



Going Ballistic

The Dynamics of the Imagination and the Issue of Intentionalism

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Abstract

Do we have control over the content of our imaginings? More precisely: do we have control over what our imaginings are about? Intentionalists say yes. Until recently, intentionalism could be taken as the received view. Recently, authors like Munro & Strohminger (2021) have developed some arguments against it. Here, I tentatively join their ranks and develop a new way to think about the way in which imaginings develop their contents that also goes against intentionalism. My proposal makes use of what we may call a ballistic framework for mental dynamics, which I sketch to some length. In this model, imaginings are articulated by ballistic events sensitive to constraints that modify the trajectories that imaginings trace in a special working space. This framework leaves room for alternatives to pre-assigned-content models, such as Kung's (2016). In the ballistic-based models sketched here, and against intentionalism, imaginings can fail to be about what we intend them to be about. The framework also has applications beyond the intentionalism debate, some of which I will sketch.

Keywords

Aboutness · Imagination · Mental ballistics · Mental dynamics

When we think of simple cases of imagining, we may be tempted to see it as a simple operation. If I decide to imagine a blue vase, it seems as if I may simply conjure it. Other types of imaginings may have more structure, either because they represent processes that unfold over time, which is reflected in the content of the imaginings (for example, imagining that we visit the beach on a sunny day), or because their objects are complex enough that it may be difficult or impossible to produce a satisfying representation of them all at once (for example, imagining all sides of a tridimensional object). Considerations of this sort suggest that we should pay attention to the descriptive resources we have to capture the structure and dynamics of imaginings. But not only: seemingly simple imaginings may also possess a richer structure and dynamics—this is a point where we might be able to afford being relatively revisionary of our ordinary conception of how imagination works. One of my goals here is to propose a new way to account for the dynamics

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of the imagination, which I will call the *ballistic* model.¹ In this model, the development of imaginings is modulated by ‘ballistic’ events that determine or modify the trajectories of mental processes in a specially defined work space.

I am also interested in examining how the issue of the dynamics of the imagination interacts with another problem that has recently gained some attraction: the question whether the content of our imaginings is under our control. The received view (*intentionalism*) is that we have full or nearly full control over the content of our imaginings: if I intended to imagine a blue vase, the content of my imagining can hardly fail to be of a blue vase. Some recent work has cast doubt on this assumption. Here, I will use this problem in order to motivate the introduction of the ballistic model. In short, the ballistic dynamics of the imagination allow for imaginings to fail to be about what we may intend them to be about. Even if in some cases we can succeed in imagining what we intend to imagine, we may also fail. I will argue that this is a feature, not a bug, of the dynamics of imaginings: in many cases it can be useful for our intentions and our imaginings to be mismatched.

I will proceed as follows. First, I will briefly explain the dispute concerning intentionalism (section 1). I will then connect the issue with the dynamics of the imagination (section 2), sketch the ballistic model of the dynamics of the imagination, including a discussion of the issue of constraints on the imagination (section 3), and show how it can be used to defend a form of anti-intentionalism (section 4). Finally (section 5), I summarize and suggest some further work.

¹ I take the terminology from Strawson (2003), but I develop the idea of mental ballistics in a different way. Strawson defends the idea that most mental activity is ballistic in the sense that the only influence one has over it is catalytic or preparatory:

No actual natural thinking of a thought, no actual having of a particular thought-content, is ever itself an action. Mental action in thinking is restricted to the fostering of conditions hospitable to contents’ coming to mind. The coming to mind itself—the actual occurrence of thoughts, conscious or non-conscious—is not a matter of action. (234)

Thus: the production of mental contents is ballistic, in ‘the technical (psychophysiological) sense in which the motion of one’s leg, after one has done whatever one does neurally in initiating a kick, is merely ballistic—as ballistic as the motion of the ball after it has ceased to be in contact with one’s foot’ (241). Strawson argues that the production of imaginistic content is due to the spontaneous activity of the imagination in this sense:

When one has set oneself to imagine something one must obviously start from some conceptual or linguistic specification of the content (spangled pink elephant), and given that one’s imagining duly fits the specification one may say that it is intentionally produced. But there isn’t intentional control in any further sense: the rest is a matter of ballistics, mental ballistics. One entertains the verbal specification and waits for the mechanism of imagination—the (involuntary) spontaneity of imagination—to deliver the image. (241)

The neurophysiological literature uses the notion of ballistics in terms of lack of feedback rather than lack of control (Brooks, 1983; cf. Desmedt & Godaux, 1979). For a critical assessment of Strawson’s ideas, see Buckareff (2005), Levy (2019) and Irving (2021).

1 The concern over intentionalism

Are we in control of the content of our imaginings, to what extent, and how? The received view, *Intentionalism*, answers the first question positively.² In its more common form, it answers the second question saying that we are essentially *always* in control (although there is some nuance about some border cases). It seldom answers the third question, often taking the matter of control as a *datum* for a theory of the imagination.

We should, however, be more precise on the scope of the intentionalist thesis. An intentionalist can accommodate that we don't have minute control over the content of imaginings; for example, they can deal with cases where in intending to imagine that we travel to Salamanca, we also imagine that we meet a friend along the way, saying that this is excess content. Intentionalists are also not bothered by the fact that in daydreams and in similar cases, our imagination is unguided. Rather, the intentionalist thesis is that, in cases where we imagine intentionally, we are in control of is that our imaginings are *about*, what Kind (2001) calls their *directedness*.

Two main arguments have been usually given in favour of Intentionalism. The first is that in some cases the same mental image can be used to represent different objects. In such cases, the argument goes, we have a semantic distinction that cannot be explained by differences in the content of the mental image. It could, however, be explained by a difference in intention. So—abductively—it is. The second argument hinges on the idea that there is a certain infallibility about our judgments about what we imagine: if I intended to imagine a blue vase, for example, and I am satisfied that I have done it (or if I intend to imagine it, and I believe I am doing it), I cannot be mistaken about this. The idea is perhaps that one cannot be mistaken about one's intentions, and so, that one cannot be mistaken about what one's imaginings are about as that is fixed by what one has intended. Again, perhaps the point is made clearer as an abductive argument: intentionalism would best explain this kind of infallibility, so given it, we abduct intentionalism.

² Intentionalism is endorsed or defended by Fodor (1975), Noordhof (2002), McGinn (2004), Dorsch (2012), Balcerak Jackson (2018) and Kind (2019). Berto's (2018) logic of imagination makes the assumption that we imagine whatever we take as explicit input for the imagining, which is along intentionalist lines.

Recently, both lines of argument have been challenged.³ Munro & Strohminger (2021) argue that Intentionalism has counterexamples, that there are alternative ways to explain the possibility to use the same mental image to represent different objects, and that it is possible to be mistaken about what one imagines.

The debate on intentionalism has important epistemological consequences. As Balcerak Jackson (2018) points out, there is a certain line of thought that undermines the epistemic value of imagination by emphasizing the kind of control subjects have of their imaginings. If we have such thorough control over our imaginings, it seems as if we cannot rely on imagination to acquire knowledge or justification: imagination seems to provide too little epistemic friction.^{4,5} A theory of the imagination that defends its epistemic value needs to address this issue. For intentionalists, the strategy will consist in showing how the imagination is constrained and non-frictionless despite being under our control (for example, this is the strategy that Balcerak-Jackson herself uses to defend the justificatory role of the imagination).⁶ I will return to the issue of constraints later.

2 Intentionalism and the dynamics of the imagination

What I want to argue here is that the discussion about intentionalism should inevitably turn into a discussion of the dynamics of the imagination, since a lot hinges on how the dynamics of how the content of imaginings is generated—and in particular, on how imaginings acquire the property of being directed towards this or that subject matter.

³ Some ideas in Williams (1966) seem to be in line with these critiques to intentionalism, but I am uncertain if there is any direct influence over the more recent versions of the view. See, for example, this quote, that is very reminiscent of some of Munro & Strohminger's examples: 'Suppose a man imagines assassinating the Prime Minister; and that his imagining this takes the form of visualisation. Suppose, further, that being rather radically misinformed about political developments, he supposes Lord Salisbury to be the Prime Minister. What is it in fact that this man imagines? It seems difficult to deny that he does imagine assassinating the Prime Minister, since that is the act - let us suppose him to be a violent anarchist - which he sets himself to imagine. Yet it would be very misleading just to say without qualification that he imagined assassinating the Prime Minister: it would naturally imply that in giving the name of the actual Prime Minister, we would be giving the name of the person that he imagined assassinating. (That it would be misleading in this way illustrates the difficulty of keeping intentional contexts pure.)' (29-30) Note that rather than rejecting intentionalism, Williams seems to suggest that the picture is more complicated than intentionalist intuitions would suggest.

⁴ Sartre (1972) gives a famous formulation of the point. Wittgenstein (1981), White (1990) and Tidman (1994) raise similar worries.

⁵ On epistemic friction, see Sher (2016) and (in the specific context of modal epistemology) Vaidya & Wallner (2021).

⁶ For the anti-intentionalist, the issue of friction still exists, but it is not in tension with their other assumptions.

This suggestion that dynamics are involved in this may not sit well with the intentionalist, for their picture often relies on the thought that imaginings have these properties from the very moment their target is decided. When someone attempts to imagine a flying fish, for the intentionalist there is no further question as to whether what they will imagine is a flying fish, regardless of what they actually manage to conjure. So it may seem that even if it goes accompanied by some acceptance of the procedural nature of imagining, intentionalism does not particularly hinge on how the dynamics of the imagination are accounted for.

Precisely, one may ask whether this is simply the consequence of not paying *enough* attention to the issue of the dynamics of the imagination. One could object, for example, that a naive version of the intentionalist idea cannot account for phenomena such as revision and misidentification of the content of imaginings. We may think that intentionalism can fail because we can intend to imagine something (a thistle, for example), execute the intention, and yet end up refusing to accept that we have managed to imagine what we intended. But the intentionalist may have resources to deal with these cases. Dorsch (2012), for example, argues that in cases where our judgments about what our imaginings are about change (he uses the example of imagining a lemon, and then imagining that one cuts it revealing the appearance of a wax replica), certain description of the process and their dynamics can be ruled out because they are in conflict with the purported indefeasibility of the subject's knowledge of what they visualise, and then proposes a different account of these processes. In doing so, Dorsch puts forth an intentionalist account of the dynamics of the imagination that anti-intentionalists should counter with an account that at least allows for the possibility that for not all imaginings what they are about is fixed intentionally. Previous attempts at defending anti-intentionalism have taken the approach of granting parts of the intentionalist dynamic story (we will see this in the case of Munro & Strohminger (2021) in section 4). It may be fruitful, however, to examine if there are alternatives—if only to put pressure on the intentionalist abductive strategy that Dorsch exemplifies.

3 The ballistic model of the dynamics of the imagination

How should we understand the dynamics of the imagination, then? Taking a hint from Strawson's idea that mental activity is ballistic, I propose that we describe the dynamics of the imagination in terms of the trajectories that imaginings trace in a specially defined kind of space. In this section, I will propose that we develop the idea distinguishing between internal, external and terminal mental ballistics (3.1), clarifying how we can think of mental episodes as having trajectories (3.2), and examine how the mental ballistics of the imagination interact with constraints (3.3), to finally discuss the ballistics of complex imaginings (3.4).

3.1 Real ballistics and mental ballistics

To develop this notion, it can be useful to exploit the original ballistic metaphor and pay some attention to its source, namely *real* ballistics—the kind of ballistics that people concerned with guns, rockets, and projectiles of all sorts worry about.⁷

Real ballistics concerns the trajectories of objects (in particular, projectiles) that are launched from a position to another.⁸ A rock that is thrown to a window follows a trajectory that is determined by the conditions of its launch, the conditions of the medium through which it travels, and the properties of the window. There is a natural way to think of this process as combining three distinct stages (illustrated in the example), and real ballistics as a discipline is usually taken to comprise three distinct concerns:

1. *Internal ballistics*, which concerns the behaviour of projectiles while still within the body of the weapon (that is, before they exit the gun chamber),
2. *External ballistics*, which concerns the behaviour of projectiles from the point they have left the body of the weapon until the moment they arrive at their targets, and⁹
3. *Terminal ballistics*, which concerns the behaviour of projectiles when they impact their targets, and after.

The whole process involves the gun, the projectile, the medium by which the projectile travels, and the target. In this case, the gun is a mechanism that is already set up in such a way that, under normal conditions, pulling its trigger would start a chemical reaction that will cause an explosion, rapidly releasing a great amount of gas which forces the projectile out of the chamber and down the barrel. Once the projectile leaves the gun, the trajectory of the projectile depends on the initial conditions of the shot, as well as the influence of gravity and the conditions of the medium through which it travels. However, unconstrained by the walls of the barrel, the projectile can take on trajectories that are unforeseen. A lot of real external ballistics is about minimizing uncertainty about these projectile trajectories.

These observations about the structure of real ballistics, and the observation that our mental lives are composed of events and processes that are triggered in certain circumstances, that develop over time, and that have certain consequences, together suggest that we could take mental dynamics to have a similar tripartite architecture, including:

⁷ Note that I use the term ‘real ballistics’ to make a contrast with usages of the term which are founded on the metaphor of ballistics, not because I think mental ballistic phenomena are any less real than projectile ballistic phenomena.

⁸ I draw from Carlucci & Jacobson (2007). For external ballistics, see McCoy (2012).

⁹ People distinguish also an intermediate ballistics, which concerns the behaviour of the projectile in the moments immediately right after it has been launched, but here I will lump this with exterior ballistics. The distinction depends on characteristics that are specific to the concrete character of projectile ballistics that do not generalize to the metaphorical cases.

1. *Internal mental ballistics*, which would concern the triggering of mental events and processes,
2. *External mental ballistics*, which would concern the development of mental events and processes ‘in-flight’,
3. *Terminal mental ballistics*, which would concern how mental events and processes ultimately alter our mental state,

This hypothesis can be taken either as a concrete proposal for developing an intermediate description of mental phenomena, or as an heuristic device for exploring certain possibilities for developing a description of that kind (an exploratory model in the sense of Gelfert (2016) and Massimi (2019)). For my purposes here the second approach is sufficient, although eventually I will suggest that the kind of descriptions that this tripartite distinction will allow us to make is an adequate description of mental phenomena at some level of abstraction.

Some general observations are in order. It is likely that internal mental ballistics are typically agential, although they should also cover the case of the spontaneous triggering of mental events. On a first approximation, a *purely ballistic* mental process is characterized by the absence of monitoring and guidance of external mental ballistics. But it is easy to see that overall, sequences of ballistic processes could be chained, and these chains could constitute guided processes. So there will be a problem of assessing the appropriate level of grain to describe mental processes when we characterize them as ballistic or non-ballistic.¹⁰

Despite its initial appeal, the metaphor is imperfect in many important regards when it is applied in the most straightforward or naive manner. Most significantly, the operation of a gun doesn’t produce projectiles, whereas the operation of our mind does seem to produce certain mental contents.¹¹ Strawson’s whole use of the ballistics metaphor makes the point that the *production* of mental items is not under our direct control. And the way he describes the ballistics of imagination suggests that he thinks of the production of the contents of imagination as a matter of external ballistics of some sort. What remains indeterminate is how to develop the ballistic metaphor in a way that preserves the tripartite structure and gives a reasonable account of what mental ballistics could be really about.

¹⁰ Walton (1990) warns against the decomposition of imaginary episodes, in particular in the case of daydreaming: ‘It is a mistake to think of a daydream as simply a disconnected series of individual mental events, acts of imagining, as one imagines first one thing, then another, then a third, and so on. The various imaginings are woven together into a continuous cloth, although only some of the strands are visible on the surface at any particular spot’ (17). The distinction between internal, external and terminal mental ballistics can be used to explain how mental processes are articulated, with internal and terminal mental ballistic events acting as articulation points.

¹¹ In principle, a gun that produces its own projectiles is conceivable. But in general this will not be part of the ballistic mechanism.

3.2 The trajectories of mental episodes and processes

What is missing from the picture sketched so far is the idea of a working *space* for mental ballistics/dynamics. In real external ballistics, the concern is the *trajectory* projectiles take through real space. What could be the equivalent in the mental case?

My proposal will be that the working space will be given by the context of ongoing mental *tasks*.¹² We make the supposition that mental activity is structured by ongoing concern with tasks. Mental events and processes will be on-task or off-task, if they contribute or fail to contribute to the achievement of those tasks. This is not to say that mental events have to be goal-oriented in any substantial way. Rather, the point is that their state will in general be measurable in terms of how on-task or off-task it is. Suppose that as a matter of fact, Stephen needs to go to his job. This is now a living concern for him that will demand him to accomplish several tasks: getting ready to go out, making sure he has his house keys, leave the windows closed, and so on. As he goes around, he needs to think about what he is doing, as well as imagine how to do things, and he comes up with ideas and plans to achieve their goals. As these mental events contribute to his overall task, we can say that they are on-task. However, Stephen also tends to wander away from his current task. He notices an unpaid bill over his kitchen table, and makes a mental note to do the transfer when he comes back home in the evening; he sees his bike leaning against the wall in the hallway and fantasizes about his longer ride on the weekend; and so on. These are off-task mental events. He thus shifts between on-task and off-task mental episodes.

The development of one's mental state can thus be described as tracing trajectories in task-space over time. Correspondingly, the ballistic working space actually has two dimensions: one is temporal (the T axis), and the other corresponds to how on- or off-task the mental state is (the R axis).¹³ It is important to note that how on- or off-task the mental state is only weakly corresponds to contributing to fulfilling the task. While in general being in an off-task state does not contribute

¹² Task relevance is usually taken as a content-based notion. Christoff et al. (2016) criticize accounts of mind-wandering (and other mental phenomena) that focus on task relevance because they don't give enough credit to the importance of dynamics. I agree. Here, my intention is to suggest a kind of hybrid view that incorporates task relevance and dynamics.

¹³ This is perhaps too simplified. States can be less than perfectly on-task or perfectly off-task without being comparably on- or off-task. Suppose that the task is to answer a question about animals in the Sahara. Then, thoughts about the number of stars in the Milky Way or the history of typography are both off-task, but it is not clear how off-task they are relative to each other. Intuitively, if these thoughts are given in a sequence, we could say that thinking about the number of stars in the Milky Way *after* thinking about the history of typography leaves us further stray from the task, but the same happens if we have this thought in the opposite order. Formally, this means that the order of the states in terms of how on- or off-task they are could be a partial lattice, effectively giving an additional dimension to the task space. One way to extend the model so it can capture this is to allow ballistic processes to move across different background task spaces.

to fulfilling the task, being on-task is not sufficient for contributing to fulfilling the task either: for example, one could *ruminates* on a question that is perfectly on-task without advancing towards answering it. The dimension of how on- or off-task mental states are will be represented as ranging from fully off-task (−1) to fully on-task (1). Furthermore, we will partition space across this dimension depending on whether states are on-task or off-task. To represent the boundary we will use 0, so that a mental state s is on-task iff $R(s) > 0$.

The resulting two dimensional space can be used to track the trajectories of mental processes over time. A basic mental item will correspond to lines between a starting point e_s and a terminal point e_t . The starting point represents an internal mental ballistic event, and the terminal represents a terminal mental ballistic event, with the line between them representing an external mental ballistic process. The only constraint on these lines is that the time coordinate of the terminal point cannot be less than the time coordinate of the starting point: mental events respect the usual causal arrow of time. In this regard, the model represents mental episodes as directed line segments. More complex processes can be build as sequences of these lines. It is important to notice that the lines themselves do not represent a continuous path across task-space; they just indicate that there is some path between the starting and terminal points (if there are intermediate points between them—and, to be clear, there may not be any—, these remain somewhat indeterminate in this representation).

While these two devices (the task/time space and the representation model for mental ballistic trajectories) are very simple, they already allow us to characterize a range of phenomena. Most interestingly, it allows us to easily distinguish between wandering, stable and focusing mental processes by the characteristics of the trajectories they trace: in a *wandering* process, task-relevance decreases, in a *focusing* process task-relevance increases, and in a *stable* process, task-relevance does not change significantly.¹⁴

Because we have partitioned task-space along the R axis at the 0 threshold, we can further characterize mental processes depending on the relative position of starting and terminal points in relation to 0. Intuitively, we want to make distinctions between processes that take our mental state from on-task to on-task, from on-task to off-task, from off-task to on-task and from off-task to off-task, additionally to the direction of this progression (see figure 1).¹⁵ Consider the differences between wandering away while off-task (when daydreaming), and wandering away

¹⁴ More precisely: in a *wandering* process $R(e_t) < R(e_s)$ by more than some significance threshold t , in a *focusing* process $R(e_t) > R(e_s)$ by more than t , and in a *stable* process, $|R(e_t) - R(e_s)| \leq t$. The point of defining these in relation to a threshold value is to capture the idea that how significant the changes in the task-relevance of mental events have to be, in order to trigger a different classification, may vary from context to context (in some cases we might want to allow the same amount of change to be more or less significant, depending on the relevant concerns).

¹⁵ Of course, we don't expect wandering processes to go from off-task to on-task or focusing processes from on-task to off-task, although technically this will depend on the threshold of signifi-

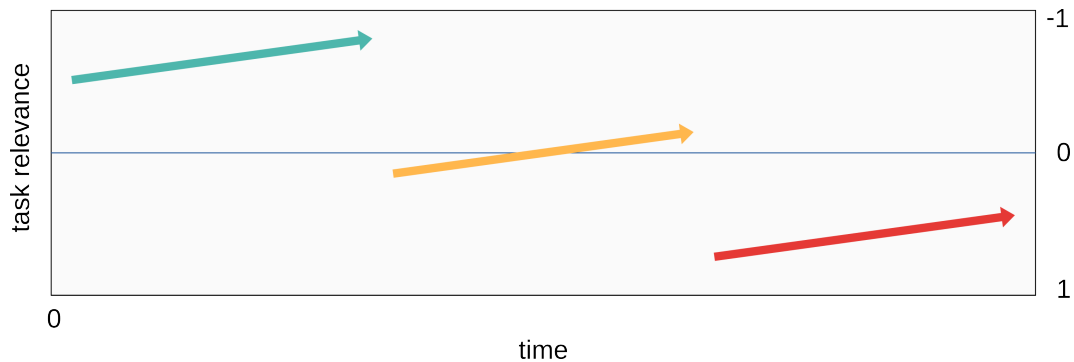


Figure 1: Different mental events share ballistic direction but differ in relative position. Here, wandering off-task to off-task (green), on-task to off-task (yellow), on-task to on-task (red).

from the current task while on-task (for example, when you are stuck on an unfruitful thought and need to come up with a new idea). Of course, the relative positions of these events in task-space are not sufficient to explain these differences, but for now the point is that it is possible to capture these observations in the model (later, I will introduce elements to the model that can help in providing more substantial explanations of these cases).

3.3 Ballistics and constraints

So far we have considered aspects of a model of mental ballistics that are fairly general. From now on, I will focus on aspects of mental ballistics that are more tailored to the imagination case. An imaginistic mental episode cannot be characterized simply by the position of its starting and terminal points, so the model needs to be enriched in several ways.

One important aspect of imaginary episodes that affects mental ballistics is the kind of constraints that they are under. These constraints affect in very significant ways how imaginistic episodes develop.¹⁶ There have been several ways to develop the idea of imagination being sensitive to constraints in the literature—the issue has become central to discussions about the potential for imagination to be epistemically significant (remember our comments on Balcerak Jackson’s (2018) take on how to conciliate intentionalism with the idea that imagination can be a source of justification). Several authors have drawn distinctions between various kinds of constraints that are relevant to the functioning of the imagination. For example, Kind (2016) talks about a *reality* constraint and a *change* constraint. The former is the constraint that imaginings must respect reality, and the latter is the constraint

cance; at the very least, stable processes can cross the threshold 0 in the R axis freely as long as the change is within the threshold of significance.

¹⁶ See for example Dorsch (2012, 2016), Langland-Hassan Langland-Hassan (2020), Kind (2016), Stuart (2021), Williams (2021), and Myers (2021), among others.

that if imaginings deviate from reality, they must be sensitive to the logical consequences of that change. If those constraints are respected, we can be assured of the potential epistemic significance of the relevant imaginings. Myers (2021), to give another example, distinguishes between constraints that have justificatory force and constraints that do not have it—rightfully, he observes that certain constraints imposed on imaginings (such as desire-based constraints, or constraints based on mistakes) may fail to provide imaginings with justification.

For our purposes here, it is important to distinguish between *deliberate* and *automatic* constraints. This distinction is orthogonal to Kind's and Myers'—the reality and change constraints, and justifying and not-justifying constraints, can *all* be imposed deliberately or automatically. Another way to explain the difference is to say that whereas Kind's constraints are distinguished in terms of their content, the deliberate and automatic distinction concerns the *manner* in which constraints are applied, independently of the properties of their content. Suppose that our tasks led us to try to imagine a piece of limestone falling to a pool. We naturally impose on the attempt our beliefs about the characteristics of limestone, as well as our beliefs and memories about relevantly similar happenings. Some of this we need to do deliberately: for example, we might imagine that after some while, the rock will absorb water from the pool and erode. This is not necessarily something that we would easily think about, but some effort can make the fact available to guide our imagination. But we may also automatically imagine that it behaves like other physical objects: that upon touching the water, it produces a wave, that it sinks to the bottom of the pool, and so on. Now, different subjects may apply the same constraints either deliberately or automatically depending on their overall cognitive disposition: a very young child may not expect the rock to sink to the bottom of the pool, and may thus fail to apply that constraint automatically on their own, but they might be able to imagine it if helped and guided by a tutor.¹⁷ Christoff et al. (2016) draw the distinction in terms of how attention is guided: in the deliberate case, we actively guide our attention to constraints, and in the automatic case, we respond to them automatically.¹⁸ Kind & Kung (2016) draw a similar distinction between constraints that have a source in our cognitive architecture (similar to what we call automatic constraints) and constraints that are voluntarily applied (similar to what here we call deliberate constraints).¹⁹

¹⁷ On imagination as a skill that can be trained, see Kind (2020).

¹⁸ Saying that we respond to them may be somewhat misleading, because automatic constraining may happen at the subpersonal level. A recent model that allows for this in principle is Williams' (2021), which takes constraining as part of a predictive processing architecture, in the form of top-down generative processes. It is often emphasized by prediction processing theorists that generative models operate at some sub-personal level(s)—see, for example, Clark (2016). For an account of deliberate constraining, the generative hypothesis needs to be supplemented with an account of how a 'personal' level fits in the predictive processing picture.

¹⁹ One difference is that here we do not necessarily take automatic constraints to have their source in our cognitive architecture; in principle, there could be constraints that are imposed by the environment. The issue of the coupling of our cognitive system and the environment is too

In the ballistic model, the pressure of deliberate and automatic constraints are two additional magnitudes that characterize mental episodes. This allows for more fine-grained distinctions between wandering, focusing and stable processes. For example, using this distinction we can distinguish between cases where on-task imaginings wander under high automatic constraints and low deliberate constraints and cases where on-task imaginings wander under low automatic constraints and relatively high deliberate constraints. The former case corresponds to what we may call *imaginistic* rumination (someone who tries to imagine their house at night but is constantly drawn to imagine monsters in dark corners would be an example). The latter case could correspond to certain instances of *imaginistic* creative thought, where someone deliberately introduces a series of generic constraints but their mind still wanders off to produce something that is less than perfectly off-task (one may think of a writer that puts a lot of effort in imagining unnecessary details—of course the writer can be unaware that they are veering off topic).²⁰

The effect of the different pressures imposed by automatic and deliberate constraints on imaginative episodes is that different episodes with different constraints will have differences in what I will call the *spread* of the episodes. The idea is that the more constrained an episode is, the less possible ways of development it will have, and that the less constrained it is, the more possible ways of development it will have. Effectively, the spread of an imaginistic episode is the range of possible states that can be the resulting terminal position of an internal ballistic event that is launched under some given automatic and deliberate constraints—the range of states that could have been the terminal position of the episode (see figure 2). We can talk also of a kind of *ballistic indeterminacy*—the content of imaginings is not fully fixed by our intentions alone. Consider the case of imagining a pink elephant. This can be done in many different ways; for example, a person might rely on some kind of propositional description of the target rather than a pictorial representation, and even then there might be many differences in the particular content of the imaginings. Keeping the manner of representation fixed, the influence of constraints could have still led to different outcomes because of ballistic effects. Spread represents how large the influence of these ballistic effects will be. It is important that both automatic and deliberate constraints *jointly* have an effect on spread.²¹

complex to deal with properly here, but it is important to notice that there may be a number of ways to go about this point.

²⁰ The effect of deliberate and automatic constraints is supposed to be a general component of the dynamics of mental states in general, not just of the dynamics of imaginistic episodes (Christoff et al. (2016) introduce the distinction in this general sense). So we can generalize: rumination *in general* (imaginistic or not) exhibits high automatic constraints and low deliberate constraints, and some instances of creative thought *in general* (imaginistic or not) exhibits low automatic constraints and high deliberate constraints.

²¹ Figure 2 represents them as opposing vectors, but this is not the intended interpretation: spread is meant to be a function of the constraints and the ‘root’ vector.

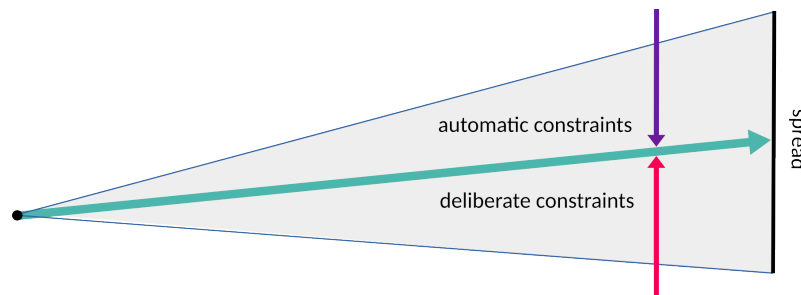


Figure 2: A mental episode's spread is a function of the starting position and automatic and deliberate constraints

The introduction of spread and constraints to the model allows us to further discriminate between imaginistic episodes. For example, we can now discriminate between instances of daydreaming and imaginistic rumination: even though both are typically off-task processes, the kind of constraints that are characteristic of them and their spread is notably different: rumination has significantly less spread because of the strong influence of automatic constraints (an observation also made by Christoff et al. (2016)). However, because of the low spread, imaginistic rumination can present the dynamic characteristics of stable mental processes, despite it being off-task. A ruminating person persists in engaging in imaginary episodes with repeated contents or low variance, which may even fall under the threshold for significance. The low spread of these cases might also increase the requirements to engage in imaginistic episodes with different profiles (one could say that because of the low spread, the processes that contain these mental episodes lose *momentum*).

In any case, the spread of imaginistic episodes in this model is a complex function of the constraints and the starting position. We have already seen some of the ways in which these interact (for example, increasing the automatic constraints seems to narrow the spread). Deliberate constraints can either increase or decrease the spread of an imaginistic episode, so there is no linear correlation. Decreasing both automatic and deliberate constraints, on the other hand, would plausibly increase the spread of the episode, up to a certain point.

3.4 The ballistics of complex imaginings

In practice, mental episodes are not atomic, but complex sequences of smaller episodes. This goes back to the point about granularity we raised already. Because of cognitive control, imagining a pink elephant could actually consist on a series of modulated passes at forming a mental image or mental description of a pink elephant. This is specially likely if we also want our imaginary target to satisfy certain features (a certain pose, for example). If we succeed, we could say that we have guided our imagination towards the task-goal, and that will have a certain trajectory (roughly, it will end in a terminal position that is relatively high

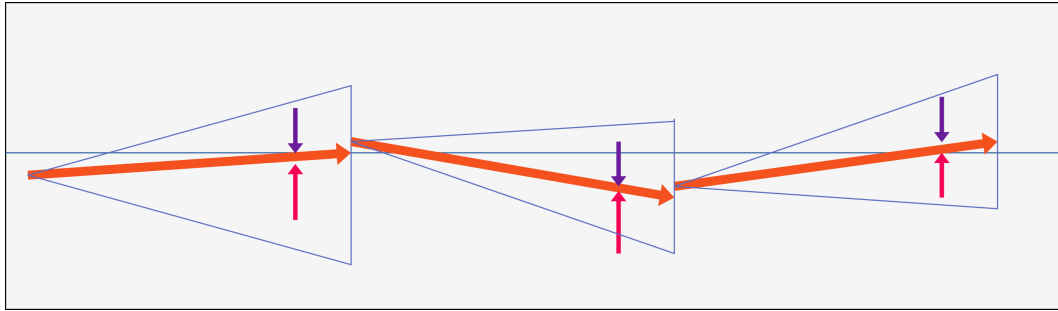


Figure 3: A mental episode can be decomposed into a sequence of mental episodes with their own ballistic trajectories.

in task-relevance). But if we break the episode in the steps, the path can look way more complicated, with task relevance decreasing and increasing at different moments. The overall trajectory is a summation of its component parts. In fact, in the model the overall trajectory can be represented as the literal sum of the vectors that describe the component episodes (see figure 3).

This last observation also suggests a different way to understand how constraints operate on imaginistic episodes. In the model as it is, both automatic and deliberate constraints seem to work on the external ballistics of mental episodes at the same time. We can see mental episodes as modulated at the same time by automatic and deliberate constraints. We could, however, hypothesize that at least some times deliberate constraints act on mental episodes at the stage of internal ballistics, with automatic constraints acting on mental episodes as they develop in their external ballistic stage. In fact, we can take this further and suppose that for every case of a process that is seen as modulated by deliberate constraints in the external ballistic stage, we can find a series of processes where deliberate constraints are introduced at the internal ballistic stage only (call this the *Deliberate Modulation Reduction* thesis). Langland-Hassan (2016, 2020) proposes a similar model where the initial content of imaginary episodes is intentional but the ulterior development of the episodes is determined by lateral constraints that are not applied intentionally. These models seem to correspond with a relatively strong version of mental ballistics. But what the *Deliberate Modulation Reduction* thesis suggests is that in effect there is no practical difference between the possible outcomes of a mechanism that allows for deliberate modulation of the external ballistics and one where there is no such modulation; and this means that even a strongly Strawsonian ballistic mechanism can be under some kind of agential control. The only requisites are (a) that internal ballistics can be under deliberate control, which Strawson accepts, and (b) that ballistic processes can be interrupted, which is plausible.²²

²² Irving (2021) suggests that agential guidance is at least in part the disposition to correct for errors. One can have this disposition without it being necessarily manifested, so it is not necessary for ballistic processes to be actually interrupted for them to be under guidance. Thus, against

It can be compelling to see the mechanism through which constraints are imposed on imaginings as some kind of dual process, in which automatic and deliberate constraints are handled by two relatively independent systems, as an instance of a dual process architecture.²³ In light of this thought, it can be interesting to briefly examine Stuart's (2021) proposal, who offers a dual process of the imagination. In this model, we can distinguish between instances of a general capacity to imagine that are effortless and automatic (what he calls imagination₁, intended as an instance of System 1 mechanisms), and others that are controlled, effortful and conscious (imagination₂, an instance of System 2 mechanisms). Stuart characterizes the former as liable to be over-constrained by previous experience and background knowledge, whereas the latter is liable to be under-constrained because it can bypass them (cf. pp. 1339-1341). This reflects our earlier observations concerning the interaction between constraints and the spread of imaginistic episodes.

While Stuart considers cases of imagination₁ episodes following imagination₂ episodes and vice versa, he takes these episodes as entirely produced by either system. I find it more plausible that, if we are going to distinguish between System 1 and System 2 mechanisms as involved in the development of imaginistic episodes, we should place them as contributing cooperatively. Indeed, we must distinguish between deliberate and automatic internal ballistics, and also between deliberate and automatic external ballistics. This can lead to different descriptions of imaginistic episodes. Consider Stuart's description of a case where someone mentions a purple elephant and we automatically form a mental image of it even if we could try to resist it. This is an instance of imagination₁ in Stuart's model. In the present model, it arises spontaneously and launches a process that is mostly sensitive to automatic constraints. The differences between the models become more apparent in cases where the overall imagining task is more complex. Stuart uses the case of imagining how a chain of uniformly distributed mass will behave when draped over a triangular frictionless prism. In Stuart's model, when someone raises the question, an imagination₁ episode is launched, and if that fails, imagination₂ kicks in. Stuart suggests that the role of imagination₂ in these cases is catalytic: iteratively, 'imagination₂ sets things up, imagination₁ evolves the system' (1339). What happens according to the ballistic model is that an imaginistic episode is deliberately launched with the imposition of certain deliberate constraints, and this episode then develops (as part of its external ballistic trajectory) under the effects of those constraints plus any relevant salient automatic constraints. In fact, the development of the content of the episodes could be either deliberately modulated or ballistic with deliberate interventions, as we discussed above. So in this

Strawson, Irving argues that mental ballistics does not preclude guidance, because even ballistic mental activity can be monitored and interrupted. A similar point is made by Levy (2019): even if there is a ballistic component to the operation of the mind, this is also subject to the kind of control over our actions that is manifested in our capacity to simply do something else. See also Bruin et al. (2015).

²³ See Evans (2008) and Evans & Stanovich (2013).

model, System 1 and System 2 can operate collaboratively in the course of the same episodes.²⁴ This vindicates more naturally, I think, the idea that these sub-tasks contribute to the overall task of imagining a given target. As we already described, the overall structure of imaginings is articulated by the occurrence of ballistic events.²⁵

4 The ballistic model and intentionalism

Now that we have a better picture of the dynamics of the imagination, we can return to the issue of intentionalism. As I mentioned before, this has independent interest, but it will also serve as an application and testbed for the ballistic model (this should address, at least partially, the concern that the ballistic model is a mere redescription of well understood phenomena).

To refresh our memory: the intentionalist thesis is the claim that ‘your imaginings are about whatever you intend them to be about’ (Munro & Strohminger, 2021, p. 11848). According to this thesis, to give a simple example, when we intend to imagine our friend coming to play games with us, we should be reasonably sure that our imaginings are about our friend and not someone else. The case for the thesis is strengthened if we distinguish between being about something and being true about something. Clearly, one can imagine a friend wanting to talk about some personal matter rather than playing games, but that may not be true of them—because of their character, they may never be willing to discuss personal matters, for example. Nevertheless, that wouldn’t prevent our thoughts to be about them.

This line of argument is taken to the limit when we consider whether we can imagine impossibilities. Can I imagine a situation where $2 + 2 = 6$? Suppose that I try to imagine this and that I do manage to imagine some situation; for example, a situation where the sum function is defined in such a way that given those inputs it gives that result and everything else remains the same (as in Baron et al., 2017). Now, ask: is this imagining about the numbers 2 and 6, and the sum function? Certainly, I intended them to be. However, my imagining is false about them in that it presents them in a situation that could not hold for them. In line with the argument in favor of intentionalism we sketched above, that shouldn’t be a problem. And yet, one may not be convinced. By changing the properties of the

²⁴ A kind of case that Stuart’s model seems unable to model is the case of sequences of spontaneous imaginistic episodes with absence of deliberate constraints. Stuart in fact characterizes imagination₂ episodes, in contradistinction to imagination₁ episodes, as potentially complex (as having ‘a beginning, end, and steps in between’, p. 1337). But this restriction is unnecessary, and it is probably better to focus on the differences in types of control and constraints.

²⁵ So far I haven’t discussed the role of terminal ballistics. Briefly, terminal ballistics involves the adoption of a new mental state, which may then trigger either directly or indirectly further mental episodes. We reach terminal positions either by expenditure of the mental resources invested in the task, or by interruption of the task, in which case the intermediate product of the mental process may or not remain in working memory.

things we intended to imagine we may have changed the subject. The point isn't that we are unable to imagine the impossible, although some people have argued along these lines (cf. Williamson, 2007), but whether *when* we do so our imaginings are about what we intended to imagine.²⁶

A popular response against this kind of worry is to appeal to the idea that part of the content of our imaginings is assigned, and that assigned content is under our control. When we imagine a situation, we simply stipulate that certain parts of our imaginings have certain properties; we do not need to discover, 'telescopically' as it were, the properties of our imaginings (Berto & Schoonen, 2018; cf. 2010, 2016). This assigned content is supposed to contrast with the qualitative content that imaginings have, the 'picture' that appears. This suggestion needs to be tweaked a bit. Munro & Strohminger (2021) suggest that the content of imaginings has *default* assigned content, which they use to explain how relatively automatic imaginings are about the things which they seem to be about. In these cases, it does not seem as if what our imaginings are about is under our control. What our imaginings are about depends on our background mental state. Munro & Strohminger argue that this means that Intentionalism cannot be correct, because our background mental state in turn depends on the causal history of our mental imagery, and this can be in conflict with our intentions.

We can examine the issue in light of our model of the ballistic structure of imaginistic episodes. At what point in their ballistic trajectories should we say that our imaginings have a determinate content? The assigned-content story suggests that imaginings have their assigned content from their inception. When we try to imagine that our friend will come, we have already decided that part of my imagining will represent my friend—the content of our imagining already contains the label 'my friend', but we still need to fill in the details. I think there are reasons to reexamine this suggestion. First, it is not obvious why we should expect assigned content to be immune to revision during the development of the imaginistic episodes. Second, it is not clear that the assignment shouldn't work as a constraint on the development of the imagining rather than as part of the content.

The first worry is less pressing in the case of short or automatic imaginings, simply because there doesn't seem to be much time for assigned content to shift. But we should be more worried about this possibility when we consider complex episodes. At any rate, any deliberate modulation of our imaginings has the potential to change the assigned content of our imaginings, and it seems that it would

²⁶ One reason to think that these things come apart is that there may not be a reason to think that when we try to imagine an impossibility and appear to succeed this is due to our having imagined a possibility instead. In other words: we may fail to imagine the impossibility we intended to imagine by imagining some other impossibility. The position is not vulnerable to Kung's (2016) argument against Kripkean error theory. If the position is viable (which I will not try to argue for here), it shows that even anti-Humean views (in Berto & Schoonen (2018) sense, where 'anti-Humeanism' amounts to a rejection of the idea that we cannot imagine impossibilities) cannot rule out error theories about the imaginability of impossibilities.

require some monitoring to check that the assignments remain consistent at all times. This is not what seems to happen in all cases.

The second worry pushes against the idea that assignments are part of the content of imaginings in the first place. When I imagine a rock falling (in ordinary contexts), my imagining is constrained by background knowledge about the behaviour of rocks when gravity is present. These constraints are not, however, part of the content of my imaginings. I can imagine something that obeys a constraint without imagining the constraint as such.²⁷ So the issue is that the intention to imagine X can serve as a constraint for one's attempt at imagining X without it being part of the content of the imagining that it is of X. The intentionalist could still raise the issue that in the case that we are considering here it would be strange to say that an imagining could obey the constraint that it should be about some x without being about x. Would we say that my imagining of my friend would obey the constraint that it is about my friend without being about my friend? The intentionalist suggestion is that the intention to imagine my friend constrains imaginings *by assigning content*. The proposal is appealing, specially if we combine it with a more dynamic picture of the process. If we plug it into the ballistic machinery, we can say: one has intended to imagine X, *pre-assigned* X to (part of) the developing imaginary content, and let the imagining run as lateral constraints (for example, Kind's reality and change constraints) deal with accommodating X into the development of the imagining. This could explain how the content-constraints are applied in a way that is relevant to the task (for example, when I pre-assign a reference to my sister, my imagining could be constrained by the ways in which I know my sister, *and not someone else*, would behave in the situations I imagine).²⁸

This kind of conciliation between intentionalism and the ballistic model still isn't entirely satisfactory. It still prevents the kind of revision that could naturally occur because of the ballistic indeterminacy of imaginings, in response to perceived errors in the development of imaginings.

There is, however, another way to think that so-called assigned content is not actually part of the content of imaginings. When we launch an imaginistic episode, we specify that we will use it in reference to a set of things that we intend it to be about. This can remain in memory as our imagining develops either automatically or in a way that is deliberately modulated—in this model, what develops is purely the qualitative content. When the episode reaches its terminal position, it is given as an input to a mechanism that assesses the product of the imaginistic episode, forming judgments that are relevant to the relevant ongoing task. It is at this point that information about assignments is retrieved and applied to the imaginary

²⁷ Cf. Berto (2017), p. 1292.

²⁸ We could make a distinction between *catalytic* and *guiding* constraints as follows: a catalytic constraint fixes the starting point of a mental episode, and a guiding constraint contributes to determining how the episode draws a trajectory to its terminal position. My intention to imagine my sister is a catalytic constraint, and the reality and change constraints as applied in this task are guiding constraints.

contents, as judgments are formed about them. Indeed, in some cases we should be able to refuse to assign labels to the content of our imagination when we find that these contents do not sufficiently match our expectations. I say that I have imagined my friend because the qualitative content of my imagining resembles my expectations of how my friend should appear; I refuse to say it when it doesn't. These expectations need not match my friend's appearance very strictly, and in fact my judgments about the content of my imaginings can be contested later either by others who are assessing the truthfulness of the judgments I may have expressed based on my imaginings or by myself when I reevaluate the judgments I formed on that basis. In other words, if there is assignment going on at all, it takes place as part of the terminal ballistics, not as part of the internal ballistics—that the content of an imagining is about X could be assigned after the fact, or *post-assigned*. In this picture, what our imaginings are about is what we take our imaginings to be about in a given context, not an intrinsic property of the content of our imaginings.²⁹ This suggests a general explanation of why the content of imaginings is not fully under our control: this is simply due to the fact that not every aspect of the relevant context where we assess our imaginings is under our control.

It may be objected that it doesn't make sense to say that the content of our imaginings is accurate or inaccurate about something if our imaginings are not about it.³⁰ However, in general a representation about X can be accurate/inaccurate of Y when X and Y are not the same, as parts of its content can be true or false about Y. Take a description of someone's struggles—it is about them, but it can also be partially true or false about someone in a similar situation. In the same way, an imagining can be accurate or inaccurate about something that it is not about, just by providing a representation of something that is partially true or false about it. So it can happen that when we intend to imagine something, we imagine something else that is partially true about what we intended to imagine. One option here is to weaken the aboutness requirement to partial truth: an imagining would be about X iff when we intend to imagine X, we imagine some Y that is partially true about X in an aspect that is relevant (and perhaps sufficient) for the satisfaction of the ongoing imaginistic task (this covers the case where when we intent to imagine X, we do imagine X, since X is more than just partially true about X).

We have sketched two possibilities for imaginings to come to be about what they are about: one is that this happens as part of the internal ballistics of imagining, via pre-assignments or by keeping the intended topic of the imagining in memory for later use in judgment, and the other is that this happens as part of the external ballistics of imagining, via post-assignments or through judgments that

²⁹ I think this suggests a 'Rylean' view of the aboutness of imaginings. In this view, there is no state of imagining such that it is about something or other—aboutness is not an intrinsic property of the content. Ryle (1949, ch. viii) himself goes further: there are imaginings but there is no content of the imaginings. *In passim*, it is worth mentioning that Ryle argues that one cannot fail to know what one fancies, and correspondingly seems to endorse a form of intentionalism (ibid, 241–243).

³⁰ I thank a reviewer for raising the concern.

interpret the content of imaginings in view of ongoing tasks. These possibilities are not mutually exclusive. In fact, a system that combines them would be flexible, and that is appealing in a general model of human imagination, which needs to account for capacity of the imagination to serve a broad range of functions. It could be that imagining relies on internal ballistics as a default way to determine the topic of imaginings (this is one way to take Munro & Strohminger's (2021) suggestion about default assignments), supplemented by a secondary process that is able to revise content as needed, correcting for detected errors and modulating the trajectory of the relevant mental processes (remember our previous observations about the possibility of taking the imagination as a dual process). It then turns out that abandoning intentionalism and adopting the ballistic picture in fact provides a better account of how we can have control of the products of our imagination.

5 Conclusion

In this paper, I have revised and extended Strawson's use of the ballistic metaphor to deal with mental phenomena, with a special focus on the use of the imagination. I hope to have shown that certain ways to think about mental ballistics are compelling. While more work is necessary to make the idea more precise, taking a hint from projectile ballistics actually offers an interesting model of mental dynamics, which I think has the potential to serve as a framework for describing in a more uniform way a wide range of phenomena, as well as serve as an exploratory model. In terms of applications, I have shown how the ballistic model is useful when discussing the issue of intentionalism, the thesis that we are in control of what our imaginings are about, and I have argued that from that perspective there are compelling reasons to think that intentionalism is false (or at least, not the whole story). The ballistic model of mental dynamics I introduced should be useful to think about a broader range of mental phenomena. In the case of the imagination, for example, I believe it can also be used to deal with the issue of imaginary resistance (resistance could be treated as a kind of ballistic event due to the influence of certain constraints). I leave that for future work.

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