



Two Kinds of Process or Two Kinds of Processing? Disambiguating Dual-Process Theories

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Abstract

Dual-Process Theories (D-PTs) claim there are two qualitatively different types of processes in the human brain-mind. Despite forming the basis for several areas of cognitive science, they are still shrouded in ambiguity: critics erroneously attack D-PTs as a whole (e.g., Evans and Stanovich *Perspectives on Psychological Science*, 8(3), 2013), the qualitative/quantitative distinction is not clear enough (De Neys *Perspectives on Psychological Science* 16 (6): 1412–1427, 2021; Dewey 2022) and, given this criterion, deciding between qualitative or quantitative differences may even be scientifically irrelevant (De Neys 2021). As a way of disambiguating the discussion and clarifying what exactly means to claim the existence of a second type of process, I define two possible categories of D-PT: The substantial and the instrumental. In the substantial case, Type 2 processes are subpersonal level ones. In the instrumental case, Type 2 processing is a personal level phenomenon that does not necessarily imply subpersonal level Type 2 processes. Discussing the different implications of each of the categories, I use as a main example to illustrate the ambiguity – and the exercise of disambiguation – the model proposed by Evans and Stanovich (2013), making clear its substantial character, and contrast it with Frankish’ (2009) – a clear case of instrumental D-PT. Finally, I discuss the contributions this distinction can make. By making the discussion clearer, it can provide a relatively unanimous framework for dual- and single-process theorists (the instrumental version) and clearer desiderata for those wishing to defend the substantive one.

Keywords Dual-process theories · High order cognition · Reflection · Conscious thought

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1 Introduction

Dual-Process theories (D-PTs) have, as their central claim, the existence of two types of processing inherent to the human brain-mind – one quick, intuitive and unconscious, the other slow, reflective and conscious. This conceptualization is old and intuitive and has been present in folk psychology and philosophical writings for centuries. But the first account of a proper Dual-System Theory is attributed to Wason and Evans (1974), and the first Dual-Process Theory to Posner and Snyder (1975), others having been proposed, often independently, by several authors, from social psychology to cognitive neuropsychology (Gawronski and Creighton 2013; Kahneman 2011; Sloman 2014; Stanovich 2011; etc.). Although many authors talked about a difference between “systems”, today it is widely recognized that “It seems implausible that the gamut of autonomous processes that have been labelled as Type 1 could in any meaningful way be described as belonging to a single system” (Evans and Stanovich 2013: 384). By the same token, it has also become virtually obsolete to regard System 2 as uniformly abstract, rule-based, and logical – since it may involve a variety of other techniques commonly associated with System 1 (Buchtel and Norenzayan 2012; Evans 2012; Frankish 2009; Stanovich 2012). Given this, today, almost every dual-process theorist refers to types of processes instead of systems.

What defines these two types of thinking has changed over time, and different authors claimed for different distinctions. From several of those initial studies emerged, at some point, the set of qualities that established the canonical division, known nowadays as the “received version” (Bargh 1989, 1994; Moors and De Houwer 2006). This includes a long list of differences. The first type of processing (T1) is fast, associative, involves little effort and is associated with slow learning, being shared between humans and other animals, requiring no Working Memory and representing unconscious – or preconscious – nonanalytical processes; being activated by the stimulus itself, it requires no intention and cannot be controlled – stopped or changed – once triggered, being thus automatic or autonomous. The Second type (T2), on the other hand, is described as possibly unique in humans, slow, flexible, rule-based, effortful and requiring Working Memory; it may require intention to occur, thus being inefficient, occupying limited processing resources and thus interfering with other tasks in execution. Besides that, it occurs consciously (even if a part of the processing is done unconsciously), the subject being phenomenally aware of the process and being able to report it verbally (Evans 2012; Stanovich et al. 2014).

Nowadays, this Dual-Process framework has become the main framework for theorizing about human cognitive abilities, having experienced and continuing to experience a steady rise in popularity. Described by some as “one of the most significant developments in the history of scientific psychology” (Sherman et al. 2014: xi) it has shaped research in many fields. As salient recent examples, we can see its influence on social psychology (Chaiken and Trope 1999; Sherman et al. 2014), moral psychology (Brand 2016), numerical cognition (Graziano 2018) or behavioural change (Borland 2013), but its influence is far bigger than

space allows me to describe, and seems to be growing (see Melnikoff and Bargh's (2018a) introduction for a long list of work that has been shaped by the framework in the last decade).

Despite being the dominant paradigm nowadays it has been widely contested and questioned over time, with many authors claiming that there is no reason to divide the cognitive mind in two (see Gigerenzer et al. 1999; Dijksterhuis 2004; Dijksterhuis et al., 2006; Pennington and Hastie 1993; etc. See also, for the similarities between types of processing and evidence and arguments for a continuum between them, Kruglanski and Gigerenzer 2018; Albright et al. 1988; Devine 1989; Nisbett and Wilson 1977; Ambady and Rosenthal 1992; Thorndike 2006; Dion et al. 1972; Damásio 1996; Kruglanski and Gigerenzer 2011; Balci et al. 2009; Bago and de Neys 2017; Buric and L' Konradova 2021; Dujmovic et al. 2021; Raelison et al. 2021).

Yet, Evans and Stanovich (2013) argued that most of these criticisms miss the mark. In an article released in 2013, they took a step forward in the debate and dealt with several of the arguments used against dual-process theories, while also admitting some past mistakes of their own and some responsibility in contributing to an erroneous conceptualization. For example, many authors were still attacking the misalignment of attributes when Evans (2006) had already identified the same problems with (old) dual-process theories (e.g., the type 1 processing source did not always come from evolutionarily old areas of the brain, and conscious thinking does not necessarily mean control of behaviour). The authors discard five groups of objections which, according to them, apply only to (some) old D-PTs (received version), failing to discredit the version they presently endorse (let us call it "clean version"). The objections discarded are: (1) The multiple and vague definitions of dual-process theories; (2) The unreliable alignment of the attribute clusters; (3) The lack of discrete types (when a continuum of styles can explain the data); (4) The fact that single-process accounts can explain dual-process phenomena and (5) the ambiguity and unconvincing status of the evidence.

After this crucial moment, we can, for the sake of clarity and simplicity, divide the literature which mentions dual-process theories into three different branches. The first (B1), which predates this discussion and continued without being necessarily affected by it, was the branch of studies that use the duality as a framework to investigate specific behaviours. Recent examples include tolerance of minority groups (Verkuyten et al. 2022), vaccine hesitancy (Bilewicz and Soral 2022) and suicidal ideation and action (Olson et al. 2022), amongst many others. The second branch (B2) is the one in which Evans and Stanovich intervened more directly, which discusses dual-process theories *per se*. In other words, the branch which debates the central question of "how many systems or types of processes are there in human cognition?". In this branch, some prominent interventions that followed Evans and Stanovich (2013) include Melnikoff and Bargh (2018a) and Mugg (2016) (more in next section). The third and most recent branch (B3), which is not entirely separate from B2, can be defined as a second-order discussion about B2, and debates whether it is scientifically relevant to argue for one or two types of processes – that is, to reach a decision on the second branch. B3 was recently energized by De Neys (2021), who argued that we need to move past this dual-or-single process discussion,

as deciding between a quantitative and a qualitative difference will not advance our understanding of human cognition.

Regardless of one's perspective on how to conceptualize the duality, Dual-Process models have shaped the pursuit of understanding the human mind (see Chater 2018; De Neys 2021). But that does not mean people who adopt a dual-process perspective mean to endorse any specific kind of difference between systems or types of process. As De Neys (forthcoming.) puts it, "Both single and dual process models focus on the interaction between intuition and deliberation. But whereas single process proponents believe there is only a quantitative difference between intuition and deliberation (i.e., the difference is one of degree, not kind), dual process theorists have traditionally argued for a qualitative view on this difference" (48). So, what is meant by the adoption of the dual-process typology is often unclear. If we take one of the (B1) examples, to see how they define the framework they adopt, the description usually refers to a general "interplay between relatively automatic and relatively controlled modes of thought" (Olson et al. 2022: 388), which does not itself entail any specific dual-process theory. In fact, it can even be in line with single-process theories, as the differences between fast/intuitive judgements and slow/deliberate judgements need not be restricted to the quantitative or qualitative. As De Neys (2021) says, "a single-model view does not deny that one can distinguish a more intuitive and more deliberate type of thinking, and these can be subjectively experienced as being quite different" (1412).

Even the (B2) dual-process discussion itself does not escape this ambiguity. In the debate between De Neys (2021) and Dewey (2021) over B2's scientific relevance¹, a common diagnosis emerged: the qualitative/quantitative debate is simply not sufficiently well defined. For instance, there is a sense in which "qualitative differences are *just sufficiently large* quantitative differences" (Dewey 2021: 1429. See also De Neys (2021: 1422)).

We need to make the claims in B2 more precise: what does it mean to argue for the existence of Type 2 *processes*? Distinguishing two interpretations, two classes of dual-process theories, might help. Evans himself argued, multiple times (e.g., Evans and Stanovich 2013), that a unified Dual-Process Theory does not exist. With that in mind, I will defend a new classification of dual-process theories, dividing them into Substantial and Instrumental, which shall work as a disambiguation tool for the debate. Its relevance for the clarification of the discussion should resonate in all three branches. For the first branch, it will provide a way of adopting the dual-process framework without adopting any dual- (or single-) process assumptions. Regarding the second branch, the tool will clarify the discussion with the introduction of a distinction (instrumental/substantial) which, being complementary to the ambiguous quantitative/qualitative one, should help clarifying, first, what has been going wrong with the B2 discussion (which is the main contribution to B3 and might help differentiate the relevant from the irrelevant part of the discussion);

¹ In response to De Neys (2021), Dewey (2021, 2022) argued the debate should not be abandoned but reframed: instead on focusing on the properties of each type of processing, it should be about cognitive models.

second, what the desiderata for dual-process theories should be. Besides, it might also generate a higher level of agreement, as I believe many single-process theorists and dual-process theorists would accept an instrumental dual-process framework.

Then, I will analyse one of the most influential dual-process theories, defended by Evans and Stanovich (2013), considering the distinction. As an example of a “clean” D-PT, I will show that, although it might sound instrumental, it is in fact substantial in its claims, contrasting it with Frankish (2009), who clearly adopts the instrumental version. I will then proceed to enumerate the advantages of the distinction here presented in disambiguating the debate, while shortly arguing against the substantial distinction: we can, in fact, *instrumentally* divide two types of thinking, as long as we do not blindly believe anything *substantial* about them – two types of *processing* do not imply two types of *processes*².

The article will be structured in the following manner. I will start by defining the clean version, which will serve as the main example, as well as its focus and goals, while summarizing the main discussion that followed (§ 2). Then, I will present Dennett’s personal/subpersonal distinction (§ 3), which will serve as basis for the proposed differentiation between types of dual-process theories (§ 4). After explaining that distinction, according to which a Dual-Process Theory can be instrumental (Type 2 processes as personal level phenomena) or substantial (Type 2 processes as subpersonal mechanisms), I will show that Evans and Stanovich’ version is substantial and present Frankish’ version as an example of an instrumental one (§ 5). Finally, I will discuss how the distinction here provided can serve as a disambiguation tool with consequences for the three branches previously presented (§ 6), and conclude (§ 7), summarizing the accomplishments of the article and its potential effects on the dual-process debate.

2 Evans & Stanovich’s Dual-Process Theory: the Clean Version

I chose Evans and Stanovich (2013) as a representative of dual-process theories for three main reasons. First, it is still one of the most influential dual-process theories. Second, it is one of the simplest and clearest ones, adopting only two defining features, which other authors have adopted (e.g., autonomy for Pennycook (2017) and Thompson (2013); conscious control for Nadurak (2021)). Third, despite its relative apparent clarity, it is possible to demonstrate both the ambiguity – what is claimed is not immediately clear once the several possibilities are established – and its dissolution, as, once we look closely, their claims are clearly substantial.

Before defining their theory, which I call the clean version, it is important to state its focus, its goals and the discussion it has generated so far. Its focus is what I will from now on refer to as Cognition₂ (the abilities linked to Type 2 processes). The abilities linked to Type 1 processes I will call Cognition₁. Intuitively,

² This paper started being written as a critique. With time, feedbacks and reviews, it became clear that the distinction created for that end should be an end in itself. Therefore, I removed the critique but kept its gist: arguments in favour of the existence of a second type of *process* seem to support a second type of *processing*, and the latter does not imply the former.

the concept seems easy to grasp. Whenever we actively *think* or have partial access to several steps of a chain of thoughts – for instance, when trying to decide in which restaurant to eat tonight, when remembering how many chairs my house has or when solving a math problem – that should be included in the concept of Cognition₂. In Evans’ words, “one can take that simply to refer to thinking which is slow and reflective and which engages Working Memory”, adding that “Few authors would deny the existence of such thought” (2019: 384).

Even this definition might raise some disagreements: what “Working Memory” means is not unambiguous. It is a controversial concept. While some theorize that it is a specific mechanism localized in the prefrontal lobe, others claim that it is a capacity made possible by the interaction of several levels of processes throughout the brain (see Gomez-Lavin 2018). But, for now, let us assume the term “Working Memory” refers just to the *ability* to keep mental representations active while the stimulus is absent. As long as we accept this definition provisionally, Dual-Process Theories are not dependent on a particular model of Working Memory *a priori*, because, although Working Memory, as a mechanistic concept, might be controversial, the *ability* itself seems quite hard to question. And that allows us to accept that “Few authors would deny the existence of such thought” and Cognition₂ as the set of abilities usually included in the concept of Type 2 processing.

The clean version differs from some other Dual-Process Theories. While some theories try to offer an architecture that explains how Cognition₂ works on a functional level and how it emerged in evolution (e.g. Carruthers 2012, 2015) the clean version does not try to explain the phenomena and how it might have evolved, but to *delimit its fundamental characteristics*, establishing certain minimum conditions for the existence of such type of cognition.

According to Evans and Stanovich, the extensive list of differences between Type 1 and Type 2 processes, although it correlates, does not define them. Given all the setbacks that property clusters faced, their “clean version” achieves cohesiveness by reducing the list of differences between types of processes to two fundamental (necessary and defining) ones:

- (a) *The Working Memory distinction*: Type 1 processes do not require Working Memory, while Type 2 processes do;
- (b) *The Autonomy distinction*: Type 1 processes are autonomous, while Type 2 are controlled and involve cognitive decoupling and mental simulation.

In previous versions, the lists of differences (see Table 1) were long and apparently unstable (according to Evans and Stanovich themselves). In contrast, their two conditions seem quite innocuous at first sight: when Working Memory is involved in the process, there is Type 2 processing; when a process is autonomous (automatically activated by the stimulus) there is Type 1 processing. But is what is being advocated that simple? Before we discuss the meaning of the claims, let us look at some of the criticisms that followed, to identify what might be wrong with the discussion.

One of the most prominent critiques was by Melnikoff and Bargh (2018a). In that paper, the target is the dual-process typology itself. Asking “what would it take for

Table 1 Some of the received version defining features (retrieved from Samuels 2009: 131)

Type 1 processing	Type 2 processing
Associative	Rule-based
Heuristic	Analytic
Parallel	Serial
Automatic	Controlled
Unconscious	Conscious
Low demand on cognitive capacity	High demand on cognitive capacity
Relatively fast	Relatively slow
Contextualized	Decontextualized
Evolutionarily old	Evolutionarily new
Conserved across species	Unique to humans

people to stop assuming that processing features are correlated?“, the authors try to “provide the largest list of counter-stereotypic exemplars ever compiled” (284/285), to question the widely accepted assumption that the features align between 2 types. The general point is one already made in the past (see Bargh 1989, 1994; Zbrodoff and Logan 1986): that “it would be more profitable to investigate each feature separately” (284), that the dual-process typology “is highly speculative and frequently misleading” (290) and that having it as the main framework for studying psychological processes “has the consequence of systematically thwarting scientific progress” (280). The answer given, in a joint letter, by several dual-process theorists to Melnikoff and Bargh had the same gist as Evans and Stanovich’ 2013 paper: according to the authors, the criticism challenges “an outdated list-of-features view” of the dichotomy while some of the authors of such response had already “argued against assuming an alignment of the numerous characteristics that have been assigned to so-called Type 1 and Type 2 processes over the years” (Pennycook et al. 2018: 667). Also, they go on saying, it attacks, not a particular theory, “but rather a class of theories, effectively treating all dual-process and dual-system theories alike” (668), and it ignores one of the most important moves made by Evans and Stanovich: the difference between typical correlates and defining features. As the joint letter notes, “Although Melnikoff and Bargh mention Evans and Stanovich’s concept of typical correlates, they do not mention the central concept of defining features” (667)³. Later, Stephens et al. (2018) and

³ Melnikoff and Bargh answered this objection questioning how “a theory could possibly consist of a single ‘defining feature’ if the ‘defining feature’ is not correlated with any other features”, since a theory “must generate predictions” (2018b: 668). Mugg (2016) made a similar point, arguing that “these new ways of dividing cognitive processes lack the explanatory promise of the Standard View that made dual-process theory attractive as an account of natural cognitive kinds” (9). According to Mugg, when D-PT gets rid of the long list of properties that distinguished the types of processes, the theory loses its explanatory powers and, thus, its interest. For this reason, Evans and Stanovich “tacitly commit themselves to the Standard View” (9), taking advantages without the consequences. This achievement, according to the author, leaves the dual-process theorists in a dilemma: “either the distinction between intuitive and reflective (or autonomous and working memory involving) falls back on using the properties of the Standard Menu, or it lacks the explanatory promise that made dual-process theory attractive “(1). The theory is thus, according to the author, dependent on the Standard Menu and, if it fails to distinguish two types of reasoning, “we would be wise to abandon” it (9).

De Neys (2021: 1415–1419), considering the previously ignored concept, showed the evidence presented by Evans and Stanovich (2013) neither confirms nor falsifies DPT, and so does not conclusively demonstrate a qualitative distinction between types of processes. Although some authors still argue, for instance, that “to prove the existence of two qualitatively different types of information processing acts, one characteristic is sufficient” (Nadurak 2021), both De Neys (2021) and Dewey (2021, 2022), mentioned the ambiguity surrounding the qualitative/quantitative distinction, and the former even argued for the scientific irrelevance of the debate – as deciding between qualitative and quantitative does not contribute to a better understanding of the difference between intuitive and deliberate judgments.

Thus, I shall provide a classification of Dual-Process Theories that (1) avoids that Dual-Process Theories are treated as a general class and attacked collectively; (2) works as a more palpable alternative to the qualitative/quantitative distinction, clarifying the debate and the criteria for the success of a dual-process theory and (3) helps clarifying how B1 is possible while B2 is unresolved.

As a first step out of this puzzle, observe that this “clean” version can be interpreted in different ways. Particularly, regarding the concepts of “process”. We need, then, to establish what is really being claimed, as the theories and the discussion around them seem filled with ambiguity and unclarity. To disambiguate and extract the meaning from this baseline framework Evans and Stanovich provide, I will consider two possibilities – two ways of interpreting what is being claimed. These two categories will work as a tool that can be used to categorize any dual-process theory and, thus, they might make the discussion fairer and, in line with Evans and Stanovich’s goals, advance it. This novel way of classifying Dual-Process Theories builds on a distinction proposed by Daniel Dennett in 1969: The Personal/Subpersonal dichotomy. Therefore, I shall introduce his distinction, to then introduce mine.

3 The Personal/Subpersonal Distinction

This distinction was introduced by Daniel Dennett in his 1969’ book *Content and Consciousness*. According to it, there are some states and activities that are only describable at a personal level. A pain, for instance, is a personal level event that only exists at such a level. There is no human pain at the subpersonal level – the feeling of pain is not to be found in the neural or psychological mechanisms that underlie it. According to Frankish (2009), “personal-level states and events are ones that are properly attributed to a person or creature as a whole, rather than to some organ or subsystem” (90). Any example that we can identify with as persons works: “trying to remember a phone number, imagining a purple cow, reciting a poem silently to oneself”. On the other hand, there are “subpersonal mental states and processes, which are invoked to explain personal-level phenomena”. These are “states and activities of neural systems, not of persons”, and examples include “bulding a mental model of a set of premises, constructing a representation of the logical form of a heard sentence, creatind a 2.5D sketch of the visual scene” (90).

Both levels of explanation can be, according to the original distinction, psychological – which means they both account for people’s actions in terms of their mental states. The goal of subpersonal psychology is, thus, to break down personal capacities into sub-capacities: “The abstract functional explanations of subpersonal psychology could act as a bridge between personal-level psychological explanation and lower-level neural explanation, allowing for the birth of cognitive science” (Drayson 2014: 340). According to Frankish (2009), “subpersonal mental states are ones that carry information about things, and subpersonal mental processes are ones involving such states” (90).

For example, for language learning, Chomsky claimed that the abilities children show early on in the process can’t be explained only in terms of the received input. Thus, there is a need for a kind of “internal grammar”. While speaking is a personal level activity, such internal grammar and whatever psychological states we attribute to it belong to the subpersonal level of explanation. Another example is visual processing and depth perception. David Marr (and others) proposed that conscious visual perception is divided into several subpersonal computational steps that convert information about light intensity or surface reflectance into information about surfaces and edges. None of the theorized subpersonal states correspond to anything present in personal experience or level of explanation. We have no personal access to the processes that lead to the perception of a 3D image, the location of the source of a sound, the understanding of language or the contents of stored grammatical rules (for a survey paper about the personal/subpersonal division, and the problems with personal and subpersonal psychology, see Drayson 2014, who discusses these examples in more detail).

Besides personal *states* divided into subpersonal processes – like the state of visually perceiving something – it can be claimed there are also *processes* that can happen at a personal level. That is the personal level of explanation: “the explanatory level of people and their sensations and activities” (Dennett 1969: 93). About Cognition₂, for instance, Dennett says that it is “a personal level, intentional activity, something we *do*. (...) It is not just something that happens in our bodies. When we think thoughts of this sort, we do, it seems, *manipulate* our thoughts, and it can be difficult or easy work” (Dennett 1998, p. 286)⁴. Frankish makes a “rough” correspondence between personal mental *processes* and conscious ones – as opposed to nonconscious ones – because “we are typically conscious of our personal mental processes, but not our subpersonal ones” (91).

⁴ For clarity, it is important to distinguish between personal level phenomena and intentionality: not every personal level phenomenon is something we *do*. A pain, for example, is a personal level phenomenon, but it is not intentional. A pain *happens* to us. Thus, it is a personal level event – but not an intentional one. Singing and reflection, on the other hand are activities that are both personal and intentional (Frankish 2009: 90 provides these examples).

Now, let us see how this distinction can serve as a basis for a differentiation between two types of dual-process theory: the substantial and the instrumental.

4 Disambiguation: Two Types of Dual-Process Theory

With this distinction in mind, we can now ask ourselves: is Evans and Stanovich's theory (and dual-process theories in general) trying to discriminate *different level* events or making claims of an ontological nature at the same level of analysis? What exactly does it mean to claim the existence of a second type of process that, being absent in perception and intuition, is present when one *thinks*? Let us call these two possible readings of a D-PT the *instrumental* interpretation (IDPT) and the *substantial* one (SDPT).

As we have seen in the introduction and will see in more depth in § 6, although most dual-process theorists (on B2) probably intend to endorse the substantial version, it is questionable whether that is the case with researchers on B1 who adopt the dual-process framework. In this sense, the instrumental version, avoiding assumptions about the differences at the subpersonal level and assuming only what we know to be the case – thinking *is* a personal level activity – gets its name from its potential usage: an *instrument* that can be used as a framework regardless of the nature of the differences between Cognition₁ and Cognition₂. The term comes from what is known in philosophy of science as instrumentalism, a view according to which the value of scientific theories and concepts is not determined by whether they are true or false, but by their power to solve theoretical problems and make empirical predictions. The substantial version, on the other hand, would align with another tradition – scientific realism – which believes the goal of science is to unravel *real* mechanisms, of which scientific theories and concepts are theoretical approximations. The goal of science according to the latter is not only to solve intellectual problems and make accurate predictions but to find out what the *substance* of certain processes is (e.g., Leplin 2001 ; Caciopo et al. 2004)⁵.

The main claim behind any Dual-Process Theory is the existence of two different kinds of process – a dual-process theory is a dual-process theory only in the sense that it endorses the existence of type 2 processes that, being absent in Cognition₁, are present in Cognition₂. And the key difference between these interpretations concerns what is meant by “process”: if such Type 2 processes are personal level ones, the theory is instrumental. If such Type 2 processes are subpersonal level ones, the theory is substantial.

The former case (IDPT) does not imply, necessarily, that a second type of subpersonal process is involved. It might be the case, for example, that the previously

⁵ Although the chosen terminology is connected to different traditions in philosophy of science, that does not entail that adopting one of the dual-process versions implies the adoption of the correspondent tradition. For instance, one can adopt the instrumental version and be a scientific realist. What is important to retain is that one (substantial) makes assumptions about the subpersonal level substance of Type 2 processing and the other (instrumental) does not, taking the different types of processing as different level events.

Table 2 Instrumental vs. Substantial dual-process theories

Instrumental DPT	Substantial DPT
<ul style="list-style-type: none"> • Cognition₂ as a personal-level process; • “Process” loosely defined. Subpersonal for T1 processes, personal for T2 processes; • Differences (T1/T2) between levels. 	<ul style="list-style-type: none"> • Cognition₂ as a subpersonal level process or as implying subpersonal processes; • “Process” as always referring to subpersonal mechanisms; • Differences (T1/T2) at the same level.

existing subpersonal processes organized themselves in a new manner that made it possible for the personal level process of thinking “consciously” to exist. In this case, Cognition₂, which is the set of abilities associated with Type 2 processing, would not be differentiable from Type 2 *processing*. Type 2 processing would be Cognition₂ *itself* – or types of Cognition₂: the act of thinking *is* the process. A personal level one (Table 2).

On the other hand, a dual-process theory can claim that, in the personal process of thinking consciously, there is a different type of *subpersonal* process involved. This is a totally different claim. Stronger than IDPT, SDPT makes a case for a qualitative difference *at the same level* – the subpersonal one. While one establishes a distinction between two levels of description and claims, perhaps, for the irreducibility of the personal level process of thinking consciously and for the relative autonomy of such a “virtual system” (e.g., Frankish (2009), as we shall see), the other claims a difference at the same level of description, defending that some different subpersonal processes subvene the personal level process of thinking consciously.

At this point, it is probably already clear to the reader how different the notion of “process” is in both cases. For a SDPT, the concept of “process” remains narrow and stable: both Type 1 and Type 2 processes are subpersonal level phenomena – i.e., certain neural and/or psychological mechanisms. For an IDPT, however, the level of definition of “process” varies depending on the type of cognition referred to, changing its meaning or scope according to the situation: When regarding Type 1 processes, it refers to the *subpersonal* mechanisms that compose System 1. When referring to Type 2 processes, it denotes personal level phenomena (e.g., thinking about what to have for dinner).

The instrumental version’s claims should be less controversial. The differentiation being between levels – and Cognition₂ a personal level phenomenon that does not imply different subpersonal processes – it raises less problems. But it is arguably useful, especially for B1’s empirical purposes, as it (1) identifies patterns in empirical data, behaviour and mental processes (see Olson et al. 2022: 392 for a summary of D-PT’s contributions) and (2) it might provide “the right explanandum” (Frankish 2009: 102) for talking about different levels of description. A substantial dual-process theory, on the other hand, has completely different depth and stronger implications, claiming for a fundamental difference between the two types of processing and implying the presence of unique neural or psychological mechanisms in the production of Cognition₂. Since “process” always refers to the same level of description, the claim is clearer and in line with the former terminology – which

claimed for a System 2. It is thus clearer but also stronger, and, so, more controversial. Type 2 processes, according to the substantial version, would thus be subpersonal level processes that, being present in Cognition₂, are absent in Cognition₁ and fail to align with the definition of Type 1 process. Possible examples of this would resemble Working Memory or the high order abilities usually ascribed to its executive component: maintenance and manipulation of contents; inhibitory powers, top-down attention, etc. (see Baddeley 2010).

De Neys (2021) says that “a dual-process model misrepresents scientific knowledge by positing that there is a qualitative difference between intuition and deliberation. But obviously, by the same logic, a single-process model equally misrepresents the scientific knowledge by positing that there is no qualitative difference.” (1421). The instrumental view, as one that does not imply anything at the subpersonal level, does not necessarily state *there are no* differences. What one is establishing is the only difference we can be certain about, and having that as one’s framework. In other words, adopting the instrumental version does not necessarily entail being against the substantial one.

Now that I have established the two different categories where Dual-Process Theories might fit, we shall ask: where does Evans and Stanovich’ clean version stand?

5 Where Does the Clean Version Stand?

Evans and Stanovich seem to try to reduce the dual-process framework to its fundamental foundations, strip it of overly ambitious features and depurate both the claims and the basic argument. The most charitable way of presenting the argument that leads to this “clean” version seems to me to go something like this. It can be said, on the one hand, that there was a noticeable pattern of empirical findings which was easier explained by two systems or types of process (for an extensive list of examples, like the famous bat and ball problem, see Kahneman 2011). It can be claimed, then, that what explains the pattern of findings is that such tasks can either be solved by processes that involve – and need – Working Memory in a distinctive way or by processes that do not involve Working Memory.

Now, is this an instrumental or a substantial claim? Evans and Stanovich also say that most critics attack Dual-Process Theories as endorsing stronger assumptions than most theorists intend to make. This might sound as an indication that their theory belongs to the instrumental patch. If that is the case, the theory would not differ much from the definition Evans provides. If the claim is that there is a second type of process, and the only necessary and defining feature of such a process is the use of Working Memory, that would resemble the “hard to disagree” definition of Type 2 processing he gives (see § 2). Therefore, the theory itself would be almost as hard to disagree with as the definition is. Instead of standing for a division at the same level – the existence of distinct mechanisms at the subpersonal level – it would be more of a useful definition, a pragmatic division between levels that provides the necessary vocabulary for talking about real phenomena – conscious thinking that uses Working Memory (as an *ability*) *exists*, however we define or explain both the process and Working Memory itself.

But such a clue is misleading, as I think we have several reasons to believe that Evans and Stanovich – and as well as other dual-process theorists – endorse the substantial version. For example, while explaining why they abandoned system-based terminology and replaced it with the “types” one, they justify it saying that “these terms indicate qualitatively distinct forms of processing but allow that multiple cognitive or neural systems may underlie them.” (2013: 226). Also, when they agree with several criticisms made to previous dual-process theories and admit several mistakes made by themselves in the past, they say that “Gibbard’s (1990) labeling of Type 2 processing as emanating from a normative control system “mistakenly implies (...) that Type 2 processing is always normative, as does Klein’s (1998) labeling of Type 2 strategies as “rational choice strategies”. Their reason for rejecting this analysis is that “Rationality is an organismic-level concept and should never be used to label a *subpersonal process* (i.e., a type of processing).” (2013: 229, emphasis mine), explicitly indicating that the definition transmitted here of type 2 process requires the existence of an inherent “supersonal” mechanism, not referring, therefore, to an “*organismic-level*” one.

In fact, there is evidence that the substantial version is the one that is usually defended by leading dual-process theorists in B2 literature. Mercier and Sperber, for instance, proposed, in 2011, that, just as the former System 1 had been accepted as an amalgamation of systems, System 2 should also be conceptualized in the same manner (95). Evans seems to have sympathized with the idea. Recently, citing the authors referred to as an influence, he stated that “there could be a set of Type 2 systems (or modules) that require Working Memory and another set of Type 1 systems that do not. In consequence, we should not think of dual-process theory as a two-process theory, but nor should be think of it as a two-system theory. Rather, it is dual-*type* theory. Multiple systems or modules could be involved with both types of processing.” (Evans 2019: 298. See also Evans 2017)⁶. He adds that, from these Type 2 mechanisms, “only one can function at a time, and each is limited in speed and processing capacity and correlated in its efficacy with individual differences in cognitive capacity” (Evans 2019: 397).

This raises several questions, but what matters for our purposes is trying to show that these authors endorse, explicitly or implicitly, the substantial version – a dual-process theory where the “processes” whose existence is claimed are subpersonal ones. And, if any doubts remained, these are dispelled at the end of the article, which Evans concludes by saying the following:

⁶ Another reason comes from the claim that there might be a need for a new kind – type 3 control processes: “Type 3 processes are wholly unconscious. They post no product in working memory and come with no feelings of rightness. Instead, they switch attention or increase effort, so that we become conscious only of a new task with which we are engaging. But they do more than this, also convening the ad hoc committee that function as a Type 2 system for a particular task.” (Evans 2019: 399).

According to the author, this idea is in line with the recent proposal by Houdé (2019), according to which there is an inhibitory control system (which he calls System 3) located in the prefrontal cortex. This also indicates a strong version of the defense of the existence of Type 2 processes, the term “process” not referring to the event on a personal level, but to certain mechanisms that need to use Working Memory to be instantiated and that, therefore, are absent in other forms of cognition.

Thinking of Working Memory as single system that does lots of different things will only get us so far. We need to start investigating and understanding the multiple Type 2 systems of thought that make use of this common resource. (2019: 410).

While the negative part of this quote underlines the limitations of assigning functions to a supposed executive component of Working Memory, the positive stance underlines the importance of understanding the several mechanisms underlying such component, therefore claiming the existence of several subpersonal type 2 processes in cognition, which proves the author's claims are substantial.

Before we move to the discussion, where the consequences of this classification will be shown, I think it is useful to reveal, for motives of comparison, what an instrumental D-PT looks like. Frankish (2009) is maybe the clearest example. According to the author, talking about a System 2 "is useful (...) as a way of highlighting the functional autonomy of personal reasoning." (Frankish 2009: 99).

Indeed, Frankish claims that such a "supermind" is not based on the emergence of new subpersonal systems or processes but on them being organized in a new way. So even if the "various subpersonal systems involved in supporting personal reasoning will be of different evolutionary ages – some, such as the visual system, very old; others, such as the language system, much more recent", the second system itself might be evolutionarily recent in a way, for "it is not the components of the system that are recent, but their assembly". In this sense, "it is possible that most, if not all, of the resources involved in supporting personal reasoning (Working Memory, language, sensory imagination, metacognitive abilities, etc.) evolved independently, and that personal reasoning emerged only when these disparate resources were co-opted to serve a new task." (Frankish 2009: 99).

For Frankish, then, the very difference between Type 1 and Type 2 processing is one of *levels*, not systems or subpersonal processes proper so-called. This is very different from what a substantial version implies (to Carruthers, for example, some Type 2 processes are deployed by the executive component of Working Memory and play an explanatory role in the functional architecture of Cognition₂). Frankish, while recognizing that "The aim of cognitive psychology is to provide reductive explanations of personal-level phenomena in terms of the underlying subpersonal states and processes" and that, "to reclassify one of the systems as a personal one" might look as "a step backwards in this explanatory project", defends that such a virtual system might provide the "right explanandum for subpersonal theory" (Frankish 2009: 102). In other words, according to the author, such a division is *useful*, as it provides the right means to arrive at the goal of explaining what and how subpersonal mechanisms make possible the personal level action of *thinking*. But that is not all. Frankish does not only provide such an explanandum as a possible one; he states that, since "different subsets of subpersonal mechanisms might be involved on different occasions, depending on the nature of the task" and "if this is right, then it will not be possible to draw a hard-and-fast distinction between the subpersonal mechanisms associated with Systems 1 and 2", then, "If we are looking for a simple binary division (...) the personal – subpersonal division may be the only one available." (Frankish 2009: 102).

This makes clear, not only that Frankish establishes an instrumental dual-distinction, but also that he holds *against* a substantial one, stating that the premises only allow for such a level-based duality. So, for Frankish, System 1 is a set of sub-personal processes. System 2, on the contrary, is a personal level, “virtual” implementation of Type 1 subpersonal processes: Type 2 processing not implying Type 2 processes.

Now that we have established the difference between the Instrumental and the Substantial versions, giving examples of each, I will discuss what effects the disambiguation can have on the three branches of the dual-process literature identified at the beginning.

6 Discussion: a Tool for Every Branch

Remember the three branches identified in the introduction. B1 includes the empirical research that adopts the dual-process framework. B2 is the discussion of whether two types of processes exist. B3 is the discussion of whether B2 is scientifically relevant. I will now explore how the distinction here introduced can positively contribute to all three.

As we have seen, it is plausible to think that most dual-process theorists in B2 are theoretically closer to Evans and Stanovich than to Frankish, endorsing a substantial dual-process theory, which makes their theory a better representative of dual-process theories in general – of authors who actively *claim* the existence of Type 2 *processes*. But this is not necessarily the case for most authors who adopt the dual-process framework, investigating either the relationship between Cognition₁ and Cognition₂ (e.g., Dewey 2022; De Neys 2021) or just using the dichotomy as a starting point to investigate indirectly related phenomena (e.g., if reflective thinking increases tolerance towards minority group practices (Verkuyten et al. 2022)). In many of these cases, the description of the framework can be taken either as instrumental or substantial. Dewey (2022), for instance, defines Type 1 and Type 2 processing, respectively, as processing that precedes or follows metacognitive control: “if some initial judgment by default reasoning causes feelings of error that exceed the threshold, metacognitive control may decide to intervene. Little is known about the specific effects of this intervention: some speculate that it increases working memory, time, and other resources that are available to reasoning” (20). See also Dewey (2021), where he referred to the distinction as between processes pre- or post- analytic engagement). Note, though, that such definition is independent of whether human cognitive architecture is ruled by one or two systems or types of processes. It just provides a general definition of the *problem* at hand, defining, not Type 1 and Type 2 *processes*, but Cognition₁ and Cognition₂ – two types of *processing*: what is to be shown is if there is a qualitative difference “between reasoning that precedes and follows metacognitive control” (21). Same with De Neys (forthcoming), who adopts the “fast-and-slow dual process label” to “refer to models that posit an interaction between intuitive and deliberate reasoning processes”, refraining from the qualitative vs. quantitative debate: “Both single and dual process theories focus on the interaction between intuition and deliberation. But they differ concerning the

question as to whether the difference between the two types of processing should be conceived as merely quantitative or qualitative in nature (...) My argument here is completely orthogonal to this issue (...) My criticism and recommendations equally apply to single and dual process models. I stick to the dual process label simply because it is more widely adopted.“ (6).

Let us take one of B1's example cited in the introduction. Olson et al. (2022), adopting a dual-process framework to investigate suicidal ideation, do not worry about the intricacies of the difference between Type 1 and Type 2 processing – what exactly does it mean for both types to be differentiable. Instead, they refer to the value of the model as one that allows you “to articulate testable predictions that improve prediction and explanation of relevant phenomena”, articulating hypotheses “regarding interactions between automatic and controlled processes in predicting suicidal ideation and lethal acts” (408). But the conceptualization of the duality is a general one – a differentiation between “automatic” responses and “controlled” processes: “the struggle between one’s “heart” and “head”” is “precisely what dual-process models are designed to address” (407). But the most important example of how B1 can adopt an instrumental duality comes from the author who probably bears more responsibility in the expansion of the dual-process typology: Kahneman, who conducted countless experiments comparing System 1 and System 2 responses, made it “absolutely clear” that those so-called systems are “fictitious characters” which “are not systems in the standard sense of entities with interacting aspects or parts. And there is no one part of the brain that either of the systems would call home” (2012: 12). In fact, they “do not really exist in the brain or anywhere else” (2011: 415). My claim regarding the first branch is then that, since B1's research can often be interpreted as instrumental, the framework can keep its empirical value independent of how the substantial debate about dual-processes turns out.

B2 and B3 can be addressed simultaneously. As we have seen, both De Neys (2021) and Dewey (2021, 2022) noted that the qualitative/quantitative debate is not sufficiently well defined, as qualitative differences can be “*just sufficiently large quantitative differences*” (Dewey 2021: 1429). To illustrate this, De Neys (2021) provides one example in which he compares himself and LeBron James playing basketball. In a sense, although they are playing the same game, one can say what they are doing is qualitatively different (1422). By providing the complementary distinction of substantial vs. instrumental dual-process theories, clarity is improved in several aspects of the debate(s). For B3, it helps understanding what is wrong with the B2 discussion: although it might be true, as De Neys (2021) argues, that deciding between a qualitative and a quantitative difference might not be scientifically relevant, as it does not improve in any way our understanding of human cognition, deciding between an instrumental and a substantial distinction has different consequences: if you take an instrumental approach, you can just embrace the use of helpful terminology for distinguishing uncontroversial categories or levels of behavior – thinking, Type 2 processing, reflection or deliberation are descriptions of personal level events. If you intend to argue for a substantial view, you have clearer desiderata – a clear vision of what needs to be argued for. Since the claim is that some Type 2 *processes* – and not only *processing* – exist, what needs to be shown is the presence of such a second type of *subpersonal* process – or at least the explanatory need

for them. Then, it must be shown that such processes are 1) present in Cognition₂; 2) absent in Cognition₁ and 3) not in line with the definition of Type 1 process⁷. Take, for instance, Evans and Stanovich. Since we concluded the duality argued for is substantial, they would need to show what type 2 *subpersonal* processes are controlled (or *not autonomous*) and *how* (ruling out, regarding the concepts of process and autonomy, intuitive and unreflective behavior⁸). Furthermore, they would need to show how Working Memory, as a subpersonal level mechanism, or how subpersonal mechanisms related to Working Memory, can be considered Type 2 processes which are only active in Type 2 processing. To mention another recent example, Nadurak (2021) claims that one defining feature is enough to establish a qualitative distinction and provides conscious control as that feature. Although it is ambiguous what it means for these processes to be *qualitatively* different in light of such defining feature, and thus what arguments or evidence we need to decide, the situation changes with the introduction of the disambiguation tool here provided: if the claim is a substantial one, the task becomes to find a qualitative distinction within subpersonal processes that correlates with the uncontroversial qualitative distinction in personal level experience (e.g., conscious or not/ effortful or not).

My own position, which I will not argue for here in the interests of brevity, is that, although an instrumental distinction can be accepted, there is no clear reason to accept a substantial one – that is, there are no presently accessible good arguments to claim that there is something substantially different at the subpersonal level between both types of processing. It has already been claimed that the evidence presented by dual-process theorists, Evans and Stanovich in particular, is not enough to confirm a qualitative difference – nor to falsify it (e.g., Stephens et al. (2018) and De Neys (2021)). For now, that is enough to indicate the absence of such reasons: if good arguments had been provided for the existence of subpersonal level Type 2 processes, that would be enough to show some kind of qualitative difference. Instead, what has been mainly argued for is the existence of a different kind of

⁷ According with the common conceptualization, intuition and perception share their processes. In Type 1 processing, which includes both, “The content of an intuition is conscious. (...) There is no awareness, on the other hand, of the inferential processes that deliver an intuition” (Mercier and Sperber 2018: 66). In fact, in recent updates of Evans’ view, this is the definition of type 1 processes – an autonomous process which output is delivered in Working Memory – because autonomy alone would include many lower-level processes (e.g., digestive) (see Evans 2019).

⁸ To illustrate this point, take the concept of Cognitive Control. When a lioness walks through the jungle in search of potential prey, its perceptual, cognitive and action systems are being “controlled” in this sense: being recruited for a *goal* – whether conscious or not. Their “automatic” responses are inhibited. At least, the irrelevant stimuli are inhibited, as the lioness is paying attention and reacting *only* to what matters for its goal. This does not lead us to conclude that what is at stake is Type 2 processes, reflection or Cognition₂: only that there is an interaction between motivational, emotional, attentional and action systems. Similarly, many instances of intuitive reasoning appear to be goal dependent – e.g., when an idea about an issue we slept on pops up in our minds, that is also an instance of purposeful cognition, although “autonomous”. This, known as insight, is widely referred to in the literature (e.g., Wagner et al., 2004). Given this, “cognitive control”, although it might not extend to all perceptual or intuitive systems, being unable to rule out intuitive and unreflective (animal) behaviour, is not sufficient to differentiate Type 2 processes from Type 1 “autonomous” processes at the subpersonal level.

processing – which, as we have seen, being a personal level phenomenon, does not necessarily imply the existence of a different kind of *process*.

For the reasoning behind the claim to be understandable, take, for instance, Working Memory as a defining feature. We can assume that, although Working Memory is present in Cognition₁ as where the outputs of Type 1 processes are delivered, it only plays a role *in the processing of information* in Cognition₂. Although this might logically lead us to conclude there is such thing as Type 2 processing, it does not naturally follow that there is such thing as Type 2 *processes*. To assume that, a substantial interpretation of what happens once an output delivered in Working Memory leads, not to overt action, but to further reflection, needs to assume that the mechanisms which do the cognitive work *after* this point are *different* from the previous ones (e.g., made by a central executive). But it can be said – and this is part of my positive proposal, which I will not develop here – that once such “thought” is in Working Memory, it works as an input to the *same* subpersonal cognitive processes, thus producing Cognition₂, a chain of related contents produced in the same manner. Even without argument, this *is* a possibility. Therefore, the presence of Working Memory in the mental activity of, let us say, deciding between two possible outcomes, does not imply the presence of subpersonal level processes that are absent in Cognition₁. It does not automatically follow, then, that a difference is a subpersonal level one, as the subpersonal mechanisms at play are, or can be, the same. Still, the difference between levels can be established, since thinking itself requires the presence of a sequence of several related and memorized steps – even if in each step what happens is a loop where the Type 1 mechanisms produce the next thought, the next output.

Through the disambiguation of the debate, the understanding of what the claims are in the dual-process debate and what has been going wrong with the B2 discussion is improved. Also, by providing those who wish to defend a substantial dual-process theory a clearer description of what such defence would require, this tool might also allow a higher level of agreement, as the instrumental version seems acceptable to many single-process theorists *and* dual-process theorists.

7 Conclusion

In this paper, I provided a disambiguation tool for the dual-process debate, classifying dual-process theories as either instrumental – the difference is between the subpersonal and the personal levels – or substantial – the differences are at the subpersonal level. Taking Evans and Stanovich (2013) as an example, I explored the ambiguity to then dissolve it, showing it is a clear example of a substantial dual-process theory, and contrasting it with Frankish (2009), who endorses an instrumental version. Although I shortly defend that there is no apparent reason to adopt the substantial version, this paper is not a critique, but a clarification – a tool to disambiguate and advance the debate. A tool that can be useful regardless of the side one stands on in this discussion.

By providing such a disambiguation instrument, the article allows researchers to work on the issue knowing better what the duality *can mean* and what *they mean* by

adopting the duality. This way, if researchers want to mention and adopt the dual-process framework and its advantages (see Olson et al. 2022: 392 for a summary) without getting trapped in an endless war, they can investigate intuitive and deliberate judgements having as a paradigm the instrumental distinction. That way, confusion is avoided as much as unnecessary, tangent discussions, as the instrumental version does not imply whoever adopts it to be a dual – or single – process enthusiast.

Regarding the substantial version, it is on theorists' hands to defend it in a way they haven't so far, if they intend to. In this scenario, given the ambiguity of the quantitative/qualitative dichotomy, which dominated the debate between dual- and single-process theorists, the alternative distinction established provides authors who want to endorse the substantial version a clearer vision of the desiderata. It might also be useful for a third route – the one I am taking myself – of trying to understand how the personal level ability to think might work and have evolved without the need for a different type of subpersonal level process to evolve – this, if we accept the claim that, as far as present arguments go, we have no reason to believe the difference between Cognition₁ and Cognition₂ is a substantial one; that is, that Type 2 *processing*, as a personal level activity, does not necessarily imply the existence of Type 2 subpersonal level *processes*.

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Declarations

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