

Towards a Definition of Efforts

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Although widely used across psychology, economics, and philosophy, the concept of effort is rarely ever defined. This article argues that the time is ripe for an explicit general definition of effort, makes some proposals about how to arrive at this definition, and suggests that a force-based approach is the most promising. Section 1 presents an interdisciplinary overview of some chief research axes on effort, and argues that few, if any, general definitions have been proposed so far. Section 2 argues that such a definition is now needed and proposes a basic methodology to arrive at it, whose first step is to make explicit the various tacit assumptions about effort made across sciences and ordinary thinking. Section 3 unearths 4 different conceptions of effort from research on effort so far: *primitive-feelings accounts*, *comparator-based accounts*, *resource-based accounts* and *force-based accounts*. It is then argued that the first 2 kinds of accounts, although interesting in their own right, are not strictly speaking about effort. Section 4 considers the 2 most promising general approaches to efforts: resource-based and force-based accounts. It argues that these accounts are not only compatible but actually extensionally equivalent. This notwithstanding, it explains why force-based accounts should be regarded as more fundamental than resource-based accounts.

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Efforts are ubiquitous and multifarious. We make efforts—individual and collective—to lift heavy weights, to solve problems, to concentrate, to stop smoking, to climb mountains, to convince others, to understand obscure texts, to improve our linguistic skills, to conceal our vices, to resist temptations, to seduce, to gather information, to earn money, to stay calm, to win games, to raise children, to write clearly, and so forth. Not only do we *make* efforts, we also *value* efforts in various ways: We deem them unpleasant, praiseworthy, efficient, vain, irrational, tenacious, and so forth. We often judge that people deserve some retribution or compensation for their efforts (and conversely some blame for their lack of effort), and we try to inculcate in children the “taste for effort”.

Unsurprisingly, given the ubiquity and multifariousness of efforts, a wide variety of sciences have been interested in efforts: various areas of psychology, economics, sociology, neurosciences, legal studies, sport sciences, robotics and artificial intelligence, ethology, and philosophy have scrutinized efforts. A broad range of causes and determinants of efforts have been investigated, and (as we shall see) efforts have been used to explain an impressive variety of phenomena.

Quite surprisingly, however, given this profusion of research on effort, few *explicit definitions* of effort are to be found in the vast and multidisciplinary literature that makes extensive use of the concept. Although definitions of some *species* of effort have been proposed, the *genus*—what all efforts have in common and in virtue of which they are efforts—remains largely undefined. Tellingly, no entry on effort is to be found in leading professional encyclopedias of neurosciences, psychology, sociology, economics, or philosophy, and, as of today, even Wikipedia lacks an entry on effort. Work on effort has largely relied on *implicit* and *pretheoretical* understanding of effort. Although such an intuitive grasp has proven suf-

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ficient to investigate various aspects of effort, the lack of an accepted explicit definition may impede the integration of the manifold researches on efforts and foster misunderstanding.

Accordingly, this article argues that the time is ripe to look for an explicit general definition of effort, makes some proposals about how to arrive at this definition, and suggests that a force-based approach is the most promising. Section 1 presents an interdisciplinary overview of some chief research axes on effort, and argues that few, if any, explicit definitions of effort in general have been proposed so far. Section 2 argues that such a definition is now needed and proposes a basic methodology to arrive at it. The key idea is to make explicit the various tacit assumptions about effort made across sciences as well as in ordinary thinking, so as to retain the most promising assumptions in an explicit definition. Section 3 unearths four different conceptions of effort from research on effort so far:

- (i) Primitive-feelings accounts;
- (ii) Comparator-based accounts;
- (iii) Resource-based accounts;
- (iv) Force-based accounts.

It is argued that the first two kinds of accounts, although interesting in their own right, are not strictly speaking about effort. Section 4 considers the two most promising general approaches to efforts: resource-based and force-based accounts. It argues that these accounts are not only compatible but actually extensionally equivalent. This notwithstanding, it explains why force-based accounts should be regarded as more fundamental than resource-based accounts.

Research on Effort: An Interdisciplinary Overview

The concept of effort has regularly been invoked in many areas of philosophy (philosophy of action, moral philosophy, philosophy of causation, political philosophy, philosophy of mind, philosophy of law) as well as in many research areas outside of philosophy (psychology of emotion, of motivation, of learning and education, of tactual perception, of attention; evolutionary psychology; classical, neoclassical, welfare, labor, institutional, behavioral eco-

nomics; exercise physiology; sport sciences; biomechanics; sociology; law and legal studies; ethology; robotics; etc.).

Research pertaining to efforts can be classified using six broad areas:

- (1) research on the *consciousness* or *feeling* of effort;
- (2) research on the causes or *determinants* of efforts: what explains effort?
- (3) research on the effects or *functions* of efforts: what does effort explain?
- (4) research on some subspecies of effort;
- (5) research on the value(s) and normative implications of efforts;
- (6) research on cognate concepts, such as trying, work, forces fatigue.

The following is an overview of some main works in these six areas. It should be stressed from the start that this overview is not exhaustive. Given that effort is a transversal concept, cutting across a wide variety of disciplines, and that no attempt has been made so far at reviewing the main research connected to efforts in all these disciplines, the following list is bound to be incomplete. Besides, given my own background, philosophical works on the topic may well be overrepresented here. But I hope that the following adequately reflects at least some of the chief research axes on effort, if not the details of all research about effort.

Works on the Sense, Awareness, or Feeling of Effort

The awareness of effort has drawn a lot of attention, which perhaps culminated in the late 19th century controversy about the feeling of effort between *centralists*—for example, [Bain \(1855\)](#); [Helmholtz \(1866\)](#); [Müller \(1842\)](#)—who equated the feeling of effort to the feeling of some efferent commands of our will, and *peripheralists*—for example, [Bastian \(1896\)](#); [James \(1880, 1890\)](#)—who equated the feeling of effort to the afferent feelings of muscle contractions (see [Jeannerod, 1983: 121–140, 1996: 104–114, 2002: Chap. V](#); and [Forest, 2007](#) for detailed discussions of this debate). The dispute is to some extent still ongoing (see [de Morree, Klein, & Marcora, 2012](#); [Marcora, 2009](#) for recent defenses of the centralist view, and [Lafargue & Franck, 2009](#); [Lafargue & Sirigu, 2006](#)

for some intermediate approaches in terms of the comparator model).

These discussions constitute one high point in the history of research on effort. For all their virtues, they may however suffer from an important downside: The relation between effort and the awareness of effort is mostly left unaddressed within the context of the centralists/peripheralists debate. While the discussions starts by considering the *experience, sensation, or feeling* of effort rather than effort in general, most of the participants then move freely between talking about effort and talking about the feeling of effort. The tacit assumption seems to be that effort just *is* a feeling. The identification of effort with the feeling thereof, however, might prove more problematic than expected, as we shall see below.

Works on the Determinants of Efforts

Another substantial body of research bears on the various bases of efforts—or of some subspecies thereof: What determines that we make, pursue, or withhold efforts? Three main kinds of determinants of efforts have been studied:

- (i) *Physiological and neurobiological determinants of efforts* (see, e.g., Gailliot & Baumeister, 2007; Gailliot et al., 2007; Gendolla, Wright, & Richter, 2012; Kurniawan, Guitart-Masip, & Dolan, 2011; Radulescu, Nagai, & Critchley, 2014; Salamone, Correa, Farrar, & Mingote, 2007; Treadway et al., 2012).
- (ii) *Psychological determinants of efforts*. How are the worthiness of the task (the rewards), the chance of success, the difficulty of the task, our own skill, and so forth, weighted against each other so as to determine whether an effort should be undertaken (Brehm & Self, 1989; Marien, Aarts, & Custers, 2014; Westbrook & Braver, 2015; Wright, 2016)? At what point do we persist in striving for a goal when the goal of disengagement becomes a live possibility (Brandstätter et al., 2013; Brandstätter & Schüller, 2013)? How do symptoms of depression affect effort-making (Brinkmann, Franzen, Rossier, & Gendolla, 2014; Silvia, Nusbaum, Eddington,

Beatty, & Kwapil, 2014)? (See Gollwitzer & Oettingen, 2012, for a review of the literature on psychological determinants of effort.)

- (iii) *Socioeconomical determinants of efforts* have been studied in detail in particular within behavioral economics. Proponents of the “fair-wage effort hypothesis” have argued that workers modulate their effort according to the difference between their actual wage and the wage they consider as fair (Akerlof & Yellen, 1990). Workers appear to also modulate their efforts with respect to the evolution of other workers’ wages, so that social comparisons also determine effort (Cohn, Fehr, Herrmann, & Schneider, 2014). Yet another factor influencing the amount of effort invested in work is whether the wage has been fixed by a third party (“responsibility-alleviation,” Charness, 2000). Some of these results had been anticipated by Baldamus (1961).

Works on the Functions of Efforts

Most research on effort uses effort as a key *explanans* of other phenomena rather than treat effort as an *explanandum*. On top of the protean “principle of least effort” (which was introduced by Ferrero, 1894, developed by Zipf, 1949, and is the idea that agents try to minimize the amount of work expended), which is recurrently appealed to as a key assumption in various areas such as ethology, ecology, linguistics, economics, and psychology (see, e.g., Hull, 1943), efforts have been used to explain a wide variety of objects. This has often been the case within philosophy:

- (i) In *philosophy of action*, the concept of effort has been invoked to capture the central distinction between actions and mere happenings. Volitionists have often proposed analyzing actions in terms of happenings caused by volitions or acts of will (although not all volitionists do so; some consider volitions to be themselves unanalyzable actions). In response to Ryle’s objection that volitions are mysterious and noticeably absent from ordinary lan-

guage (Ryle, 1949: 64), many volitionists have identified volitions with tryings, strivings, or efforts (Davis, 1979; Giné, 1990; Hornsby, 1980; Lowe, 1996: 157 sqq., 2000: 246 sqq.; McCann, 1975; O'Shaughnessy, 1980). One early proposal of this sort is to be found in Lewes (1878) who presents effort as what distinguishes the fact that I raise my arm from the fact that my arm goes up.

- (ii) In the context of the *free will debate*, Kane's influential incompatibilist-libertarian theory of free will gives a key role to effort of will. A choice is free, Kane argues, only if it results from an effort of will that is itself indeterminate (Kane, 1996: 128). Kane's proposal has prompted intense discussions, some of which specifically target the concept of effort of will he employs (Clarke, 1999; Coffman, 2004; Mele, 2006).
- (iii) The concept of effort has also played a key role in the classical issue of *akrasia* or *weakness of will*. Challenging the received Davidsonian view that the akratic agent acts against his best judgment, Holton (1999, 2009: Chap. 6) argues that the weak-willed subject rather acts against his former resolutions. Sticking to one's resolutions, Holton argues, requires willpower, or strength of will, the exercise of which takes effort. Likewise, Ainslie (2001) equates willpower with the ability to stick to one's personal rules (an ability, he stresses, that comes with its own downsides), so that willpower helps us resist our tendency to prefer present satisfactions over delayed ones.
- (iv) *The justification and origin of our idea of an external world* is another central philosophical issue in which a key role has been assigned to effort. A long-standing proposal in both philosophy and genetic psychology has it that the feeling of effort is essential to the justification and/or to the origin of our belief in an external world. According to this proposal, only that which is resistant to our efforts is to be represented as existing independently from

us. In direct versions of the view, the feeling of resistance to our efforts is held to *directly present* us with the distinction between us and the external world; in indirect versions of the view, the feeling of resistance is only claimed to constitute a key premise in an inference to the existence of the external world. It is partly because of this epistemological issue that the feeling of effort gained a lot of attention during the 19th century, which prompted the debate between centralists and peripheralists mentioned above. This led James to write, albeit disapprovingly, "There is no commoner remark than this, that resistance to our muscular effort is the only sense which makes us aware of a reality independent from ourselves" (James, 1880). Various versions of the thesis that resistance to our will or effort is a symptom of reality are to be found in Descartes (1993: 101; 2000, *Seconde Partie*, §1 —although Descartes does not mention the term "resistance" or "effort"), Malebranche (1991: 40–43), Locke (2008, IV, xi, §5), Berkeley (1998: 105), Condillac (1997), Fichte (1963), Maine de Biran (2000, 2002, who also attributes the view to Schelling, Bouterwek, and Bichat), Schopenhauer (1969, Bk II), Brown (1846, lec. XXIV: 151), Müller (1842: 269), Desutt de Tracy (1801: pp. 113–122, 331–334), Bain (1855, pp. 198, 1875), Fouillée (1889), Durkheim (1999: 22), Peirce (1935: 1.24, 1.320, 1.324, 1.332, 2.84, 5.7, 5.45, 5.539, 5.607, 6.19, 7.531, 8.266, 8.330), Dilthey (2010), Scheler (1961, Chaps. II & III, 1973b, 1973a: 135–8), Heymans (1905), Baldwin (1906), Katz (1935: 8, 1989: 51), Stout, 1931 (Bk. IV, Chaps. 1 & 6); and, more recently, Garnett (1965), Hampshire (1982), Hamlyn (1990), Baldwin (1995), Russell (1995, 1996), Cassam (1999), Bermudez (2000: 164), Smith (2002), Williams (2002: 136), Matthen (2005: 8), Massin (2009, 2011c), Declerck (2014).

- (v) *Absorption*. The contrapositive thesis has also been considered in some de-

tail. In the same way that the feeling of effort (“effort-fulness”) has been claimed to be the chief source of our knowledge of the distinction between ourselves and the world, *effortlessness* has been claimed as the explanation for cases where the subject–object distinction vanishes. That effortlessness leads to the disappearance of the self–world dualism is an important strand in philosophical and psychological research pertaining to the ownership of one’s body and the use of tools. One recurring hypothesis here is that we experience as belonging to our own body not just any parts of our own biological body but also any external appendage that we can move at will, without effort. The *locus classicus* on tools and prosthetic touch is Lotze (1888, Bk V, Chap. 2, §4: 588–9), and further examinations of tool integration are to be found in de Vignemont (2007, 2013, 2014), Gibson (1968); Katz (1989); Klatzky and Lederman (1999); Martin (1992, 1995); O’Shaughnessy (2003); Stout (1903: 92–3); Wagmann and Carello (2003); and Yamamoto and Kitazawa (2001). As pointed out by Billeter (2002), a similar idea is to be found within Chinese philosophy. The transition from self–world dualism to the absorption of the subject in the object is a central theme in the philosophy of Tchouang-Tseu. Tchouang-Tseu put forward several detailed descriptions of initially complex actions in which the subject–object distinction vanishes as the action becomes performed with more and more ease.

- (vi) The experience of effort has also been claimed to constitute our primary *epistemological access to causal relations*. Arguing that causation is nowhere to be presented in experience, Hume discusses this possibility in a famous footnote. It is not the case, Hume argues, that the experience of effort, or *nisus*, presents us with relations of necessitation between distinct existents. The view that feelings of effort give us empirical access to necessary connections or forces has however been endorsed,

pace Hume, by Newton (see Jammer, 1999), Maine de Biran (1993, 2002), Broad (1923: 162), Spiegelberg (1960, vol. 2: 662), Fales (1990: 12), Beebee (2009), Schrenk (2014), Marshall (2015).

- (vii) Efforts have also been appealed to in answer to the philosophical question of the nature of *achievements*. Bradford (2014: Chap. 2) has recently proposed a detailed account of achievements, which she partly analyses in terms of products of *difficult* processes, where the *difficulty* of a process is in turn understood in terms of effort. Bradford therefore takes efforts to be primitive, and analyses difficulty in terms of efforts.
- (viii) On top of giving us access to causation and to the distinction between ourselves and the world, the feeling of effort has been ascribed various other epistemic functions. It has been claimed (a) to give us access to our own *agency* (the relation between the feeling of efforts and the sense of agency is discussed in Bayne, 2011; Demanet, Muhle-Karbe, Lynn, Blotenberg, & Brass, 2013; Dries, 2013; Pacherie, 2007, 2008; Preston & Wegner, 2009); (b) to inform us about the *likeliness of success* (Kruger, Wirtz, Van Boven, & Altermatt, 2004); (c) to present us with the *solidity* of bodies (Locke, 2008, II, iv); (d) to inform us about our *energy expenditures* (Preston & Wegner, 2009); (e) to inform us about the need to stop an ongoing task or to reassess it against alternatives (Hockey, 2011; Inzlicht, Schmeichel, & Macrae, 2014; Kurzban, 2016; van der Linden, 2011).
- (ix) Muscular efforts have been used to explain the achievements of *haptic* or *effortful tactile perception* (e.g., Lederman, Ganesan, & Ellis, 1996; McCloskey, Ebeling, & Goodwin, 1974; Turvey, 1996; Turvey & Carello, 2011).
- (x) Mental efforts (in this context interchangeably called “effort of cognition,” “decision costs,” or “mental labor”) have been appealed to as a key variable in experimental economics to explain why decision makers do not always take the decisions that would maximize their

monetary payoff (V. L. Smith & Walker, 1993; Camerer & Hogarth, 1999 refine this labor-theory of cognition by introducing the ideas of cognitive capital and production).

- (xi) Effort has been appealed to in order to explain why bizarre or difficult linguistic stimuli are better remembered than common stimuli (the “processing-difficulty effect”: E. J. O’Brien & Myers, 1985; Walker, Jones, & Mar, 1983; the “bizarreness effect”: Imai & Richman, 1991).

Works on Species of Efforts

Fourth, although the nature of the *genus* effort remains a largely unexplored area, important research has been pursued pertaining to the nature of various *subspecies* of effort:

- (i) On the nature of *muscular effort* (Banister, 1956; McArdle, Katch, & Katch, 2009; Nubar & Contini, 1961);
- (ii) On the nature of *effort of attention* (Kahneman, 1973) or *cognitive effort* (Ackerman, 2011; Kruglanski et al., 2012; Kurzban, Duckworth, Kable, & Myers, 2013; Westbrook & Braver, 2015), or on some aspect of such efforts, such as their subjective difficulty (Robinson & Morsella, 2014).
- (iii) On moral effort, *effort of will*, or effort to resist temptation (C. Campbell, 1939; Holton, 2009; Fehr, 2002; Knoch & Fehr, 2007).

We shall below return to the content of the main proposals advanced in these various fields.

Works on the Value(s) of Effort

Another important research area concerns the *value(s)* of effort. It has recurrently been claimed in practical philosophy that effort constitutes one main basis of *desert* (Bradford, 2014; Sadurski, 1985a, 1985b; Sher, 1979). Furthermore, the idea that effort has a moral value is reflected in influential conceptions of *justice*, *economic values*, and *ownership*:

- (i) *Desert-based conceptions of distributive justice* have it that wealth should reward efforts (Milne, 1986; Miller, 1989, 1996;

Roemer, 2009; Sadurski, 1985a, 1985b; see Lamont, 1995 for critics).

- (ii) *Labor theories of economic value* (Locke, 1988; see Marx & Engels, 1867; Ricardo, 1891; A. Smith, 1887; Vaughn, 1978; see Carson, 2004 for a recent reassessment) have it that the economic value of a good results from the amount of effort needed to produce it, or, alternatively, from the effort spared to the owner of that good. The difficulty of labor is thus an omnipresent idea in Smith, who constantly appeals to “hard work,” “hardship endured,” “toil and trouble,” and the like to explain economic value. Bastiat (1996) and his American disciple Perry (1878) equate economics with the science of exchanges and argue that efforts, rather than goods, are the fundamental “exchangeables,” the basic entities we trade. Hearn (1864) even proposed defining economics as the “science of efforts to satisfy human want.” The intuitive motivation behind the view that efforts confer value to the things produced through them has been studied in psychology by studies on “effort heuristics” (Kruger et al., 2004) and in social psychology by studies on “effort justification” (Aronson & Mills, 1959); a closely related idea is also suggested by studies on the “Ikea effect” (see Norton, Mochon, & Ariely, 2011), according to which people attach more value to goods that they played a role in creating.
- (iii) *Labor theories of appropriation*. Locke (1988) famously claimed that one becomes the owner of a good by “mixing” one’s labor with it. That ownership is as a retribution for one’s effort has been advanced in recent discussions about intellectual property rights (Rosenberg, 2013).

It is however difficult to determine what is valuable in effort in the absence of a prior understanding of the nature of effort. One promising answer, which fits nicely with the hypothesis that efforts are to be analyzed in terms of forces, has however been advanced by Reginster (2007) in the context of interpreting Nietzsche’s view on the value of the will to power, the rough idea being that effort spent in the process of overcoming resistance accrues some

agonistic intrinsic value (I come back to this proposal below).

Works on Cognate Concepts

A last group of research, although they do not explicitly mention efforts, instead targets concepts that are arguably tightly connected to effort. Such concepts are that of *tryings*, of *forces*, of *work*, of *fatigue*, and of *difficulty*.

- (i) *Trying*. Independently of its possible role in the definition of action mentioned above, the concept of *trying* has itself become a target of investigation. The concepts of effort and trying are arguably close cognates; one promising hypothesis to be considered below is that efforts constitute a subspecies of tryings. It is indeed plausible that all efforts are tryings—although the reverse may not hold. [Waismann \(1994\)](#) writes, “‘To try’ seems to mean less than ‘to make an effort’; there is no reference to any energy in ‘trying’” (p. 72; see also [Glock, 1996](#); [Hacker, 2000](#), 571–572). *Effortless tryings* to move objects might occur in the world imagined by Descartes: “If every time our hands moved towards any place, all the bodies in that place receded as quickly as our hands approached, we should never feel hardness [=resistance]” (*Principles*, II, iv). *Preventive tryings* such as trying to cause a draft by not closing the window might also be effortless (see [Von Wright, 1963](#)). If true, the three following issues about trying might generalize to efforts:

- The first bears on the relation between trying and action. On the standard view, trying to Φ is an essential ingredient of the action of Φ -ing. The view comes in two main versions: Either trying to Φ is held to be a common ingredient in both the action of Φ -ing and the failed attempt to Φ ([Armstrong, 1973](#); [Broadie, 1966](#): 29; [Gorr, 1979](#): 237; [Grice, 1991](#): Chap.1; [McCann, 1975](#); [Peacocke, 2008](#): 249); or trying to Φ is held to be identical to the action of Φ -ing in case of success, but to be a *sui generis* mental event in case of failure (various versions of that disjunctive approach have been

developed by [Faulkner, 2014](#); [Hornsby, 1980](#): 34–39; 2010; [L. O’Brien, 2007](#): Chap. 8; and [O’Shaughnessy, 1973, 2009](#)). There are several problems with the view that acting necessitates trying (see in particular [Schroeder, 2001](#)). Following the pioneering works of [Taylor \(1973\)](#) and [Chisholm \(1976](#): 69–84), it has been argued, against the standard view, that one should analyze tryings in terms of actions rather than actions in terms of tryings ([Cleveland, 1997](#); [Grünbaum, 2008](#); [Hacker, 2000](#): 571; [Jones, 1983](#); [Massin, 2014b](#); [Wilson, 1989](#)). This “action-theory of trying” has recently come under attack in a series of papers by [Ruben \(2013, 2015, 2016\)](#), albeit not on behalf of the standard view, but in defense of a conditional theory of tryings whose main upshot is that tryings are not particulars.

- Another relevant discussion pertains to the limit of what one can try. [James \(1890\)](#) noticed that “the sense of impotence inhibits the volition.” [Ludwig \(1995\)](#) argues along similar lines, as an answer to [Adams \(1995\)](#), that one cannot try to do what one thinks is impossible; [Schmid \(2011\)](#) argues that the ability-constraints on tryings and intentions are given by some affective rather than cognitive states. If similar constraints apply to efforts, such discussions may prove highly relevant for determining the limits of what one can strive for.
- Third, the concept of trying has also received important attention within practical philosophy. In moral philosophy, [Griffith \(2007\)](#) has recently argued that trying is the locus of freedom and responsibility; [Scheler \(1973a\)](#) suggests in various places that strivings are the primary bearers of moral values. One also finds a vast literature within the philosophy of law and legal studies about the penal status of attempts (see notably [Duff, 1996](#)). [Yaffe \(2010\)](#) has recently argued that identifying attempts with tryings, which legal studies fail to do explicitly, paves the way for a solution to the problem of the criminalization of attempts. According to the

“transfer principle” he endorses, attempts inherit their penal status from the conducts they would have led to, had they been successful.

- (ii) *Forces*. A second concept tightly connected to effort is that of forces. How exactly the two concepts relate to each other is a question that I shall come back to below, but one possibility, alluded to above, is that the feeling of effort gives us epistemological access to forces, construed as causal relations. Another, entirely compatible, way is to construe the relation between effort and forces as metaphysical: Perhaps forces (physical, mental) are key ingredients of efforts, in the sense that efforts essentially involve the exertion of some forces, as the etymology of the term seems to indicate (the word comes from the old French “esforz,” meaning exerting strength). The physical and philosophical discussions surrounding the concept of forces have a long and fascinating history (Jammer, 1999). Antirealism about forces used to be a fairly standard view, firmly grounded in both the Cartesian and Humean traditions (there were, however, important exceptions: Bolzano, 1972; Boscovich, 1966; Euler, 1752; Kant, 2004). Recent works in philosophy of sciences and metaphysics have however reinstated force-realism as a viable and plausible option (Armstrong, 1997; Bigelow, Ellis, & Pargetter, 1988; Creary, 1981; Esfeld, 2013; Fales, 1990; Johansson, 2004; Massin, 2009, 2016; Molnar, 2003; Strawson, 1987; J. J. Wilson, 2002, 2007, 2009). This progress toward a realist understanding of forces arguably paves the way for an analysis of efforts partly in terms of forces.
- (iii) *Work and labor*. On top of the concepts of trying and forces, the important but scattered literature on concepts of labor or work (see, e.g., Applebaum, 1992; Hamesse, 1990; Theocarakis, 2010) displays important connections between the concepts of work and of effort. How are these con-

cepts connected? One possibility is that work or labor correspond to a subspecies of effort: the kind of effort that characterizes activity that aims at producing some economic goods or services. Clearly not all effortful activity is work: The effort we invest in winning a game, in trying to convince a friend, or in cleaning one’s car is not *work* in the strict sense. The young kid digging a hole in the sand and complaining that it is a lot of work is plausibly stretching the concept of work.

- (iv) *Fatigue*. The concept of fatigue is tightly connected to the concept of effort and has been the target of various psychological works (e.g., Ackerman, 2011; Hockey, 2013; Noakes, 2012).
- (v) *Difficulty*. The concept of difficulty, likewise, seems tightly connected to the concept of effort. Authors who subscribe to the motivation intensity theory (Brehm & Self, 1989; Gendolla, Wright, & Richter, 2012) hypothesize an essential connection between effort and difficulty, according to which effort is a function of (or amounts to?) the difficulty of the behavior required to reach an end. Westbrook and Braver (2015) argued that some difficult task might not be effortful, if by difficulty we mean a low probability of success (e.g., hitting the bullseye is difficult, but not clearly effortful). We will also come back to this concept of difficulty below.

Limits of the Present Research

Despite significant scientific advances in the determinants, roles, values, and subspecies of efforts, as we have seen, works addressing the question of *what all efforts have in common, in virtue of which they are efforts*, remain absent from the actual state of the art. With respect to such a general definition of effort, the present state of the art is lacking in four respects:

1. While there are substantial works about the nature of some *species* of effort (muscular, cognitive . . .), *virtually no work on the genus effort is to be found*.

2. *Research works on effort remain scattered:* They target different functions, features, or species of efforts, and remain widely isolated from each other.
3. *Research on the value of efforts has remained largely disconnected from research on their nature.* The question of what it is about the nature of efforts that grounds their moral worth remains largely unaddressed; likewise, the constraints put on the nature of efforts by our evaluation of efforts is hardly ever taken into consideration.

Why We Need a Definition of Effort

This section argues that, given the present state of effort-research, an explicit and general definition of effort would constitute an important step forward. One may, however, object that it runs contrary to the spirit of *empirical* research to adopt a definition of effort *prior* to empirical investigation. We should not put the cart before the horse: Empirical sciences will eventually deliver a definition of effort—an understanding of its real nature—but they cannot start from a definition. First, we uncover the various causes and physiological substrates of effort, then we find out what effort is. Or so the objection goes.

There is some truth in this line of thought: Not *everything* about effort can be known “from the armchair.” I maintain, however, that *some* truths about effort not only can but *must* be known from the armchair—and these truths are crucial for effort research. Here are a couple of arguments to this effect.

First, there clearly *are* propositions about effort which we know to be true prior to any empirical investigations. “Effort is not a planet” is one of them, albeit admittedly hardly illuminating. As we will see, more relevant *a priori* claims about the nature effort can be uncovered. Here is a blunt list of some of these claims, to be defended below: “Efforts are not feelings”; “Efforts are actions”; “Efforts can fail or succeed”; “Efforts are always exerted against some resistance”; “Effort are always made to reach some goal”; “The intensity of efforts is not a function of their failure/success.”

The second reason why we need to get clear about a definition of effort prior to empirical investigations is that, absent an initial definition

of effort, we face three impossibilities. First, the *practical impossibility of investigation*: How are we to look for something we have no idea about?¹ Second, the *theoretical impossibility of mistake*: Whatever is found can be claimed to be exactly what we were looking for. Third, the *epistemic impossibility of disagreement*: If effort cannot be characterized independently of the various empirical explanations of it that can be given, then no two such explanations could ever conflict, for no two explanations would ever be about the same explanandum. So, empirical investigations into efforts depend on some prior understanding of what efforts are. This may sound trivial, but note that one immediate consequence of it is more controversial: namely, that scientific inquiries are not empirical through and through and must rely on some *a priori* characterization of their objects.

Third, a growing concern is that research on effort is too scattered. Richter and Wright, in their introduction to the sole volume to date that aims at unifying research into effort from various fields of psychology, write:

Given the history of effort discussions and the current level of interest in effort processes, one might think there would be a consensus on the character of the effort construct. Unfortunately, this is not the case. [. . .] Although disagreements about effort character are understandable and healthy in some respects, they impede the advancement of related science and must ultimately be resolved. (Richter & Wright, 2014, p. 745)

Plausibly, the lack of a common definition of effort impedes interdisciplinary collaboration. In particular, since different areas of effort research often target different species of effort, bringing together these divergent works is difficult precisely because of the lack of a shared account of the genus effort. Psychologists studying attention, philosophers studying weakness of will, physiologists studying muscle exercise and ethologists studying mating behavior are interested in different species of efforts—efforts of attention, efforts of will/to resist

¹ A problem is known as the “paradox of inquiry” or “Meno’s paradox,” after the following famous passage of Plato: “How will you look for [a definition of virtue], Socrates, when you do not know at all what it is? How will you aim to search for something you do not know at all? If you should meet with it, how will you know that this is the thing that you did not know?” (Plato, *Meno*, 80d, in Cooper, 1997: 880).

temptations, muscular efforts, and mating efforts. While some of the problems they encounter and some of the solutions they propose are often strikingly similar (as we shall see), transfer and collaboration between such fields is hampered by the lack of a common account of effort.

Fourth, exclusive reliance on a tacit understanding of effort leads to misunderstanding and equivocation. Von Kriegstein recently raised this worry about philosophical research pertaining to effort:

While rarely analyzed itself, the concept of effort is used to analyze other important concepts in a variety of philosophical contexts, including desert, attention, competence, and distributive justice. Given the ambiguities in our everyday notion of effort [. . .], using an unanalyzed notion of effort to explicate these other concepts runs the risk of equivocating between different concepts. (Von Kriegstein, 2017, p. 28)

What holds true within philosophy holds true *mutatis mutandis* across various scientific disciplines. Absent an agreed-on explicit definition, the possibility that researchers from various fields use the term “effort” to refer to utterly distinct phenomena cannot be ruled out, so it may be that no unique concept of effort is to be found across sciences. As we have seen, an impressive variety of explanatory roles are ascribed to the concept of effort. This may raise legitimate suspicion about the unity of such an all-purpose *explanans*. A possibility, therefore, is that instead of a single generic concept of effort, we can find only disparate uses of the term “effort” referring to no common natural kind. Just as some have claimed that the ordinary concepts of pain (Corns, 2016; Hardcastle, 2001) or of mental state (Churchland, 1981) are of no scientific relevance, one may argue that, once we subject it to scrutiny, the idea that there is a single concept underlying the various uses of “efforts” in the various sciences loses its plausibility. The inevitable conclusion is that science should get rid of it. Such a skeptical or eliminativist conclusion is not to be excluded *ex ante* and would in itself constitute a substantive result. For the unity of the concept of effort is widely taken for granted and hardly ever questioned. In ethics, many different species of efforts are considered to be equally viable candidates when it comes to grounding desert. Furthermore, in economics and in behavioral sciences, efforts are assumed to belong to a

single natural kind in that their respective costs can be compared in the process of decision making (McFarland & Sibly, 1975; McNamara & Houston, 1986; Spurrett, 2014). The only way to assess the sceptical hypothesis that different species of effort have nothing in common, is to try to find a general definition of effort. If we fail, this will be a clue that perhaps there are no essential features common to all efforts to be found. In the meantime, the default assumption that all efforts must have something in common should prevail.

In sum, an explicit definition of effort, one may hope, would not only allow us to circumvent the various paradoxes raised by the idea of a fully a posteriori account of effort, but would also foster interdisciplinary collaborations on the topic and ensure that the term “effort” is used univocally across sciences. How are we, from the armchair, to search—and possibly fail to find—some essential properties of efforts? The proposal is basically that looking for a definition of effort consists in trying to *make explicit* our pretheoretical understanding of effort; we make a lot of assumptions about efforts, both in ordinary life and in sciences. By unearthing them, one may hope to arrive at a clear understanding of the nature of efforts.

Four Main Approaches to Efforts

Efforts as Primitive Feelings

One possible reason why effort is rarely explicitly defined is that effort is often tacitly assumed to be an intuitively clear feeling, accessible through introspection. The view that effort is a raw feeling or primitive sensation is explicitly endorsed by Maine de Biran (2002: 115 sqq)—although Maine de Biran tends to waver between this view and a force-based account of effort; see below) and more recently favored by Bradford (2014: 39). The view is also prevalent among most participants in the peripheralist–centralist debate (see above), as well as among those who subscribe to the *indirect* approach, according to which the existence of an external reality is *inferred* from a sensation or feeling of effort (see above).

According to the primitive-feeling approach, the “of” in “a feeling of effort” is not the representational “of” (as in “the seeing of a dog”) but the specificatory “of” (as in “a piece of

cake,” “a book of psychology”). Together with pains, tickles, and nausea, efforts are held to belong to the category of feelings, where feelings are typically understood as mental episodes that do not refer to anything beyond themselves (contrary to, e.g., perceptions or beliefs).

This primitive feeling-view, however, clashes with at least six well-entrenched intuitions about effort, which suggests that efforts belong to the category of *actions*, not of *feelings*:

- First, while feelings are episodes we *have*—we *have a feeling of pain, or a strong feeling for some person*—efforts are *made* by us: We have feelings, but make efforts. Note that this remains true if we think that effort-talk is primarily predicative rather than referential: *To feel* is something that happens to us; *to strive* is something that we do.
- Second, efforts have a teleological dimension that feelings lack: Efforts are essentially connected to a goal or end, which the striving subject aims to attain, while feelings do not display such goal-directedness. This might be challenged in at least two ways. First, one may claim that feelings have adaptive value. Even so, it remains that, *from the point of view of the subject*, feelings do not clearly aim at something. Second, one may contend that feelings, such as the feeling of pain, *call for* some reaction—for example, pain should be avoided. This is true, but quite different from feelings being themselves directed toward an end. Efforts do not in any sense call for the pursuit of an end: They *are* pursuits of ends.
- Third, and relatedly, efforts are *productive*: One can lift weights, convince people, solve equations, or win the tour de France thanks to efforts. One cannot do these things thanks to feelings—although feelings certainly do have other sorts of influences on our behavior.
- Fourth, and relatedly, efforts have *success conditions*. When an effort achieves the goal it aims at, it is successful (and, if it doesn’t achieve the goal, it is a failure). Feelings by contrast have no success conditions. However, (some) feelings have accuracy conditions (insofar as they have contents), which efforts lack: Efforts can-

not be veridical, feelings cannot be successful.

- Fifth, efforts typically (perhaps essentially) are accompanied by some resistance, which the agent tries to overcome. Things *resist our efforts*. But they do not in any sense *resist our feelings*.
- Sixth, efforts are, under certain conditions, grounds for *desert* or *praiseworthiness*, which is not clearly the case of feelings. When one praises a student or a marathoner for his efforts, we do not praise him for his feeling. One might rightly retort that, in fact, we are sometimes praised or blamed for our feelings. But first, the praiseworthiness of feelings seems to depend on our having some indirect voluntary control of them (e.g., one can educate one’s sensibility). *Insofar as they happen to us*, feelings are not praiseworthy: They are praiseworthy only insofar as we can do something about the feelings we have. Second, the kinds of feelings that are thought to deserve praise or blame are typically *moral* feelings (compassion, envy . . .). It is very unlikely that the feeling of effort belongs to this category of moral feelings; the feeling of effort is rather on the same level as the feeling of pain or fatigue. Feelings of this kind are neither blameworthy nor praiseworthy (we cannot praise or blame people for feeling pain, except perhaps insofar as they can be held responsible for having these feelings).

If this is true, efforts are not feelings. In all likelihood, efforts are rather actions. *Pace* the primitive-feeling view of effort, the “of” in the “feeling of effort” must be the representational “of” after all: Feelings of effort are feeling-acts directed at efforts as their objects. Efforts are felt, in the same way that hardness, hotness, or pains are. Feelings of effort *bear on* efforts, and efforts, consequently, should be distinguished from our feeling them.

There might however be a grain of truth in the primitive-feeling view of effort. Even if efforts are not feelings but actions, perhaps one of their essential components—their difficulty or unpleasantness—is necessarily felt.

If efforts are not primitive feelings, can they be analyzed? Combining proposals made in various areas of this scattered research field, three broad kinds of definitions of effort emerge:

comparator-based accounts, resource-based accounts and force-based accounts.

Comparator-Based Accounts of Efforts

An influential proposal meant to reconcile peripheralism and centralism about effort (see above) argues that the feeling of effort consists in, or arises from, a comparison between the efferent order sent by the will, and the subsequent afferent signals received from the muscles. In cases of partial mismatch, some feeling of effort arises. This account, anticipated by Diltney (2010), found its first technical formulation in von Holst and Mittelstaedt's (1950) description of the efference-copy mechanism, and has since been constantly refined (see Frith, 2012 for an overview). Comparator-based models have been widely used to explain the phenomenology of agency as well as various related delusions and pathologies (see, e.g., Bayne, 2011; Bayne & Pacherie, 2007; Blakemore, Wolpert, & Frith, 2002; Haggard, 2005; Pacherie, 2008). More to the point, comparator-based models have been used to understand the feeling of effort (Jeanerod, 1983; Lafargue & Franck, 2009).

However, comparator-based accounts *as applied to efforts* raise two problems. First, like centralism and peripheralism, they seem to be accounts of the *feeling* of effort, rather than of efforts as such. That is, comparators might explain how we *represent* or *become aware of* our own efforts, but they do not themselves account for what efforts are.

Second, comparators account well for the *success* or *failure* of efforts, but they fail to account for the *intensity* or *difficulty* of efforts. This is due to the fact that the intensity of an effort is not a function of its success. Intense efforts sometimes fail, and slight efforts sometimes succeed. Hence, mismatches between efference-copies and reafferences are not correlated with the intensity of efforts. Thus, comparator mechanisms can explain neither the intensity of effort nor our awareness thereof.

Summing up, comparator-based accounts are not so much about effort as about our representation or awareness of effort; additionally, comparator mechanisms can contribute to the representation of the success or failure of efforts, but fail to account for their intensity or difficulty.

Resource-Based Accounts of Efforts

Resource-based accounts define efforts in terms of the “expenditure,” “investment,” “consumption,” “allocation,” or “depletion” of *energy* or *resources* in order to reach one's goals: “The construct of effort can be defined as the mobilization of resource to carry out behavior” (Gendolla & Wright, 2009, p. 134). One common driving metaphor here is that of economic investment or consumption (Wright, 2014, 2016): We have at our disposal a limited—finite, scarce—resource, such as money, which we can use to reach our goals; making an effort consists in allocating part of this resource to the pursuit of one of our goals. Resource-based accounts of effort avoid the main defects of primitive-feeling and comparator-based accounts. Contrary to primitive-feeling accounts, resource-based accounts do not essentially conflate efforts with the feelings thereof, and rightly equate efforts with *purposeful action*, namely, the action of using some limited resource to reach some goal. Contrary to comparator-based accounts, resource-based accounts do not conflate the intensity of efforts with their degree of success or failure: According to resource-based accounts, *the intensity of an effort simply corresponds to the amount of resource dedicated to a task*. For instance, the more energy is consumed, the more intense the effort. One main rationale in favor of resource-based accounts consists in the abundant empirical literature showing that prolonged mental efforts negatively impact performance and efficiency over time (e.g., Arai, 1912; Lorist, Boksem, & Ridderinkhof, 2005; Scerbo, 2001; Warm, Matthews, & Finomore, 2008).

The term “resource-based accounts” covers a large variety of theories. An initial distinction among them pertains to whether resources are considered to be consumed or depleted after their allocation:

1. Some resource-based accounts appeal to some limited but *nondepletable* resource, such as attention (Kahneman, 1973) or some computational process (Kurzban et al., 2013); focusing one's attention on some task leaves less attention available for other tasks, but the total amount of attention remains constant;
2. Other resource-based accounts appeal by contrast to a limited and *depletable* resource, such as energy (Gendolla & Wright, 2009):

Using energy to perform a task not only leaves less energy available for other tasks, but also decreases one's total amount of energy.

Another way to distinguish among resource-based accounts is according to the category of resource they appeal to: physiological, functional or psychological, or simply conceptual:

1. Physiological approaches appeal to *metabolic resources*, glucose depletion being one main candidate (see Gailliot & Baumeister, 2007; Gailliot et al., 2007 for a review). Holroyd (2016)'s "waste disposal hypothesis" proposes instead that resource depletion corresponds in fact to the accumulation of a toxic waste product in neutral tissue (amyloid-beta).
2. On a functional level, depletion of a *computational capacity* is often appealed to (Kurzban et al., 2013; Westbrook & Braver, 2015).
3. Another influential albeit increasingly controversial proposal appeals to *strength of self-control*: Effortful action, in this hypothesis, "consumes one's self control," leaving one in a state of "ego depletion" (see Baumeister, Muraven, & Tice 2000 for a defense; Hagger, Wood, Stiff, & Chatzisarantis., 2010 for the state of the art; 125 Inzlicht & Schmeichel, 2012 for an account of ego depletion that avoids positing such a controversial resource as self-control).
4. Finally, some resource-based accounts have it that the "resource" talk is non-committal: Although agents engaging in effortful behavior can fruitfully be described *as if* they were allocating some limited resource, this does not entail that there is any finite resource really allocated by the agent.

These different approaches to the resource depleted in effort are compatible; thus, glucose is sometimes held to be the realizer or substrate of self-control.

Yet a third way to distinguish among resource-based accounts of effort pertains to the intensity of efforts. By contrast to comparator-based accounts of effort, resource-based accounts provide a straightforward account of the intensity of effort: The intensity of an effort is just the amount of a resource that is invested in

the pursuit of a goal. But that in itself does not explain *why* such-and-such amount of the resource is allocated to the pursuit of the goal; resource-based accounts might also be distinguished according to how they conceive of the chief determinants of effort mobilization. Three influential (but nonexhaustive) proposals have been as follows:

1. According to the first proposal, the intensity of an effort—that is, the amount of a resource invested in the pursuit of the goal—is a function of the intensity of the motivation or the desirability of the goal (J. P. Campbell & Pritchard, 1976). The more we want something, the more we invest resources to get it.
2. According to the second proposal, the intensity of an effort depends not so much on the strength of the motivation as on the difficulty of the task required to reach one's goal (Brehm & Self, 1989; Gendolla et al., 2012).
3. According to the third proposal, the intensity of an effort depends instead on the next-best alternative action that one foregoes in performing the action in question. Thus, the cost of solving a mathematical problem when the next-best alternative is mind-wandering is relatively low, while the cost of solving that same mathematical problem when the next-best alternative is to have dinner with friends is higher. In other words, the intensity of an effort corresponds to its opportunity cost (Kurzban, 2016; Kurzban et al., 2013).

Although these different accounts are sometimes presented as mutually exclusive, it is worth noting that, in principle, they could be combined: The intensity of an effort—the energy it requires—could be jointly determined by the intensity of the motivation, the intrinsic difficulty of the task. *and* its opportunity cost.

A careful examination of the various versions of the resource-based theory is beyond the scope of this article. While primitive feeling accounts and comparator-based accounts of efforts face some serious objections, I do not think that the resource-based approach in general suffers from such structural defects. I shall however argue below that force-based accounts of effort, which I will now introduce, may, on

balance, be more plausible than resource-based accounts.

Force-Based Accounts of Efforts

Force-based accounts of efforts explain efforts in terms of *forces exerted in order to reach some goal*. Note that force-based accounts of efforts *do not equate efforts with forces*. Rather, force-based accounts equate efforts with *intentional exertions* of forces, more precisely, with voluntary actions of exerting some force so as to produce some desired outcome. Efforts are therefore not *just* forces on such accounts.

The reason why this point needs to be stressed is that at least two different strands of thought may lead to mistakenly conflating effort with forces.

- First, the terms “effort” and “force” are often used equivalently in mechanics’ textbooks (alternatively, “effort” is sometimes used to refer to a subspecies of forces). The sense in which we are using “effort” here is of course different: Physical objects do not make efforts on each other; effort in our sense is a partly psychological concept, essentially connected with the pursuit of a goal.
- A second reason why effort and forces are sometimes conflated is that the feeling of effort has often been advanced as the source of our epistemological access to forces. The idea is put forward by Newton in order to explain the concept of force, and even Hume, who of course rejects the idea, recognized that the feeling of effort or “*nisus*” is the chief candidate when it comes to the possibility of experiencing forces.² Broad sums up the proposal this way: “Unquestionably the sensational basis of the scientific concept of force is the feelings of strain that we experience when we drag a heavy body along, or throw a stone, or bend a bow” (Broad, 1923, p. 162).

Equating the feeling of effort with the feeling of forces, however, encourages the conflation between efforts and forces. This is a mistake: Forces, unlike efforts, are not goal-directed. A less misleading candidate for the feeling of forces is the sense of pressure (de Vignemont and Massin, 2015; Massin, 2010). Unlike the feeling of effort, which presents us with inten-

tionally exerted forces, pressure perception presents us with goal-free forces, deprived of any telos.

Relatedly, as we saw, peripheralists identify the feeling of effort with the feeling of muscle contractions. This naturally suggests that muscular efforts are nothing but muscle contractions. This proposal has, however, rightfully been criticized: Spontaneous muscle contractions, such as cramps, or externally generated muscle contractions, do not count as efforts (see, e.g., Dillthey, 2010; Garnett, 1965: 78; Maine de Biran, 2002: 120; McCloskey et al., 1974; Scheler, 1973a: 120). Muscle contractions can happen to us, but efforts are things we do; at best, effort might be equated with *voluntary* muscle contractions.

Hence, effort, unlike force, is partly a teleological concept. Efforts, on force-based accounts, contain at least two aspects: a force and a telos, that is, the force exerted by the agent, and the goal that the agent thereby pursues.

Are there essential ingredients to effort other than exerted force and goal-directedness? Force-based accounts of effort have been especially popular among philosophers and psychologists interested in the idea that the feeling of effort presents us with the distinction between ourselves and the external world (see above). Key to their view is the idea that through effort we encounter some *resistance* from the external world. Accordingly, exerting a force in order to reach some goal is not yet sufficient to make an effort. Consider again Descartes’ world: “If every time our hands moved towards any place, all the bodies in that place receded as quickly as our hands approached, we should never feel hardness [=resistance]” (*Principles*, II, iv). In such a world, although we might exercise forces on the objects around us so as to make them move, we would not be making any efforts, for these objects (including our own body) would not resist us.

Consequently, upholders of the force-based approach typically hold that efforts essentially

² “It may be pretended, that the resistance which we meet with in bodies, obliging us frequently to exert our force, and call up all our power, this gives us the idea of force and power. It is this *nisus*, or strong endeavour, of which we are conscious, that is the original impression from which this idea is copied” (Hume, 2000; see Fales, 1990; Massin, 2009; Marshall, 2015 for discussion).

involve at least *two* forces: the force intentionally exerted by the agent, and the *resistive force* exerted in return by that on which he acts. Accounts of efforts along these lines have been endorsed by, among others, J. Baldwin (1906); Destutt de Tracy (1801, pp. 113–122, 331–334); Dilthey (2010); Heymans (1905); Maine de Biran (2000, 2002; Peirce (1935: 1.24, 1.320, 1.324, 1.332, 2.84, 5.7, 5.45, 5.539, 5.607, 6.19, 7.531, 8.266, 8.330); Scheler (1973b, 1973a: 135–8, 1961, Chaps. II & III); Stout (1931, Bk. IV, Chap. 1 & 6); and more recently, T. Baldwin (1995); de Vignemont and Massin (2015); Garnett (1965); Hampshire (1982); Hamlyn (1990); Massin (2010); Russell (1995, 1996).

Maine de Biran (2002) introduced one of the first versions of the force-based account (although he presents it as only an account of the *causes* of the primitive feeling of effort, a complication I shall ignore here). According to his proposal, an effort consists in the exercise of some “hyperorganic” force, coming from the will, which encounters an opposite muscular force (p. 125). Although suggestive, Maine de Biran’s proposal relies on the assumption that *psychical and physical forces can compose with each other* (an assumption that is particularly crucial for him because he equates efforts with the pineal gland linking the mind and the body). However, even if “hyperorganic” or “mental” forces are granted (more on this below), it remains doubtful that such forces can compose with physical forces, such as gravitation, so as to affect the motion of bodies.

A second version of the force-based account, which I favor, avoids this problem. For simplicity’s sake, let us first focus on *motor* efforts. According to this second account, a motor effort consists of (i) an agent exercising a mechanical force (F_1) on a body in order to make it move or stay at rest and (ii) that mechanical force being at least partly counterbalanced by an opposite force (F_2): the resistive force (see Figure 1).

The two opposing forces here are mechanical. The locus of mental causation is no longer at the meeting point of the two forces (contrary to Maine de Biran’s picture), but rather prior to the meeting point, in between the agent and the muscular forces she *exerts* (the dotted arrow in Figure 1). The proposal therefore avoids the need for physical and psychical forces to compose (this is at the price of leaving mental causation unexplained; but addressing this

problem is not the task of a definition of effort).³

The *intensity* of an effort, I submit, does not correspond to the magnitude of the exerted force, but to that of the resistive force, that is, to the degree to which the exerted force is counteracted by the resistive force. That is, if the exerted force is of greater intensity than the resistive force, the intensity of the effort corresponds only to the part of the exerted force that is counteracted by the resistive force. The “surplus” of exerted force, the part of it that is not counteracted by any force, does not add to the intensity of the effort. The intensity of an effort can never be greater than the resistance encountered. This is why there are no efforts in Descartes’ world.

It may be tempting to think that the *success* of an effort depends on the exerted force (F_1) having a higher absolute magnitude than the resistive force (F_2), for otherwise the body would never move in the direction of the exerted force. This view is however mistaken: When one flies a kite, the goal is typically that the force we exert on the string exactly compensates for the force exerted by the wind, so as to maintain the kite in equilibrium. More generally, we do not only aim at *moving* things around (in which case, effort indeed succeeds only if the magnitude of F_1 is superior to the magnitude of F_2); we may also aim at *keeping* things in their place (in which case the magnitudes of F_1 et F_2 must be the same), or we may aim at *slowing moving things down* (in which case the magnitude of F_1 must be inferior to the magnitude of F_2).

Force-Based Versus Resource-Based Accounts

Differences Between the Two Accounts

The force-based and energy-based accounts appear to be the most promising accounts of effort. Both are structurally similar in that they equate efforts with *purposive actions*: the exertion of force in order to reach some goal on the

³ As it stands, the force-based account fails to account for efforts in which the resistive force is *not* colinear with the force exerted but, say, orthogonal to it, as the force exerted by the tide of a river on the swimmer trying to cross it. See Massin (2016, §5) for a solution to that worry.

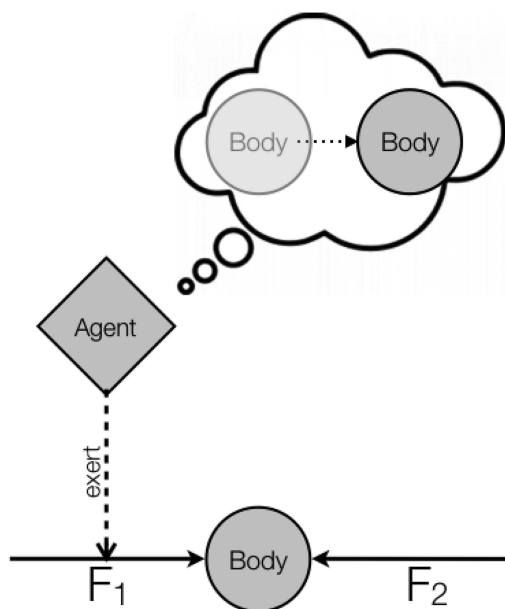


Figure 1. Force-based account of effort.

one hand, and the use of some resource in order to reach some goal on the other. What, exactly, is the difference between them? Two key differences are these:

1. While resource-based accounts equate effort with the use of a *scalar quantity* such as energy, force-based accounts equate effort with the employment of some *vectorial quantity*: force.
2. Relatedly, in resource-based accounts the *difficulty* of efforts stems from the fact that resources are *limited* in quantity, whereas in force-based accounts the difficulty of efforts stems from the fact that voluntarily exerted forces are *counteracted* by other forces. Thus, on resource-based accounts, the intensity of an effort is a function of the amount of energy used (given that energy is available in finite quantity), while in the force-based account, the intensity of an effort is a function of the degree to which the exerted force is counteracted by the resistive force. According to resource-based accounts, difficulty stems from scarcity and thereby *cost*; according to force-based accounts, difficulty stems from *resistance*.

How are these two accounts related? To tackle this issue, let us look at an analogous question that arises within the context of classical mechanics. As is well-known, there are two formulations of classical mechanics: One, Newtonian, starts from the concept of force; the other, Lagrangian, gives precedence to the concept of energy. Both force and energy can be defined in terms of each other, via the concept of mechanical work. As Feynman (1963) urges, the two formulations, although distinct in their fundamental concepts, are “exactly equivalent.” The good news is that one does not have to choose between force-based and energy-based mechanics, in the sense that they are not incompatible, but, on the contrary, mutually entailing. The less good news is that one still has to decide which of the two formulations is the most fundamental (if any): Do we consider forces to be prior to energy? Or do we consider energy to be more basic than forces?

My suggestion is that *the debate between resource-based and force-based accounts of effort within the psychology of agency exactly parallels the debate between energy-based and force-based mechanics*. Correspondingly, one does not need to *choose* one or the other conception of effort, if by “choosing” one means “rejecting the other”—for both accounts are extensionally equivalent.

This appears to vindicate Kruglanski et al.’s (2012) approach, which refuses to choose because force-based and energy-based accounts of effort. Their “cognitive energetic theory,” which they also label “force-field analysis,” instead promotes a *mixed* approach that understands effort in terms both of force exertion *and* of resource consumption. Thus, they first characterize cognitive efforts in terms of forces exerted against some resistive force:

Our cognitive energetics theory (CET) assumes that motivated cognition represents a dynamic process wherein a driving force matches a restraining force to effect goal pursuit. (Kruglanski et al., 2012, p. 1)

But, although they initially introduce their model as a force-based account—by emphasizing the opposition between an “effective driving force” and a “restraining force”—they soon define the driving forces in terms of energy:

Effective driving force [. . .] represents the actual amount of energy ultimately invested in goal pursuit. [. . .] For a goal-directed activity to be carried out, the

magnitude of the effective driving force needs to match the magnitude of the restraining force, that is, supply the energy to do “what it takes” to effect goal pursuit. (Kruglanski et al., 2012)

I fully agree with them that effort is a goal-directed activity. I also wholeheartedly agree with their presentation of the force-based account, and applaud their emphasis on the need to appeal to two forces to analyze effort, one exerted by the agent, the other resistive.

I however, I disagree with them on one important point: That energy-based and force-based accounts are equivalent does not mean that no choice has to be made between the two in the sense that forces and energy could coexist in a single mixed approach. Force- and energy-based mechanics are equivalent but impervious to each other; no version of classical mechanics explains motion in terms of both forces and energy—this would lead, among other things, to a bad form of causal overdetermination. On the face of it, the same should hold for theories of effort. Thus, although we may not have to *reject* one of the two accounts, we at least have to determine *which account of effort we take to be the most fundamental*. Kruglanski et al. take energy or resources to be more fundamental than driving force. A driving force, they claim, has two “elements”: resources or energy, on the one hand, and goal importance on the other. It is unclear to me in what sense energy and goal importance can be “elements” of a force; my suspicion is that this conflates the *determinants* or *causes* of a force with the *elements* or *constituents* of that force. Be that as it may, I would like to finish by addressing the following question: Taking for granted that energy- and force-based accounts of efforts are extensionally equivalent—that is, that they count as efforts in exactly the same episodes—which of these two sorts of accounts is the most fundamental, if any? After having argued that both resource-based and force-based accounts face very similar challenges when it comes to basic actions, mental efforts, and difficulty, I shall conclude by arguing that force-based accounts should be given priority over energy-based accounts.

Common Challenges: Basic Actions, Mental Efforts, and Difficulty

Force- and energy-based accounts face three main similar kinds of challenges.

Basic actions. Force-based accounts presuppose that *forces can be exerted intentionally*, so as to bring about motions. The Davidsonian orthodoxy in philosophy of action has it however that our most basic physical actions are *bodily movements*. Moving one’s body is the least we can do. Can exercises of forces nevertheless be intentional? Without prejudging this complex issue (see, e.g., Hornsby, 1980: 20–32), it might be noted that at least one kind of fairly basic action seems to consist in intentional exercises of forces, namely *pushing* and *pulling*. Such actions, it appears, can be performed successfully even if neither motion nor changes in motion occur (“I pushed the door heavily, but it did not open”).

Resource-based accounts of effort face a very similar worry, insofar as “using energy” is also not a basic action according to philosophical orthodoxy. Analogously, defenders of resource-based accounts may retort that *spending*, *consuming*, *expending*, and *investing* can be intuitively understood as basic actions.

Mental forces, mental energy? How does the force-based account generalize to *nonphysical efforts*—mental efforts such as efforts of will, efforts of attention? One way to generalize the model is to introduce *mental forces*, so as to equate mental efforts with the exercise of mental forces against some other mental resistive-force. The move is not unprecedented: The idea that there are mental forces that compose with each other has been advanced by Deutsch (1968); Freud (1910/1937, 1915/1959—see McLaughlin, 1987 for a useful discussion); Lewin (1938); Sidgwick (1981: 112); and Wundt (1897: 186). Economists have also proposed understanding the relation between utilities or preferences in terms of composition of forces (Fisher, 2006: Chap. 3; Jevons, 1967: 133). More generally, force-related expressions are quite common within both ordinary and scientific psychology: “mental muscle,” “strength of will,” “will-power,” “spring of action,” “resisting temptations,” “being torn between desires,” and “attraction and repulsion” are recurring psychological idioms. This suggests that the idea of overcoming internal resistance is no less intuitive than the idea of overcoming physical resistance. The key issue, however, is whether this mechanical idiom, as applied to the mind, should be taken *literally* or

metaphorically, lacking real psychological counterparts

Here, again, resource-based accounts face a similar worry: While mechanical energy is a respectable concept, the appeal to mental energy or ego depletion may raise the same skeptical worries as the appeal to mental forces. An initial, instrumentalist solution for both accounts, alluded to above, is to use “energy” and “force” in some ontologically noncommittal sense. They can be thought of as pure theoretical devices that allow us to make good predictions but lacking real psychological counterparts. A more realist solution is to argue that, like the concepts of *parts* and *space*, which have both a material side (as applied to material objects or physical space) and a formal side (parts of a proposition, temporal parts of a process; space of colors, space of a function), the concepts of force and energy also have a formal or abstract kernel, which allows them to apply beyond mere physical reality.

Objective intensity versus subjective difficulty. A third problem encountered by force-based accounts pertains to the distinction between two kinds of intensities that can be ascribed to the same effort—a distinction peculiarly salient in the case of physical efforts. Lifting a weight at a given speed requires the exertion of the same force, whoever the agents are; thus, the *objective intensity* of their efforts will be the same according to the force-based account. But lifting the weight will be more difficult for small children than for adults (see Naccache et al., 2005; Noakes, 2012 for empirical confirmations). This difference pertains to what one may call the *subjective intensity* of an effort. While the *objective intensity* of an effort measures the *objective degree* to which one acts against the resistance encountered, in contrast, the *subjective intensity* of an effort measures the *subjective cost or difficulty* of the action for the agent. While the objective intensity of an effort is only a function of the force actually exerted and of the physical resistance encountered (a force measurable by a dynamometer, in the physical case), the subjective intensity also depends on the *abilities* of the agent (which include not only innate abilities, but also long-term acquired abilities, and short-term modifications of them, e.g., depending on our state of fatigue, etc.). The more able the agent, the easier it is for him to exert a given physical

force (see Wright, 2014 for presentation of this hypothesis and further references). Thus, equally objectively intense efforts may be subjectively more or less difficult. While the distinction between objective and subjective intensity, as well as the determinants of subjective intensity are reasonably clear, the difficulty is in understanding *what subjective intensity or difficulty is*. Since subjective difficulty is *ex hypothesis* distinct from the exercise of a physical force against resistance, the force-based account of effort seems to say nothing about it.

There seem to be two main options. The first is to equate difficulty with the *unpleasantness* of effort: It is more unpleasant for the child than for the adult to lift a heavy weight, because the child has less capacities. This move is however unlikely to capture the intuitive difference between the two cases, for we are inclined to say not just that the child suffers or endures more, but that he makes *more effort*. Lifting a weight takes *more effort* when one’s physical ability are low.

The second option is to *equate the subjective difficulty of the physical effort with the objective intensity of a second-order effort*. Lifting the weight, in this approach, *is an effort that requires more or less effort* depending on one’s abilities. The proposal is consequently that, when lifting a weight, we make not one but *two* efforts: the first-order effort *to lift the weight*—which consists in exerting a physical force opposed to gravity; and the second-order effort *to persevere in doing that first-order effort*, that is, the effort required in order to continue to exert a force opposed to gravity. The reason why it takes second-order efforts to exert first-order efforts is that (first-order) efforts are unpleasant. This unpleasantness (which depends on the agent abilities) is *not identical* to the difficulty of the first-order effort (contrary to what the former option claims), but *explains* it. It is *because* first order efforts are unpleasant that it is difficult to sustain them, through second-order efforts. Thus, while first-order efforts are strivings against *physical resistance*, second-order efforts are strivings against aversion to (the unpleasantness of) first-order efforts. While the first-order effort is the exertion of a physical force against a resistive force (gravity), the second-order effort is the exertion of a mental force against a psychological one (aversion to first-order effort). Delboeuf (1881) already

suggested that such an intermingling of mental and physical efforts may be the rule rather than the exception. If true, the objective intensity of a physical effort is determined by the objective amount of physical force exerted, while the subjective difficulty of this first-order effort corresponds to the objective intensity of the second-order effort required to sustain this first-order effort. In other words, the subjective difficulty of the physical effort just is the objective intensity of the second-order effort required to overcome one's aversion to (the unpleasantness of) physical effort.

Here, once again, resource-based accounts face an analogous problem: The amount of energy actually expended does not typically correspond to the subjective difficulty of the effort. Energy-based accounts may retort in a similar vein that the effort to lift a heavy weight really involves two efforts/expenses of energy: the physical energy expended in order to make the weight move upward and the mental energy expended in order to expend that physical energy, which depends on the agent's abilities.

In Favor of Force-Based Accounts

Can we then find any reason to favor one of the two accounts over the other? I shall conclude this article by advancing three reasons why force-based accounts of efforts should be considered as more fundamental than energy-based accounts: (i) Only force-based accounts properly capture the idea of a *resistance to our effort*, which is fundamentally the idea of a force. (ii) Resource-based accounts render the link between *making an effort* and *getting tired* metaphysically necessary, while it is arguably metaphysically contingent (iii). Force-based accounts neatly explain the apparently paradoxical facts that we seem to praise and enjoy efforts partly *in virtue of their unpleasantness*.

Resistance. The first reason is that force-based accounts fit better with our *ordinary* understanding of effort. It is perhaps no accident that Kruglanski et al. (2012) start by presenting their theory by appealing to the concept of force. From the point of view of commonsense and ordinary language, it is somewhat unnatural to describe and think of effort in terms of energy consumption or of investment of resources. By contrast, force-based accounts are more in tune with our ordinary thinking. They are, to begin

with, in accordance with the etymology of the term "effort," which comes for the old French *esforz*, meaning "exerting strength." Additionally, the way they capture the intensity or difficulty of effort corresponds to the way we describe efforts as attempts to overcome some *resistance*, or as striving against *opposition*. By contrast, *resource-based accounts do not directly capture this idea of resistance to our efforts*, but replace it with the concept of cost.

Striving and getting tired. The second argument in favor of force-based accounts is that such accounts are less likely than resource-based accounts to beg the question about the relation between *effort* and *fatigue*. The worry is that the idea of depletion of energy seems more tightly connected with the process of *getting tired* than with the action of striving. There is no doubt that there are strong empirical connections between fatigue and effort. As mentioned above, one main argument in favor of resource-based accounts is based on the empirically established fact that prolonged mental efforts negatively impact performance and efficiency over time (e.g., Arai, 1912; Lorist et al., 2005; Scerbo, 2001; Warm et al., 2008). But precisely because such a connection between effort and fatigue needs to be established empirically, it should not be part of our general definition of effort. If we are to claim that efforts cause fatigue, or increases thereof, and if increasing fatigue is understood in term of energy depletion, then effort should not itself be understood in terms of energy depletion. Otherwise put, *the relation between effort and fatigue should not be prejudged by our very definition of effort*. One may perhaps conceive of a being with an infinite amount of energy at his disposal—a being who therefore never gets tired—despite his making constant and intense efforts. Subjectively, such a being could find effort hard, unpleasant, and difficult. He may grimace in pain when lifting heavy weights. But he never feels tired as a result. (Or think of a miser who can print money at will, but who still strives to overcome his repulsion toward spending it.) Such an indefatigable yet striving being may well be *empirically* impossible, but he is arguably not *metaphysically* impossible; hence, such a possibility should not be precluded by our very *definition* of effort. The trouble is that this is

precisely what resource-based accounts of effort tend to do: They render the link between effort and fatigue analytic and essential. Force-based accounts, by contrast, stay clear of any substantive commitment about the relationship between fatigue and effort.

Praiseworthy and enjoyable because unpleasant. The third and last argument in favor of the priority of force-based accounts is that, contrary to resource-based accounts, force-based accounts provide a straightforward and plausible way out of two paradoxes concerning our normative assessment of effort. The two paradoxes arise from the widely admitted fact that efforts are *unpleasant*: “Efforts are from their very nature more or less disagreeable,” writes Hearn (1864), Ortega y Gasset (1949: 1170) concurs: “Effort is only effort when it begins to hurt.” In spite of this, we ascribe, seemingly paradoxically, two chief kinds of positive value to effort:

- (1) We (sometime) ascribe positive hedonic value to efforts. In spite of their unpleasantness, efforts are sometimes enjoyed. We speak of having or developing a *taste for effort* (Waterman, 2005), we speak of the *satisfaction* and *gratification* of efforts, and we take pleasure in a large panoply of effortful activities, such as endurance sports, difficult games, or scientific research.
- (2) We (typically) ascribe positive *moral* value to effort. Under some conditions to be specified,⁴ efforts are widely held to be praiseworthy, admirable, and to constitute one main ground of *desert* (see above).

These two positive evaluations of effort raise two parallel axiological paradoxes:

- (1) If efforts are unpleasant—hedonically bad—how can they also be pleasant?
- (2) If efforts are unpleasant—hedonically bad—how is it that they are sometimes morally good?

The paradoxes are all the more pressing given that the unpleasantness of effort appears to be part of the *explanation* of their pleasantness and of their moral value: Efforts are pleasant and praiseworthy, or so it seems, *partly because they are unpleasant*. We would neither enjoy

nor praise efforts if they were not somehow unpleasant. This is very odd. Could it be that our positive hedonic and moral assessments of effort rely on some suspiciously flagellant conviction? Does enjoying and praising efforts in virtue of their unpleasantness amount to ascribing intrinsic value to the self-infliction of pain?

There are, broadly speaking, two ways out of these paradoxes. The first, which may be dubbed “*ascetic*,” has it that efforts accrue moral value because they *manifest one’s self-control*. Thus, efforts may engender some *pride about one’s self-mastery*, hence explaining the pleasantness of effort. For the same reason, effort might deserve to be praised.

Instead of trying to rebut ascetic proposals of this kind (see Bradford, 2014:107 for critics), I would like to explore a somewhat less complacent approach to the hedonic and moral values of efforts. Pleasures taken in efforts are typically less reflexive than the pleasure of self-pride. They typically belong to the category of *pleasures in activity*, in which one is *absorbed* in the task being performed. Pleasures in activity are to be contrasted with pleasures of attainment: In pleasures in activities, one takes pleasure in *pursuing* certain ends in contrast to *attaining* them (Allen, 1930; Bain, 1875; Bühler—see Mulligan, 1988; Johansson, 2001; Ryle & Gallie, 1954; Shand, 1920; Sidgwick, 1981). Now, if all activities are effortful, and if all efforts are unpleasant, then every pleasure in activity involves *mixed feelings* (Massin, 2011a, 2014a), which raises the paradox we are now dealing with. But pleasures in activity also suggest a solution. A plausible explanation of the paradoxical connection between the enjoyment and the unpleasantness of effort is this: Games that are too easy are boring; unchallenging activities quickly become unpleasant. Up to a cer-

⁴ I am here ignoring several complications. First, one common ground for skepticism with respect to the moral value of effort is that, to the extent that the ability to make efforts is itself undeserved—for example, because some people are borne more prone to effort than others—efforts cannot ground desert (Rawls, 1971, p. 104; see Sher, 1979 for one possible answer). Second, *malicious* or *pointless* efforts do not seem morally valuable. Third, even rational efforts directed at valuable goals might not be valuable. A common idea within Aristotelian virtue ethics, but also within Stoic ethics (K. Campbell, 1985), is that accomplishing deeds effortlessly makes one even more praiseworthy (see Douglas, 2014; Sorensen, 2010 for discussion).

tain limit (above which despondency takes over; see Brandstätter et al. 2013), the more we encounter resistance or adversity, the more we enjoy the activity. On this hypothesis, the ground of the effort's pleasantness does not so much lie in self-pride than in the challenge offered by adversity. While this hypothesis is hardly expressible in terms of resource depletion—for the reason mentioned above, that the ideas of adversity, resistance, and opposition do not figure in such accounts—it is straightforwardly captured by force-based accounts of effort, which construe effort as exertion of forces against some resistance.

What about the moral value of efforts under this approach? Nietzsche paid particular attention to two aforementioned paradoxes about effort—that is, that an *effort's pleasantness depends on its difficulty* and that *the virtue and freedom of the striving agent depends on his encountering resistance* (Dries, 2015; Nietzsche, 1968; Reginster, 2007). On a broadly Nietzschean account, the moral worth of effort consists in some *agonistic* value. The corresponding virtue is not that of self-control, but rather that of *perseverance* or *tenacity*. In the same way that the pleasures of pursuit are of higher hedonic value than then pleasures of attainment, the value that accrues to the striving against some resistance is held to be morally superior to the value of the achievement of overcoming it. Here again, resource-based accounts of effort cannot clearly make sense of this idea because they fail to clearly connect effort with resistance.

Wrapping up, defining efforts in terms of voluntary exertion of forces against some resistive force allows one to explain the *hedonic value* of efforts in terms of the pleasure taken in challenging activity; and it allows one to explain the *moral worth* of effort in terms of the value of tenacious striving against adversity. Both the hedonic and the moral values of effort, so understood, are grounded in the opposition between active and passive forces that lie at the heart of effort.

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