

# DOES LEADERSHIP DEVELOPMENT NEED TO CARE ABOUT NEUROETHICS?

Dirk Lindebaum  
Cardiff Business School  
mail@dirklindebaum.EU  
-dirklindebaum.EU-

Ismael Al-Amoudi  
Cardiff Business School  
al-amoudii@cardiff.ac.uk

Virginia L. Brown  
Cardiff Business School  
BrownVL@cardiff.ac.uk

## Abstract

In this essay, we ask whether leadership development needs to care more about neuroethics in an era when neuroscientific interventions gain credence at work? Informed by emerging discussions amongst neuroscientists, we address two main issues. First, recent debates cast significant doubt on the validity of neurofeedback (especially neurofeedback using electroencephalography). These studies argue instead that it works through placebo rather than real effects. Second, further ethical concerns arise in response to (i) questionable commercial practice, (ii) issues of organizational in/justice and (iii) tendencies to ignore or downplay practical wisdom. Our discussion incites us to be both critical of neuro-feedback's scientific credentials and aware of its broader historical conditions of possibility. We complement these cautions with a call to action for leader development researchers and practitioners.

**Keywords:** ethics, electroencephalography, leader development, neuroscience, neurofeedback

**Acknowledgements:** We would like express our gratitude for the care and concern that the editor Bill Foster and the three reviewers have generously invested into the review process of this essay.

---

Cite as:

Lindebaum, D., Al-Amoudi, I. & Brown V. L. (in press) Does Leadership Development Need To Care About Neuroethics? *Academy of Management Learning & Education*.

*Please do not cite without permission until the essay has undergone copy-editing by the journal.*

Does leadership development need to care about neuro-ethics? Bearing in mind that neuro-ethics is “concerned with ethical, legal and social policy implications of neuroscience” (Illes & Bird, 2006, p. 511), we are motivated to ask this question for two reasons.

First, a growing number of leadership development researchers and practitioners are enthusiastic about the promises of neurofeedback, especially that based upon electroencephalography (EEG-nf). Neurofeedback constitutes a self-regulation technique providing individuals with feedback about specific levels of brain activity in conjunction with specific target behaviors (see the 'primer' in the Appendix, but also Balthazard, 2011; Rock & Schwartz, 2006; Waldman, Wang, Hannah, & Balthazard, 2016; Waldman, Balthazard, & Peterson, 2011). As a relevant example, prior studies (see Waldman et al., 2011) suggest that the use of neurofeedback putatively enabled researchers to convert un-inspirational leaders (i.e., the less effective ones with an ‘anger management’ problem) into inspirational ones (i.e., those who are more effective)<sup>1</sup>. And yet, we must ask what the consequences are for leadership development if neuroscientists flag up serious reservations about the validity of EEG-nf? For instance, neuroscientists such as Thibault and Raz (Thibault, Lifshitz, Birbaumer, & Raz, 2015; Thibault, Lifshitz, & Raz, 2016; Thibault & Raz, 2016a, b, in press) express serious doubts about the validity of data derived from EEG-nf, arguing that the majority of studies fail to adequately design experiments capable of singling out the unique variance that EEG-nf can explain. In consequence, they conclude it is highly likely that the observed effects in EEG-nf studies are due to placebo effects.

---

<sup>1</sup> Beyond the problems highlighted in the following sentences, we also note the significant weaknesses in the design of that study that adversely impinge upon the validity of the conclusions (see Lindebaum, 2013b, for a detailed treatment of this).

We contend that this raises significant questions about the ethical and practical ramifications for leadership development if questionable data is treated as superior or more valid in comparison with traditional modes of data. This position is regularly invoked by advocates of neuroscience. For instance, leadership development projects seeking to harness purportedly ‘better’ predictions derived from neuroscience argue that “neurofeedback approaches to develop better leaders” have great promise as “traditional measures [e.g., of leadership] explain only 10% of variance in outcomes” (Waldman, Wang, & Fenters, 2016: 12), or that “leadership neuroscience could help leaders hone certain skills or improve in areas where they are weak” (Balthazard, 2011).

Second, beyond these epistemological challenges posed by neurofeedback, we also ask whether there are ethical challenges, yet to be articulated, arising in response to the application of EEG-nf for enhancement (in the context of leadership development) rather than clinical purposes? We ask this question as a follow-up to Lindebaum’s (2016: 544) remark that there “is little – if any – deeper conversation about the ethics of neuroscience as such among advocates of organizational neuroscience, especially if neuroscience is applied to emotional or cognitive enhancing in healthy individuals rather than clinical purposes”.

In this essay, we draw upon recent debates in neuroscientific and psychological journals to draw the attention of leadership development researchers and practitioners to the validity issues afflicting EEG-nf (Thibault & Raz, 2016a, b, in press). Furthermore, we discuss a number of ethical concerns arising from the considerable commercial interests kindled by EEG-nf technologies and from the potential erosion of organizational justice and practical wisdom that are likely to follow EEG-nf’s unreflexive adoption.

We note that ethical concerns are further magnified once we see how the validity issues inherent in EEG-nf have not yet lowered the putative appeal of better predictions provided by neuroscience. Such a situation helps create a considerable market and training industry around ‘brain fitness’ and enhancement (Underwood, 2016)<sup>2</sup>. For instance, prospective leaders can enjoy an intensive brain-training retreat for a mere \$15,000, and the whole ‘brain fitness’ market is expected to grow to \$6 billion by 2020 according to some news articles (Alsever, 2015; but see also Simons et al., 2016). Even within business schools, neuroscience-based executive education programs are now being offered<sup>3</sup>. Thus, ethical issues can arise when “efforts to commercialize neuroscience . . . frequently outpace[d] the underlying science” (Ashkanasy, Becker, & Waldman, 2014: 909). Nevertheless, organizations keen for quick fixes concerning organizational capability and behavior in increasingly complex and dynamic settings may find the alleged benefits too appealing to question due to lack of necessary ‘neuroliteracy’ on the topic (Roskies, 2002).

In the remainder of this essay, we address the following points. First, we offer a brief overview on the topic of neuro-ethics, noting its prosperity as a dedicated subfield within neuroscience (Fuchs, 2006; Illes & Bird, 2006; Illes, Tairyan, Federico, Tabet, & Glover, 2010; Kalichman, Plemmons, & Bird, 2012; Levy, 2008, 2011). Our motivation is to highlight the significant ethical and practical questions this discipline raises. Second, we underline the relevance of these debates for leadership development, especially in relation to ethical concerns arising from the applications of data whose validity has been called into question by neuroscientists

---

<sup>2</sup> We do see EEG-nf as one tool in the pool of ‘brain training’ technologies where commercial interests run high. For instance, Balthazard (2011) notes that “the concept has been proven”, adding that “now we have to go beyond the proof of concept into operationalization. Then, we will move into the delivery of products and services”.

<sup>3</sup> See, for example: <http://executive.mit.edu/openenrollment/program/neuroscience-for-leadership/#.V4I3aPOV9gU> or [http://www8.gsb.columbia.edu/execed/program-pages/details/1026/POIPd\\_](http://www8.gsb.columbia.edu/execed/program-pages/details/1026/POIPd_) (both retrieved on the 10<sup>th</sup> of May 2017).

themselves. Third, we extend prior critiques to identify as-yet underexplored ethical challenges. And fourth, we draw this essay to a close with a pro-tem vote of no confidence in the scientific credential of EEG-nf, followed by a call for action (i) not to be blindly seduced by neuroscience's promise of producing better and more reliable data, (ii) to focus upon alternatives to the seductive appeal of neuroscience that are more viable in relation to leader development, and (iii) to develop greater sensitivity about the teleology of the 'enhancement' agenda at work of which neuroscience is now a central component. Although we frame our essay around the theme of leader development, we believe that a broad community of stakeholders is likely to have an interest in the arguments presented here, including individuals in organizations, management scholars, leaders concerned with sustainable organizational development, organizational development practitioners, and those stakeholders with concerns about the impact and influence of organizational practices across various sectors (e.g., public, private and non-for-profit) on society.

### **Neuro-ethics: a brief overview**

The concept of neuro-ethics is polysemic as it refers both to the ethics of neuroscience and to the neuroscience of ethics (Roskies, 2002). Our essay focuses exclusively, however, on the ethics of neuroscience as we examine the ethical problems arising from the application of neurofeedback (especially in the context of EEG-nf) to leadership development. By contrast, the neuroscience of ethics is concerned with the neurobiology of moral and ethical thinking and decision making, how intuitions are generated, and how individuals form judgments that specify which courses of action are prohibited, permissible, or even obligatory (Akinci & Sadler-Smith, 2012; Levy, 2011). While these studies are interesting in their own right – and bring their own problems and interrogations – they are not directly relevant to the present argument.

On a more generic level, advances in neuroscience continue to shape our understanding of the brain and can provide new ways to take advantage of that understanding according to some scholars (Kalichman et al., 2012). These changes are set to profoundly alter societies and the people who live in them, not only in terms of curing brain-related diseases, but also in terms of how neuroscience can be enlisted to boost cognitive capabilities of workers in a competitive marketplace through the application of technology or drugs (Harari, 2014; Lindebaum, 2013b; Sahakian & Morein-Zamir, 2007; Wastell & White 2017). While these fast, deep, and social transformations are presented in an unquestionably positive way by the commercial actors who promote them (as highlighted by Thibault & Raz, in press), they also raise significant neuro-ethical questions for organizations and societies, especially in terms of the technology leads to a concentrated distribution and access to power. If the logic of advocates is followed that ‘brains can be boosted’, Wastell and White (2017) maintain that “contestable choices are being made about who to help, who needs to change and how many is spent on creating a better world” (p. ix).

Indeed, as our understanding of brain functioning advances, we are prompted to revisit significant “philosophical questions about free will, responsibility, identity, and the nature of consciousness” (Chan & Harris, 2011: 77). Although these are time-honored questions, neuroscience imposes the need to re-engage with them and consider them in a new light. Not only in their own right, but even more pressingly in the context of using neuroscience to inform management practice. In this respect, it has been documented that the issues identified above by Chan and Harris (2011) have been largely ignored in the context of management (Lindebaum, 2013a, b, 2016), with far-reaching social implications. For instance, if leaders begin to constitute themselves and their followers as ‘neurological subjects’ (Chan & Harris, 2011), this will shift perceptions of leadership towards a more “biologized” version, embodied

brains separate from the complex social systems that they inhabit (Cunningham-Burley, 2010). This, in turn, is bound to affect our understanding of ourselves as well as ongoing relationships we have with others (for a discussion what that means for leadership development, see Lindebaum, 2013b).

Overall, the advance of neuroscience will not impact solely upon the neuroscientific community, but also upon diverse groups and members of society (Kalichman et al., 2012; Wastell & White 2017). It raises, *inter alia*, questions about power and access to resources the moment the public succumbs unquestioningly to the idea that they must subscribe to neuro-enhancement (either through drugs or technology) to remain ahead of others in the quest for, or preservation of, highly-paid knowledge work (Harari, 2014).<sup>4</sup>

In light of these issues, we find claims to the effect that “without the appropriate application of cognitive neuroscience, organizational science will find it far more difficult to advance at the same rapid rate that it has over the past century” (Lee, Senior, & Butler, 2012: 922) premature at best, if not entirely misguided. Since when, we submit, has the need for more ‘speed’ in knowledge production been a harbinger of quality knowledge? It is ironic that advocates of neuroscience in management are concerned with speed in the theoretical and empirical foundations of their field, while neuroscientists themselves continue to grapple with, and raise fundamental (and lingering) questions about, theoretical foundations of neuroscience, and the validity of the data produced (e.g., Button et al., 2013; Jonas & Kording, 2016; Simons et al., 2016; Thibault & Raz, in press).

---

<sup>4</sup> For a first-hand account, see <http://www.bbc.co.uk/bbcthree/item/b4e29767-f9b8-4cd1-b19e-ae3b5f158035>, accessed on the 7<sup>th</sup> of December 2016

## **Neurofeedback and leader development**

Great expectations are raised when scholars ask whether we can “*revolutionize* the way that inspirational leaders are identified and developed” (Waldman et al., 2011, p. 60, italics added). In their study of 50 business executives, Waldman and colleagues used data generated by quantitative electroencephalography (qEEG) in combination with an appraisal of vision statements and traditional leadership questionnaires (2011a). As a mode of assessment, qEEG employs advanced signaling processing techniques to retrieve data about brain activity through the skull and scalp. To this end, several electrodes are placed at specified locations on the scalp (see Waldman et al.’s article for more information). In terms of study design, while participants underwent the qEEG examination, they were asked to engage in a vision task, which these scholars claim to be a typical activity that characterizes inspirational leadership. Waldman and colleagues collected perceptions of inspirational leadership by way of a questionnaire survey from three to six direct reports of each executive. Findings indicate seemingly distinct activities in the right frontal brain region that reputedly sets inspirational leaders apart from those who are not. They also move on to apply their ideas to developing leaders, a central question for scholars interested in management learning (Antonakis, Fenley, & Liechti, 2011).

As a result of the presumed benefits of EEG-nf, the appeal for both researchers and practitioners resides in the assumption that we can understand the neurobiological mechanisms as well as the therapeutic potential of this approach. In the interim, EEG-nf has morphed into an industrious clinical field, which features international accreditation boards, specialized academic journals, and over a thousand practitioners (Thibault et al., 2015). Despite the widespread use of EEG-nf among researchers, specialty clinics, and private institutions in relation to a variety of disorders and impairments (Thibault et al., 2016) and, more recently, cognitive



enhancements (Gruzelier, 2014), recent systematic reviews in the neuroscientific literature have largely dismissed the effects of EEG-nf as “placebo-driven” (Thibault et al., 2016, p. 248). More precisely, it has been claimed that, although the potential of EEG-nf as an alternative form of medical treatment is not entirely denied, “mounting evidence refutes the clinical superiority of feedback training over sham treatment” (see Thibault et al., 2016, for cited studies to this effect)<sup>5</sup>.

Of note, the authors warn that the gold standard across medical research domains, namely, double-blind sham-controlled studies, are conspicuously absent in the case of clinical EEG-nf studies. The extent of this deficiency is such that Thibault and colleagues could only identify one sham-controlled, double-blind EEG-based neurofeedback study demonstrating clinical superiority of veridical over sham feedback following a literature search (see Thibault & Raz, 2016b, for details). Whereas advocates of EEG-nf continue to tout the effectiveness thereof for treating a variety of psychological and neurological disorders (Arns, Heinrich, & Strehl, 2014; Cannon, 2015), Thibault and colleagues argue that “it appears that influences *other* than the feedback itself bring about improvements in clinical endpoints across a range of disorders” (Thibault et al., 2016, p. 249, italics added). These scholars make explicit reference to psychological factors, such as participant motivation, administrator-patient interactions, or client confidence in technology in this regard (Thibault & Raz, 2016b). This observation has direct bearings upon how we study the process of learning at work. As scholars have recently repeated, “greater attention [should] be given to the forms of social interaction and the context in which learning takes place” (Cajiao & Burke, 2016: 509). We elaborate upon the significance of this

---

<sup>5</sup> ‘Sham’ treatment refers to “feedback not derived from the participant's brain activity. Or, feedback derived from the participant's brain, but not from the region or frequency of interest” (Thibault et al., 2016). It is also the case that researchers sometimes provide random feedback, or feedback garnered from a previous trial with a different participant.

reference to ‘psychological’ mechanisms (which produce the placebo effects) for leadership development in the ‘call to action’ section. However, if the authors are correct in their conclusions, it should be clear that there are fundamental problems with this type of intervention in terms of its validity. This, in turn, entails critical theoretical and practical implications for leadership development scholars.

Theoretically, in the hope to generate new theories or theoretical insights as a direct consequence of using EEG-nf, researchers must be keenly aware of this likely limitation. Given the probable invalidity of the effects detected by EEG-nf, there is a risk of theory contamination. To understand this argument, it is worth revisiting Horkheimer’s (1937/1976) point that the validity of a theory is dependent upon propositions being consonant with actual facts. In the presence of a contradiction between theory and data, both must be re-examined, since either the data are wrong, or the principles of the theory are inaccurate. In relation to EEG-nf and the (as yet unsupported) assumption about its validity, this implies that any contradiction between the data and theory would prompt a scrutiny of the theoretical principles, rather than the actual cause of the contradiction (i.e. the data generated by EEG-nf).

By taking for granted the relevance of data gathered through EEG-nf, researchers engage in a sloppy research avenue for two reasons. First, researchers rely on unwarranted data to advance theories of human behavior in general and of leadership in particular. While reliable data do not guarantee good theory, it is unclear how unreliable data can help produce better theory. We also submit that revisiting the whole theory is usually more onerous than questioning the data, so most researchers will question the data before questioning the theory. And second, leadership development researchers enthusiastic about EEG-nf approaches run the risk of failing to question their own theories precisely because they assume that EEG-nf provides more robust data than traditional sources of information, such as data based upon

questionnaires, interviews, observation or ethnography. The willingness to engage in this research avenue, in light of recent systematic reviews such as those provided by Raz and Thibault (2016b, in press), brings to question the epistemological, but also the ethical, integrity of such studies. Equally alarming, this sloppy research avenue is also a recipe for the bad management practice which often follows bad management theory (Ghoshal, (2005).

A practical example can help us appreciate how bad management practice can emerge if data that are considered superior are, in fact, not. Drawing upon Waldman and colleagues (2011), they report the following intervention story:

“As a case example, one of our participants was a manager who reported anger management problems. Obviously, someone with such issues might be challenged when assuming a leadership role, as emotional equanimity is an important quality. It is hard to imagine that anyone in a leadership position who “flies off the handle” could be seen as inspirational. With the help of a neurotherapist, we were able to pinpoint the root cause of the behavior, which as it turns out could be traced to a childhood baseball injury. This injury had affected a portion of the brain particularly relevant to an individual’s emotional stability, especially with regard to anger issues. Based on knowledge gained through prior qEEG research dealing with the neurological basis of anger management problems . . . with a series of neurofeedback sessions, the individual was able to rearrange neuropathways in the affected area, create new pathways with healthy neighboring neurons, and largely correct the problem. Accordingly, he was able to set the stage to become a more effective leader” (p. 69).

This vignette, which the authors refer to a ‘case example’, highlights what they see as the ultimate goal “to be able to assess leadership potential via neuroscience technology, and then use neurofeedback to more directly develop the neurological wiring associated with effective leadership behaviors” (Waldman et al., 2011, p. 69). We contend that this suggestion is premature due to the limitations of neurofeedback (as discussed), as well as the portrayal of the angry manager as inherently bad. Recent debates have conceptually highlighted the cost of collapsing together all kinds of

anger while applying the universal (and misguided) perception that all expressions of anger constitute a ‘problem’. This is because such an approach suppresses the informational and energetic value of what has been termed ‘moral anger’, such that appraisals of moral transgressions (i.e., informational value) and sustaining one’s willingness to take corrective action (i.e., energetic value) can be diminished (Lindebaum & Gabriel, 2016). With this possibility in mind, what ostensibly appears like a ‘success’ story in the vignette above may, on closer inspection, turn out rather detrimental to workplaces. As Lindebaum and Garbriel (2016) note, “a world without anger would be, possibly, a compliant and quiescent world but not a just world” (p. 903).

## **ETHICS BEYOND PROBLEMATIC DATA**

In addition to our concerns relative to unreflexive reliance on disputable data (see above), we are concerned about ethical questions that arise as a result of questionable commercial practices, but also of EEG-nf’s potential to degrade organizational justice and to erode or marginalize practical wisdom. To these questions, we now turn.

### **Questionable commercial practices?**

The first, and perhaps most obvious, ethical question raised by neurofeedback relates to the commercial ethics of this lucrative enterprise. The scientific credentials of the ‘neuro’ in neuro-feedback make the practice more appealing than others based upon other forms of feedback (a brain scan shouts ‘science’ after all, see Wastell & White 2012). Advocates claim that “the concept has been proven” and that “now we have to go beyond the proof of concept into operationalization. Then, we will move into the delivery of products and services” very soon (Balthazard, 2011). Indeed, a Neurotech index has been listed on Nasdaq since 2007, enabling an unprecedented

commercialization of brain related products<sup>6</sup>. However, in a forthcoming article, Thibault and Raz (in press: 33) point out the possibility of dominant business interests in the use and proliferation of EEG-nf technology in specialist clinics, noting that “whereas the published literature may paint a semi-rigorous and scholarly image of EEG-nf, under this superficial veneer flourish strong business agendas largely incongruent with the standards of academic investigation and medical research”. They go on to describe a meeting with a representative of a non-profit international neurofeedback organization, in which the representative “scoffed at the idea that the International Society for Neurofeedback and Research consists of academic researchers” (p. 33).

In addition, there are also ominous signs emerging that consumers who are prompted to purchase a service according to what is ‘on the tin’ may not be getting what they expected. For instance, the recent ruling by the Federal Trade Commission (FTC) in the US against ‘Lumosity’ firmly underlines this point. The firm has to pay \$2 million to settle FTC deceptive advertising charges for its “Brain Training” programme. This product alleged to boost performance in everyday life and safeguard against cognitive decline<sup>7</sup>. Taking together the above example as well as the validity issues afflicting neuroscientific data or interventions, it is central to recognize the ethical dimensions here, as unreliable research is useless and wasteful (Button et al., 2013). In addition, even if it has been argued that EEG-nf works (through placebo, but not real effects) as a clinical intervention, would it be ethical to charge up to \$10,000 for a standard programme (see Thibault & Raz, in press) if there is *no specific* neurological effect behind the intervention?

---

<sup>6</sup> Retrieved from <http://ir.nasdaq.com/releasedetail.cfm?releaseid=265676> on 17<sup>th</sup> of May 2017.

<sup>7</sup> Retrieved from <https://www.ftc.gov/news-events/press-releases/2016/01/lumosity-pay-2-million-settle-ftc-deceptive-advertising-charges> on the 22<sup>nd</sup> of June 2016.

### **Compromising organizational justice**

It would be a dangerous fantasy to imagine that leadership development based upon neurofeedback is confined to the laboratory and bears no effect on what goes on in the workplace, especially when the fees are paid by employers<sup>8</sup>. A more reasonable view is that, in the absence of normative conventions stating otherwise, organizations paying \$15,000 for each of their prospective leaders' intensive brain-training retreat will also expect full access to the 'results' and 'scores' of their employees (for a discussion of power and conventions, see Al-Amoudi & Latsis, 2014). Not only will corporate clients seek to access the results, but they will also seek to use the data collected from neurofeedback sessions to inform the myriad organizational procedures through which employees are scored and compared, and through which they make decisions affecting employees' careers (Lindebaum, 2013b).

Most organizations already rely on personnel management systems based on quantitative performance indicators. The results of EEG-nf can easily become central within broader decision-making processes for two reasons. First, because they *appear* to provide precise quantifiable data (relevance and robustness are, as we have seen, minor concerns). And second, because the scientific assumptions at the origins of neurofeedback's appeal are likely to make such use of the data quite uncontested within the organization. The use of presumably uncontested data generated through EEG-nf is likely to complicate attempts to resist organizational change, even when the latter is detrimental to the organization and/or the lives of its members (see Courpasson, Dany, & Clegg, 2011, on productive resistance). Sceptics might raise the objection that neuroscience does not play a role yet in performance management

---

<sup>8</sup> A more circumspect scholar recently suggested - in a private conversation with one of the authors - that the organisation involved in his/her research project on the neurological basis of decision-making was eager to use the data obtained for promotion and intervention purposes. Expectations had to be managed so as to clarify that the data is not suitable (yet) to for such use.

appraisals. However, a recent report by the Chartered Institute of Personnel Development (CIPD, 2014) in the UK argues otherwise, suggesting that “neuroscience also has application to reward, performance management, and even marketing and customer strategy” (p. 30, and see also footnote 8).

From a superficially scientific perspective, reliance upon neurofeedback data for career promotion (or firing) decisions can be viewed as a positive step for organizational justice, which is “concerned with the ways in which employees determine if they have been treated fairly in their jobs and the ways in which those determinations influence other work-related variables” (Moorman, 1991, p. 845). As the common belief goes, both justice and perceptions of justice should be improved whenever subjective, and presumably fallible and partial, appreciation by peers and line-managers is replaced by presumably less fallible and partial objective data gathered by a ‘third party’ and through state-of-the-art technology.

Problems arise, however, whenever approaches based on EEG-nf fall short of attaining the impartiality or infallibility claimed by their advocates. In these respects, the lack of validity of EEG-nf is problematic for organizational justice, which is compromised whenever data informing the distribution of resources are known to be irrelevant or otherwise unreliable. For instance, some individuals may be singled out, on the basis of EEG-nf tests, as not being sufficiently ‘inspirational’ for their organization, and hence not sufficiently effective if one accepts the logics of previous studies (Waldman et al. 2011, but see also Knippenberg & Sitkin 2013 for a strong critique of inspirational/transformational leadership). We are concerned about the implicit and unquestioned privileging of some leadership traits over others, as such discrimination can constitute a clash with concerns for organizational injustice. And we feel all the more concerned when these traits are reflected in neurofeedback data which are probably invalid and, therefore, are very loosely related to performance or

development. Our point, therefore, highlights the need for a public discussion about which behaviors deserve being developed to suit the needs of specific circumstances, and whether these are can be developed through EEG-nf or not.

Furthermore, organizational justice is compromised whenever neurological data minimizes the importance of actual behaviors and accomplishments. A manager who is respected by her peers and who led her team to accomplish commendable projects is likely to be penalized if her brain signals do not fit the patterns attributed to leadership. In other words, organizational justice is compromised by a reification and fetishisation of brain signals assumed to be as, if not more, relevant than the actions of an employee and the opinions of her colleagues.

### **Downplaying practical wisdom**

The above considerations about the potential of EEG-nf to minimize the significance of accomplishments and peer opinion is indicative of neurofeedback's (and more generally neuroscience's) inability to account for subtle, complex and highly context-dependent considerations when evaluating leadership potential. But EEG-nf's blindness to what is subtle, complex and context-dependent does not only mean that it cannot form subtle, complex and context-dependent judgments. It also means that it cannot appreciate it or measure it, let alone train it.

And yet, the capacity to form complex, subtle and context-dependent judgments has been examined and discussed throughout a long tradition of scholarship, albeit one that leaves little room for as crude approaches as EEG-nf. Almost 24 centuries ago, Aristotle identified the importance of practical wisdom (or *phronesis*) both as a virtue and as a mark of leadership. Practical wisdom is, according to him:



“a true and reasoned state of capacity to act with regard to the things that are good or bad for man ... It is for this reason that we think Pericles and men like him have practical wisdom, viz. because they can see what is good for themselves and what is good for men in general; we consider that those can do this who are good at managing households or states”. (*Nicomachean Ethics*, Book VI)<sup>9</sup>

The importance of phronesis for leadership has not escaped the attention of contemporary leadership scholars. Indeed, in the pages of this very journal, Shotter and Tsoukas (2014) proposed that phronetic leaders “are people who, in their search for a way out of their difficulties, have developed a refined capacity to intuitively grasp salient features of ambiguous situations and to constitute a "landscape" of possible paths of response, while driven by the pursuit of the notion of the common good” (Shotter & Tsoukas, 2014, p. 224).

And yet, practical wisdom also confronts advocates of neurofeedback with an insuperable conundrum: what evidence do we have that a faculty trained in the laboratory will then be wisely mobilized in a real-life situation, unless we suppose that subjects have already developed their practical wisdom? Hence, practical wisdom, or phronesis, seems at once a human faculty that is untestable by neurofeedback and one that is necessary for improvements in the laboratory to bear any significance in the workplace. This incapacity to grasp phronesis is ethically problematic for leadership development programmes based on EEG-nf. Firstly, because they promise to train leadership skills while ignoring the skill which is perhaps the most important of all. And secondly, because phronesis is, as Aristotle rightly remarked, not merely a skill but also a moral virtue that is necessary for the

---

<sup>9</sup> Retrieved from <http://classics.mit.edu/Aristotle/nicomachaen.6.vi.html> - on the 24<sup>th</sup> of January 2017.

identification and pursuit of the common good. Forms of leadership training that ignore or downplay phronesis are, therefore, liable to foster attitudes that are detrimental to organizational efficiency but also to the collective pursuit of the common good.

## **SO WHAT? A PRO-TEM VOTE OF NO CONFIDENCE AND CALL TO ACTION**

Having identified both the deficiencies in appreciating neuro-ethics in research and practice around leadership development (and beyond), and the inherent validity issues afflicting EEG-nf, we are now in a position to cast a pro-tem vote of no confidence against leadership development and practices informed by EEG-nf. But our vote of no confidence has to be pro-tem for two reasons. Firstly, we remain aware of the ultimate need to have the result obtained through the systematic literature reviews upon which we draw here (Thibault et al., 2015; Thibault et al., 2016; Thibault & Raz, in press) confirmed through meta-analytical studies. However, unless the arguments by neuroscientists and us are refuted, scientific rigor commands skepticism rather than enthusiasm. Secondly, our vote of no confidence is pro-tem because our point is less to discourage research at the intersection of neuroscience and management than to discourage premature triumphalism. Thus, we wish to encourage reflexivity and critical awareness in management learning and leadership development studies about the pitfalls of relying upon data with questionable validity. Our vote of no confidence is, therefore, followed by a call for action to inform future debates and research.

Below we pay particular heed to the following points. First, we underscore the need not to be 'seduced' by the putative benefits of neuroscience (e.g., more valid and reliable data or interventions) in relation to leader development research and practice. Second, vis-à-vis the caution that the effects of EEG-nf are likely placebo-driven as

opposed to being driven by neuroscientific interventions as such, we advocate a return to more psychologically-driven interventions. Third, by re-visiting Habermasian thought on the prehistory of modern positivism, we wish to call upon readers to engage with greater scrutiny and reflection in the emerging debate on organizational neuroscience as applied to leader development. Our aim is to encourage a clearer historical understanding of what is being done here, and why? And with what consequences for the workplace? We elaborate on these arguments below.

### **Avoid seduction by neuroscientific data**

The seductive potential of neuroscience in informing management research and practice implies a crucial need to develop more acute neuro-literacy (see Roskies, 2002) amongst scholars and practitioners in order to prevent the undesirable consequences for management learning, including leader development (Lindebaum, 2013b). Other fields, such as family policy, have already documented the severe consequences for families and children if questionable neuroscience research starts to inform policies in a given domain (e.g., promoting early neuroscientific interventions to improve the lives of children, see Wastell & White 2012, 2017). Likewise, funding agencies of interdisciplinary research need to be aware about the conceptual and methodological limitations of neuroscience as applied in leader development and beyond. They may not obtain the benefits promised in research grant application if these are not sufficiently sensitive to the limitations of neuroscience. Recall that unreliable research is not efficient and squanders valuable resources (Button et al., 2013). Ghoshal (2005) would add here the element of harm, for as long as social scientists hide ideology in the pretense of science, there is the potential of much damage being done to individuals and groups within organization. More specifically, he argued that the combination of a 'pretense of knowledge', together with an

‘ideology-based gloomy vision’, fosters the adoption of excessive truth claims rooted on partial analysis and unbalanced assumptions. Crucially, for the pretense of knowledge to obtain legitimacy in management studies and beyond, theorizing must be value-free and, worse still, entails a dismissal of ethical concerns (Suddaby, 2014).

Therefore, we argue that leader development needs to become clearer and more transparent about the ethical ramifications which ensue from its practical interventions. Put differently, there is a need to examine more systematically our own ethical standards, and that of the organizations we collaborate with vis-a-vis their financial interests (for details, see Thibault & Raz, in press; Underwood, 2016) to better understand the role that neuroscience can, should, or should not play in the decisions we make about leader development interventions. A greater focus on neuroethics as advocated here will be integral to limiting any adverse ethical, legal, and social policy implications resulting from the application of neuroscience at work. This is a highly sensitive issue; it is well established that placebo effects are regularly used for clinical purposes as physicians seek to generate a therapeutic effect in a patient (Lichtenberg, Heresco-Levy, & Nitzan, 2004). Yet, it is fair to assume that this therapeutic effect might be challenged if the general public is sufficiently informed about the placebo effect of a particular drug or intervention. However, that therapeutic justification is abandoned if leadership researchers and practitioners move into enhancement applications. While here the effects of EEG-nf would also vanish once the general public is sufficiently informed about its probable underlying placebo effect, there is an added complexity; a public outcry is not unlikely – especially in times of news going ‘viral’ - about the fact that under the pretense of ‘science’, vested commercial interests are thriving (Thibault & Raz, in press; Underwood, 2016). The net damage is far greater than pinpointing questionable data within specific scientific

disciplines; it has the unintended consequences that the public's trust in science overall is compromised.

### **Return to psychologically-driven interventions**

In terms of interventions based upon EEG-nf, we suggest that there are insufficient grounds yet for 'psychological' factors in leader development to be superseded with interventions based upon neuroscientific ones, such as EEG-based neurofeedback<sup>10</sup>. In this respect, Thibault and Raz (2016b, p. 497) assert that "relevant studies seldom show that receiving neurofeedback . . . constitutes a necessary component for attaining the supposed benefits", adding that "psychosocial factors (e.g., expectation and motivation), rather than neurophysiological parameters, may mediate the reported clinical improvement". Like others (Kanfer & Ackerman, 2004), we thus argue that a variety of psychological factors likely contribute to the outcome of management learning. In fact, we note that these psychological factors can themselves have an impact upon the brain. For instance, Pascual-Leone and colleagues (2005) describe how "mental practice alone may be sufficient to promote the plastic modulation of neural circuits" (p. 380) following an experiment which demonstrated the biological impact of visualization on the brain. This is because mental simulations of movements activate some of the same central neural structures involved in the performance of the actual movements (for more evidence, see Decety, 1996). Building upon this, we contend that the benefits of addressing leader development by way of neuroscientific

---

<sup>10</sup> However, we note that the uncritical application of psychological research has been a feature of, for instance, business coaching (see, e.g., Blackman, Moscardo, & Gray, 2016). Although the cited study ascertained converging factors contributing to the effectiveness of business coaching, it also notes that "determining the primary beneficiaries of coaching, the factors that contribute to coach credibility, and how the organizational and social context impacts on coaching" in addition to "weaknesses in coaching research methodology" are all issues to be addressed in future research (Blackman et al., 2016: 459). At the same time, we refer to prior studies on the ethics of neuroscience which highlighted why neuroscientific data can raise different kinds of ethical liabilities compared to standard psychological testing, such as personality tests or IQ testing (Lindebaum, 2013b).

interventions are not outweighed by side-lining psychological interventions – that, in fact, the addition of neuroscientific ‘knowledge’ to an intervention may ultimately contribute less to an intervention than psychological factors. For instance, we wonder whether the ‘angry manager’ (as referred to in Waldman et al., 2011) could have also changed his/her behavior through a focus on psychological processes? Considering recent intervention studies on cognitive re-appraisal, we respond in the affirmative. Denny and Ochsner (2014) report that individuals were able to learn to regulate (i.e., to cognitively re-appraise) their emotional responses effectively over the course of four sessions (each spaced 2–5 days apart) in order to reduce self-reported negative affect and, under some conditions, also succeeded to experience less perceived stress in their daily lives. All of this was observed in the absence of any involvement of neuroscientific interventions. Indeed, it has been argued recently that re-appraisal can be a potent mechanism to enable workers to see through emotional repression at work, thereby setting the stage for their own emancipation from that repression (Lindebaum, 2017).

Further to this, we underline that leader development interventions are not introduced into a social vacuum. For one thing, we note that those interventions which are contextually sensitive yield promising results (Bourbonnais, Brisson, & Vézina, 2011). We note, in particular, that the context is made up of anything which surrounds the intervention – something that neuroscientific interventions cannot take into account. As others have underscored, “the social dimension of human existence presupposes context; neuroscientific methodology does not” (Frost & Lumia, 2012: 464). This observation seems especially relevant in an era in which technology obfuscate concerns around the ‘context’ of interventions in the quest for immediate ‘fixes’, often resulting into performative discourse and ultimately establishing new norms through practice. For another, we note that one-on-one sessions (such as

coaching) are more likely to succeed compared to computer-based delivery formats in enhancing key variables, such as resilience (Vanhove, Herian, Perez, Harms, & Lester, 2016). We argue, therefore, that future intervention should not be ‘blinded’ by the allure of neuroscience (Wastell & White 2012) and remain focused instead on psychological rather than physiological approaches to modify behavior. Relevantly, neuroscientists have advocated that practitioners could isolate the underlying placebo mechanisms, which may then offer the opportunity to forgo expensive and lengthy training sessions, while continuing to offer an effective non-pharmaceutical alternative. More specifically, it has been argued that if interacting with patients prompts positive outcomes, practitioners could invest more time in communicating prior to commencing neurofeedback (Thibault & Raz, in press).

### **Teleology of ‘enhancement’ agenda in the workplace**

Our discussion of neuro-ethics prompts us to develop a critical awareness of neuroscience’s historical conditions of possibility. If a lead is taken from Habermas (1987), the real task of early positivism (in which neuroscience is embedded) has been to justify “sciences’ scientific belief in themselves by constructing the history of the species as the history of the realization of the positive spirit” (p. 72)<sup>11</sup>. Quoting Comte, he adds that the aim of the positive spirit is “man’s actual influence on the external world” and to bring “about direct modification of the surrounding milieu” (p. 72). These ideas – seen in the context of this essay – inspire the thought that, in the case of neuroscientific enhancement for example (as opposed to clinical applications), it is perhaps no longer the domination of the natural environment, but rather the direct

---

<sup>11</sup> For Habermas (1987), scientism “means science’s belief in itself; that is, the conviction that we can no longer understand science as one form of possible knowledge, but rather must identify knowledge with science” (p. 4).

domination of workers through technology that is at play. There is an interesting connection here with key tenets in critical theory, namely, its interest in the role of the natural science in the forces of production and a source of legitimation in society (Connerton, 1976). But in the 21<sup>st</sup> century and in many knowledge economies, the ‘force of production’ is the individual employee, or the team of which he/she is a part (Osterman, Kochan, Locke, & Piore, 2001). Thus, the idea that we need to use neuroscience to ‘enhance’ our thoughts, emotions, and behaviors to function better at work reflects an aspiration toward performative knowledge (i.e., types of knowledge solely serving the purpose of economic efficiency, see Cabantous, Gond, Harding, & Learmonth, 2015)<sup>12</sup>.

Related to this, the Historian Y. N. Harari noted recently (in Kuhn, 2015) that – in the next 100 years or so – the most significant revolution will be in the human condition itself (*das Menschsein selbst*). This is a central thesis, for irrespective of all historical changes in the past, the human condition served as a constant. *We* did not change; we possessed the same bodies and more or less identical physical and cognitive capacities over millennia. Harari (2014) worries that this constant is bound to change, and he refers to biotechnology, *inter alia*, as a manifestation of that imminent change towards a transhumanistic society. He writes:

Perhaps in a few decades ... genetic engineering and other forms of biological engineering [i.e., including neuroscience] might enable us to make far-reaching alterations not only to our physiology ... but also to our intellectual and emotional capacities (p. 403, italics added).

If the domain of organizational neuroscience continues to grow and develop with the same speed and volume – and simultaneous lack of scrutiny on fundamental

---

<sup>12</sup> Note that this implies a significant passage from the early aspiration of positivism (and the scientists representing this tradition) to dominate the natural environment to the domination of human beings as such for particular (political) purposes.



theoretical and methodological assumptions, it will imply that we become complicit in generating the very future that Harari cautions against.

### **CONCLUDING THOUGHT**

In concluding our essay, we are partly sympathetic to Boyatzis's (2014) view that "the field of neuroscience is rife with fascinating discoveries" even though "this is not neuro-magic" (p. 302). Given the evidence presented here and elsewhere, however, we would suggest paraphrasing that into "there is no neuro-magic, and applying neuroscience to leader development is rife with conceptual and methodological pitfalls". So yes, the leader development community should care about neuro-ethics if the aim to prevent bad management practice is not more than mere lip service. To suggest that ethical concerns are 'overstated' in the application of neuroscience to management appears to flow more from dogmatic belief in scientism and adherence to cherished ideas - coupled with growing commercial interest - rather than from rigorous reasoning based upon evidence available.

## APPENDIX

### A brief primer on EEG - neurofeedback

Neurofeedback is a self-regulation technique providing individuals with feedback about specific levels of (electrical) brain activity in conjunction with specific target behaviors. As reported in Thibault and Raz (in press, see Figure 1), the number of studies on EEG-nf has exponentially increased in the past 30 years. Neuroscientists generally assume that this type of feedback can help individuals “entrain, change, and regulate neural activity” (Thibault et al., 2016, p. 247). In providing more background on their approach to neurofeedback, Waldman and colleagues (2011) claim that neurofeedback training protocols can be designed which are akin to playing video games with one’s brain rather than one’s hands, and during which feedback is provided by rewarding targeted performance (a soothing sound) and sanctioning undesired brain patterns (an unpleasant sound). Correspondingly, neurofeedback “represents a form of operant conditioning . . . [where] the brain (unconsciously) learns to adapt to the desired patterns of performance. By repeating the process multiple times, the brain learns the desired pattern in response to a given stimulus, leading toward optimal functioning” (Waldman et al., 2011, p. 69). Interested readers can consult prior comprehensive review on the technicalities and processes associated with neurofeedback, especially but not limited to rigorous experimental designs to tease apart the effects of veritable *vs* sham feedback and the role of various control conditions (see, e.g., Thibault et al., 2016, esp. Figure 3).

## REFERENCES

- Akinci, C., & Sadler-Smith, E. 2012. Intuition in Management Research: A Historical Review. *International Journal of Management Reviews*, 14(1): 104-122.
- Al-Amoudi, I., & Latsis, J. 2014. The arbitrariness and normativity of social conventions. *The British Journal of Sociology*, 65(2): 358-378.
- Alsever, J. 2015. Can Electric 'Brain Training' Devices Make You Smarter? *Fortune*, November 17th (Retrieved on the 19th of June 2016 from <http://fortune.com/2015/11/17/electric-brain-training-devices-cognitive-enhancement/>).
- Antonakis, J., Fenley, M., & Liechti, S. 2011. Teaching Leadership - Can Charisma Be Taught? Tests of Two Interventions. *Academy of Management Learning & Education*, 10(3): 374 - 396.
- Arns, M., Heinrich, H., & Strehl, U. 2014. Evaluation of neurofeedback in ADHD: The long and winding road. *Biological Psychology*, 95: 108-115.
- Ashkanasy, N. M., Becker, W. J., & Waldman, D. A. 2014. Neuroscience and organizational behavior: Avoiding both neuro-euphoria and neuro-phobia. *Journal of Organizational Behavior*, 35(7): 909-919.
- Balthazard, P. A. 2011. Using Neuroscience to Learn How To Build a Better Leader. Retrieved from <https://research.wpcarey.asu.edu/using-neuroscience-to-learn-how-to-build-a-better-leader/> 10 May 2017.
- Bourbonnais, R., Brisson, C., & Vézina, M. 2011. Long-term effects of an intervention on psychosocial work factors among healthcare professionals in a hospital setting. *Occupational and Environmental Medicine*, 68(7): 479-486.
- Boyatzis, R. E. 2014. Possible Contributions to Leadership and Management Development From Neuroscience. *Academy of Management Learning & Education*, 13(2): 300-303.
- Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafo, M. R. 2013. Power failure: why small sample size undermines the reliability of neuroscience. *Nat Rev Neurosci*, 14(5): 365-376.
- Cabantous, L., Gond, J.-P., Harding, N., & Learmonth, M. 2015. Critical Essay: Reconsidering critical performativity. *Human Relations*, 69(2): 197-213.
- Cajiao, J., & Burke, M. J. 2016. How Instructional Methods Influence Skill Development in Management Education. *Academy of Management Learning & Education*, 15(3): 508-524.
- Cannon, R. 2015. Editorial Perspective: Defining neurofeedback and its functional processes. *NeuroRegulation*, 2(2): 60-69.
- Chan, S., & Harris, J. 2011. Neuroethics, *Brain Waves Module 1: Neuroscience, society and policy*: 77-85. London, UK: The Royal Society.
- CIPD. 2014. Neuroscience in action: Applying insight to L&D practice. Retrieved from <https://www.cipd.co.uk/knowledge/culture/behaviour/learning-report> accessed on 1 May 2017.
- Connerton, P. (Ed.). 1976. *Critical Sociology*. Harmondsworth, UK: Penguin.
- Courpasson, D., Dany, F., & Clegg, S. 2011. Resisters at Work: Generating Productive Resistance in the Workplace. *Organization Science*, 23(3): 801-819.

- Cunningham-Burley, S. 2010. Engaging with neuroscience: examining neurological subjectivity and what this means for debates about enhancement technologies. **Presented at "Beyond The Body: Perspectives on Enhancement" Conference in Manchester (UK), 9-11 April.**
- Decety, J. 1996. Do imagined and executed actions share the same neural substrate? *Cognitive Brain Research*, 3(2): 87-93.
- Denny, B. T., & Ochsner, K. N. 2014. Behavioral effects of longitudinal training in cognitive reappraisal. *Emotion*, 14(2): 425-433.
- Frost, C. J., & Lumia, A. R. 2012. The Ethics of Neuroscience and the Neuroscience of Ethics: A Phenomenological-Existential Approach. *Science and Engineering Ethics*, 18(3): 457-474.
- Fuchs, T. 2006. Ethical issues in neuroscience. *Current Opinion in Psychiatry*, 19(6): 600-607.
- Ghoshal, S. 2005. Bad Management Theories Are Destroying Good Management Practices. *Academy of Management Learning & Education*, 4(1): 75-91.
- Gruzelier, J. H. 2014. EEG-neurofeedback for optimising performance. I: A review of cognitive and affective outcome in healthy participants. *Neuroscience & Biobehavioral Reviews*, 44: 124-141.
- Habermas, J. 1987. *Knowledge and Human Interest*. Cambridge, UK: Polity press.
- Harari, Y. N. 2014. *Sapiens: A Brief History of Humankind*. London: Harvill Secker.
- Horkheimer, M. 1937/1976. Traditional and Critical Theory. In P. Connerton (Ed.), *Critical Sociology*: 206-224. Harmondsworth, UK: Penguin Books.
- Illes, J., & Bird, S. J. 2006. Neuroethics: a modern context for ethics in neuroscience. *Trends in Neurosciences*, 29(9): 511-517.
- Illes, J., Tairyan, K., Federico, C. A., Tabet, A., & Glover, G. H. 2010. Reducing barriers to ethics in neuroscience. *Frontiers in Human Neuroscience*, 4: 1-5.
- Jonas, E., & Kording, K. 2016. Could a neuroscientist understand a microprocessor? *bioRxiv*.
- Kalichman, M., Plemmons, D., & Bird, S. J. 2012. Editors' Overview: Neuroethics: Many Voices and Many Stories. *Science and Engineering Ethics*, 18(3): 423-432.
- Kanfer, R., & Ackerman, P. L. 2004. Aging, Adult Development, and Work Motivation. *Academy of Management Review*, 29(3): 440-458.
- Kuhn, J. 2015. Wir werden gewaltige Ungleichheiten erleben [We will experience considerable inequities]. *Süddeutsche Zeitung*, Retrieved from <http://www.sueddeutsche.de/digital/universalhistoriker-yuval-harari-wir-werden-gewaltige-ungleichheiten-erleben-1.2337102> on 30 March 2016.
- Lee, N., Senior, C., & Butler, M. 2012. The Domain of Organizational Cognitive Neuroscience: Theoretical and Empirical Challenges. *Journal of Management*, 38(4): 921-931.
- Levy, N. 2008. Introducing Neuroethics. *Neuroethics*, 1(1): 1-8.
- Levy, N. 2011. Neuroethics: A New Way of Doing Ethics. *AJOB neuroscience*, 2(2): 3-9.
- Lichtenberg, P., Heresco-Levy, U., & Nitzan, U. 2004. The ethics of the placebo in clinical practice. *Journal of Medical Ethics*, 30(6): 551-554.

- Lindebaum, D. 2013a. Ethics and the neuroscientific study of leadership: a synthesis and rejoinder to Ashkanasy, Cropanzano/Becker, and McLagan. *Journal of Management Inquiry*, 22(3): 317-323.
- Lindebaum, D. 2013b. Pathologizing The Healthy But Ineffective: Some Ethical Reflections On Using Neuroscience In Leadership Research. *Journal of Management Inquiry*, 22(3): 295 - 305.
- Lindebaum, D. 2016. Critical Essay: Building new management theories on sound data? The case of neuroscience. *Human Relations*, 69(3): 537-550.
- Lindebaum, D. 2017. *Emancipation through Emotion Regulation at Work*. Cheltenham, UK: Edward Elgar.
- Lindebaum, D., & Gabriel, Y. 2016. Anger and Organization Studies - From Social Disorder to Moral Order. *Organization Studies*, 37(7): 903-918.
- Moorman, R. H. 1991. Relationship between organizational justice and organizational citizenship behaviors : do fairness perceptions influence employee citizenship? *Journal of Applied Psychology*, 76(6): 845-855.
- Osterman, P., Kochan, T. A., Locke, R., & Piore, M. J. 2001. *Working in America: A blueprint for the new labor market*. Cambridge: MIT Press.
- Pascual-Leone, A., Amedi, A., Fregni, F., & Merabet, L. B. 2005. THE PLASTIC HUMAN BRAIN CORTEX. *Annual Review of Neuroscience*, 28(1): 377-401.
- Rock, D., & Schwartz, J. 2006. The neuroscience of leadership. *Strategy and Business*, 43(Summer): 1-12.
- Roskies, A. 2002. Neuroethics for the new millenium. *Neuron*, 35(1): 21-23.
- Sahakian, B. J., & Morein-Zamir, S. 2007. Professor's little helper. *Nature*, 450: 1157-1159.
- Shotter, J., & Tsoukas, H. 2014. In Search of Phronesis: Leadership and the Art of Judgment. *Academy of Management Learning & Education*, 13(2): 224-243.
- Simons, D. J., Boot, W. R., Charness, N., Gathercole, S. E., Chabris, C. F., Hambrick, D. Z., & Stine-Morrow, E. A. L. 2016. Do "Brain-Training" Programs Work? *Psychological Science in the Public Interest*, 17(3): 103-186.
- Suddaby, R. 2014. Editor's Comments: Why Theory? *Academy of Management Review*, 39(4): 407-411.
- Thibault, R. T., Lifshitz, M., Birbaumer, N., & Raz, A. 2015. Neurofeedback, Self-Regulation, and Brain Imaging: Clinical Science and Fad in the Service of Mental Disorders. *Psychotherapy and Psychosomatics*, 84(4): 193-207.
- Thibault, R. T., Lifshitz, M., & Raz, A. 2016. The self-regulating brain and neurofeedback: Experimental science and clinical promise. *Cortex*, 74: 247-261.
- Thibault, R. T., & Raz, A. 2016a. Neurofeedback: the power of psychosocial therapeutics. *The Lancet Psychiatry*, 3(11): e18.
- Thibault, R. T., & Raz, A. 2016b. When can neurofeedback join the clinical armamentarium? *The Lancet Psychiatry*, 3(6): 497-498.
- Thibault, R. T., & Raz, A. in press. The Psychology of Neurofeedback: Clinical interventions even of Applied Placebo. *American Psychologist*.
- Underwood, E. 2016. Regulators seek to tame brain training's 'Wild West'. *Science*, 351(6270): 212-213.
- Vanhove, A. J., Herian, M. N., Perez, A. L. U., Harms, P. D., & Lester, P. B. 2016. Can resilience be developed at work? A meta-analytic review of resilience-

- building programme effectiveness. *Journal of Occupational and Organizational Psychology*, 89(2): 278-307.
- Waldman, D., Wang, D., Hannah, S., & Balthazard, P. 2016. A neurological and ideological perspective of ethical leadership. *Academy of Management Journal*.
- Waldman, D. A., Balthazard, P. A., & Peterson, S. J. 2011. Leadership and Neuroscience: Can We Revolutionize the Way that Inspirational Leaders are Identified and Developed? *Academy of Management Perspectives*, 25(1): 60-74.
- Waldman, D. A., Wang, D., & Fenters, V. 2016. The Added Value of Neuroscience Methods in Organizational Research. *Organizational Research Methods*.
- Wastell, D., & White, S. 2012. Blinded by Neuroscience Social Policy, the family and the Infant Brain. *Families, Relationships and Societies*, 1(3): 399-416.
- Wastell, D., & White, S. 2017. *Blinded by science: The social implications of epigenetics and neuroscience*. Bristol, UK: Policy Press - University of Bristol.

#### Author details

Dirk Lindebaum is a Professor in Organisation and Management at Cardiff Business School. He has developed a wider curiosity for diverse notions, constructs, methods and controversies in recent years. This appetite for learning and searching led him to pursue a significant body of research around emotion at work, the latest culmination of which is his book *Emancipation Through Emotion Regulation at Work* (published by Edward Elgar in 2017). In addition, his interest in emancipation has also led him to engage with the field of organizational neuroscience, where emancipation refers to the liberation from repressive scientific discourses and technologies which have potentially dehumanizing consequences for individuals at work. Read more about his work at [dirklindebaum.EU](http://dirklindebaum.EU).

Ismael Al-Amoudi (Phd, University of Cambridge) is an Associate Professor at Cardiff Business School. He is the director of the Cardiff Organisational Research Group, the deputy director of the Centre for Social Ontology (London) and an associate editor of the *Journal for the Theory of Social Behaviour*. Ismael's research stands at the intersection of social theory, ethics and management studies. He is particularly interested in how social norms are sustained and challenged, cherished and reviled, justified and transgressed. Recent publications include papers in *British Journal of Sociology*, *Business Ethics Quarterly*, *Cambridge Journal of Economics*, *Human Relations*, *Organization* and *Organization Studies*.

Virginia Brown is a PhD student at Cardiff Business School. Her research focuses on the use of neuroscience in organizations. She is particularly interested in how neuroscientific knowledge, methods and theories are translated into a work setting. Virginia has a background in the corporate world as well as substantial experience working as an executive coach.