



# Paying attention to attention: psychological realism and the attention economy

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## Abstract

In recent years, philosophers have identified a number of moral and psychological harms associated with the attention economy (Aylsworth and Castro, In *Journal of Applied Philosophy* 38:662–673, 2021; Castro and Pham, In *Philosophers' Imprint* 20:1–13, 2020; Williams, In *Stand out of our light: Freedom and resistance in the attention economy*, Cambridge University Press, 2018). Missing from many of these accounts of the attention economy, however, is what exactly attention is. As a result of this neglect of the cognitive science of attention, many of these accounts are not empirically credible. They rely on oversimplified and unsophisticated accounts of not only attention, but selfcontrol, and addiction as well. Of note are accounts of the attention economy that rely on the ‘brain disease’ rhetoric of addiction and subsequent control failures (Aylsworth and Castro, In *Journal of Applied Philosophy* 38:662–673, 2021; Bhargava and Velasquez, In *Business Ethics Quarterly* 31:321–359, 2021), accounts that rely on a strict dichotomy of top-down vs. bottom-up attention (Williams, In *Stand out of our light: Freedom and resistance in the attention economy*, Cambridge University Press, 2018; Aylsworth and Castro, In *Journal of Applied Philosophy* 38:662–673, 2021), and accounts that construe attention as a limited resource (Williams, In *Stand out of our light: Freedom and resistance in the attention economy*, Cambridge University Press, 2018). Drawing on recent work from the neuroscience and psychology of attention, I demonstrate the shortcomings of these accounts and sketch a way forward for an empirically grounded account of the attention economy. These accounts tend to uphold strict dichotomies of voluntary control (e.g., compulsion versus choice, dual-process models of self-control, and top-down versus bottom-up) that cannot account for the complexities of attentional control, mental agency, and decision-making. As such, these empirically and conceptually impoverished accounts cannot adequately address the current so-called crisis of attention. To better understand the harms associated with the attention economy, we need an empirically responsible account of the nature and function of attention and mental agency.

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## 1 Introduction

The commodification of attention on the online advertising marketplace, social media, and smartphone apps has been the subject of much concern among philosophers of technology during recent years, leading to what many have called a ‘crisis of attention’ (Aylsworth & Castro, 2021; Bermúdez, 2017; Bhargava & Velasquez, 2021; Castro & Pham, 2020; Williams, 2018). The ‘attention economy’, the market where “consumers give new media developers their literal attention in exchange for a service (such as a news feed or access to pictures of friends)” (Castro & Pham, 2020), has been charged with contributing to the current adolescent mental health crisis, threatening the autonomy of individuals, preying on people’s psychological vulnerabilities, and undermining collective autonomy and democracy (Bhargava & Velasquez, 2021; Castro & Pham, 2020; Twenge, 2017).

Missing from many of these accounts of the attention economy is what exactly attention *is*. That is, what is the thing that is being commodified? Moreover, how does its commodification and subsequent fracturing contribute to the psychological harms and moral concerns mentioned above? Attention is, after all, a real cognitive capacity that has been the subject of much rigorous and scientific debate (Treisman & Gelade, 1980; Posner & Petersen, 1990; Desimone & Duncan, 1995; Awh et al., 2012; Hommel et al., 2019; Shomstein et al., 2022). Moreover, attention is increasingly recognized as essential to understanding mind, agency, and action by philosophers of mind and cognitive science (Mole, 2011, 2023; Jennings, 2012, 2015, 2020; Wu, 2013, 2014, 2023; Watzl, 2017, 2022). As a result of this neglect, many accounts of the psychological impacts of the attention economy in the philosophy of technology are not empirically credible. They rely on oversimplified and unsophisticated accounts of not only attention, but self-control, and addiction as well. Of note are accounts of the attention economy that rely on the ‘brain disease’ rhetoric of addiction (Pickard, 2022) and subsequent control failures (Alter, 2017; Aylsworth & Castro, 2021; Bhargava & Velasquez, 2021), accounts that rely on a strict dichotomy of top-down vs. bottom-up attention (Aylsworth & Castro, 2021; Williams, 2018; Wu, 2017), and accounts that construe attention as a limited resource (Baumeister, 1998; Williams, 2018).

After a brief note on contemporary debates about attention (Sect. 1.1), I provide an overview of some prominent ways the attention economy has been discussed (Sect. 2). I then discuss addiction, self-control, and attention in turn. I argue that the ‘brain disease’ rhetoric of addiction found throughout many accounts of the attention economy wrongfully characterizes problematic technology use as (solely) a compulsion, and that recent empirical work on addiction warrants greater consideration of choice architectures and user agency (Sect. 3). I then demonstrate that accounts that rely on dual-process models of self-control cannot account for the complex role of motivation and value-based decision making (Berkman et al., 2017) in self-control decisions (Sect. 4). Next, I show how recent work on attention modulation (Awh et al., 2012; Shomstein et al., 2022; Todd & Manaligod, 2018) complicates the traditional dichotomy of top-down

vs. bottom-up attention, suggesting that bottom-up capture, or attention hijacking, is not an empirically credible way to explain the attention economy (Sect. 5). In Sect. 6, I argue that these fundamental misgivings about the nature of attention have led to the mistakes inherent in the self-control and addiction accounts. I then argue that construing attention as a limited resource repeats many of the mistakes associated with the “ego-depletion” model of self-control (Baumeister, 1998) (Sect. 7). With our more empirically responsible account of attention in place, I consider some implications of this account for recent policy recommendations (Sect. 8). I conclude with some remarks on how to better integrate the science of attention with normative accounts of the attention economy (Sect. 9).

Ultimately, I argue that to fully comprehend the supposed moral and psychological harms associated with the attention economy, philosophers of technology must come to better understand the nature and function of attention and mental agency, more generally. Many of the current accounts of the attention economy seem to take for granted William James’ famous adage that “[e]veryone knows what attention is” (James, 1890), and these accounts are worse off for that. The psychology and neuroscience of attention can help address these shortcomings.

## 1.1 A note on attention

What I offer here is not a fully developed, nor once and for all account of attention. One is not necessary to begin to rectify the shortcomings of the philosophical literature on the attention economy. Rather, what I offer is an account of attention that more completely recognizes the variety of influences on attention, and as such, how selecting one among many possible actions (including mental actions) is solved through attention. To that extent, I follow Wu (2023) in taking as my starting point a Jamesian *common ground* view; namely, that attention solves a *selection problem* for the organism in question. This can be taken as a relatively uncontroversial starting point of all current prominent theories of attention.

In the philosophical literature, there is a clear dividing line between current prominent theories of attention. Accounts such as those proposed by Jennings (2020, 2022) and Watzl (2017, 2023) construe attention as the basis of control. On the other hand, accounts such as those proposed by Wu (2014, 2023) and Mole (2011, 2023) do not take attention to be the source of control that Jennings and Watzl do. Rather, attention is simply put the “the taking possession of the mind, in clear and vivid form, one out of what seem several simultaneously possible objects or trains of thought” (James, 1890, p. 403). In other words, we attend to things as part of responding to them. Attention, then, is selection for guiding action (Wu, 2014). Although the *common ground* view can be seen as a starting point for both sides of the debate, Jennings and Watzl want to say more, positing an internally directed mechanism that is attention.<sup>1</sup> I find

<sup>1</sup> These accounts of attention can be construed into two broad camps, inflationary accounts such as those proposed by Jennings (2020, 2022) and Watzl (2017, 2023) and deflationary accounts such as those proposed by Wu (2014, 2023) and Mole (2010, 2023). According to inflationary accounts, attention is an internally directed mechanism that orders and prioritizes mental states for the purposes of being selective in order to focus our behaviours and respond to the world around us. Attention is the basis of control on this account. For Watzl (2017, 2023), attention is the modification of mental priority structures. On this account, attention

the accounts of Wu (2014, 2023) and Mole (2011, 2023) more compelling and more aligned with recent empirical work. Taking the *common ground* view emphasized by these accounts as a starting point for thinking about attention brings into clearer focus the empirical shortcomings of current accounts of the moral and psychological harms associated with the attention economy.

## 2 Addiction and self-control failure

Many accounts of the attention economy portray the associated moral and psychological harms as primarily issues of addiction that then lead to subsequent self-control failures (Alter, 2017; Aylsworth & Castro, 2021; Bhargava & Velasquez, 2021). Moreover, these accounts tend to rely on the ‘brain disease’ rhetoric of addiction, suggesting that the locus of the problem, and therefore the most plausible solutions, are brain-based (Pickard, 2022). These kinds of accounts suggest that “as we become addicted to the dopamine surge we get from our phones [amongst other aspects of the attention economy], we weaken our frontal lobe’s executive function, and this makes us worse at sticking to a task like reading a book” (Aylsworth & Castro, 2021, p. 3). Similarly, Bhargava and Velasquez (2021) argue that the fact that “the same molecular pathways (e.g., dopaminergic) that operate in substance addictions are implicated in internet addiction”, warrants the use of brain disease models of addiction to understand the harmful effects of the attention economy. These accounts make ample reference to the author and tech investor Nir Eyal, who literally wrote the book on how to grab and hold the attention of users: He writes:

Research shows that levels of the neurotransmitter dopamine surge when the brain is expecting reward [...] which suppresses the area of the brain associated with judgment and reason while activating parts associated with wanting and desire (Eyal, 2013, p. 7).

The attention economy, on these accounts, works by manipulating the ‘pleasure centers’ in our brain, mediated by dopamine, and in doing so addicts us to the associated technology. This leads to subsequent failures to self-regulate our behavior, both online and offline.

This ‘brain disease’ rhetoric of addiction construes the problematic technology use and resulting harms associated with the attention economy as a matter of *compulsion* as opposed to *choice*, suggesting that users are being passively acted upon by the *persuasive design* (Eyal, 2013; Williams, 2018) of these technologies. In other words, users are stripped of their agency, being *unable* to effectively direct their attention and exert self-control. As Pickard (2022) remarks, this construal of addiction suggests that “if

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Footnote 1 continued

plays an early and explanatory role, internally ordering mental states and as such sitting atop a hierarchical control system. Jennings (2020, 2022) takes this a step further to suggest that attention is essentially linked to a self that modulates neural activity, with attentional control providing evidence of an emergent self that does the ordering of mental states. According to deflationary accounts, attention does not itself order mental states, rather attention is the result of the various influences of those mental states, with voluntary control, physical salience, bias, learning history, and more, all influencing where attention gets allocated. It is these many and varied influences of attention, brought into focus by deflationary accounts of attention, that many current accounts of the attention economy do not account for, resulting in not only empirically inadequate uses of attention, but self-control, and addiction as well. Thank you to an anonymous reviewer for this distinction.

people could stop using, they would. But they can't, which is why they don't" (p. 326). A common way of elaborating how the attention economy supposedly addicts the user is by hijacking one's attention. For example, the persuasive design of infinite scroll on TikTok hijacks the brain so that the desire to keep watching becomes irresistible; voluntary and value-based choice go out the window. As Aylsworth & Castro argue:

Smartphone addiction poses a distinct threat to our rational capacities because an effect of the addiction is susceptibility to having one's attention hijacked at frequent intervals, interrupting one's ongoing tasks (Aylsworth & Castro, 2021, p. 4).

Some have even gone as far as to compare aspects of the attention economy to "digital heroin" (Kardaras, 2016), and others speak in terms of 'hacking' (Lustig, 2017), and 'impossible self-regulation' (Williams, 2018) to describe the effects of the attention economy on the brain—all making recourse to the "intense flush of pleasure" (Alter, 2017, p. 71) caused by dopamine surges to the prefrontal cortex.

These accounts rely on oversimplified and unsophisticated accounts of not only attention, but self-control, and addiction as well. To demonstrate these shortcomings I will tackle these accounts of attention, self-control, and addiction separately, first showing their empirical inadequacy and subsequently how they fail as accounts of the moral and psychological harms associated with the attention economy.

### 3 Addiction

Aagaard's (2020) phenomenological account rightfully critiques the 'brain disease' addiction<sup>2</sup> model of problematic technology use as a form of neurobehaviorism, whereby dopamine takes the place of the behaviorist notion of a 'powerful reinforcer' and the concept of operant conditioning is replaced by the psychopathological concept of addiction. Although dopamine surely plays a role in the "intense flush of pleasure" (Alter, 2017, p. 71) associated with the *persuasive design* of the attention economy (as it does with many other types of pleasure or reward (Arias-Carrón et al., 2010), expected reward (Takahashi et al., 2017), decision-making (Rogers, 2011), and much more), and although problematic technology use may sometimes appear as a behavioural addiction,<sup>3</sup> reducing the effects of the attention economy down to these neurobehaviourist terms misses the mark as it construes our engagement with the technologies associated with the attention economy as a *compulsion*.

Aagaard (2020) goes some way to demonstrating why the addiction model of the attention economy fails, but does not fully dispense with—or, for that matter, adequately address—the notion of compulsion. He argues that problematic technology

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<sup>2</sup> Importantly, I do not propose to offer a once and for all definition of *addiction*. Rather, my aim here is to highlight the shortcomings of one predominant way of discussing addiction, especially as it relates to problematic technology use.

<sup>3</sup> Indeed, in some cases it may be correctly classified as such. However, the term *addiction* is used much too freely to describe all instances of problematic technology use.

use can be better characterized as *bad habits*<sup>4</sup> but speaks of these habits as “prereflective and (...) ‘below’ the level of conscious decision-making” (p. 568), which may still be (mis)construed as purely a form of compulsion, leaving little to no room for agency and conscious decision-making. Even if prereflective habits are the correct way to understand some instances of problematic technology use, these habits developed over time. Presumably, at some point, conscious, value-based decision-making led to the development of these habits. Aagaard’s (2020) account seems ill equipped to deal with this, arguably more pressing, aspect of technology misuse.

Although the technologies of the attention economy may *persuade* us to behave and to attend in certain ways, and these ways of behaving and attending may *appear* as a compulsion, we should not lose sight of the agency nor the malleable motivations of the user. In other words, we must understand the problematic technology use and subsequent moral and psychological harms associated with the attention economy as, at least in part, matters of *choice*. Accounts of the attention economy which seem to rule out choice and agency on the part of the user are too reductive.

Although construing the harmful effects of the attention economy as a neurobiological problem of compulsion—an addiction—may offer an intuitively satisfactory way of explaining the issue and suggest certain avenues (e.g., brain-based) of rehabilitation, this way of explaining addiction has been shown to be (at least in many cases) demonstrably false. As Pickard (2020) notes, there are ever-growing converging lines of evidence from both animal and human studies that context-specific contingencies and the presence of non-drug alternatives affect the choices of the user. As Ahmed and colleagues demonstrate, rodents will often forego drugs when food and social rewards are readily available in forced-choice laboratory studies (Ahmed et al., 2010). Further, there are many human studies that have similarly demonstrated that drug consumption is not a purely compulsive or automatic behaviour but remains a value-based decision-making process, to a greater or lesser degree under the control of the user<sup>5</sup> (Hart et al., 2000; Hogarth, 2018). For example, Hart and colleagues demonstrate that crack-cocaine users more readily accomplish behaviour change/alter patterns of consumption when alternative reinforcers are available (Hart et al., 2000). When given the choice of a financial reward or self-administering the drug, significantly less cocaine was self-administered (Hart et al., 2000). These controlled laboratory settings, as well as the animal studies, have certain limitations, but what they readily demonstrate is the role of agency and value-based choice behaviour in habitual drug use (Pickard, 2012). If compulsion is not the correct way to conceptualize the behaviours of users when it comes to some of the most habit forming drugs such as crack-cocaine and

<sup>4</sup> I agree with this way of construing problematic technology use, but much empirical and conceptual work remains to be done to accurately and usefully explain the moral and psychological harms associated with the attention economy in terms of habits. For example, are the kinds of habits associated with problematic technology use akin to a kind of ‘strategic automaticity’ (Jennings, 2020)? How much of the behaviour is automatic? Moreover, how does this kind of problematic technology use become habituated in the first place?

<sup>5</sup> Crucially, I am not claiming here that the user “always has a choice”, especially as this kind of rhetoric is used to shoulder the responsibility of problematic behaviours solely on the user. Rather, what I am arguing is that it is not black and white – agency/choice are always at play to a greater or lesser degree. As outlined further below, compulsion and choice interact rather than merely compete. Moreover, the exercise of agency and recognition of responsibility does not mean that blame necessarily follows (Pickard, 2017).

heroin, then it is unlikely the correct way to conceptualize users' relationship to the attention economy.

Recent work on attention modulation (Awh et al., 2012; Todd & Manaligod, 2018) also makes room for choice and agency in addiction. Traditionally, it has been thought that there are two ways of modulating attention: through voluntary, goal-directed action, and through bottom-up, automatic processes. However, a third form of modulation, *historical bias*, needs to be taken under consideration (Awh et al., 2012; Todd & Manaligod, 2018). This is also clear when one takes a *common ground* approach to attention that emphasizes the varieties of influences on attention, as biases are essential to consider when addressing how a given selection problem is solved (Wu, 2023). On this account, learned value and reward association, decision-making history, and priming also modulate attention.<sup>6</sup> Crucially, these influences on attention may be largely automatic, but as the experiments (Hart et al, 2000; Ahmed et al., 2010) mentioned above demonstrate, they are also under a degree of control. Learned value and reward associations and more can be *rewritten* in a sense. Because attention is the focus of our actions, and historical bias acts as a strong influence on that focus, thinking about attention modulation matters for addiction, especially as it relates to choice and value. We must understand the influences on attention to understand behaviour.

What the empirical and theoretical work demonstrates is that when other choices are readily available, users often forego the use of drugs. Moreover, as Pickard (2022) emphasizes, simply affirming the agency of the user (in her writing, the drug user) makes successful control of behaviour much more likely. Therefore, to the extent that the problematic technology use associated with the attention economy can be construed as a kind of behavioural addiction, the problem may be one of *choice*, not *compulsion*, or hijacking, hacking, etc. What the attention economy effectively does is to significantly alter our choice architecture to make certain choices (spending hours on Twitter, watching the next video on YouTube, doomscrolling etc.) more likely. The more we make these choices, the more we become biased to make them in the future. This is not the same as compulsion. The questions we need to ask about the attention economy, then, change from "how do these technologies addict or compel users?" to, "how does the attention economy affect how we make choices?" And, "how does the attention economy limit our choice set and subsequently, what we attend to?" And, "how does it affect our values?"<sup>7</sup> We need to move beyond the rhetoric of addiction, and especially the 'brain disease' model that emphasizes compulsion, to better understand the nature of the attention economy and its associated moral and psychological harms.

<sup>6</sup> Historical bias is discussed in further detail in Sect. 5, below.

<sup>7</sup> Here, and throughout, when I use the word *value* I have in mind Glimcher and Ernst's (2014, p.238) account of values and decision-making wherein values are signals "formed by the integration of different attributes of the options for choice at the time of decision making." Similarly, Berkman et al., (2017, p. 423) define subject value as "the weighted sum of choice-relevant attribute values" tracked by neurons in a "*noisy, probabilistic fashion*" (italics in original). Crucially, these weights vary by person, context, and time.

## 4 Self-control

Closely related to the problem of construing problematic technology use as compulsive and the issues explained above with the ‘brain disease’ rhetoric of addiction is the issue of self-control. As Berkman and colleagues note: “Self-control is often conceived as a battle between “hot” impulsive processes and “cold” deliberative ones” (Berkman et al., 2017, p. 422). In the context of the attention economy, the “hot” impulsive processes would be the ones compelling you towards the novelty, infinite scroll, moral outrage, and so on associated with many aspects of the attention economy whereas the “cold” deliberative processes would be the ones trying to inhibit those responses, working to keep you focused on the task at hand or your current goals. This kind of dual-systems model (Kahneman, 2011) of the attention economy suggests that the urge to use social media or scroll through your smartphone is automatic (as opposed to value-based, or controlled) and that this automatic urge must be inhibited in order to stay on task or promote the goal that you *actually want* to pursue. In this way, just as the ‘brain disease’ model of addiction as applied to the attention economy boils everything down to compulsion, the dual-systems model of self-control boils everything down to inhibition and automaticity.

This way of thinking about the attention economy and our engagement with it can be found in the writing of Williams (2018), Osatuyi and Turel (2018), Turel & Quahri-Saremi (2016, 2018) and elsewhere. Williams argues that the attention economy presents us with a novel “self-regulatory burden” (Williams, 2018, p. 21), the implication here being that the *persuasive design* of the attention economy makes it that much more likely that the automatic, impulsive processes of System 1 will win out over the slow, deliberative processes of System 2. As Turel and Qahri-Saremi (2018) suggest: “... online behaviors that are mostly unplanned can be explained via a tug-of-war between system 1 and system 2 cognitive processes: strong impulsion generated by system 1 and weak inhibition of these preoccupying thoughts by system 2” (p. 3060). They go on to suggest that “[u]nplanned media use can become excessive and possibly meet addiction criteria” (Turel & Qahri-Saremi, 2018, p. 3060), suggesting that it is this failure of self-control, explained using dual-systems theory, that leads to the addiction issues outlined above.

Aagaard (2020) tackles the shortcomings of dual-systems theory accounts of the attention economy but again, his critique ultimately stops short of articulating how these accounts fail to recognize the agency of the user. Aagaard sums up the problem with the dual-systems theory account as: “Conscious control is celebrated, while habits are demonized” (Aagaard, 2020 p. 566). Although they are correct to suggest that we should not immediately associate automatic, impulsive behaviours with *bad* habits, this alone does not fully address the pitfalls of a dual-systems theory account of the attention economy. As Berkman and colleagues remark: “Dual-process models collapse this universe of behaviors into a single process, inhibition, and, in so doing, ignore the diversity of pathways to self-control success” (Berkman et al., 2017, p. 423). Self-control, according to Berkman et al. (2017), is nothing more than a subset of value-based decision-making. That is, in self-control decisions such as those involved with the attention economy—pitting scrolling through social media or hours of autoplay on YouTube versus cleaning the house or finally getting around to reading that book



your friend lent you—the subject is selecting a course of action based on values, motivation, biases, the attentional field, etc. among several alternatives, like any other value-based decision that we make. Similarly, Inzlicht et al. (2013) propose a process model of self-control, “whereby the value of exploiting resources of reward is pitted against the utility of exploring the environment for new opportunities” (Inzlicht et al., 2013, p. 219). Because the technologies associated with the attention economy are reliable resources of reward they are valued by the subject, and so often win out during these value-based decision-making processes. Crucially, these processes are not purely automatic or habitual but rely on a weighting of one option amongst others that in turn rely on considerations of the trade-off between exploitation and exploration, expected value or reward versus perceived cognitive effort, and more. Dual-systems theory oversimplifies the numerous considerations that are at play in these self-control, value-based decision-making processes.<sup>8</sup>

As Berkman et al. (2017) note, the neuroscientific research on self-control may initially appear to support a dual-systems theory approach. The deliberative process of self-control choices are associated with increased activity in lateral prefrontal areas and less activity in areas that correspond to reward such as the ventral striatum and ventromedial prefrontal cortex (vmPFC) (Berkman et al., 2017). However, the ventral striatum and vmPFC have been shown to reflect the value not only of automatic or impulsive choices but of controlled choices as well (Kable & Glimcher, 2007). As opposed to the tug-of-war implied by dual-systems theory and explicitly referred to as such by Turel and Qahri-Saremi (2018) above, the neuroscience suggests that values are integrated across numerous brain areas associated with both control and automaticity. There is not competition between different areas, with the lateral prefrontal areas trying to inhibit the ventral striatum or vmPFC, but rather there is integration and cooperation across these areas (and others) that result in a value-based decisions being made. Relying on dual-systems theory to explain our engagement with the attention economy and its subsequent moral and psychological harms greatly oversimplifies and misrepresents the neuroscience of decision-making. Further, as with the ‘brain disease’ rhetoric of addiction discussed above, dual-systems theory explanations strip the user of agency, boiling self-control decisions down to an unconscious tug-of-war between competing brain regions which, because of the *persuasive design* of the attention economy, the user cannot successfully intervene in.

Wu’s (2013) work on automaticity and control further undercuts a dual-systems theory approach to self-control and makes room for mental agency. Wu sets out to address the following dilemma: that automaticity pervades agency, yet automaticity is incompatible with agency. In other words, much agentive control appears automatic, but automaticity implies the absence of control. Wu, however, argues that intentional

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<sup>8</sup> Similarly to the discussion of habits above, problematic technology use may become relatively automatic (always picking up your phone and scrolling Instagram when at the dinner table, etc.) and so associated with system 1, but this does not account for the value-based, deliberative choices (associated with system 2) that led to the development of these seemingly automatic behaviours. Accounts such as Turel & Qahri-Saremi mistakenly assume that system 1 drives problematic technology use without accounting for how the behaviour developed. In other words, biases to act one way instead of another are taken to be automatic, without accounting for where these biases stem from.

action must involve both control and automaticity. Take the case of skilled behaviour, such as expertly playing a piano. As Wu remarks, to expertly play the piano.

... we relinquish some control but not all. We control the type of thing we intend to do, say playing a certain work. We thus act intentionally. In playing the piano, the automaticity aimed for is that specific notes played need not be represented in one's intention (Wu, 2013, p. 255).

In this way, automaticity is a form of control.<sup>9</sup> Ultimately, what these accounts of automaticity and control suggest is that dual-process accounts which distinguish voluntary, intentional control from automatic, reflexive behaviour are untenable. Intentional action is not solely on the side of slow, deliberative control. Moreover, automaticity may be interpreted as a sign of agency, not its absence.

Importantly, attention plays a crucial role in self-control and value-based decision-making processes (Berkman et al., 2017). As Berkman and colleagues emphasize, attention shapes self-control and adaptive choice by dictating what options enter the choice set for the subject at any given moment, "foregrounding their salient attributes" (Berkman et al., 2017, p. 423). In other words, what we attend to will affect our values and subsequent self-control decisions. This relationship is not a one-way street, however. Just as what we attend to will shape our values (by gating our choice set, the information we are exposed to, etc.), our values similarly shape what we choose to attend to. In the context of the attention economy, as our values become more and more shaped and entrenched by the algorithmic machinations of its associated technologies, we may become more likely to direct our attention towards the attention economy. Thus, selection history and reward history (Awh et al., 2012), both of which shape our subjective values and interests, are essential to understand why we attend to the things that we do. It is to the importance of these aspects of attention that I now turn.

## 5 Top-down versus bottom-up attention

For decades, most prominent models of attention modulation have posited a strict dichotomy between top-down (or endogenous) and bottom-up (or exogenous) control, with top-down control being determined by the current voluntary and explicit goals of the subject, and bottom-up control being determined by the physical salience of the environment (Posner, 1980; Jonides, 1981; Corbetta et al., 2002; Buschman & Miller, 2007; Beck & Kastner, 2009). Whether implicitly or explicitly, many accounts of the impact of the attention economy on our ability to meaningfully attend make use of this long-established way of carving up attention modulation. Writing about consumer advertising and how consumers divide their time up among many available applications, Rieser and Furneaux (2022) suggest that "[e]xogenous attentional control (...) accounts for how salient external stimuli redirect human attention away from cognitive process that are currently focused elsewhere" and go on to characterize exogenous control by external stimuli as "independent of the mental states of users"

<sup>9</sup> Jennings's (2020) discussion of strategic automaticity bears resemblance to Wu's (2013) solution to the threat of automaticity. On Jennings's account, strategic automaticity is a kind of control because "it uses experiences to determine the relevant stimulus-response pairing, rather than waiting for input from other neural areas" (Jennings, 2020, p. 188).

(Rieser & Furneaux, 2022, p. 3–4). Other (some more implicit) accounts, suggest that the bells and whistles of the attention economy ‘hijack’ our attention (Aylsworth & Castro, 2021), that our attention is stolen by screens that “literally seize scarce mental resources” (Wu, 2017), and that the information quantity and velocity (external stimuli) that defines the attention economy will cause one to “lose control over one’s attentional processes” (Williams, 2018, p. 15, italics in original). These accounts (and others) seem to rely heavily on the dichotomy between top-down and bottom-up attention to explain how the attention economy impacts our individual and collective capacities to attend. Further, they seem to suggest that anything that is not voluntary, goal-driven behaviour falls into the camp of bottom-up influences on attention.

Recent empirical work, however, has called into question this strict theoretical dichotomy, criticizing it for its oversimplification of attention modulation and for ignoring a third influence on attention, *historical bias* (Awh et al., 2012; Shomstein et al., 2022; Todd & Manaligod, 2018).<sup>10</sup> Awh et al. (2012) single out selection history (including selection reward) as one aspect of selection phenomena that cannot be accounted for by either top-down, voluntary, goal-directed attentional control or bottom-up capture of attention by physically salient stimuli. What Awh and colleagues mean by selection history is that there are effects of an individual’s past experiences that influence the landscape of the subject’s selection biases. For example, when specific distractors are associated with specific target positions or goals, the experience of these distractors in the past will drive more efficient orienting of attention.<sup>11</sup> This kind of attention modulation, though perhaps more amenable to a top-down description, does not fit neatly within the confines of the theoretical dichotomy between top-down and bottom-up attention as it has been used in the attention literature. Similarly, Todd and Manaligod (2018) propose that the theoretical framework of a priority state space (PSS) should replace the top-down versus bottom-up dichotomy. The PSS takes into account associative and statistical learning (similar in some ways to Awh et al.’s (2012) selection history), semantic associations, and motivational and affective salience that again, do not fit neatly into the strict theoretical dichotomy that has dominated much attention research. The PSS necessarily and correctly complicates the endogenous/exogenous distinction of attentional control by emphasizing the complex interactions of various sources of salience that do not neatly fit this divide. It is the changing of this PSS over time that determines what gets attended to in a given context (Todd & Manaligod, 2018).<sup>12</sup>

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<sup>10</sup> Philosophers have begun to question the distinctions well (Mole, 2023; Wu, 2023). Ganeri (2016, p. 63) writes: “The purported distinction between endogenous and exogenous which cognitive psychologists help themselves to brings with it far too many theoretical presuppositions to be helpful in the analysis of attention...”.

<sup>11</sup> Crucially, the attention economy may not be representative of a specific, and recurring, distractor set that should enable users to more effectively exert attentional control because of the constantly changing *content* of the associated distractors. In other words, novelty may disrupt the ability of selection history to protect against distractors.

<sup>12</sup> Crucially, we should not confuse the framework of the priority state space (PSS) with Watzl’s (2017, 2023) priority structure account of attention. The PSS captures the variety of influences and control structures that shape attention, instead of positing attention as the basis of control, as Watzl (2017, 2022) would have it.

Here, whether or not we take attention to be the basis of control or not matters greatly. If we adopt the former account, then attention is the source of top-down modulation (Jennings, 2012, 2020; Watzl, 2017, 2023). Once attention becomes an explanatory gear in the modulation mechanism, one may also be tempted to say attention modulates our historical biases. These historical biases such as reward associations, expectations, learned representations and so on are mental states, after all, and according to Watzl (2017, 2023), attention is the ordering of these mental states. On this account then, historical biases are just another priority structure that attention controls. If we adopt Wu's (2023) *common ground* view, however, historical biases become a central cog in the machine, dictating how and where attention is deployed (Wu, 2023). This account helps us to see the importance of understanding these historical biases when discussing the attention economy, as well as attention and agency writ large, a point that many accounts of the attention economy that assume a strict dichotomy of top-down and bottom-up attention miss.

The neural substrates of attention modulation have been interpreted much like the neural evidence for dual-systems theory outlined above, with prefrontal neurons and frontal cortices more generally vying for top-down control over bottom-up impingement mediated by parietal neurons and sensory cortices (Buschman & Miller, 2007). However, as Todd and Manaligod (2018) emphasize, the underlying affective and motivational influences on attentional selection need to be considered to better comprehend the process of selection, which, on the PSS account, is rarely ever purely bottom-up or devoid of value-based decision-making (or other top-down influences). These different sources of value and salience are integrated across numerous brain areas and distinct neural pathways all of which have a nontrivial impact on attentional prioritization (Todd & Manaligod, 2018).

The switch from thinking about attention modulation as a strict dichotomy between top-down and bottom-up control to thinking in terms of priority structure maps and the plethora of influences on attention from affective and motivational stimuli, to implicit or explicit values, to semantic relationships, drastically changes how we should conceptualize the impact of the attention economy on our attention. It cannot be described purely in terms of bottom-up capture or hijacking, rather we must consider the variety of influences such as affective and motivational states that dictate where we allocate our attention. No longer can we rely on explaining the effects of the attention economy in terms of the bottom-up capture mediated by *persuasive design* alone.

One may object at this point that it is by no means clear that the authors cited above (Bermúdez, 2017; Williams, 2018; Castro & Pham; Aylsworth & Castro, 2021; Bhargava & Velasquez, 2021), writing about the harmful effects of the attention economy, are relying on this strict dichotomy between top-down and bottom-up attention. One could argue that though the language of capture, hijacking, and so on may suggest this, in cases where it is not made explicit that their account relies on this dichotomy, this criticism falls flat. I agree that in many cases the philosophers and technology ethicists writing about the attention economy are not explicitly relying on this failed dichotomy, in part because they are not explicitly relying on *any* plausible empirical model of attention. This is exactly the problem. As the primary subject matter of the literature on the attention economy is human attention and how its manipulation and fracturing is the source of much moral and psychological concern, we are owed an

explicit account of attention.<sup>13</sup> Without one, we end up with misguided explanations of why the attention economy is harmful, and moreover, what can (and cannot) be done about it. Without such an explicit account of attention on the table, the reader is left to infer what exactly is being invoked when attention is being talked about. To the extent that one can infer what empirical account of attention may be able to line up with the account of the attention economy being given, I argue that it is abundantly clear, in light of recent neuroscience that shed lights of the shortcomings of the theoretical dichotomy between top-down and bottom-up attention, that these accounts are misguided, not least of all because of their oversimplified accounts of attention.

## 6 From attention to addiction

When an account of attention that upholds this strict dichotomy between top-down and bottom-up attention is relied upon to explain the moral and psychological harms associated with the attention economy, the step to get from here to the dual-systems model theory of self-control outlined above is a natural (though mistaken) one to make. If the model of attention one relies on can be cleanly cleaved into attention that is driven by voluntary, goal-directed behaviour (slow and deliberative) and attention that is captured by physically salient stimuli (automatic, impulsive) then the dual-systems model account of the attention follows close behind. The account would suggest that the slow, deliberative processes of System 2 that are necessary for inhibition of the problematic technology use and the directing of attention to task-relevant stimuli is thwarted by the constant stream of information, videos, notifications, and so on that inevitably capture our attention because of their physically salient nature that works on the automatic and impulsive nature of System 1. This view also fits nicely with the ‘brain disease’ rhetoric of addiction which suggest that our problematic technology use is compulsive, and so beyond our control. It is no wonder, then, that starting with an oversimplified and empirically unsophisticated account of attention (whether implicitly or explicitly) leads to misguided characterizations of the nature of self-control and addiction. In this way, the problems of the self-control and addiction accounts of the problems of the attention economy can be seen as rooted in misgivings about the nature of attention, and more specifically, the varieties of influences on attention.

The question of attention and agency is a question about the “boundary conditions of volitional control” more generally, and represents a fundamental question about human cognition (Awh et al., 2012). The dichotomy of attentional control that has been largely upheld to date between top-down and bottom-up mechanisms highlights a clear boundary between voluntary and automatic control over attention, but as many have begun to demonstrate, large swaths of attentional phenomena go unexplained,

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<sup>13</sup> I am not suggesting that all philosophers working on the ethics of the attention economy should stop what they are doing at once and take up some neuroscience. However, to the extent that the aim of the literature is to develop a robust account of the *how* the attention economy causes the harms that it does, an empirically responsible account of attention needs to be given. Further, there is much valuable philosophical work on the nature of attentional control and mental agency (Jennings, 2020; Wu, 2013, 2014, 2023) that warrants engagement from philosophers of technology writing about the attention economy.

or are drastically oversimplified by such an account. As such, uncritically taking on such an account of attention, whether implicitly or explicitly, is an impediment to our understanding of the moral and psychological impact of the attention economy on our ability to attend and on related cognitive capacities. As should be clear, a central issue with many of these accounts of the attention economy is the lack of room that they give to human agency, motivation, and control. These accounts paint the human user as compulsive, impulsive, and at the mercy of distraction. Although these things may all be true to a degree, this does not capture the full range of human volitional control, nor how the problem of selection is solved through attention. As Aagaard (2020) correctly remarks, the human technology user is an intentional being and the problematic technology use and subsequent harms associated with the attention economy springs forth from purposeful and meaningful activity that cannot be reduced to ‘brain disease’ models of addiction, dual-systems theory self-control failures, or bottom-up attentional capture alone.

## 7 The “ego-depletion” model of self-control

In almost all of the accounts of the attention economy touched on above, attention is construed as a limited resource. These accounts suggest that the attention economy drains our attentional resources that we might otherwise use on other tasks, goals, etc. (Williams, 2018; Wu, 2017). According to this view, the attention economy presents us with the “challenges of self-regulation” (Williams, 2018, p. 16) that take advantage of our “daily stockpile(s) of willpower” (Williams, 2018, p. 33). This way of construing both the nature and function of attention and the effects of the attention economy relies heavily on the “ego-depletion” model of self-control (Baumeister et al., 1998), suggesting that the attention economy depletes the resource of our attention.

The “ego-depletion” model of self-control posits that self-regulation and associated capacities such as attention and restraint draw on some kind of limited resource or energy, “such that engaging self-control quickly consumes this inner capacity” (Inzlicht et al., 2013, p. 127). Once in this state of “ego-depletion”, further attempts at self-control become more and more difficult and are prone to failure. To use an example, exerting self-control at Time 1 by completing three straight hours of difficult writing with no digital distractions will likely lead to failures of self-control at Time 2, perhaps leading you to scroll through TikTok or watch YouTube endlessly, neglecting your other responsibilities. According to Williams (2018), the self-regulatory burden posed by the attention economy places such a high demand on our daily stockpiles of willpower that we become depleted exceptionally fast, making us more susceptible to wasting time scrolling through Instagram or watching video after video on YouTube, and subsequently making it more likely that we will be unable to complete subsequent tasks that require sustained attention such as doing homework or having a meaningful conversation with family and friends (Williams, 2018). Thus, according to this view, the attention economy is morally and psychologically damaging because it depletes our ability to self-regulate due to the demanding nature of the self-regulatory burden it

poses. Crucially, Williams paints the user as at the mercy of *persuasive design*, referring to the “burdens of impossible self-regulation” (Williams, 2018, p. 100) that result from the attention economy. Once again, the user has been stripped of their agency.

Relying on the “ego-depletion” model of self-control once again renders these accounts of the attention economy empirically inadequate, and moreover, may lead to mistaken interventions.<sup>14</sup> According to cognitive psychologist David Navon (1984), although the notion of a resource or limited capacity model may be a useful and even seductive concept because it is easy to understand and may fit well with observable data, resources are also vague and malleable concepts that, although useful as metaphors, may ultimately be misleading. They are, so Navon (1984) says, akin to a theoretical soup-stone—unnecessary and providing no actual explanatory power. As Navon remarks, trying to identify resource pools or predict task interference based on resource functions “may prove to be as disappointing as would attempts to isolate within the human mind the analogues of the functional components of the digital computer” (Navon, 1984, p. 232). This is, not least of all, because of the complex ways that incentive, task difficulty and complexity, priority, and more interact to shape our attentional and self-control. In 1984, then, Navon was trying to do away with the concept of resources as it was then used in the psychology of attention, but today it remains a cornerstone of most accounts of the attention economy.<sup>15</sup>

The “ego-depletion” model of self-control has many problems, from unfounded conclusions that glucose is the relevant resource that is necessary to exert control, to a failure to consider the role that motivation, value, and rewards plays in our decisions regarding when we *choose* to exert self-control over our actions (Inzlicht & Schmeichel, 2012; Inzlicht et al., 2013). In this way, the problems with using these resource accounts of attention to explain the harms associated with the attention economy are similar to those accounts that stress compulsion, inhibition, and attention hijacking; it strips the subject of much of their agency, since once the resource is depleted, you are *unable* to exert control. Inzlicht and colleagues (2012, 2013) have published a number of papers that highlight the role of intentionality, emotion, and motivation in self-control, arguing against the validity of ‘ego-depletion’ model. To the extent it makes sense to speak of depletion, it is not in the context of the depletion of a resource, but the depletion of the relevant affective and motivational states to stay on task. Inzlicht and colleagues suggest that “depletion leads to shifts in motivation, [which] suggests that it alters the salience of (and attention to) competing goals and the intensity of experienced emotions associated with these goals” (Inzlicht et al., 2013, p. 131). This shift implies a reorienting from ‘have-to’ goals to ‘want-to’ goals. What this alternative theory of self-control suggests is that there are no depletable resources that controls our ability to attend, but that trade-offs among expected reward, cognitive effort, incentive structures, and values dictate where and when we *choose* to attend and exert self-control. This is in keeping with accounts of attentional control that emphasize selection history and reward (Awh et al., 2012), the PSS (Todd & Manaligod,

<sup>14</sup> To be clear, there are certainly limits on how much can be attended to at any given time. This is not being called into question here. What the ‘ego-depletion’ model states is that exerting attentional control at Time 1 would lead to the decreased ability to do so at Time 2, as if there were some pool that is drained by exerting control that one must wait to be refilled before using again.

<sup>15</sup> Indeed, the very idea of an ‘attention economy’ rests on the idea of attention-as-resource.

2018), and accounts of self-control that take seriously motivation and value-based decision making (Berkman et al., 2017). As with moving from models of the attention economy that emphasize addiction and subsequent self-control failures to models that emphasize choice and agency, this reorienting of how we think about attention and the attention economy paints a picture that doesn't construe the user as purely passive and doomed to failure.

## 8 Implications for recent policy recommendations

Once a suitably updated and empirically responsible conception of attention is used to inform discussions of the attention economy, novel ways of addressing the associated moral and psychological harms become apparent. Here, I will focus on two recent policy recommendations and reports that would benefit from the kind of engagement with the science and philosophy of attention outlined throughout. Namely, I address the Global Education Monitoring Report 'Technology in education: a tool on whose terms?' (UNESCO, 2023), and the U.S. Surgeon General's Advisory on 'Social Media and Youth Mental Health' (U.S. Surgeon General, 2023). Both of these reports are concerned with how problematic, excessive, and unhealthy technology use are negatively impacting youth populations across a variety of domains, with problems of attention placed front and center. As the Surgeon General's report notes: "Excessive and problematic social media use, such as compulsive or uncontrollable use, has been linked to sleep problems, attention problems, and feelings of exclusion among adolescents" (2023, p. 10). The phrase "compulsive or uncontrollable use" already constrains possible interventions; namely, putting the focus on externally imposed sanctions and technological change. Once again, we see here the language of the brain-disease rhetoric of addiction and the construal of problematic technology use as pathological. The Surgeon General's report suggests as much when they uncritically state that "studies have shown that people with frequent and problematic social media use can experience changes in brain structure similar to changes seen in individuals with substance or gambling addictions" (2023, p. 9). The report also notes that nearly a third of social media use "may be attributable to self-control challenges" (U.S. Surgeon General's Advisory, 2023, p. 9), but as detailed above, self-control challenges are a subset of value-based decision making processes (Berkman et al., 2017), and not necessarily indicative of malfunctions of attention leading to addiction.

As a result of framing problematic and excessive technology use in terms of compulsiveness and uncontrollability, a large number of the U.S. Surgeon General's recommendations for addressing these problems are focused on policy and technological change. These recommendations are laudable and necessary. Policy makers should strengthen protections to ensure greater safety for children on social media, and technology companies should design and develop tools that promote safe and healthy online environments, among other things. These changes will be necessary to ensure a future where technology can be used for the benefit of all, but they should not be emphasized at the expense of more personal and immediate changes that can be made. Some of these changes are also noted but focus too much on the need to 'reach out for help', 'create boundaries', and 'develop protective strategies'. Again, helpful



recommendations, but they suggest that the tools of the attention economy inevitably manipulate their users unless the proper defenses are in place.

Notably missing are any kind of recommendations that encourage children and adolescents to recognize their agency and sense of control. If a third or more girls aged 11–15 say they feel addicted to social media, and nearly 3-in-4 teenagers think they are being manipulated by technology companies (U.S. Surgeon General’s Advisory, 2023), then we need to foster their sense of agency and control, not construe their use of technology as “compulsive or uncontrollable”. This can be accomplished in a variety of ways but first and foremost, children and adolescents should be educated about the ways that social media and other technology companies *attempt* to capture their attention, change their motivations, and shape their behaviour. Moreover, children and adolescents should be encouraged to reflect on what motivates their social media use when these tactics are effective, and whether or not those motivations line up with their own values and likes. As Pickard (2022) notes, framing problematic drug use in terms of motivation, value, and choice as opposed to compulsion and inevitability greatly increases the users’ sense of agency. The same is likely to be true here. Although technological and policy change are both necessary, they are slow, cumbersome, and flawed processes. Moreover, as a recent study notes, U.S. federal agencies have a very poor track record when it comes adopting and implementing AI policy goals (Lawrence et al., 2023). By focusing on individuals and their environments, we can make more immediate changes that those enabled through policy.

Similar oversights are evident in the 2023 Global Education Monitoring Report on technology in education. The report notes that “the mere proximity of a mobile device can be a distraction, resulting in students losing their attention from the task at hand” (2023, p. 81). What is taken for granted here and in other places in the report is that the problem is (solely) the mobile device and not the ‘task at hand’. As noted throughout, attention is allocated based on a variety of influences, not least among them motivation and value. Individuals, students included, need to be properly motivated in order to stay on the task at hand and further, in order to learn. Numerous studies have demonstrated the ability of subjects to stay on task in the face of distractors given the proper motivation, task difficulty, and incentives (Inzlicht et al., 2013). The conclusion of the report that smartphones are a distractor to learning may be true in many cases, but the recommendation to ban smartphones in many educational settings is myopic. Solutions such as this fail to address the wider array of influences on performance in school, and can be seen as a result of neglecting the fuller complexity of attention and self-control.

The report notes that students should not be shielded from the risks (and opportunities) that come with technology entirely, but if smartphones are made to shoulder all the blame, then technology will be banned when it is unnecessary to do so, or when other alternatives are available. What should be the focus of our concerns regarding technology and education is to develop good technological habits, which banning can effectively hinder. As Awh et al. (2012) and Todd and Manaligod (2018) emphasize, historical bias including learning, reward and value, and priming, has a major impact on where attention is allocated. As such, we should strive to establish safe and healthy technology habits when users are young. Ultimately, using a suitably updated concept of attention to address the harms of the attention economy suggests that bans (on their

own) may be counterproductive. In essence, focusing on bans at the cost of education and healthy technology use may simply delay the onset of bad technology habits, rather than foster good ones. Further, the account of attention developed throughout highlights the importance of considering the larger motivational and attentional environment of users when addressing these problems. In not doing so, we will be prone to the oversights evident in these reports and may inadvertently contribute to the problem in our attempts to solve it. Paying attention to the science and philosophy of attention is necessary to develop effective policy to address the harms of the attention economy, youth social media use, and more. The foregoing is just one example of how policy recommendations should change when we take seriously the science and philosophy of attention. Future work will explore these implications for policy further, as well as implications for technological design and development, and how structuring our wider technological environments can address the harms associated with the attention economy.

## 9 Conclusion

What I have sketched above suggests that there remains much work, both empirical and conceptual, to be done to better grasp the supposed moral and psychological harms associated with the attention economy, and moreover, that this work requires an interdisciplinary and collaborative effort across philosophy, psychology, and neuroscience. In many cases, philosophers of technology have done an excellent job articulating the many worries to do with autonomy, freedom, self-identity, and more (Aylsworth & Castro, 2021; Bermúdez, 2017; Bhargava & Velasquez, 2021; Castro & Pham, 2020; Williams, 2018) associated with the attention economy. However, as a result of the lack of engagement with the philosophy and science of attention and mental agency, these accounts fall short of being able to give an empirically responsible and coherent account of the nature and sources of these harms. Brain-disease models of addiction and its application to problematic technology use suggest that our engagement with these technologies is *compulsive*, rather than a matter of *choice*. Similarly, construing self-control as a battle between ‘hot’, impulsive, automatic behaviours and ‘cold’, slow, deliberative processes suggests that the *persuasive design* of the attention economy renders the user unable to make value-based decisions. I have argued that accounts of the attention economy that fail to recognize the agency of the user are rooted in a misunderstanding of the very nature of attention, exemplified by an overreliance on what current neuroscience tells us is an inadequate picture of attentional control, namely the theoretical dichotomy of top-down and bottom-up control. Further, accounts of the harms of the attention economy that rely on “ego-depletion” models of self-control do not stand up to empirical scrutiny. What all of these accounts have in common is a failure to affirm the user as an intentional being with (greater or lesser degrees of) agency and values, wants, and desires that shape what we *choose* to attend and where and when we *choose* to exert self-control.

Ultimately, what the arguments I have presented suggest is that the moral and psychological harms associated with the attention cannot be explained solely in terms of simple brain-based models, nor simple external stimuli models. We should instead be

focussing on the messier, more complex, but more empirically adequate interactions within and between these systems, whilst recognizing and affirming the agency of the user. This leads to novel and concrete proposals for addressing the harms associated with the attention economy as evidenced by my discussion of recent policy recommendations. In order to understand the attention economy and its associated moral and psychological harms, we must first understand attention.

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