (2009). Socioeconomic status and the developing brain. *Trends in Cognitive Sciences, 13*, 65–73.

- Hackman, D. A., Betancourt, L. M., Gallop, R., Romer, D., Brodsky, N. L., Hurt, H., & Farah, M. J. (2014). Mapping the trajectory of socioeconomic disparity in working memory: parental and neighborhood factors. *Child Development, 85*, 1433–1445.
- Hanin, M. L. (2021). Theorizing digital distraction. *Philosophy & Technology, 34*, 395–406. <https://doi.org/10.1007/s13347-020-00394-8>
- Hargittai, E. (2010). Digital na(t)ives? Variation in internet skills and uses among members of the “net generation.” *Sociological Inquiry, 80*, 92e113. <https://doi.org/10.1111/j.1475682X.2009.00317.x>
- Hargittai, E., & Hinnant, A. (2008). Digital inequality differences in young adults’ use of the internet. *Communication Research, 35*, 602e621.
- Hargittai, E., & Jennrich, K. (2016). The online participation divide. In L. A. Friedland & M. Lloyd (Eds.), *The Communication Crisis in America, and How to Fix It*. Palgrave Macmillan, pp. 199–213. https://doi.org/10.1057/978-1-349-94925-0_13
- Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: the effects of multitasking in learning environments. *Journal of Computing in Higher Education, 15*(1), 46–64.
- Howard-Jones, P. (2014). Neuroscience and education: A review of educational interventions and approaches informed by neuroscience. Millbank, UK: *Education Endowment Foundation*. Accessed 5th of January 2024. <https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/neuroscience-and-education>
- Jennings, C. D., & Tabatabaiean, S. (2023). Attention, Technology, and Creativity. In D. G. Burnett, & J. E. H. Smith (Eds.), *Scenes of Attention: An Interdisciplinary Inquiry*. New York: Columbia University Press, pp. 24–141.
- Kärki, K., & Kurki, V. (2023). Does a person have a right to attention? Depends on what she is doing. *Philosophy & Technology, 36*(4), 86. <https://doi.org/10.1007/s13347-023-00673-0>
- Kirschner, P. A., & De Bruyckere, P. (2017). The myths of the digital native and the multitasker. *Teaching and Teacher Education, 67*, 135–142.
- Kobul, M. K. (2023). Socioeconomic status influences Turkish digital natives’ internet use habitus. *Behaviour & Information Technology, 42*(5), 624–642. <https://doi.org/10.1080/0144929X.2022.2034970>
- Kraushaar, J. M., & Novak, D. C. (2010). Examining the effects of student multitasking with laptops during the lecture. *Journal of Information Systems Education, 21*(2), 241–251.
- Lawson, G. M., & Farah, M. J. (2015). Executive function as a mediator between ses and academic achievement throughout childhood. *International Journal of Behavioral Development, 41*(1), 94–104. <https://doi.org/10.1177/0165025415603489>
- Lee, C. S., & McKenzie, K. (2015). Socioeconomic and geographic inequalities of internet addiction in Korean adolescents. *Psychiatry Investigation, 12*, 559–562. <https://doi.org/10.4306/pi.2015.12.4.559>
- Liu, J., Peng, P., Zhao, B., & Luo, L. (2022). Socioeconomic status and academic achievement in primary and secondary education: a meta-analytic review. *Educational Psychology Review, 34*, 2867–2896. <https://doi.org/10.1007/s10648-022-09689-y>
- Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2011). *Risks and safety on the internet: the perspective of European children. Full Findings*. EU Kids Online.
- Lo Re, S. (2022). The glowing screen before me and the moral law within me: a kantian duty against screen overexposure. *Res Publica, 28*, 491–511. <https://doi.org/10.1007/s11158-021-09538-9>
- Marsh, S., Dobson, R., & Maddison, R. (2020). The relationship between household chaos and child, parent, and family outcomes: a systematic scoping review. *BMC Public Health, 20*(513), 1–27. <https://doi.org/10.1186/s12889-020-08587-8>
- Nesbitt, K. T., Baker-Ward, L., & Willoughby, M. T. (2013). Executive function mediates socio-economic and racial differences in early academic achievement. *Early Childhood Research Quarterly, 28*(4), 774–783. <https://doi.org/10.1016/j.ecresq.2013.07.005>
- Neter, E., & Brainin, E. (2012). eHealth literacy: a marker for “digital divide” in health information. *Reviews in Health Care, 3*(3), 145–151.
- Noble, K. G., Houston, S. M., Brito, N. H., Bartsch, H., Kan, E., Kuperman, J. M., et al. (2015). Family income, parental education and brain structure in children and adolescents. *Nature Neuroscience, 18*(5), 773–778.
- Ragnedda, M., & Ruiu, M. L. (2017). Social capital and the three levels of digital divide. In M. Ragnedda & G. Muschert (Eds.), *Theorizing Digital Divides* (pp. 21–34). Routledge.

- Ragnedda, M. (2019). Conceptualising the digital divide. In Mutsvairo, B., and Ragnedda, M. (Eds). *Mapping the Digital Divide in Africa. A mediated Analysis*. Amsterdam: Amsterdam University Press, pp. 27–43.
- Rawls, J. (1999). *A Theory of Justice* (revised). Harvard University Press.
- Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hale, T. M., & Stern, M. J. (2015). Digital inequalities and why they matter. *Information, Communication & Society*, 18(5), 569–582. <https://doi.org/10.1080/1369118X.2015.1012532>
- Rodríguez-Hernández, C. F., Cascallar, E., & Kyndt, E. (2020). Socio-economic status and academic performance in higher education: A systematic review. *Educational Research Review*, 29, 100305. <https://doi.org/10.1016/j.edurev.2019.100305>
- Saarinén, A. (2020). *Equality in cognitive learning outcomes: the roles of educational practices*. University of Helsinki. Accessed 5th of January 2024. <https://urn.fi/URN:ISBN:978-951-51-6713-2>
- Sarsour, K., Sheridan, M., Jutte, D., Nuru-Jeter, A., Hinshaw, S., & Boyce, W. T. (2011). Family socio-economic status and child executive functions: the roles of language, home environment, and single parenthood. *Journal of the International Neuropsychological Society*, 17, 120–132.
- Satici, S. A., Gocet Tekin, E., Deniz, M. E., et al. (2023). Doomscrolling scale: its association with personality traits, psychological distress, social media use, and wellbeing. *Applied Research Quality Life*, 18, 833–847. <https://doi.org/10.1007/s11482-022-10110-7>
- Schradie, J. (2018). The digital activism gap: how class and costs shape online collective action. *Social Problems*, 65, 51–74. <https://doi.org/10.1093/socpro/spx042>
- Sharma, B., Lee, S. S., & Johnson, B. K. (2022). The dark at the end of the tunnel: doomscrolling on social media newsfeeds. *Technology, Mind, and Behavior*, 3(1). <https://doi.org/10.1037/tmb0000059>
- Sheehy-Skeffington, J., & Rea, J. (2017). How poverty affects people's decision-making processes. *Joseph Rowntree Foundation*. Accessed 5th of January 2024. <https://www.jrf.org.uk/savings-debt-and-assets/how-poverty-affects-peoples-decision-making-processes>
- Sirin, S. R. (2005). Socioeconomic status and academic achievement: a meta-analytic review of research. *Review of Educational Research*, 75(3), 417–453. <https://doi.org/10.3102/00346543075003417>
- The United Nations. (2020). *World Social Report 2020. Inequality in a Rapidly Changing World*. Sales No E.20.IV.1. Accessed 5th of January. <https://www.un.org/development/desa/dspd/world-social-report/2020-2.html>
- van Dijk, J. (2020). *The Digital Divide*. Polity Press.
- Vedechkina, M., & Borgonovi, F. (2021). A review of evidence on the role of digital technology in shaping attention and cognitive control in children. *Frontiers in Psychology*, 12, 611155. <https://doi.org/10.3389/fpsyg.2021.611155>
- Wachs, T. D. (1979). Proximal experience and early cognitive-intellectual development: The physical environment. *Merrill-Palmer Quarterly of Behavior and Development*, 25(1), 3–41. Accessed 5th of January 2024. <http://www.jstor.org/stable/23084575>
- Waters, N. E., Ahmed, S. F., Tang, S., Morrison, F. J., & Davis-Kean, P. E. (2021). Pathways from socio-economic status to early academic achievement: the role of specific executive functions. *Early Childhood Research Quarterly*, 54, 321–331. <https://doi.org/10.1016/j.ecresq.2020.09.008>
- Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multi-tasking with technology on real-time classroom learning. *Computers & Education*, 58, 365–374.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.