Intelligence Socialism[1]

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Forthcoming in *Oxford Studies in Philosophy of Mind*

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From artistic performances in the visual arts and in music to motor control in gymnastics, from tool use to chess, from language to scientific and math skills, humans excel in a variety of skills. No other species is capable of excellence in so many disparate domains. The versatility of human skills is quite remarkable.

It is natural to expect for a theory of intelligence to be informed by a theory of skills and skillfulness—i.e., on the plausible assumption that skillful behavior is a visible manifestation of intelligence, it is natural to expect that we can learn about what makes us distinctly intelligent, both individually and as a species, by looking at the sort of tasks at which we excel and by studying how we can reach this sort of excellence.

More controversial is the question as to which kind of skills *in particular* we should study in order to theorize about intelligence. In this article, I introduce and discuss two opposite views about the relation between skills and intelligence. According to the first view, a particular kind of skills—i.e., theoretical or intellectual skills—have a privileged connection to intelligence, in the sense that their acquisition and exercise especially requires, manifests, and develops intelligence. I call this view '**Intelligence Elitism**'—'elitism' for short. According to elitism, there is a big divide among skills when it comes to intelligence, and the divide tracks the

[1] I am grateful for comments to the audiences at Utah University and at Stanford, and in particular to Gabe Greenberg, Krim Delko, Spencer Ivy, Antonia Peacocke, Wendy Sankin, Krista Lawlor, and Michael Bratman.

distinction between theoretical or intellectual skills—such as math or chess—and practical and embodied skills—such as carpentry, tool use, or sport skills.

Elitism is well-represented in psychology and in psychometrics. Arguably, it has a long pedigree in philosophy too—though explicit arguments for it are hard to come by. The opposite view is **Intelligence Socialism**—'socialism' for short. According to socialism, intelligence behavior is everywhere skilled behavior is. On this view, there is no principled difference in intelligence that tracks the divide between theoretical or intellectual skills and practical and embodied skills. Any skill from so-called 'theoretical' skills, such as math and scientific skills, to 'practical' skills such as carpentry, embroidery, or tool use, from 'intellectual' skills such as chess or musical composition, to 'embodied' skills such as motor and athletic skills, has equal right to be deemed intelligent.

The primary goal of this article is to bring to the fore, for the first time in the philosophical literature, the controversy between elitism and socialism, to sharpen it, and to highlight its significance. At the same time, I also aim at laying the foundations for undermining the sovereignty of elitism by mounting an inductive argument on behalf of socialism.

My argument will be in two parts. I defend the general claim that, on a plausible behavioral understanding of intelligence, every kind of skillful behavior, simply *qua* skillful, counts as intelligent. Then I go on to isolate the best set of arguments for the further elitist claim that, on a thicker, non-behavioral, understanding of intelligence, there is a difference in intelligence that tracks the divide between theoretical or intellectual skills, on one hand, and practical and embodied skills, on the other. I suggest that these arguments rest on shaky empirical and philosophical grounds. While I will not be able to foreclose all arguments that one might envisage on behalf of elitism, I hope to discuss the most interesting and challenging ones, and in this way to shift the burden of proof on the advocates of elitism.

I conclude by comparing my preferred form of socialism to other forms of socialism. While elitism has generally found little opposition in philosophical quarters, some opposition has come from anti-cognitivists about skills. Indeed, as I will argue, Ryle and Dreyfus were both socialists and their socialism was predicated on their anti-cognitivism. I will suggest, instead, that the case for socialism does not need to compromise on the cognitive nature of skills and intelligence.

In §1, I provide evidence that elitism is pervasive in psychometrics and that it has a long pedigree in philosophy too. In §2, I spell out elitism and socialism. In §3, I explain why the controversy matters. In §4, I provide a first argument to the effect that every skillful behavior is intelligent. This first argument assumes a psychologically thin, behavioral, notion of intelligence. It therefore raises the question whether socialism can be upheld on a thicker conception of intelligence that makes substantial commitments on the cognitive structures involved in intelligent behavior. In §5, I discuss several arguments on behalf of elitism that are predicated on a thicker conception of intelligence, and I show them all wanting. In §6, I discuss an anthropocentric argument for elitism, according to which skills that humans only possess are especially intelligent and I highlight its flaws. In §7, I end by comparing socialisms.

1. Elitism in the wild

1.1. Elitism in Psychometrics

Since its dawn, the history of psychometrics has been a history of elitism. Binet and Simon (1916)'s first tests of intelligence effectively only tested verbal, logical and mathematical skills, and so did every subsequent edition of the Stanford Binet intelligence scale based on it. Weschler scales were put forward as an alternative to the Stanford-Binet intelligence scale but effectively were based on the same assumptions—i.e., that verbal skills as well as logical skills, including those tested by picture completion tests, were the main indicators of general intelligence. Tests for so called fluid intelligence (Cattell 1987, Horn 1994) look at puzzle solving skills whereas tests for crystallized intelligence test rate of knowledge acquisition (e.g., KAIT, Kaufman and Kaufman 1993). No drawing tests or tests for manual dexterity were ever included in any of these tests, nor were any motor coordination tests. All these tests are often accompanied by definitions of intelligence that more or less explicitly betray their underlying elitism. Intelligence is sometimes declared to reside in analytical and verbal skills. To this day, Edwin Boring's (1923) dictum "Intelligence is what the tests test" constitutes a popular slogan in the psychometric literature.

This tradition of psychometrics has been criticized by many quarters. However, these critiques have often gone in the direction of merely extending the set of skills that are supposedly core for intelligence. For example, Sternberg (1997:399) suggests that standard intelligence tests leave out 'practical intelligence', to be measured by measuring 'practical skills'. But by 'practical skills', Sternberg really only means the ability to solve everyday problems—to include organizational skills, managerial skills, or social skills. So while Sternberg enlarges the range of skills that are relevant for the study of intelligence, his work on intelligence neglects a variety of skills—such as embodied skills such as dancing and athletic skills, as well as manual skills.

Gardner (1983, 1993) is famous for having proposed a theory that contemplates the existence of seven distinct intelligences—linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intrapersonal sense of self, and interpersonal—thereby considerably enlarging the scope of traditional psychological theories of intelligence. His theory of multiple intelligence is motivated by a rejection of elitism. In many quarters of psychology, psychometrics, and education studies, however, Gardner's theory has been quickly dismissed as tapping not so much intelligence but "aptitude" or "motor skills"—both deemed outside of the scope of intelligence (e.g., Gottfredson 1998:26; Klein 1997; Waterhouse 2006; Blumenfeld-Jones 2009).

This reception of Gardner's theory is indicative of the still prevailing elitism in psychometrics. Elitism also transpires in the conception of those tests measuring practical and embodied skills. In the motor sciences, tests to assess motor performances and coordination are not thought of as intelligence tests but rather as tests for 'physical fitness' (e.g., Australian Sports Commission, 1994; President's Council on Physical Fitness and Sports, 2001). While some have come up with similar tests for manual dexterity, by and large these tests are used for diagnostics of motor abnormalities rather than as intelligence tests. Likewise in the musical and artistic domain, tests for excellence have been proposed but their predictive validity remains well below those of IQ tests (Plucker & Renzulli, 1999; Gagne', 2005).

1.2 Elitism in philosophy

Elitism has a long pedigree in philosophy too, though explicit arguments for it are hard to come by. As a representative example, consider Aristotle in the Posterior Analytics, defining *quick wit* (*ankinoia*) "as the faculty of hitting upon the middle term instantaneously" (*Post. An. Book* I:34). Here, intelligence is defined in terms of a *theoretical* ability—the ability to reason syllogistically. For an example of modern elitism, in his *Pensées*, Pascal (1852, 1 §2) suggested that there are exactly two kinds of intellect—the precise intellect and the mathematical intellect. Both intellects are thus understood in terms of theoretical reasoning: the former is the ability to "penetrate acutely into the conclusions of the premises"; the latter is "the capacity to comprehend a great number of premises without confusing them."

Explicit theorizations of elitism are perhaps less common in contemporary times, partly because, as others have noticed, philosophers of intelligence have by and large shine away from providing substantive theories of intelligence (White, 2002, 78; Fridland, 2015; Coelho Mollo, 2022). However, elitist definitions of intelligence in terms of linguistic competence modeled along Turing's (1950) test are often discussed in the philosophy of mind (e.g., Block 1981:11). Moreover, a plausible case can be made that elitism was one of the main targets of anti-cognitivists such as Ryle and Dreyfus.

In the *Concept of Mind*, Ryle targeted the view according to which "intellectual operations" are the "core of mental conducts", and according to which "all mental concepts are defined in terms of concepts of cognition." According to this view, that Ryle labeled 'intellectualist legend', "the primary exercise of the mind consists in finding answers to questions", or in a "special class of operations that constitute theorizing" and "the goal of these operations is the knowledge of true propositions and facts. Mathematics and the established natural sciences are the model accomplishments of human intellects" (Ryle 1949, 26).

Here, Ryle's main target was the classical elitist idea that theorizing behavior in physics or mathematics is the model of intelligent behavior. Ryle took on debunking this elitist picture. Ryle (e.g., 1949: 48) argues that every skillful behavior—that of "the boxer, the surgeon, the poet, and the salesman" alike—is intelligent and that all human actions, whether theoretical or practical, are operations of the mind, and as such they can all be performed either intelligently or stupidly.[2]

[2]Ryle went a bit further than socialism. Ryle (1974) thought that the general question "What is intelligence?" hardly makes any sense and argued that there are as many kinds of intelligence as there are spheres of human activity—Ryle was a multiple intelligence theorist *ante litteram*.

So, Ryle was definitely a socialist. Dreyfus (e.g., 2002) was one too. He also opposed the idea that intelligence is exclusive to rational reflection. Importing the idea of absorbed coping from Merleau Ponty, Dreyfus argued that in such paradigmatically intelligent behavior, an agent does not (even) need a mental representation of one's goal. According to Dreyfus, it is wrong to recognize intelligence only in activities involving reflection and representation—hence his slogan 'intelligence without cognition'. Dreyfus' fight against cognitivism about intelligence can be understood as a fight against elitism.

Though elitism has been attacked by two prominent anti-cognitivists about skills, it is still well represented in the philosophy of education. For example, Hand (2007, 41) argues that the quality of mind picked out by the term 'intelligence' is an aptitude for theorizing and that classifying non-theoretical activities as intelligent unduly changes the subject matter (more on this in §7).

1.3 Elitism in popular culture.

The internet is replete with many general rankings of the most intelligent individuals. None includes outstanding athletes or artisans.[3] In these rankings, chess players, mathematicians and scientists are listed as stereotypical examples of intelligent individuals—more so than carpenters, embroiderers, farmers, and soccer players.

Elitism is also implicit in the ordinary choices of words to refer to embodied skills. For example, while it is ordinary to speak of 'manual skills', 'manual intelligence' is not nearly as common—other labels tend to be used instead, such as *manual dexterity*: indeed, a google search for "manual dexterity" returns 5.4 millions entries, "manual skills" returns about a million

[3] E.g., https://www.jagranjosh.com/general-knowledge/top-10-most-intelligent-people-on-earth-1477392275-1, https://learnonlineschool.info/top-10-most-intelligent-people-of-all-time/, https://financesonline.com/13-most-intelligent-people-in-the-history-of-the-world/

entries; a search for "manual intelligence" returns less than 80 thousands entries, while a google scholar search returns only 500 entries for "manual intelligence", against the 50 thousands entries for "manual skills" and the 90 thousands entries for "manual dexterity".

Finally, elitism underwrites striking patterns of inference about intelligence. Let us distinguish *attributive* uses of an adjective from its *predicative* uses. In an attributive use, "an X Y" does not necessarily entail that one is both X and Y. For example, "Mary is the main client" does not entail that Mary is both main and a client"—in "Mary is the main client,""main" is used only attributively and not predicatively. Now, people is generally much less inclined to accept inferences from "She is an intelligent footballer" to "She is intelligent", or from "She is a soccer genius" to "She is a genius" than they are to accept inference from "She is a math genius" to "She is a genius". That is to say, in phrases such as "an Intelligent X" or "an X genius," "intelligence" or "genius" tend to be used non-predicatively when X stands for embodied activities and predicatively when X stands for intellectual activities.

1.5 Opposite Trend in Machine Intelligence

While prevalent in psychometrics, it is worth noting that, in machine learning, elitism is widely questioned. One line of argumentation in these quarters rests on the observation that certain motor skills—such as holding an egg without breaking it—are much harder to program (e.g., Kim *et al* 2021) than intellectual skills such as chess. Indeed, the problem of programming such motor skills is, as of now, unsolved. This point is often also made together with the observation that animals and later humans have been evolving motor skills over millions of years and only recently—in the last 80000 years or so—have they acquired intellectual or theoretical skills (Gabora & Russon 2011). If so, motor activities came much earlier in the evolution of our species than intellectual skills. Since we had more time to refine them, and given that they prove much harder to program, the argument concludes that motor skills must rate higher in the hierarchy of intelligence than intellectual skills.[4]

This argument effectively replaces standard elitism (theoretical, intellectual > practical, embodied) with a different form of elitism—one that also posits a difference in intelligence across these domains but in the opposite direction (practical, embodied > theoretical, intellectual). I will bracket this argument in the following (though it will resurface in a slightly different form in §5.5), since my goal here is to oppose elitism in the form that it has standardly taken rather than to replace it with a different form of elitism.

2. Clarifying elitism and socialism

As a first pass, let strong elitism be the view that:

Strong Elitism: Only some kind of skillful behavior is intelligent.

As stated, elitism takes some kinds of skills to be the only repository of intelligence but is silent on *which* kind of skills these are. We might imagine a proponent of elitism to insist that, say, only soccer skills are the manifestation of intelligence, though this sort of elitism is unlikely to get a vast consensus (except, perhaps, in Italy or in Brazil). And of course, this is not the form that elitism has taken historically. Historically, elitism has been maintained for a particular privileged set of skills—theoretical, such as mathematical or scientific skills, or intellectual skills, such as chess.

A few preliminaries are in order. What is a skill? As a rule of thumb, by ‘skills’, I will

[4] I am grateful to Krim Delko here.

mean abilities that correspond to *areas of learned expertise*. In this technical sense of 'skills', very basic motor abilities such as moving one's thumb do not count as skills, since they do not correspond to areas of expertise. By contrast, soccer, math, gymnastics, painting, or chess all count as skills. So understood, skills allow for different stages of acquisition—novice, beginner, competent, proficient, and expert. Throughout, I will be comparing skilled agents across domains *at the highest level—i.e., at the expertise level*.

Every skill is practical *in a sense*, since every skill characteristically manifests in actions. The distinction between theoretical and practical skills concerns the kind of *goal* that skills have. Theoretical skills have *epistemic* goals—they aim at truth or knowledge. Practical skills do not have epistemic goals. So, philosophical, mathematical, or scientific skills count as theoretical since they aim at truth or knowledge. Soccer skills, chess skills, musical composition skills, in contrast, are practical since their goals—such as scoring goals, winning a game, or composing music—are not epistemic.

	Manifestations	Limbs/extremities	Aim at truth/knowledge
Theoretical skills	Mental actions (thinking)	✘	✔
Practical skills	Mental/bodily actions	Some do	✘

Intellectual skills	Mental actions (thinking)	✘	Some do
Embodied skills	Bodily actions	✔	✘ (mostly don't)

Table 1: Theoretical, Practical, Intellectual, and Embodied Skills

The distinction between intellectual and embodied skills is orthogonal to that between theoretical and practical skills. It does not concern the characteristic goal of the skill; rather, it concerns whether its exercise requires the use of limbs, extremities, and muscles. Embodied skills are those that require for their exercise the use of muscles—in particular that of striatic and skeleton muscles, or 'controllable muscles'. Their characteristic manifestations are *bodily actions*. Intellectual skills, by contrast, do not constitutively require the use of controllable muscles. Their characteristic manifestations are *mental actions*.[5] For example, chess is an intellectual skill since it can also be played mentally.

Thus, certain skills, such as chess, are practical since they do not have epistemic aims but also intellectual since they do not need muscle movements for their exercise (Table 1). Theoretical skills tend to be intellectual. However, there are exceptions. Under the current taxonomy, linguistic skills such as asserting count as theoretical in that they plausibly aim at truth or knowledge; however, such skills are embodied, since they need the use of muscles and extremities for their exercise. If this is correct, then there are embodied skills that have epistemic

[5] On a similar distinction, cf. A. Peacocke (2021).

goals. I will keep using 'theoretical' for any skills which have epistemic goals, whether or not they are embodied. So in this sense, 'theoretical' will be used to include linguistic embodied skills too. Moreover, I am taking elitism to concern theoretical skills as well as intellectual but practical skills such as chess. Thus, in the following, the divide that will concern us is between "theoretical *or* intellectual" skills on one hand, and "practical *and* embodied" skills on the other. The former category includes skills that characteristically manifest in mental actions as well as some embodied skills (such as linguistic skills). The latter only include skills that characteristically manifest in bodily actions and that do not have epistemic goals.

Given this understanding of the relevant categories, let strong elitism be the view that:

> **Strong Elitism*:** Only some kind of skillful behavior (that which exercises theoretical or intellectual skills) is intelligent.

Socialism, in its moderate form, denies strong elitism*:

> **Moderate Socialism:** *All* skillful behavior—whether it exercises theoretical or intellectual skills, or practical and embodied skills—is intelligent.

A more moderate form of elitism might allow that practical and embodied skills are intelligent too. It insists, however, that only some kind of skillful behavior, that which exercises theoretical and intellectual skills, is *especially* intelligent:

> **Moderate Elitism:** Only some kind of skillful behavior (that which exercises theoretical

or intellectual skills) is especially intelligent.

Strong socialism denies it:

> **Strong Socialism:** The distinction between theoretical or intellectual skills on one hand, and practical and embodied skills on the other, does not track a principled difference in intelligence.

A clarification concerning the qualification 'principled' in 'principled distinction' is in order: strong socialism might concede that certain kinds of skillful behavior are *as a matter of fact*—that is, for contingencies having to do with how those skills have been practiced, exercised, and taught—more intelligent. Their proponents contend that, *even so*, there is nothing *principled* about this difference. Thus, in both its moderate and strong forms, socialism is a claim about the level of intelligence that *can* in principle be manifested by practical and embodied skills, rather than a statement about the current and actual level of intelligence exercised in those domains.

A second observation is that socialism is not the same as the view that *any* intelligent behavior is skillful behavior. On the assumption that skillful behavior is learned, a socialist might allow for some intelligent behavior that is not learned, and so deny that every intelligent behavior is skillful. Socialism is also not committed to the multiple intelligences thesis. According to multiple intelligences theorists, there is no such thing as *general intelligence*—the only sort of intelligence that there is is domain-specific. By contrast, one might be a socialist by virtue of believing that there is general intelligence but that it is equally required, developed, manifested across the theoretical/intellectual and practical/embodied divide.

The final observation is that skills come into two *big clusters*—theoretical or intellectual skills on one hand, and practical and embodied skills on the other; each cluster involves many different skill domains. There might be differences in how difficult it is to acquire the skills within each domain. Each of these levels of difficulty might correspond to a difference in intelligence. For example, mathematical skills for first year college students are easier than those of a math graduate student, and being able to solve higher-than-n-sided Rubik's cubes is more difficult than solving n-sided Rubik's cubes.[6] Strong socialism is *not* the claim that each skill in each domain is as intelligent as any skill in that domain or as any skill in any other domain. Rather, it is the claim that there is no principled difference in intelligence that tracks the *particular* divide between theoretical or intellectual skills and practical and embodied skills.

3 Why the controversy matters

The controversy between elitism and socialism has direct consequences in the philosophy of education. People advocating elitism in the philosophy of education also advocate that education should prioritize, not only involve, theoretical and intellectual activities.[7] On the assumption that education has, among its main goals, that of developing intelligence, if theoretical activities were better at developing intelligence than practical and embodied activities, then it would be appropriate to think that theoretical activities ought to be prioritized in the curriculum.

There is also a more general argument suggesting that the controversy is of moral significance. Its first premise is that:

[6] Thanks to Gabe Greenberg here.
[7] For example, see Hand 2010.

Premise 1: Everything being equal, what is intelligent has more value than what is not.

According to Premise 1, intelligence is an added value (and lack of intelligence is a lack of *some* value). Of course, intelligence is not the *only* value, nor the most important one. Premise 1 only claims that, if two pieces of behavior differ only in their intelligence, and not in other dimensions (moral, aesthetics, etc), then this difference in intelligence between the two behaviors alone corresponds to a difference in value.

The next premise is:

Premise 2: Arbitrary distributions of unequal value are likely to promote unfairness.

By "*arbitrary*," I mean a distribution that does not actually track any real difference in value. This premise is hardly controversial. If in a population, some individuals are deemed more valuable than others, and if this unequal distribution does not track any real difference in value, then those individuals who are deemed more valuable are valued more than they should, and at any rate more than other equally deserving individuals. Thus, if arbitrary, distributions of unequal value are likely to promote unfairness.

Premise 3 describes elitism as the view that an unequal distribution of intelligence-value is appropriate:

Premise 3: Elitism recommends an unequal distribution of intelligence-value.

The conclusion follows that, if the distribution of value recommended by elitism is arbitrary—i.e., if it does not track any real difference in value—then it is likely to promote unfairness:

Conclusion: If arbitrary, elitism is likely to promote unfairness.

Resisting Premise 1 commits one to the claim that intelligence is not really something valuable, under any dimension. This seems hardly believable. If intelligence is normative even just in a minimal sense—i.e., thumbs up for what is intelligent, thumbs down for what is not intelligent—then there must be some value to intelligence and to the behavior that manifests it.

I already defended Premise 2. Premise 3 follows from the definition of elitism and from Premise 1. So Conclusion follows from some rather weak assumptions about intelligence, value, and elitism. Against elitism, socialism contends that the unequal distribution of value recommended by elitism is arbitrary—it does not correspond to any real difference in value. So, it does matter a great deal which of socialism versus elitism is right.

4. A Behavioral Argument for Moderate Socialism.

As Dretske (1993, 201) put it, intelligence can be thought of as something like *money*, as something most have in some quantity, or like *wealth*—as something possessed only by those who have more than the average amount of money. In this section, I mount an argument to the effect that every skillful behavior is intelligent in the *money sense*—i.e., that there is a thin sense of intelligence that attaches to every skilled action, whether theoretical or intellectual, or practical and embodied.

As I will understand it, the relevant 'thin' sense of intelligence is *behavioral*. Behavioral intelligence has some features that are widely agreed upon. For one thing, it is goal-directed. For example, when we say that a plant's root motion toward water sources or that its closing its leaves in response to perceived threats are intelligent, these ascriptions are understood relative to goals of fitness and reproduction. Likewise, agentively intelligent behavior is intelligent relative to goals—the goals of its agent. At least some of the goals are of an agent because they are (more or less explicitly) adopted by them—i.e., agents have goals that are not fully determined by the evolutionary goals of fitness and reproduction.

Whether agentive or not, intelligent behavior by S is *goal-directed*, and its goal fixes the standard of success for that behavior. Another feature of intelligent behavior is its *flexibility*—the ability to change appropriately in light of the different, novel or changing circumstances. Repetitive and automatic behavior such as the assembly line or parroting is at odds with intelligence. Likewise, the flexible behavior of an expert dancer is more intelligent than the repetitive and stereotyped waggle or round dance of honeybees. It is its open-endedness that makes the former intelligent, and the fixity of the latter that makes it not-so-intelligent.

Finally, it is plausible that some behavior is intelligent only if it *learns* from past experiences—i.e., if one makes the same mistake over and over again, then it would be legitimate to conclude that one's behavior is not intelligent. This discussion suggests that a behavior by S is intelligent if it is (i), (ii), and (iii):

(i) **goal-directed—**appropriate in light of goals S possesses.

(ii) **flexible—**changes appropriately in light of a variety of different, novel, and changed circumstances.

(iii) **adaptive—**changes appropriately in light of previous interactions with the world.

These three conditions of intelligent behavior nicely capture the practice of many cognitive scientists who talk of intelligence, as well as of those philosophers who have engaged with the topic (e.g., Dennett 1969, 1996; Dretske 1993; 1998, Legg and Hutter 2007, Hurley and Nudds 2006, Marcus 2020, Fridland 2015; Deacon 1997; Coelho Mollo 2022). There are other perks to this definition of intelligence. For one thing, it is not *species-specific*—it does not apply only to humans; it is not *origins-specific*—it applies to biological as well as artificial systems (Coelho Mollo 2022: §3); it also captures the normativity of intelligence—the fact that, everything else being equal, intelligence is a good thing and lack of intelligence is not a good thing.

Now, skillful behavior satisfies this behavioral definition of intelligence—i.e., it displays the same features of goal-directedness, flexibility, and adaptivity.

For one thing, skillfulness is goal-directed. Skills characteristically manifest in *actions*—abilities that do not characteristically manifest in actions like digesting or sweating are not skills. Compare, moreover, the clown who tumbles with the goal of amusing the audience, and the klutz who tumbles but with no goal. Only the former behavior is agentive and skillful. Its goals fix the standards of success for skillful behavior—e.g., jumping above a certain height is both the goal of a skilled high jumper as well as the success condition for their performances.

The idea that skillful behavior is flexible has a long history. It is a point Aristotle was fond of making about *technai*. As Charles (2001: 63) puts it, for Aristotle skilled craftsmen, “have the ability to devise new methods and new products: give him the wood, and he can tell you what can and cannot be done with it.” According to the Zhuangzi, “A good swimmer will get the knack of it in no time. And if a man can swim under water, he may never have seen a boat before and still he’ll know how to handle it!” (Zhuangzi 2013: 148). Ryle makes this point about the flexibility of skills as well, when he states "Take his example of the soldier exercising at scoring a bull's eye: 'Was it luck or was it skill?' If he has the skill, then he can get on or near the bull's eye again, even if the wind strengthens, the range alters and the target moves" (Ryle 1949: 45).

Indeed, the flexibility of skillful behavior arguably tells it apart from habitual behavior, such as the autopilot or the assembly line, as well as from instinctual behavior. Compare the beautiful instinctual wild song of zebra finches, which never changes (Fehér et al 2009), to the versatility of an opera singer. Flexibility is also a criterion for the folk concept of skillfulness—e.g., Alcaraz counts as more skilled in virtue of his remarkable flexibility to different surfaces (clay, grass, hand and carpets); Meryl Streep is more skilled in virtue of her flexibility to play a variety of acting roles.

Thus skillful behavior is both goal-directed and flexible. Is skillful behavior adaptive? For starters, recall that skills are areas of *learned* expertise. There are different ways of characterizing learnability. One promising way is in terms of *modal dependence*—a behavior is learned rather than innate if it exhibits a strong modal dependence on the environment, in the sense that it would not easily develop in a variety of different environments. The acquisition of skills is modally dependent on the environment, since it does depend on the resources made available by the environment—e.g., Incas' tool skills were shaped by the availability of stone, copper, and bronze, but not of iron (Romney 2021)—as well as on the social environment: on the availability of vertical or horizontal transmission (Hosfield 2009) and of verbal feedback (e.g., Morgan *et al*. 2015; e.g., Sullivan *et al.* 2008). Instinctual behavior is, instead, resilient: it develops across a variety of different environments (cf. Stich 1975; Ariew 2007).

Pointing out that skilled behavior is learned goes only some way towards demonstrating its adaptivity, since one might wonder whether a skilled agent is capable of adaptive behavior even *after* becoming an expert. Work in the psychology of expertise suggests that that is exactly the case. Ericsson (et al 2003, 2006) has studied the role of practice in expert improvements and offers evidence that experts can continuously improve their performances provided they keep engaging in *deliberate practice*. In other words, experts can keep improving if they keep practicing with the intention of fixing mistakes and learning from them—dull repetition of sequences will not do for improvement. Arguably, moreover, recent evidence from the psychology of sports suggests that it is not just through deliberate practice but also through competitive performances that the experts continuously adapt. Toner and Moran (2015) provide evidence that athletes can improve substantially through competitive performances, especially when they are experimenting new techniques (see also Toner et al 2015). So, for example, tennis players like Federer who switched to a larger racket or golfers players who start utilizing a new swing are observed to fully master their new tool only after facing several competitive performances.

In conclusion, the behavioral hallmarks of intelligence—goal-directedness, flexibility, adaptivity—are also general features of skillful behavior. This concludes my first argument that skillful behavior *in general*—whether theoretical or practical, or intellectual and embodied—is intelligent.

5. Towards Strong Socialism

The first argument for the intelligence of all skillful behavior assumed a thin, behavioral, definition of intelligence. As such, it can be accepted by philosophers of all stripes, including behaviorists such as Ryle and non-cognitivists such as Dreyfus.

Precisely because it only invokes a behavioral definition of intelligence, one might wonder whether the argument establishes *enough*. Recall Blockheads: systems comprising giant look-up tables or tree structures that include all possible sensible behaviors given any possible input, in addition to a brute force string or tree search computational procedure to find the appropriate output for each input. These systems are arguably not intelligent (Block 1981); yet they might well satisfy the current behavioral definition of intelligence. Accordingly, one might worry that skillful behavior counting as intelligent in this thin behavioral sense does not suffice to show that it is *really* intelligent.[8]

So, the question arises whether socialism can be held on a thicker notion of intelligence—one that makes substantial commitments on the sort of cognitive structures plausibly involved in intelligent behavior. This question is methodologically difficult to tackle for several reasons. First, there does not exist at the moment any consensus among cognitive scientists and philosophers about what cognitive structures are required for intelligent behavior; secondly, given how pervasive elitism is, it cannot be ruled out that the identification of certain structures with cognition and intelligence might itself be due to an implicit elitist bias. For example, only recently have neurocognitive scientists started classifying the motor system among the cognitive systems (cf. Stanley and Krakauer 2013,2). Thirdly, elitists themselves hardly ever provide any explicit arguments for their view, as if it was obvious. Thus, the extant cognitive science and the philosophy of intelligence do not offer reliable guidance on how to address this question.

Bearing these methodological quibbles in mind, in the following, I am going to discuss several arguments that it is tempting to adduce in favor of elitism. Each invokes cognitive

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[8] I am however sympathetic to those who downplay the importance of such counterexamples (Dennett 1994) on the grounds that they are not even nomologically possible.

structures that are commonly thought to be involved in intelligent behavior in a thicker sense—i.e, thinking processes, executive functions, cognitive control and cognitive architecture, abstraction, and knowledge. For each of these, I argue either there is evidence that those cognitive structures are equally present across the theoretical/intellectual and practical/embodied divide; or there is reason to question whether they ought to be identified with higher forms of intelligence.

5.1 The argument from thinking

Intellectual skills constitutively manifest in mental actions of *thinking* (§2). Thus, it is tempting to argue that thinking plays more of a constitutive role in intellectual skills than in practical and embodied skills. If so, one might think "game over for the socialist."

Not too fast. The fact that practical and embodied skills manifest in bodily actions rather than mental activities does not mean that thinking does not play a constitutive role in them too. After all, thinking might play a constitutive role in the exercise of a skill even though it is not its characteristic manifestation—for example, if it were a necessary condition for its manifestation. To be sure, *theoretical* thinking—thinking about how things are, the sort of thinking aimed at truth or knowledge—cannot be plausibly taken to play the same role in practical and embodied skills as it does in theoretical or intellectual skills. However, theoretical thinking is not the only kind of thinking that there is, by philosophers' lights too. Philosophers have for long appealed to *practical thinking*—thinking about what to do, aimed at good actions—as a distinctive sort of thinking. In addition to practical and theoretical thinking, Aristotle (*Met*. Z.7, 1032b6-10) talks of a distinctively *productive* kind of thinking. 'Productive' thinking is thinking about *how to do things*—a kind of thinking that has a product as a goal and is the sort of thinking that the exercise of *technai* requires.[9] So, even if theoretical thinking is not constitutive of practical and embodied skills, we ought not conclude that *other* kinds of thinking, such as practical and productive thinking, do not play a constitutive role in practical and embodied skills.

Nonetheless, an argument is needed for why we should expect *any* thinking to enter constitutively in the exercise of practical and embodied skills. My goal next is to outline a novel argument to the conclusion that *some* thinking, or some cognitive process very much like it, is constitutive of any skilled performance.

A long tradition in philosophy takes thinking to be good cognitively because, among other things, it has the feature of '*productivity*' or, as I will call it, '*generativity'* (e.g., Fodor 1975; Fodor 2001, 233).[10] By 'generativity', I am referring to the capacity of producing an indefinite number of meaningful thoughts about a vast array of possible subject matter starting from a certain finite number of building blocks, or conceptual resources (Frege 1892). Not only is thinking generative in this sense. It is *the* generative cognitive process *par excellence*. Even the generativity of language is generally believed to be parasitic on the generativity of thought (e.g., Fodor and Lepore 1996).

Now, as noted in §3, skills quite generally are flexible. One aspect of skills' flexibility is that they are *generative*. A skill is *generative*, in the sense that a skill enables the expert to produce a potentially infinite number of different products of the same kind, out of a finite number of building blocks. For example, music builds a potentially infinite number of different songs out of a finite number of notes. Math builds a potentially infinite number of theorems out of a finite set of axioms. Dance builds a potentially infinite number of sequences of moves out of

[9] Pavese (2021b).

[10] Since I just used 'productive' as a particular kind of thinking—thinking about how to bring about a certain product, I will talk of 'generativity' to refer to the general productivity of thinking.

a basic set. Carpentry builds a potentially infinite set of wooden objects out of a basic set of tools and operations. Gymnastics and lifting build a potentially infinite set of routines out of a finite set of basic bodily movements. And so on and so forth.

Now, if generativity is the hallmark of thinking, the generativity of skills suggests that thinking, *or a cognitive process very much like it*, might equally characterize theoretical or intellectual skills as well as practical and embodied skills. Indeed, the argument that the generativity of skills is to be explained by the generativity of thinking is even stronger. It is widely thought that what explains the generativity of thinking is its recursivity (Hauser, Chomsky and Fitch 2002) and that the recursivity of thought is realized in its *hierarchical structure* (versus linear structure) (Hinzen 2012; Berwick & Chomsky 2016). A long tradition in philosophy takes thoughts themselves to be LF-trees (Higginbotham 1993; Larson and Ludlow 1993; King 2007). The hierarchical structure would explain the generativity of thought, since this sort of structure enables one to create an infinite number of thoughts by adding more branches to the tree out of a finite number of building blocks and given a set of rules (Martins, et al 2017).

But here is the thing: hierarchical structure is to be found in pretty much *every* skill, including practical and embodied skills: in musical skills (e.g., Lerdahl. & Jackendoff 1983; Patel 2003); in dancing skills (e.g., Charnavel 2016, 2019, 2023; Patel-Grosz et al 2022), in motor skills (Lashley 1951), lifting skills (e.g., Esipova 2022), in tool use as well as in food processing (Sterenly 2012) and more generally action planning (Fitch & Martins 2014). Here is a brief overview of three case studies: music, dance, and lifting.

The role of hierarchically structured mental representation in the computation of pitch is a common ground of a lot of research on musical skills. Via exposure to tonal music, musicians acquire highly structured representation of musical pitch. For example, a musical key such as

C-major is represented much more than simply a scale: C,D,E,F,G,A,B. Within this scale there is a hierarchy of importance, such that some pitch classes are perceived as more central or stable than others, with the first (C) being the most stable, followed by the fifth (G) and third (E) pitch class. Based on empirical research on the psychology and neuroscience of musical skills, Lerdahl (2001) provides an algebraic model for quantifying the tonal distance between any two musical chords in a sequence, yielding a value that incorporates the tripartite distances of pitch classes, chords and keys. This model also provides a method for deriving tree structures, such as that in Figure 1, which serves as a hypothesis for the perceived relations between chords. In this figure, a phrase from a musical composition is shown to be structured along a hierarchical pattern of tension and relaxation. Right-branching indicates an increase in tension and left-branching a decrease. The tree shows how local tensing and relaxing motions are embedded in larger scale ones. Work on musical skills suggests that like linguistic sequences, musical sequences are not resulting from the haphazard juxtaposition of basic elements. Instead, combinatorial principles operate at multiple levels, such as in the formation of chords, chord progressions, as well as keys in music (Lerdahl and Jackendoff 1983; Patel *et al* 1998; Patel 2003).

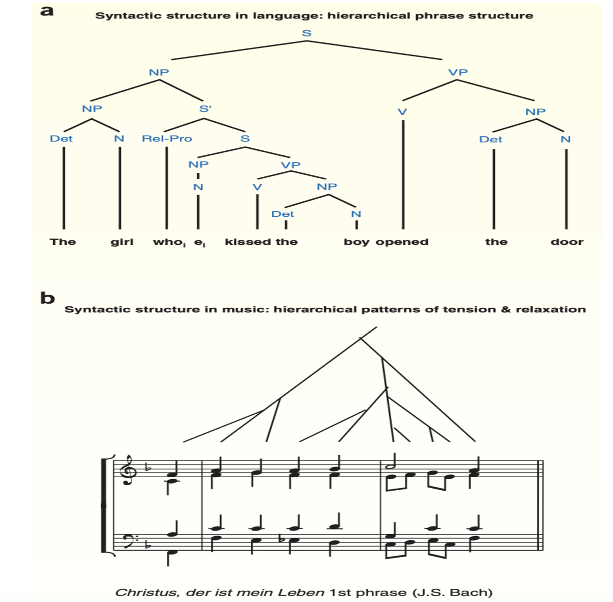

Figure 1: Hierarchy in Music (Jackendoff and Lerdahl 2006: 56)

Recent work on the grammar of dancing has similarly unveiled its hierarchical structure (Charnavel 2019). Like musical sequences, dancing sequences come with a *grouping structure*, which in the case of dancing has as its most basic components *continuous positions*. Movement is, accordingly, a sequence of continuous positions. Groups are themselves segmentations of movements into a set of continuous positions in the scenic space. Such grouping is subject to *well-formedness rules*—e.g., only contiguous positions can constitute a group and a dance as a whole constitutes a group. In addition, grouping is subject to *preference rules*. While the former only define formal conditions on grouping configurations, the latter state substantive conditions about what parameters within dance affect perceived grouping. Among the preference rules, there are *local* ones—which determines the boundaries of groups—and *global* ones—which determine larger-level grouping. For example, similarity is a local rule—according to which positions that resemble each other tend to be perceived as grouped together. By contrast, repetition and parallelism are global rules determining higher level grouping, according to which when a series of changes (of direction, speed, etc) is repeated with respect to some (parallelism) or all (repetition) parameters, it constitutes a group. Local and global rules determine a hierarchical structure—local rules indicate the lowest levels of grouping, while the global rules determine the higher levels of grouping; principles of parallelism, symmetry and repetition apply recursively, and yield several hierarchical levels of grouping (Figure 2).

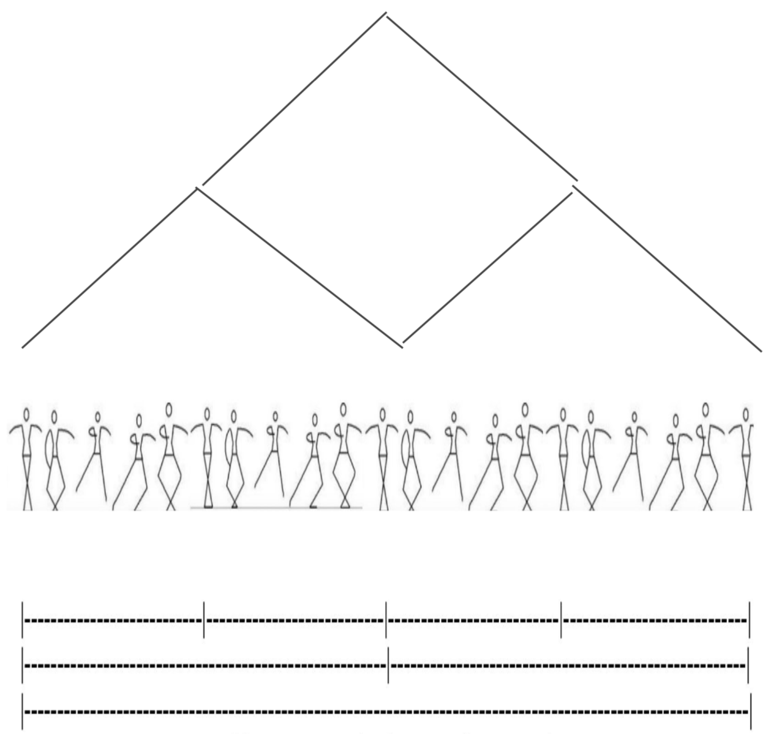

Figure 2: Recursivity in dance (Charnavel 2016: 30)

The non-linearized hierarchical structure of motor skills such as lifting has been studied by Esipova (2023). Figure 3 represents its concentric phase in the repetition of a deadlift—where the eccentric phase is the reversing of the movement. Though the deadlift requires several repetitions, the repetitions themselves are hierarchical, and their nodes are movements such as knee extension and hip extension. Variations of deadlift vary these nodes—such as the stiff-leg deadlift and the Romanian deadlift, that eliminate the knee extension/flexion component. New exercises can be created as innovative variations of existing exercises. There also exist modification patterns that, once learnt, can be productively applied to new cases. For example, one productive modification is the "1.5-rep" modification, whereby the lifter goes through a certain portion of the full routine twice within a single rep to increase time under tension for the target muscle(s) in that portion of the full routine. Another example of productive modification is the "paused rep" modification, where we simply introduce a "pause" into the compositional structure—i.e., an isometric contraction of the target muscle(s), which will also target a specific point of the routine. Repetitions themselves are embedded into large structures (Esipova 2023:§4), such as warm-up sets, exercise sessions, training sessions, training microcycle (weekly), training mesocycle (e.g., several weeks), training macrocycle (over years).

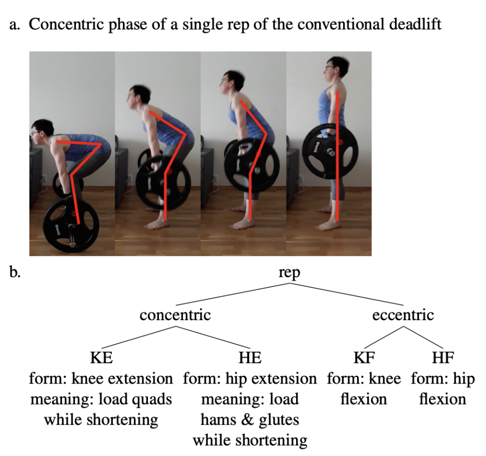

Figure 3: Hierarchy in a Deadlift (Esipova 2023: 888)

Indeed, any complex action—whether embodied or intellectual—can be thought of as having a hierarchical structure. For example, Figure 4 shows how to think of the complex action of *making coffee* hierarchically as a tree.[11] If so, the presence of hierarchical structure cuts across the theoretical-intellectual/practical-embodied divide.

Thus, just like that of thinking, the generativity of skills might be explained by their hierarchical structure. Moreover, if the signature of thinking is generativity and the generativity of thinking is explained by its hierarchical structure, then if we have an argument that *every* kind of skill—whether theoretical or intellectual, or practical and embodied—in virtue of its hierarchical structure, does bear the signature of thinking, or least of some cognitive process very much like thinking *vis a vis* its generativity.

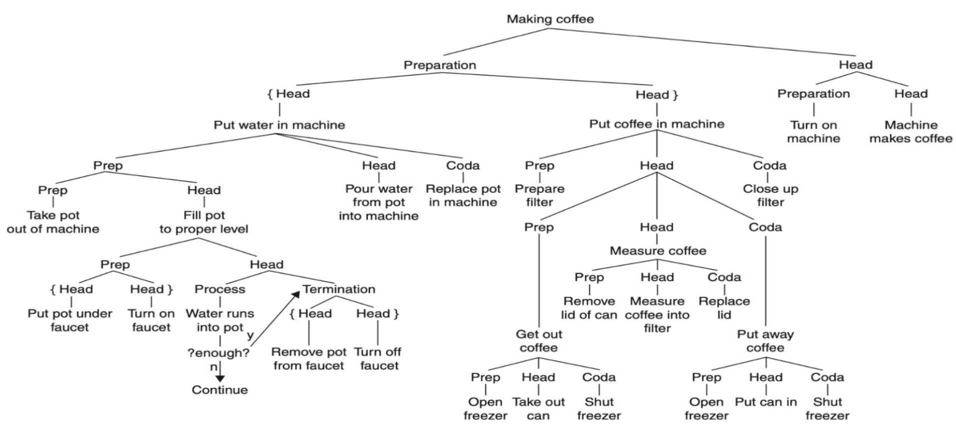

Figure 4: Hierarchy in food processing

5.2 The argument from executive functions

In the light of the generativity of skills and their hierarchical structure, one might concede that something like thinking is constitutively involved in every kind of skilled action. But one might

[11] Indeed, human cognition seems to be generally biased towards a hierarchical organization. See Steedman (2009). Recent work in semantics shows that context as well is best modeled as having a hierarchical organization (Kocurek and Pavese 2022).

insist that what is crucial to intelligent action is not just thinking *per se* but a *particular* kind of thinking—*conscious or flexible* thinking, the sort of thinking that pertains to what cognitive scientists call *executive functions*. The elitist might argue that, while conscious thinking is constitutive of theoretical and intellectual skills, it is incompatible, or even *hinders*, practical and embodied skills. Indeed, there is a long tradition that argues that conscious thinking hinders skilled performance in the practical domain. As Williams (1985, 167) states it "... a practical skill is destroyed by reflection on how one practices it."

In response, I first discuss a case study that nicely illustrates that conscious thinking improves embodied performance in cases of targeted innovation. Then, I sketch an argument to the effect that most, if not all, expert performances involve *some* degree of innovation. Following a widespread belief in cognitive science that conscious thinking is unmatched for its flexibility and creativity, this will provide some grounds for the claim that conscious thinking plays a role in many or most of expert performances, independently of the intellectual and embodied divide.

As a case study, consider the famous invention of the Fosbury flop, by the young Dick Fosbury. As a high school student, Fosbury struggled with the most common high jumping technique then available—the straddle technique, involving facing the bar forward, and twisting the body mid-air to navigate their way over the bar (Figure 5). Fosbury would not perform well with this technique, as he found himself dislodging the bar too often with his legs while passing the bar. As a result, he failed to even clear the minimum qualifying height for high school competitions. Fosbury soon realized he had to change his body movement in order to clear the necessary height—in particular, that by facing the bar backwards, he could elevate his body as well as with the straddle technique but that from that position he could more easily elevate the legs as the center mass of his body was passing below the bar, thus lowering the chances of dislodging the bar with his lower body. After many refinements and experiments, he realized that the flop would improve by building up sufficient speed to launch his or her center of mass into the air. So he further reasoned to improve the run up to the jump. He found an approach at a certain distance from the high jump bar, between 40 and 60 feet in front, and 10-14 feet to the side of the bar, and that it was best to first run straight forward, building horizontal speed, then follow a curve towards the bar. He realized that the vertical velocity helped raise the center of his mass, while the angular momentum helped rotate his body.

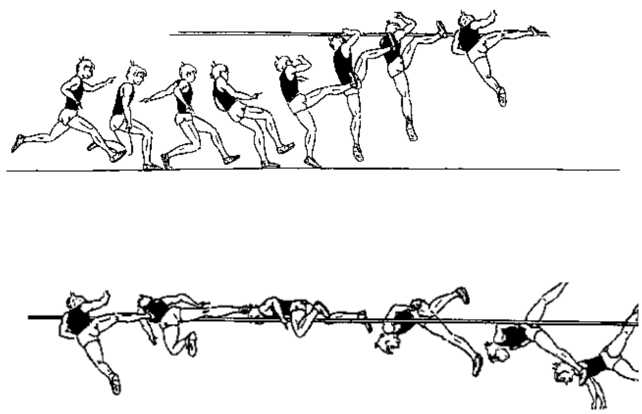

Figure 5: The Straddle Technique

Now Fosbury progressively developed his flop and the run up, over a 5-years period. He went from struggling to clear the minimum height required to qualify for high school meetings in 1963 to winning the olympic medals 5 years after, in 1968. He achieved this innovation, which revolutionized the sport of high jump, with continuous planning and conscious productive reasoning about how best to get his center mass to reach a higher height, given his physical characteristics and given his understanding of the extant techniques.[12]

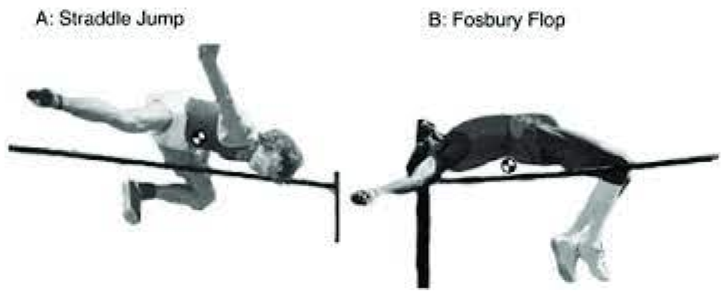

Figure 6: A Comparison

This case study is a vivid example of how conscious reasoning *can* improve skilled embodied performance. When a performance is to be innovated upon, conscious reasoning provides the level of flexibility required for the innovation. This observation is still compatible with conscious thinking being only preparatory, not central to the performance itself—for it is only in the preparation of the jump that Fosbury ought to think in order to innovate. If so, why at all think that conscious thought is present also during the performance?[13] In the following, I'd like to outline a more general argument that typical expert performances must all require some level of conscious thinking—an argument that is predicated on some assumptions that are widespread in the cognitive sciences.

[12] As evidenced by Fosbury's explicit reports describing the process of his innovation: "I knew I had to change my body position and that's what started first the revolution, and over the next two years, the evolution." "I was looking for a technique which involved sprinting diagonally towards the bar, then curve and leap backwards over the bar, to give me a much lower center of mass in flight than traditional techniques."

[13]Lots of work has been done in recent times to debunk the general idea that conscious thinking is detrimental to embodied performance (e.g., Montero 2016). For example, for a long time, people had thought that thinking processes were too slow to sustain the speed of expert performances—e.g., Papineau (2013) had speculated that thinking could not explain the ball release to bat, in elite cricket, since this takes between 0.4 and 0.8 seconds and thinking processes are much slower. However, this conviction has recently been shown to be empirically unsupported. The voluntary reaction time response, which is the minimum time it takes to produce a non-automated response to a stimulus, has been estimated at 120-180 ms (Schmidt and Wrisberg, 2008; Christensen et al 2019:704). As Montero (2016) puts it, parts of becoming an expert might very well be becoming *much faster* at thinking. Likewise, the objection that thinking can be distracting has been similarly rebutted—it turns out that it is not so much thinking that distracts but *what* the expert thinks about when acting (Montero 2016, chapter 6).

The first premise is that targeted innovation must invoke some degree of conscious thinking whereby the expert individuates the issue to be addressed and devises a solution to it. This is well illustrated by the case of the Fosbury flop. More generally, the reason for thinking this is that conscious thinking is unmatched in its flexibility and creativity—indeed, it is widely thought in cognitive science that no other cognitive function exhibits the level of flexibility that conscious thinking affords (e.g. Collins & Koechlin 2012; Diamond 2013).

The second premise is that it is not only in the preparatory and planning phase that this sort of innovation is needed. Targeted innovation is often required *during the performance*, since it is not the case that every contingency can be planned ahead: almost every performance will involve problems the expert has not previously experienced, such as new equipment, unfamiliar environmental conditions, an unforeseen circumstance, as well as novel combinations of factors. Now, if expert performance were fully automatic and did not involve conscious thinking, then the expert would have to have an automated response to all those contingencies. However, these responses would require *very large* spaces of different solutions—or contingency spaces—and all skill domains will have very large contingency spaces.

Since it seems implausible that experts are endowed with all of these prefabricated solutions to contingencies, Christensen et al (2019: 700-1) have argued on these very bases that skills cannot ever fully automatize. Following this line of reasoning, the argument concludes that since most expert performance will require some level of conscious thinking for coming up with innovative solutions to new contingencies. That is to say, the flexibility required for expert targeted innovation both in the planning phase and in the course of the performance is naturally explained by conscious thinking—the flexible cognitive process *par excellence*.

5.3 The argument from cognitive control

The argument just sketched for the role of conscious thinking in expert action is entirely general. Nonetheless, one might contend that conscious thinking is still more central in theoretical and intellectual skills. It is tempting to think that while in theoretical and intellectual skills, the skilled performance is *always* under the cognitive control of the agent, not so for practical and embodied skilled performances, in which the body plays more of a starring role.

However, the assumption that intellectual skilled performances are dominated throughout by conscious thinking is actually at odds with what we know about the cognition of these sorts of skills. The picture that emerges from the cognition of intellectual skills is one in which part of every or most intellectual performance is actually not under executive functions at all (Smith and Blankenship 1989, 1991; Stokes 2007, Ivy 2022). Rather, it is *incubated*—delegated to cognitive subsystems that fall below the agent's cognitive control. Consider Jane, a mathematician who thinks all the hard thoughts for a bit, then leaves them to pause while a subcognitive system elaborates them to finally spit out the solution to her query, which Jane the day after simply has to acknowledge and verify. Jane is very efficient with her math problems and theorems. But conscious thinking only plays a role in the initial phase and in the final phase of her performance (Figure 7). The central part of the performance is not done at the conscious level.

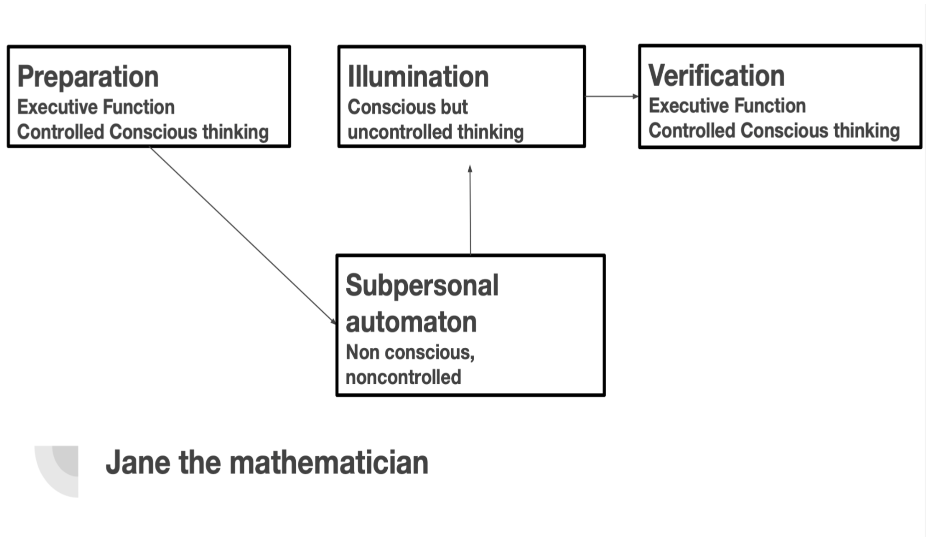

Figure 7: Incubation in theoretical/intellectual skills

Incubation is observable in practical and embodied skills too. A natural place to look is at mental practice and its long term effects on athletic performance. There is a strong correlation between mentally practicing and improvement in athletic performances; athletes who visualize do better, and athletes have stronger visualization abilities than non-athletes (Blankert & Hamstra 2017). Also, there is a general theory according to which imagined models for possible actions can be stored in working memory and latently activate connections between visual stimuli and motor control through dorsal processing streams (Moran & O'Shea 2020; Holmes & Collins 2001). So, mental practice gives rise to a cognitively loaded process with downstream effects on motor control—something functionally very much alike the sort of incubation that is found in intellectual skills (Figure 8).[14]

Thus, when it comes to both conscious cognitive control and cognitive architecture, there do not seem to be principled differences in skills that track the intellectual/embodied divide. In all cases, some degree of conscious cognitive control is at least necessary for the sort of targeted

[14]Thanks to Ivy Spencer for discussion here.

innovations that expert performances are replete with; and in all cases, expert performances involve some degree of incubation so that part of the performance is not under the agent's cognitive control.

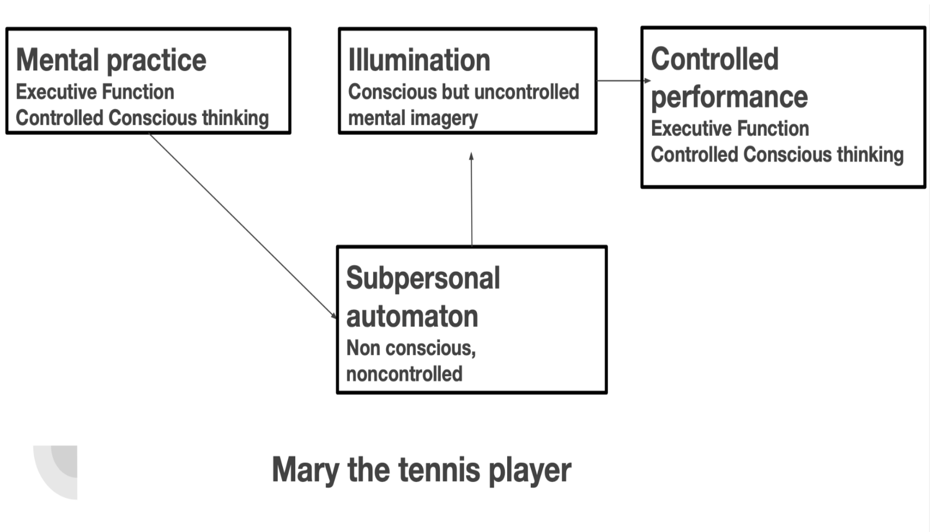

Figure 8: Incubation in embodied skills

5.4 The argument from knowledge and cognitive architecture

Yet another avenue for the elitist is to argue for the superiority of theoretical or intellectual skills on the ground that they require more *knowledge* about their subject matter than practical and embodied skills.

The argument from knowledge is flimsy. Recall that intellectual skills differ from practical and embodied skills in that they do not require the use of extremities for their exercise. It would be bizarre to think that any skill that does not require the use of extremities for its exercise will require more knowledge about their subject matter than any skill that does. In fact, the opposite seems more likely to be true—embodied skills are likely to require the employment of knowledge about the external world more than intellectual skills since the success of bodily actions depends more on whether the external world cooperates than the success of mental actions does.[15]

Now, it is true that the case of motor skills is what originally motivated the foundational distinction in cognitive neuroscience between declarative and procedural cognitive systems. The case of HM is well-known: After bilateral removal of the hippocampus, parahippocampal gyrus, entorhinal cortex, and most of the amygdala to relieve debilitating symptoms of epilepsy, H.M. was unable to form new memories of facts or events and he could no longer access memories he acquired in the few years leading up to his surgery. Nevertheless, Milner (1962) found that over 10 trials, H.M. developed motor-skills necessary to trace the outline of a five-pointed star in a condition of only being able to see the reflection of the star, his hand, and the pencil in a mirror. This learning indicated a dissociation between the function of forming memories for facts and events, on one hand, and the function of improving motor-skills, on the other. Cohen and Squire (1980) used this evidence to warrant the importance of the procedural component to motor skills.

While this has also often been taken to indicate that declarative knowledge is not necessary for motor skills, this conclusion has recently been shown to be unwarranted (Stanley and Krakauer 2013; Pavese 2013; Krakauer 2020, 2021). Krakauer has drawn attention to the

[15] Stanley (2012) argues that the theoretical/practical distinction tracks the distinction between know-that and know-how (https://archive.nytimes.com/opinionator.blogs.nytimes.com/2012/05/06/the-practical-and-the-theoretical/). According to Stanley, the theoretical maps into propositional knowledge; the practical maps into know-how. Thus, Stanley thinks that undermining the know-how/know-that distinction suffices to undermine the theoretical/practical distinction I am not convinced that endorsing intellectualism about know-how—the view that know-how consists in know-that—or practicalism about knowledge-that—the view that knowledge-that is a kind of knowledge-how—would suffice to undermine elitism. The reason is that the distinction between theoretical/practical does not *prima facie* line up with the know-that/know-how distinction. Thinking and reflecting—the theoretical operations *par excellence*—are not themselves states of knowledge-that. Rather, they are (mental) actions. Just like for any other action, it makes sense to ask whether one knows how to perform them. Since the theoretical and practical each correspond to kinds of know-how, it is unclear why one ought to think that the theoretical/practical distinction maps into the propositional knowledge/know-how distinction. Indeed, the controversy between elitism and socialism is independent of the distinction between know-how/know-that. For example, one might contend that theoretical know-how is more connected to intelligence than practical know-how, regardless of whether or not they are reducible to propositional knowledge. Indeed, as we have seen, this is precisely what elitism holds, without having to take a stance on whether know-how is propositional in nature.

fact that at each trial HM needed to be reminded of basic knowledge of the task—of what a pen and a mirror were—in order to initiate the task. So far from showing that knowledge of the task is not necessary for motor skills, the case of HM and amnesiacs are best understood as showing the necessity of *both* the declarative and procedural component to motor skills (Christiensen et al 2019; Pavese 2017, 2019). Moreover, the same dichotomy between procedural and declarative components has been subsequently posited for intellectual skills, with parallel evidence from amnesiacs (Anderson 1982; Taatgen 2013; Knowlton & Foerde 2008).[16]

All in all, the extant neurocognition of embodied and intellectual skills warrants positing no difference in their knowledge component across these kinds of skills.[17] Intellectual and embodied skills are also arguably alike in their procedural components. Cognitive scientists speak of procedural systems as involving procedural instructions and take these procedural instructions to be *bona fide* representations (e.g., Tulving 1985; Anderson 1982; Knowlton & Foerde 2008). For example, Tulving tells us that "[t]he representation of acquired information in the procedural system is prescriptive rather than descriptive" (Tulving 1985: 387–8). Here Tulving is not just talking about the motor system but more generally about procedural memory systems which may be involved in the generation of embodied and intellectual actions alike. Along the same lines, Anderson (1982) studies intellectual skills such as learning to program a computer or to solve a differential equation. For the acquisition of skills of this sort, Anderson (1982:369-371) distinguishes a declarative system and a procedural system in which the domain knowledge is "directly embodied in procedures for performing the task." Procedures are

[16] See Pavese 2019, 2020 for a discussion of this psychological literature.

[17] Indeed, action-theoretical considerations motivate crediting knowledge with a role to play in expert skilled performance, quite independently of the intellectual and embodied divide. A long tradition takes knowledge to be central to intentional and deliberative action (Anscombe 1958). Similar arguments support the role of knowledge in skilled expert action as a form of controlled action: the expert must know what they are doing as they are doing it, on pain of losing control on their performance (Pavese 2018, 2021a; Beddor and Pavese 2022; Pavese and Beddor 2023; Pavese et al 2023). These arguments hinge on entirely general features of control in expert action that are independent of the theoretical/intellectual and the practical/embodied divide.

characterized as "primitive rules" and such primitive rules are represented as instructions. For examples, a primitive rule for performing addition would have the form of a conditional instruction/imperative, conditional on the goal of the task:

If the goal is X, then do Y!

Since Anderson (1982), it has been very common for psychologists and neuroscientists to think of procedural representation in such prescriptive terms for both intellectual and embodied skills. For example, in their study of intellectual skills such as solving a differential equation, Singley & Anderson (1989:165) talk of "procedural representations" for algebraic operations such as 'restate' and 'evaluate'. By "procedural representations," they mean a "production rule" and they model production rules along the lines of computer program's instructions (Singley & Anderson 1989:190–1).

In both the intellectual and embodied cases alike, the procedural component is generally understood as highly cognitive—not only as involving procedural representations but also as conducting computations over such representations. At least since Wolpert (1997)'s theory of motor control, neuroscientists have thought of motor processes as involving complex computations translating intentions into motor representations of goals (see also Butterfill and Sinigaglia 2014). In order to explain certain interesting cases of motor adaptations, Mazzoni and Krakauer (2007) talks of the motor system "as having a mind of its own," and elaborating implicitly planning driven by considerations of consistency in the perceptual and motor inputs—planning that can also be at odds with an agent's explicit strategy. As Fridland (2017) stresses, the motor system itself exhibits some intelligent behavior that in some respects resembles agentive intelligence. Chunking processes, enhancing the efficiency of both intellectual and motor performances, are recoverable for both intellectual and motor tasks alike (Fridland 2019, Pavese 2019).

All in all, more parallels than differences emerge from the cognitive architecture of intellectual and embodied skills. Nonetheless, one difference seems undeniable: theoretical and intellectual skills concern more abstract subject matters than practical and embodied skills. I will discuss it next.

5.5 The Argument from Abstraction

Abstraction is the process of subsuming representations under more general ones. The opposite of abstraction is *specification*—the process of breaking down general and abstract representations into more specific and concrete ones. According to the argument from abstraction, theoretical or intellectual skills are more connected to intelligence since they concern more abstract subject matters and so require higher levels of abstraction.

First off, notice that it would be a mistake to think that only theoretical or intellectual skilled actions involve abstract thinking and abstract representations. As an example, consider tool use where the impact of abstract thinking has been directly studied. In evolutionary psychology, it is a given that the teaching of general and abstract truths enhances the acquisition of tool use. For example, Morgan *et al*. (2015)'s simulation models show that the teaching of abstract concepts, such as that of a *platform edge*, contributed to the development of Oldowan stone knapping techniques. Even contemporary stone tool production is radically improved by the introduction of concepts for functional parts of the tool. For example, Adze making in Langda is associated with a large body of terminology and other technological concepts concerning both the functional parts of the tool as well as the different raw materials used to make them. The most expert and able craftsmen from Irian Jaya are those that have accumulated such abstract knowledge through years of apprentice and experience (Stout 2002). This work in evolutionary psychology is complemented by recent findings in cognitive psychology according to which abstract and linguistic representations, including the practice of labeling, can substantially improve performances at non-linguistic tasks (Kompa and Mueller 2020).

So abstract thinking *can* positively affect practical and embodied skills, by affecting both cognitive control and the transmission of the skill. Nonetheless, theoretical and intellectual skills are likely to involve *more* abstract thinking than practical and embodied skills. Should we conclude that they are thereby more intelligent?

Though it has a long pedigree in philosophy, the assumption that more abstraction always and invariably allows for a higher level of understanding ought not to be granted. That is so because abstraction is helpful cognitively in that it *simplifies* computation, making it more tractable (Mirolo et al 2022). Specification, by contrast, renders the computation more complex, and so less tractable. Thus, it is actually computationally *harder* to think by specification than to think by abstraction. If so, then it is unclear why we ought to think that thinking by abstraction is more intelligent than thinking by specification since it is genuinely unclear why thinking of a subject matter by simplifying it should be considered more intelligent than e.g., reaching an understanding of a concrete situation in all its complexity and details. After all, the latter is more computationally difficult and much harder to program (compare with the argument for the superior intelligence of embodied skills in §1.5). Indeed, while it might be true that abstract thinking is more needed for theoretical and intellectual activities than for practical and embodied ones, we should be cautious in identifying higher levels of abstraction with higher levels of intelligence, since this identification itself might very well be an expression of a brute elitist bias.

6. The Anthropocentric Argument for Elitism

Perhaps the most common style of argument in favor of elitism relies on the thought that humans differ from non-human animals in that they uniquely possess certain skills—linguistic skills and skills that are based on linguistic skills, such as math or scientific skills. Since this kind of skillful behavior, and the capacity for complex thinking that comes with it, distinguishes us from non-human animals, it is natural to conclude that this sort of skillful behavior stands out as particularly intelligent (e.g., Berwick and Chomsky 2016).

Concerning this line of argument, I'd like to question whether linguistic skills are truly the only skills humans excel at. Against this idea, there is reason to think that humans stand out in the animal domain in a *variety* of skills—including skills that humans share with nonhuman animals. If linguistic skills are not the only skills humans excel at, the conclusion that linguistic skills are the repository of higher intelligence is much harder to sustain.

Of course, it is true that nonhuman animals are often better physically endowed from birth—they can exhibit more physical prowess than humans, more muscle structure, more aerobic capacity, better reaction time, more perceptual acuity, etc. As a result, for example, in many motor and perceptual domains, they outrun humans. But we should not conclude from this that their *skills* are better in those very same domains. For not every ability is a skill.

Skills differ from both instincts and habits. Skills differ from instincts in that they are learnable and amenable to cultural modification; they differ from habits in that they are acquired by active learning and that can be improved by learning and innovation. If so, not every motor and perceptual capacity is a skill. For example, general vision, motor and perceptual acuity are not skills, since while they can be developed, they cannot be acquired: they develop pretty much in every environment that is favorable to an individual's development. Basic motor abilities, such as locomotion and the capacity for basic limb movements, are not skills either, since they have all the hallmarks of instinctual behavior (Piaget 2005). Thus excellence at these tasks does not entail excellent *skilled* behavior in the corresponding motor or perceptual domains.

Instead, if one focuses on those abilities that are better titled to be considered skills—since they are learned, allow for a big variation in a population and are heavily affected by culture and social learning—it is unclear that nonhuman animals are better at them. For one thing, humans show bigger margins of improvements and more progression steps in most or all of those athletic activities for which training, active practice, and cultural innovation make more of a difference. For example, among primates humans excel in the long run (e.g., Lieberman and Bramble 2007), for which running economy, deliberate practice, and regular training play a substantially bigger role than, e.g., in sprinting. In the sprint, performances depend on reaction time and fast muscle fiber (Lippi et al 2008). Whereas reaction time has a limited margin of improvement when compared with muscular power and aerobic capacity, endurance athletes' performance is regulated by slow muscle fibers and by aerobic capacity which can be substantially increased by either regular training or manipulation. So sprint performances have a limited margin of improvement due to training than endurance performance.

As another illustrative example, humans have been capable of the comparatively higher margins of improvement in the high jump, where innovations such the straddle technique, the Fosbury's flop, or fiberglass poles (Dapena 2016), as well as the role of teaching and imitation from others are more determinant (Lippi et al. 2008). If what distinguishes skills from other abilities such as instincts and habits in the practical domain is precisely the role of active learning in their acquisition and their susceptibility to cultural innovation, then we find that it is not at all clear that humans do not also excel at practical and embodied skills.

As a final example, consider tool use. Primates are capable of tool use, and so are other animals such as dolphins and birds, which use tools for foraging and sheltering. Though tool use is a skill that nonhuman animals possess too, humans clearly excel at it. The sort of tools humans are capable of producing are much more diversified for functions than for any other animals. And complex forms of cumulative culture are clearly present only for humans. Cumulative culture is the phenomenon whereby a skill is culturally innovated up in a cumulative fashion across generations (Boyd and Richerson 1988; Tomasello et al 1993; Mesoudi and Thornton 2018; Birch and Heyes 2021), giving rise to the so-called *ratchet effect*—where a ratchet is a device with angled teeth that allow a bar only to move in one direction, with no possibility of reverting back to prior less effective states (e.g., Tennie *et al* 2009). This generational improvement gradually diversifies the range tools and artifacts available (Basalla 1988); sometimes improvements are even less gradual, such as the potters' wheel (Foster 1959), Cristofori's piano incorporation of hammers and action (Giordano 2016), or the electrification of musical instruments (Goldsmith 1977). By contrast, other species of animals, including our nearest primate relatives, do have tool use but their tool use traditions do not exhibit the ratchet effect (Tomasello et al 1993: 508; Boyd and Richerson 1988, p.80; Dean et al 2014; Derex 2022).[18]

In conclusion, there are a variety of skills at which humans excel and that are not exclusive to humans. Thus, there is little reason to think that human intelligence manifests more in linguistic and intellectual skills than in any of these other embodied and practical skills.

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[18]The argument does not depend on the claim that cumulative culture is unique to humans, which has been contested. (cf. Sasaki and Biro 2017), only on the claim that cumulative culture exhibits a higher level of complexity in the human case (cf.. Mesoudi and Thornton 2018, pp. 4-5).

7. Comparing socialisms

My goal in this article has been to make explicit, for the first time in the philosophical literature, the controversy between elitism and socialism, to sharpen it, and to lay the foundation for opposing the sovereignty of elitism. I have pointed out that on a thin conception of intelligence, every skillful behavior, whether practical or theoretical, whether intellectual or embodied, qualifies as intelligent. I have also suggested that many common arguments for elitism that are based on a thicker or anthropocentric conception of intelligence rest on shaky philosophical and empirical grounds. My argument being inductive, it cannot be conclusive. Nonetheless, I take myself to have at the very least covered the most compelling arguments for elitism, and in this way to have at least shifted the burden of proof on the advocate of elitism.

Let me emphasize that my argument for socialism is compatible with there being a *de facto* difference in intelligence that tracks the theoretical-intellectual/practical-embodied divide. My argument has put emphasis on innovation as a mark of high intelligence. Suppose we find that skilled athletes or craftsmen tended, as a matter of fact, to be less innovative and, as a result, less thoughtful and so less intelligent than mathematicians. My point is that even this difference, if there was one, would not show socialism false since it would be more likely due to contingencies about how the respective practices have culturally evolved than to principled considerations due to the nature of the relevant skills. An illustrative example: sport training tends to emphasize social learning—learning by imitation and by teaching—over individual learning, in which the individual has to find their own way to perform a task and so is encouraged to look for innovation if extant ways are not as effective, as in the Fosbury example. But this is a contingency of how the skill is practiced. If the sport skill was taught and transmitted differently, with more emphasis on individual innovation over imitation, then skilled performances in this area could become more innovative and so more intelligent.

I conclude by considering an objection against socialism (e.g., Hand 2007). ‘Intelligence’ comes from the Latin *intelligere*—to understand. Thus, etymologically, ‘intelligence’ refers to cognitive abilities. By advocating that practical and embodied skills ought to count as intelligent, one might worry that the socialist is simply advocating a change of meaning of the word. This objection does apply to forms of socialism that are explicitly non-cognitivist about skills, who advocate using ‘intelligence’ to talk about allegedly utterly non-cognitive behavior. In this sense, Ryle (1949) and Dreyfus (2002) are guilty of effectively changing the meaning of the word ‘intelligence’.

My form of socialism is not exposed to the same charge. My claim is that ‘intelligent’ applies not just to intellectual and theoretical skillful behavior but also to skillful behavior that is practical and embodied, in the sense clarified. This change in extension does not correspond to a change in intension of the concept of intelligence, since I argued that ‘intelligent’ should apply to practical and embodied skills in virtue of these skills being cognitive. Precisely because my socialism does not compromise on the cognitive nature of skills, it is not as exposed as other forms of socialism are to the charges of extending the concept of intelligence beyond its proper bounds.

So much the better for socialism. And for cognitivism.

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