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Organizational Cognitive Neuroscience – Potential (Non-) Implications for Practice

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Dr. Michael JR Butler is Reader in Transformational Change, and Founder/Director of The TRANSFORMATION Project (www.thetransformationproject.co.uk), Aston Business School, UK. Michael's research interests focus on understanding change from a multi-disciplinary perspective (institutional, biological and historical). He is on the Editorial Board of International Journal of Complex Governance Networks and Asia Pacific Journal of Business Administration, and Review Editor, Frontiers in Psychology, section Educational Psychology. He publishes in leading management and organization journals (British Journal of Management, Human Relations, International Journal of Operations and Production Management, Journal of Management, The Leadership Quarterly and Organization Science). He has co-edited three books (the most recent, the CIPD's Introduction to Organisational Behaviour). His engaged scholarship (funded to c£1.5m) has been recognized (CMI and ESRC), and the OECD used his research to evaluate international policy implementation. An ERDF project facilitated measurable growth across 38 SMEs.

Organizational Cognitive Neuroscience – Potential (Non-) Implications for Practice

Abstract

Purpose: To highlight the potential implications and non-implications for leadership and organization development of a recent systematic review of empirical developments in organizational cognitive neuroscience (OCN).

Design/methodology/approach: Butler *et al.*'s (2015) systematic review of forty empirical articles related to OCN is re-interpreted in terms of its potential to reveal (non-) implications for practice. OCN is critically discussed, then related to the research findings from studies with two methodological designs.

Findings: At this stage of OCN's emergence, it appears that neuroimaging and physiology-based research methods have equal potential in their implications for practice, though hormonal data poses ethical public interest dilemmas. Both methods cannot be reduced to specific forms of application to practice, but they set an aspirational direction for the future development of leadership and organizations.

Practical implications: There appear to be two paces of translational activity – practitioners are moving more quickly than academics in applying OCN to practice. It is suggested that a meeting of minds may be needed to ensure that any risks associated with applying OCN to practice are minimised or eliminated.

Social implications: Inter-disciplinary research, like OCN, requires a social consensus about how basic research in cognitive neuroscience can be applied to organizations. A think tank will provide opportunities for deeper engagement and co-production between academics and practitioners.

Originality/value: Critically exploring the potential implications of OCN for practice, by basing the discussion on a systematic review of empirical developments.

Keywords

Organizational Cognitive Neuroscience, Leadership, Organization Development, Management, Knowledge Exchange

Introduction

The new field of Organizational Cognitive Neuroscience (OCN) is deepening understanding of managerial decision-making (for a systematic review of recent developments, see Butler *et al.*, 2015). This statement refers to deepening theoretical understanding of decision-making within management and organizations. However, deepening understanding about the application of theoretical advances in the context of leadership and organization development is proving more problematic. This is mainly because mobilising the new knowledge for the education of leaders and their teams is not easy. What do the results of neuroimaging and physiology-based research methods tell us about the practice of decision-making? Some scholars tell us that OCN theory may have implications for practice (Boyatzis *et al.*, 2012), whilst others, are much more circumspect (Lindebaum and Zundel, 2013). This article takes a middle line. The article should be read as a parallel contribution to Butler *et al.* (2015), emphasising here the potential implications and non-implications of Butler *et al.* (2015) for those leading change and organization development activities.

Three contributions are made in the article. First, at this stage of OCN's emergence, it appears that neuroimaging and physiology-based research methods have equal potential in their implications for practice. Physiology-based research methods, notably hormonal data, pose specific ethical public interest dilemmas, and this is on top of other methodological debates such as the approach's explanatory depth. Crucially, both methods cannot be reduced to specific forms of application to practitioners. This means that great care needs to be taken in applying OCN research, which may involve more value-led decision making for the future development of leadership and organizations. Second, at a societal level, inter-disciplinary research, like OCN, requires a consensus about how basic research in cognitive neuroscience can be applied to organizations. Some early-stage ideas for a deeper engagement between

academics and practitioners are suggested. Third, there appear to be two paces of translational activity, with practitioners moving more quickly than academics in applying OCN to practice. Greater synchronicity is needed between the two positions, with a due consideration for the role of ethics in basic and applied research.

The article is set out in the following way. First, it is important to be clear about what is meant by OCN because the term is not yet fixed in its definition. As part of this discussion, theoretical and methodological debates associated with OCN are acknowledged. In addition, it is also important to be aware that critically exploring the potential implications of OCN for practice is not sufficiently discussed. Second, key findings from Butler *et al.*'s (2015) systematic review of OCN and managerial decision-making will be briefly summarised. The findings are presented according to the two most widespread methodological designs (neuroimaging and physiology-based research methods). Each research method is supported by an example from the three clusters in which research is taking place (economics, marketing and organizational behaviour). The potential implications and non-implications of the key findings for leadership and organization development will be highlighted. Third and finally, the overall contributions of OCN to the practice of leadership and organization development will be outlined, as will future directions for knowledge exchange in this area.

What is OCN?

OCN is not yet fixed in its definition. This is not surprising because OCN is an emerging field of research which is just beginning to explore the application of biology within leadership and organization development. What most observers may agree on is that there is a contemporary

focus on understanding the relationship between people's mental processes and their behaviours and effectiveness in organizations. Hannah *et al.* (2013, p. 406) would go as far to state that this is a 'cognitive revolution'. Lindebaum and Zundel (2013, p. 857), though, take the opposite view: 'we find suggestions that we are at the brink of a neuroscientific revolution in the study of leadership premature, and a sole focus on neuroscience, at the expense of insights from other social science disciplines, dangerous.' A systematic review of forty empirical studies focused on OCN and managerial decision-making (Butler *et al.*, 2015), does not constitute a revolution, but it signals the emergence of OCN as new resource for leadership and organization development. More than that, OCN is a missing level when exploring the process of change and the variability of the success in implementation (Butler and Senior, 2007). This is because OCN deepens understanding of managerial decision making at the cognitive level (Butler *et al.*, 2015), and contributes to emerging debates about materializing strategy as a practice that 'people do in organizations' (Arnoud *et al.*, 2016, p. 38).

In 2007, the notion of *organizational cognitive neuroscience* (OCN) was introduced, and a collection of related articles was edited in a Special Issue of the *Annals of the New York Academy of Science* (Senior and Butler, 2007). OCN was defined in terms of its root idea, social cognitive neuroscience (SCN) (Ochsner and Lieberman 2001). SCN embeds cognitive neuroscience in the social sciences, studying the processes in the human brain that allow people to understand human relations, and does not restrict research methods to neuroimaging (Lieberman 2006). OCN was first defined as:

'applying neuroscientific methods to analyse and understand human behaviour within the applied setting of organizations. This may be at the individual, group, organizational, inter-organizational and societal levels. Organizational cognitive neuroscience draws together all the fields of business and management, including their operation in the wider social world. It does this in order to integrate understanding

about human behaviour in organizations and, as a consequence, to more fully understand social behaviour.’ (Butler and Senior 2007, pp. 8-9.)

However, by 2011, as OCN began to take hold as an emerging field, the definition needed to be expanded. This avoided the unintended emphasis on method and enabled the inclusion of theory in order to contribute to both organizational and cognitive neuroscientific knowledge:

‘The organizational cognitive neuroscience approach ... is not concerned with only the application of neuroscience methodologies to organizational research questions. Instead, the term “organizational cognitive neuroscience” designates a genuinely multidisciplinary approach, in terms of both theory and method...organizational cognitive neuroscience is not simply the study of brain systems themselves but may also incorporate the use of prior knowledge of brain systems to develop new hypotheses about organizationally relevant issues. Thus, it both provides a more inclusive scope and more clearly defines the key cross-disciplinary nature of organizational cognitive neuroscience, in that research in this area may contribute both to organizational and cognitive neuroscientific knowledge.’ (Senior *et al.*, 2011, p. 805).

It is interesting that these two papers have been collectively cited 102 times (Google Scholar, February 2016), which suggests that the field of OCN is only just opening up for investigation. Critically, within these and other citations are several important theoretical, methodological and practical positions and omissions. In other words, there is still the ongoing need to conceptually clarify OCN (Foxall, 2014).

Based on the above definitions by Butler and Senior (2007) and Senior *et al.* (2011), theoretically, OCN has been positioned in a variety of ways. Healey and Hodgkinson (2014) succinctly capture this debate and place the above definitions at one extreme of the OCN field. Healey and Hodgkinson (2014, p. 766) link our work with Becker *et al.* (2011): ‘advocates such as Becker *et al.* (2011) are calling for a new, biologically rooted, subfield that aims to

map neural mechanisms as the prime causes of organizational behaviour (see also Lee *et al.*, 2012; Senior *et al.*, 2011).’ However, at the opposite end of the continuum: ‘scholars are warning that applying neuroscience to MOS [management and organization studies] is a dangerous distraction (Lindebaum, 2013; McLagan, 2013).’ (Healey and Hodgkinson, 2014, p. 766). There is a wide gap between viewing OCN as one of the prime causes of organizational behaviour and as a dangerous distraction. To re-iterate, this article takes a middle line between the two positions.

There are methodological debates associated with OCN too. The debates are captured in Butler *et al.* (2015), and so they will not be repeated in full here, but the limitations concern both neuroimaging and physiology-based research methods. Neuroimaging research predominantly uses functional magnetic resonance imaging (fMRI), which provides an indirect measure of neural activity in the brain via measures of changes in blood flow and blood oxygenation (Butler *et al.* 2015). There is the danger with neuroimaging analysis of the over-interpretation of the research findings because imaging studies tend to provide a macro level view of activations in the brain (Poldrack 2006). This means that it is harder to identify the engagement of specific cognitive processes. New approaches are being developed, such as the opening up of databases, to increase understanding about micro level activations (Poldrack *et al.*, 2013).

Equally, physiology-based research methods, which tend to measure hormone levels using salivary assays, have the danger of a false expectation of explanatory depth (Butler *et al.* 2015). One limitation concerns identifying causality from collecting salivary testosterone (Apicella *et al.*, 2008). Apicella *et al.* (2008) caution that if it is collected on only one day then claims about causality cannot be made, nor can results be discussed as reflecting stable, trait-level

values. Coates and Herbert (2008) reveal some of the complexities of OCN research designs involving hormones to offset concerns about limitations. They were given access over a two week period to seventeen City of London traders, whom they followed for eight consecutive business days, taking saliva samples twice per day, whilst recording a variety of performance data. Clearly, rigorous methods are needed to resolve the methodological debates about OCN research (Butler *et al.*, 2015).

There has been a missing element to the debates about OCN research, the potential implications for practice. From a practice perspective, the OCN definition proposed by Senior *et al.* (2011) does not go far enough. The application of OCN is defined too narrowly ‘in terms of both theory and method’ (Senior *et al.*, 2011, p. 805). In order to fulfil the ambition of ‘a more inclusive scope’ which ‘clearly defines the key cross-disciplinary nature of organizational cognitive neuroscience’ (Senior *et al.*, 2011, p. 805), reference could also be made to applied research reporting. Applied research reporting includes the application of OCN research to knowledge exchange in settings such as leadership and organization development. However, such an extension of the definition of OCN needs to be qualified by the caveats set out above during the discussion of OCN theory and methodology.

Butler (2014) has tried to capture the full range of research and practice activities associated with OCN in a conceptual model of co-production which is used to reveal the many interdisciplinary intersections between society, organizations and the brain (Table 1). By co-production it is meant integrating both the research and practice activities associated with OCN which have previously remained undifferentiated (Osborne and Strokosch, 2013). Osborne and Strokosch (2013, pp. S39-42) define ‘enhanced co-production’ as the bringing together of

diverse voices linked to an organization in order to transform the organization by co-producing new processes. In terms of OCN, researchers and practitioners have the potential to collaborate and innovate with organizational processes by interrogating the meaning of OCN research findings. As will be discussed later, in order to respond to emerging debates within OCN, such as focusing on OCN's potential implications for practice, the model needs to be continuously adapted. The discussion will start with the model in its 2014 form, and then proceed to a small but important addition. Butler's (2014) Model of Co-Production in OCN is one representation of the interaction exploring how mental processes are linked with a context to produce social behaviour.

Table 1 here

The underpinning theory for the Model is more fully discussed in Butler (2007; 2014). In relation to the argument put forward in this article, it is important to stress that co-production is derived from a mode 2 approach to researching management and organizations (Gibbons *et al.*, 1994). A mode 2 approach highlights that knowledge is produced in the context of a real-world problem and the theoretical development is co-negotiated with practitioners, which includes leadership and organization development activities. Mode 2 encourages OCN researchers to reveal the variety of intersections between society, organizations, leadership and the brain.

Mode 2 is related to a critical realist position and has been discussed in the context of OCN research (Healey and Hodgkinson, 2014). A critical realist position examines 'organizations

and organizational behaviour as a reflection of embodied but also socially situated cognition.’ (Healey and Hodgkinson, 2014, p. 783). Put another way, OCN is a missing level in organization studies: ‘it is through feelings, which are inwardly directed and private, that emotions, which are outwardly directed and public, begin their effect on the mind.’ (Butler and Senior, 2007, p. 13).

The Model of Co-Production in OCN reflects the intersection between knowledge and real-world problems by highlighting both rigour and relevance across four dimensions: basic research reporting, applied research reporting, media reporting and power processes (Butler, 2014). The focus here is on the introduction of a new box to the Model, ‘Academic Journals – Practice Orientation’. The reason for this is because no previous box would be an appropriate location for this article. To elaborate, the work reported in Butler *et al.* (2015) sits in the ‘Conceptual Studies’ box because their study systematically reviewed forty empirical articles which naturally sit in the ‘Empirical Studies’ box. However, the purpose of this article is to highlight the potential implications and non-implications for leadership and organization development of Butler *et al.* (2015). Osborne and Strokosch (2013) point out that co-production models have limitations unless there are practical mechanisms to ensure implementation. The audience for this article is likely to include those who may be in the ‘University Spinout’ and ‘Commercial Enterprises’ boxes, those who are likely to enact research ideas which are appropriate to their context. To bridge between basic research reporting and applied research reporting, there is an important role for academic journals with a practice orientation, such as the *Leadership and Organization Development Journal*, in addition to ‘Academic Magazines’ and the ‘Mainstream Press’.

Having critically discussed OCN, a selection of research findings from the studies systematically reviewed in Butler *et al.* (2015) are re-interpreted in terms of their potential to reveal (non-) implications for practice. Can OCN research tackle real-world problems within a mode 2 approach? The selection of research findings focuses on two widespread methodological designs: neuroimaging and physiology-based research methods.

Neuroimaging

Neuroimaging is still the main research method for OCN research. An example from each of the three clusters of economics, marketing and organizational behaviour will be presented. The clusters were identified in Butler *et al.*'s (2015) systematic review of OCN and managerial decision-making. This will be followed by a discussion about the potential implications of the OCN empirical articles for leadership and organization development.

The empirical articles which use the neuroimaging research methodology fall into two types, those which theoretically extend OCN research by targeting brain networks, and those which have a more potential for application to practice. Within the economic decision-making cluster, for example, Dimoka (2010) concludes that the potential of fMRI is to justify theoretical propositions. From this stance, Dimoka (2010) and Krueger *et al.* (2007) show that trust and distrust activate specific brain networks which are linked to specific behavioural outcomes. Tabibnia *et al.* (2008) focus on brain processes to investigate the positive impact of fairness revealing that fair offers lead to higher happiness ratings and activation in several reward regions of the brain.

A similar pattern is found in the marketing decision-making cluster. Contributions are theoretically identifying the activation of distinct brain networks. Bakalash and Riemer (2013) reveal greater amygdala activation in memorable advertisements. Neuroimaging can also locate possible mechanisms in the brain related to prospective decision-making, suggesting that specific patterns of brain activity, the activation of distinct neural networks, may predict purchasing decisions (Knutson *et al.*, 2007).

The pattern is maintained when considering decision-making in organizational behaviour. Krueger *et al.* (2009) revealed that key competencies underlying emotional intelligence are mediated in part by distinct sectors within brain networks. In research more directly related to leadership and organization development, Boyatzis *et al.* (2012) used fMRI to examine memories of experiences with resonant and dissonant leaders, because a resonant leader produces a positive emotional and interpersonal tone in their interactions with colleagues, whilst a dissonant leader has the opposite effect. Boyatzis *et al.* (2012) revealed that recalling past experiences with resonant leaders activated neural areas which included positive affect, whilst recalling past experiences with dissonant leaders activated regions related to avoidance, narrowed attention, decreased compassion and negative emotions.

From these empirical articles, what are the potential implications of the research findings for leadership and organization development? There is no easy answer. Of the three studies which do not focus on identifying brain networks, there are method limitations which hinder the generalisation of the results. Tabibnia *et al.* (2008) use students as experiment participants, not leaders and organization development consultants. Knutson *et al.* (2007) also use young people (18-26). In contrast, Boyatzis *et al.* (2012) have access to senior-level executives, but

only a small sample size (eight). This might suggest there are limited implications for leadership and organization development.

One provisional answer is that there seem to be implications for management and organization. Having found that there seems to be evidence for the positive impact of social utility over material utility, that-is-to-say, fairness over unfairness in monetary payoffs, Tabibnia *et al.* (2008) suggest that leaders in organizations need to be aware of the impact of the application of financial rewards for work behaviours. The role of financial rewards as a motivational device is widely discussed within organizational behaviour, but OCN research adds a further depth of analysis.

Another answer seems to be clear in its implications but ethically harder to implement. Knutson *et al.* (2007) suggest that specific patterns of brain activity can predict purchasing decisions, so marketing managers may seek to maximise subject engagement in a product. Knutson *et al.* (2007) argue that their findings have implications for understanding consumer overspending and under-saving. Knutson *et al.*'s (2007) research has ethical implications when issues such as marketing managers seeking to maximise consumer overspending and under-saving are raised.

Boyatzis *et al.* (2012) combine both of the above answers provided by Tabibnia *et al.* (2008) and Knutson *et al.* (2007), in that Boyatzis *et al.* (2012) actively suggest what can be implemented and what cannot be implemented in the context of leadership and organization development. They argue the case for resonance in leadership, and against dissonance, which

has clear implications for organization development. This is because ‘relationships with resonant leaders are characterized by mutual positive emotions, a subjective sense of being in synchrony with one another’ (Boyatzis *et al.*, 2012, p. 261). Resonance seems to be a unconscious process stimulated by eye contact or touch, facial expressions, and speech intonation, which inspires hope, compassion, playfulness and mindfulness (Boyatzis and McKee, 2005). On the other hand, ‘relationships with dissonant leaders produce negative emotions, interpersonal discord’ (Boyatzis *et al.*, 2012, p. 261). Boyatzis *et al.* (2012, p. 261) indicate that these insights and those from similar research: ‘may help in the design of leadership development. Knowing the neurological processes behind both a leader’s behavior and his or her followers’ responses may allow for improved pedagogy and training, thus helping leaders to form more effective relationships.’

Practically, it appears that neuroimaging has some potential in their implications for practice. It is clear, though, that neuroimaging cannot be reduced to a specific form of application. Tabibnia *et al.* (2008) and Boyatzis *et al.*’s (2012) work, however, might help to set a general direction for the future development of leadership and organizations, for example, by indicating the value of the positive impact of social utility over material utility (Tabibnia *et al.*, 2008), and by arguing the case for resonance in leadership (Boyatzis *et al.*, 2012). Knutson *et al.*’s (2007) research poses ethical questions about the nature of society and the predominance of the market economy which need to be worked out at a strategic and policy level. Nevertheless, leaders and organizations probably reflect on these ethical issues when they debate their organizational visions and missions.

Physiology-based research methods

Following a similar pattern to the section on neuroimaging, the article now turns to briefly summarising key findings from a selection of studies which used physiology-based research methods in Butler *et al.*'s (2015) systematic review. This section will then explore the potential implications of the findings for leadership and organization development. Similarly, an example from each of the three clusters (economics, marketing and organizational behaviour) will be presented.

The empirical articles which use physiology-based research methods, unlike neuroimaging, are less likely to distinguish between targeting brain networks and also have potential for application to practice. Within the economic decision-making cluster, for example, Apicella *et al.* (2008) report that men with testosterone levels one standard deviation above the mean invested almost 12% more of their portfolio in a financial game compared to men with average levels.

Verbeke *et al.* (2014), from the marketing decision-making cluster, focus on dopamine. More specifically, they investigate two genes, *DRD2* and *DRD4*, which code for receptors for dopamine, and which modulates synaptic transmission. *DRD2* and *DRD4* are risk genes which mean that they are linked with addiction or impulsivity, but Verbeke *et al.* (2014) argue that they might have opposite effects in certain environments. Verbeke *et al.* (2014) investigated a potential interaction between individual differences in the dopamine system and the role of attachment styles on behaviour in sales. They found that genetic variation in *DRD2* and *DRD4* interacted with attachment, in particular, 'the avoidant attachment style has a positive effect on CO [customer orientation] for sales representatives' (Verbeke *et al.*, 2014, p. 10). Avoidant attachment styles, keeping a certain amount of distance between self and customer, may be

beneficial in goal-directed and reward-related situations, leading to a greater application of skills and a greater chance of success (Verbeke *et al.*, 2014).

Considering decision-making in organizational behaviour, Wong *et al.* (2011) argue that research has yet to identify innate personal traits that are related to leadership success and organizational performance. Zyphur *et al.* (2009) found that the greater the mismatch between testosterone and status, that-is-to-say, a high testosterone level and low status, the worse the collective efficacy of the group.

Again, from these empirical articles, what are the potential implications of the empirical research findings for leadership and organization development? Similarly, there is no easy answer, and boundaries have to be set around provisional answers. Setting boundaries might suggest there are limited implications for leadership and organization development compared to the analysis of the empirical articles within the neuroimaging section. As will be shown, physiology-based research methods have equal potential in their implications for practice, but hormonal data poses specific ethical public interest dilemmas.

Similarly to Saad and Vongas (2009), Zyphur *et al.* (2009, p. 70) recognise that ‘The study of the biological underpinnings of behavior is in its nascent stages in the field of management’. This suggests that there is not yet sufficient information to know what to do with such findings. The approach taken by Saad and Vongas (2009) and Zyphur *et al.* (2009) at this stage is to acknowledge the limitations of their study, so that readers can make their own judgement about the value of their findings. Verbeke *et al.* (2014) also acknowledge that their study is a small

step in understanding the consequences of biological processes in decision-making related to management and organizations.

Nevertheless, Zyphur *et al.* (2009, p. 70) go on to argue that the relationship between hormones and leadership and organization development is important because, and the quotation is intriguing, ‘Hormones provide a slower means of control’ over the functioning of biological processes compared to the nervous system. Control over the functioning of biological process raises several unresolved ethical concerns when related to leadership and organization development. One concern relates to management and organizational practices, the taking of hormonal measures. Outside a research context, what are the circumstances which allow for the collection of hormonal data? If data collection is allowable in a range of circumstances, what should management and organizations then do with the data, especially in relation to considering control? Currently there does not appear to be clear guidance about how to answer these questions, but as more empirical research becomes available about a potential role for hormones in regulating biological process, a process for reaching a consensus will be needed.

An answer to both questions is to limit the collection of hormonal data to research studies, which are likely to have been through an ethical audit during the research design phase. Once subsequent research findings are published, those involved in leadership and organization development then need to have access to the research findings in order to better understand the range of possible behaviours of themselves and their teams in different contexts, and the potential causal mechanisms. This includes biological processes. It is from this position that there may be a role for considering the potential of Verbeke *et al.*'s (2014, p.11) study in that

it ‘can provide more valid and fair criteria for management than reliance only on background information, interviews, and psychological tests’ in hiring and training.

Despite Verbeke *et al.*’s (2014) optimism for the potential of their study, physiology-based research methods cannot be reduced to a specific form of application. Apicella *et al.* (2008) and Zyphur *et al.*’s (2009) work poses ethical questions about measuring hormones (testosterone) to identify innate personal traits and the relationship to leadership success and organizational performance. More broadly, there are issues about more clearly delineating personal freedom and potential future work encroachments on these freedoms, especially the role of leadership in enforcing such boundaries. To address the issue more fundamentally, management and organizations could look towards healthcare for a model of how to proceed with ethical debates surrounding biological and health data. The Nuffield Council on Bioethics (2015, p. xv) succinctly capture the nature of the concerns surrounding biological data: ‘There is a public interest in the responsible use of data to support advances in scientific knowledge, innovative treatments and improvements in health services. However, there is also a public interest in protecting the privacy of individuals: privacy is fundamentally important to individuals (and groups) in the establishment and maintenance of their identity, their relationships and their sense of personal well-being. In biomedical research and health care data initiatives, which link and re-use data, public and private interests are entangled in complex ways. Such data initiatives must address the following question: what is the set of morally reasonable expectations about the use of data and what conditions are required to give sufficient confidence that those expectations will be satisfied?’ It might be the right time for management and organizations to set up their own council on bioethics, setting out the public interest dilemmas and how they may be resolved. Until the public interest dilemmas are

resolved, it appears that the full potential of physiology-based research methods might not be realised.

Contributions to the practice of leadership and organization development

Butler *et al.* (2015) argue that there is a need to explore translational activities about how OCN research findings can be ethically applied to the management of organizations. This article makes three overall contributions to OCN translational activities, which relate to the practice of leadership and organization development. Future directions for knowledge exchange in this area are identified.

The first contribution of this article is that at this stage of OCN's emergence, it appears that neuroimaging and physiology-based research methods have equal potential in their implications for practice. Physiology-based research methods, especially hormonal data, however, pose competing ethical public interest dilemmas between advancing knowledge to facilitate leadership and organizational development, and safeguarding personal freedoms. Until these are resolved, the practical application of physiology-based research methods might be held back.

In terms of neuroimaging research, Tabibnia *et al.* (2008) and Boyatzis *et al.*'s (2012) work helps to set a positive vision for the future development of leadership and organizations. The vision is founded on social utility or fairness in monetary payoffs (Tabibnia *et al.*, 2008), and resonance in leadership characterized by mutual positive emotions such as inspiring hope (Boyatzis *et al.*, 2012). Knutson *et al.*'s (2007) research, however, poses societal level ethical

questions about the predominance of the market economy, balancing consumer overspending with less spending, and under-saving with more saving. It is hard to see how this type of OCN research can be reduced to a specific form of to-do list for leaders in their organizations.

A similar conclusion about specific forms of OCN research application not being evident is particularly found in physiology-based research methods. This is despite Verbeke *et al.*'s (2014) optimism for the potential of their study, the development of valid and fair criteria for management in the hiring and training of salespersons, which is counter-intuitively based on the avoidant attachment style being positive in sales. In contrast, Apicella *et al.*'s (2008) work on testosterone levels in a financial game, or Zyphur *et al.*'s (2009) on testosterone to assess status in the group, raises difficult ethical concerns about individual freedom versus organizational control over personal biological information and its relationship to leadership success and organizational performance.

The second contribution of this article is that OCN research requires a social consensus about how basic research in cognitive neuroscience can be applied to organizations. This is because there are different paces of translational activity between practitioners and academics and because there are different potential implications for practice between neuroimaging and physiology-based research methods. To achieve a consensus, a social mechanism needs to be in place to debate these differences.

Such debates are currently underway in diverse locations and are a potential useful resource. For example, the Behavioural Insights Team (BIT, the Nudge Unit) is now independent of the

UK government being partly owned by the Cabinet Office, employees and Nesta (<http://www.behaviouralinsights.co.uk/>). BIT claims to be the world's first government institution dedicated to the application of behavioural sciences. Another example is BBC Radio 4's 'The Human Zoo', a collaboration with Warwick Business School (<http://www.bbc.co.uk/programmes/b036tbly>). The broadcasts have a more general remit to explore the biases in human behaviour.

In the context of leadership and organization development, a dedicated non-partisan think tank which met regularly would provide opportunities for deeper engagement and co-production between academics and practitioners. The remit of the consortium would be to strike a balance between commercial demands and the ethics of controlling human behaviour in management and organization. Once robustly debated, guidelines for the application of OCN research could be issued and monitored. A potential model for the think tank is the Nuffield Council on Bioethics (2015).

An implication of the title of this article is that there appear to be two paces of translational activity related to OCN research, and that academics are seeking to diffuse their research to practitioners. The third contribution of this article is to stress the opposite trend that practitioners are moving more quickly than academics in applying OCN research. Indeed, Butler *et al.* (2015) noted that practice-based organizations are already active in providing professional support to neuromarketers, and that the application of OCN to practice is likely to accelerate in the future as more empirical research is published. Neuromarketing consultants use brain scans, for example, to evaluate consumers' cognitive and emotional responses to

consumer products (Powell, 2011). Brain scans are also used in law to reveal the capacities of defendants, and to predict punishment in jury decisions (Powell, 2011).

Academics, however, are divided about how to apply OCN research findings to leadership and organization development. Rightly, from an ethical perspective, Lindebaum and Zundel (2013) discuss the dangers of reductionism as pressures increase for research to have impact. It should not be assumed that they OCN research can be translated to leadership and organization development. Balthazard *et al.* (2012) acknowledge that the applicability of OCN knowledge is not immediately apparent.

However, Balthazard *et al.* (2012) also propose the possibility of a neurologically-based assessment of leader behaviour. This suggests that some academics might be seeking to align the different paces of translational activity between themselves and practitioners. Above, ideas are suggested that might begin a process of facilitating a meeting of minds between the two stakeholders. This may, in turn, ensure that any risks associated with applying OCN research to practice, the danger of the over-interpretation of findings, are minimised or, ideally, eliminated.

Concluding remarks

Currently, there does not appear to be a sufficient discussion about critically exploring the potential implications of OCN for practice. With the growth of published OCN research, and its consolidation through a recent systematic review of empirical developments (Butler *et al.*, 2015), such a discussion becomes more important. This is because OCN research raises profound ethical issues related to leadership and organization development. This article is part of the start of the evaluation of the practical and social implications of OCN research. OCN is a brave new world of research and practice opportunities, but it comes with debates and concerns, and more basic and applied research is needed to more fully understand managerial decision making.

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Table 1. Revised Model of Co-Production in Organizational Cognitive Neuroscience

		Relevance Considerations of Use				
		No		Yes		
Rigour Quest for Fundamental Understanding	Yes	Basic Research Reporting		Applied Research Reporting		
		Conceptual Studies	Empirical Studies	University Spinout	Commercial Enterprises	
		Science Ideology	Academic Critique	Academic Journals – Practice Orientation	Academic Magazines	Mainstream Press
		Power Processes		Media Reporting		