Emotional empathy of postgraduate students

Abstract

Purpose

This paper focuses on the leaders' ability to recognise and empathise with emotions. This is important because leadership and particularly transformational leadership are principally focused on an individual's social interactions and their ability to identify emotions and to react empathetically to the emotions of others (Psychogios and Dimitriadis, 2020). Many leadership theorists suggest the ability to have and display empathy is an important part of leadership (Bass, 1990; Walumbwa, et. al., 2008).

Design/methodology/approach

To examine the extent to which those who work in jobs with a significant element of leadership education can recognise and empathise with emotions, ninety-nine part-time postgraduate executive MBA students took part in an emotional recognition test. First, all participants were shown a sequence of pictures portraying different human facial expressions and the electrical activity in the brain as a result of the visual stimuli were recorded using an electroencephalogram (EEG). The second stage of the research was for the participants to see the same seven randomised images, but this time, they had to report what emotion they believed they had visualised and the intensity of it on a self-reporting scale.

Findings

This study demonstrated that the ability to recognise emotions is more accurate using EEG techniques compared to participants using self-reporting surveys. The results of this study provide academic departments with evidence that more work needs to be done with students to develop their emotional recognition skills. Particularly for those students who are or will go onto occupy leadership roles.

Originality

The use of neuroscientific approaches has long been used in clinical settings. However, few studies have applied these approaches to develop our understanding of their use in social sciences. Therefore, this paper provides an original and unique insight into the use of these techniques in higher education.

Keywords

Competency, Higher Education, Skills, Emotion, Empathy, MBA

Introduction

Empathy is a complex social phenomenon which has various meanings. Smith (2006) states that empathy is the understanding of the state of mind of others. Whereas, Hollin (1994) states that empathy is the ability to see the world, including one's behaviour, from another person's perspective. Furthermore, Marsh (2018) and MacLean (1967) both state that empathy is the ability to identify one's own feeling with those of others. Decety (2010) proposes that empathy can have a social and moral regulatory function which can have positive social implications.

More recently, social neuroscience has started to understand the phenomenon of empathy. Matson et al (2020) demonstrated how counselling psychologists have started to use techniques such as electroencephalogram (EEG) to better understand empathy. While Maffei et al., (2019) used EEG to measure empathy in a small group of female students. Singer et al (2004) showed that both experiencing pain and empathising with the pain of others evoke brain responses, notably in the cingulate and insular cortices. Shamay-Tsoory, Aharon-Peretz and Perry (2009) point out that the emotional contagion system, the phenomenon of having one person's emotions and related behaviours directly trigger similar emotions and behaviours in other people is the basis of one's ability to empathise emotionally. For example, *I feel what you feel*, illustrates the emotional contagion system. This idea of matching relations has been correlated in Gallese (2007) to the mirroring neuron system (MNS).

Currently there are no studies that have undertaken work into empathy using neuroscientific techniques in an applied manner such as this. Therefore, this paper offers alternative ways of exploring empathy has previously not been used. In theorising empathy, existing studies have focused on specific conceptual elements. For example, Drimalla et al. (2019) examine the mirroring aspect of emotions, whereas, Geng et al. (2018) highlight the endocrinological impact on emotions, principally the role of oxytocin, or Dolder et al's. (2016) study of the pharmacological influence of substance misuse on emotions. A considerable number of studies consider the impact of emotions from the perspective of deficits. As many studies have looked at elements of empathy, this paper focuses on linking the theoretical constructs associated with empathy and its practical applications.

However, the empathetic response system is more than pure emotional contagion and also involves cognitive perspective-taking. The second form of empathy requires more complex cognitive functions, including empathic perspective-taking and mentalising. This is a process whereby one understands another person's perspective, termed cognitive empathy. For example, *I understand what you feel and/or think*, requires higher cognitive functions (Decety and Jackson, 2004). Several theoretical models have tried to address the issues of distinct emotional and cognitive facets of empathy progressing (Adams, 2001; Preston and de Waal, 2002; Decety and Jackson, 2004; Shamay-Tsoory, Aharon-Peretz and Perry; 2009 and Marsh, 2018). Most of these models support a theoretical framework in which the empathic process entails a hybrid emotional as well as cognitive components which

functionally intertwine to form an empathic state. However, these models often fail to address directly the relationship between the cognitive, emotional and more recently behavioural (Eginli & Tas, 2019) aspects of empathy.

Whilst the discourse in the neural relationship between emotional and cognitive elements of empathy continues touched upon later in this paper, we are more concerned with the practicalities of empathy. Therefore, this paper will focus on the leaders' ability to recognise and empathise with emotions. To determine this, 3 cohorts of part-time postgraduate executive MBA (Master of Business Administration) students had their abilities to empathise measured. All students participating were in leadership or management roles within their respective organisations; this ensured that there was a link between the theoretical aspects of empathy and the practicalities experienced by leaders. To achieve this, the paper will use innovative methods to consider why empathy is an important leadership trait and explore in greater depth what is empathy. After which, we will discuss the methodology and technology used to assess empathy before presenting the results and our conclusions. What this paper highlights are how scientific techniques can be used to support one's understanding of contemporary leadership issues.

Emotional empathy

Since the 1950s two distinct leadership roles have emerged, the task leader and the socio-emotional leader which have been well documented in leadership literature (Bales, 1958). These two roles have been conceptualised into theories such as transformational and transactional leadership (Bass, 1990). Transformational leadership principally focusing on building relationships with those whom leaders work, whereas transactional leadership critically focuses on task achievement.

Hughes, Patterson & Terrell, (2005) suggest developing leaders with high emotional intelligence (EI) is key to individual and organisational success, especially in people-centred professions. Although Lambert (2020) highlights that emotional intelligence is just one facet of the traits a leader needs and that an individual's ability to recognise emotions is to some extent dependent on their position within the organisational hierarchy, he too concludes that emotional recognition is key to leadership. Closely linked to emotional recognition is empathy. Without the ability to recognise and experience emotions one cannot show empathy. This has been shown in studies by Shamay-Tsoory, Aharon-Peretz and Perry (2009) and Shamay-Tsoory, (2015) which use emotional recognition to assess empathetic systems. Emotional recognition and empathy are integral notions to Emotional Intelligence, from the very beginning of its conception (Goleman, 1995), and thus are crucial to a person's performance as an individual and within social groups.

Given that leadership and particularly transformational leaders are principally focused on social interactions individuals need not only to be able to identify emotions but to be able to react empathetically to the emotions of others (Psychogios and Dimitriadis, 2020). This ability to particularly important when considering transformational leadership. Bass and Avolio (1994) suggest that transformational leadership comprises of four domains:

1. **Charisma:** The charismatic leader providing vision, a sense of mission, instilling pride, gaining respect and trust, and increasing optimism amongst staff.
2. **Inspiration:** Concerned with the leader acting as a role model for others, communicating the vision and the use of symbols to focus efforts.
3. **Individual consideration:** While a leader's charisma may attract staff to a vision or mission, the leader's use of individualised consideration also significantly contributes to individuals' achieving their fullest potential.
4. **Intellectual stimulation**: An intellectually stimulating leader provides staff with a flow of challenging new ideas that stimulate rethinking of old ways of doing things and recognising the value that staff bring to the task or organisation.

This view of transformational leadership is shared by Dionne et al., (2004); Bayram & Dinç (2015) and Al-Abrrow, (2018). What is apparent from Bass and Avolio's (1989) model is that each of the four domains requires individuals to have behavioural traits underpinned by high levels of empathy.

Therefore, empathy, which the aforementioned authors suggest is a trait, is a central mechanism in our understanding of those whom we interact. As a construct, empathy is fundamental to leadership. Many leadership theories suggest the ability to have and display empathy is an important part of leadership. As already mentioned, transformational leaders need empathy to show their followers that they care for their needs and achievement (Bass, 1990). Yet, authentic leaders also need to have empathy in order to be aware of others (Walumbwa, et. al., 2008).

As mentioned earlier, recent evidence from neuroscience indicates that empathy involves at least two dissociable systems: emotional empathy (a developmentally and phylogenetically early system of empathy) and cognitive empathy which develops much later than emotional empathy. Whereas, the final element of empathy, behavioural empathy is a construct that is defined as actions taken in response to the internal experience of cognitive and/or emotional empathy. Behavioural empathy is independent of other forms of empathy as the actions taken by an individual can also be as a result of a deficit of empathy (Tamayo, Rizkalla, Henderson, 2016).

Emotional empathy involves vicarious sharing of emotions as well as the elicitation of similar emotions experienced when observing others. This is due to Preston and de Waal's (2002) perception-action hypothesis, where the perception of behaviour in others automatically triggers one's own representation of that behaviour. This results in a shared understanding of the behaviours which subsequently generates an appropriate emotional response. This process has been observed in studies that have shown there to be an automatic state-matching reaction, sometimes called a mirroring system, where the brain mirrors or matches the emotional state of the individual being observed (Fan, Duncan, et al; 2011). It is worth noting that emotional empathy can trigger emotional pain as well as physical pain too. There is accumulating evidence showing that emotional pain—the painful feelings following

social rejection, exclusion, or loss, sometimes called social brain theory —relies on some of the same neural circuitry that is involved in processing physical pain.

While emotional empathy provides the fundamental foundations of empathy, for example, *I feel what you feel*, it is cognitive empathy that has the ability to create a theory about other individuals mental state and cognitively take the perceptive of others. Cognitive empathy is based on the psychological construct of Theory of Mind: a set of interrelated concepts we use to make sense of our thoughts, feelings, and behaviours, as well as those of others (Gleitman, Gross and Reisberg; 2011). It is this cognitive process that enables us to understand other's thoughts, intentions, emotions and beliefs, and internally reflect through one's self-awareness upon the state of others.

It is this notion of self-awareness that underpins a wider understanding of empathy. Not only is there a need to be able to identify the emotions of others, but as individuals engaged in social interactions, there is a need to be able to process these observed emotions in order to be able to react empathically to those around us. However, as Shamay-Tsoory, (2015) points out, in everyday situations, both emotional and cognitive processing are necessary and a deficit in either aspect will affect an individual's ability to understand social interactions, but also suppress their ability to provide support to others.

Methodology

The objective of this paper was to examine the extent to which those who work in jobs with a significant element of leadership education can recognise and empathise with emotions. The sampling unit was a part-time postgraduate executive MBA (master's in business administration) students. Ninety-nine individuals (*n=99*), fifty-nine where male (*m=59)* and 40 where female (*f*=40), participated in an emotional recognition test. This sampling unit was selected due to participants being employed as leaders or managers within their organisation. Therefore, individuals would already have experience of leading others within their workplace. This will ensure a level of validity to the results, due to their real-world application. Participants were self-selecting through presentations to their class cohort based on a convenience sample (Plowright, 2011) and all had at least five years of leadership experience, hence the executive MBA rather than the standard MBA programme. Table 1 provides a summary of the participants.

Age	Number
20-29	3
30-39	68
40-49	26
51-60	2
Total	99

Table 1: summary of participant ages

An important point to note is that for some studies 99 respondents would be considered small. However, for studies using the techniques employed here, this would be considered a large study. This larger than average study was deliberately done to get a set of data from which to explore whether there are any differences in individuals' ability to recognise emotion and whether a further larger study should be conducted. This initial study would provide details of whether a larger scale study should be conducted. It is also worth noting that the results of this study as this stage may not be generalisable due to the limitations of sample size.

The study was conducted in two stages. First, all participants were shown a sequence of pictures portraying different human facial expressions of emotions. There were seven different emotions depicted (neutral, happy, angry, afraid, disgusted, sad, surprised) (See figure 1) based on the Karolinska Directed Emotional Faces (KDEF). The images are all black and white and slightly blurred. This is to minimise the risk of individuals using non-emotional cues such as colour tones to determine the expressed emotions, Lundqvist, Flykt, and Öhman (1998). At the same time, biometric data of the electrical activity in the brain as a result of the visual stimuli were recorded using an electroencephalogram (EEG). This measurement was after initial calibration readings were obtained from each participant. This calibration ensured that a baseline reading was recorded in a non-stimulated environment.

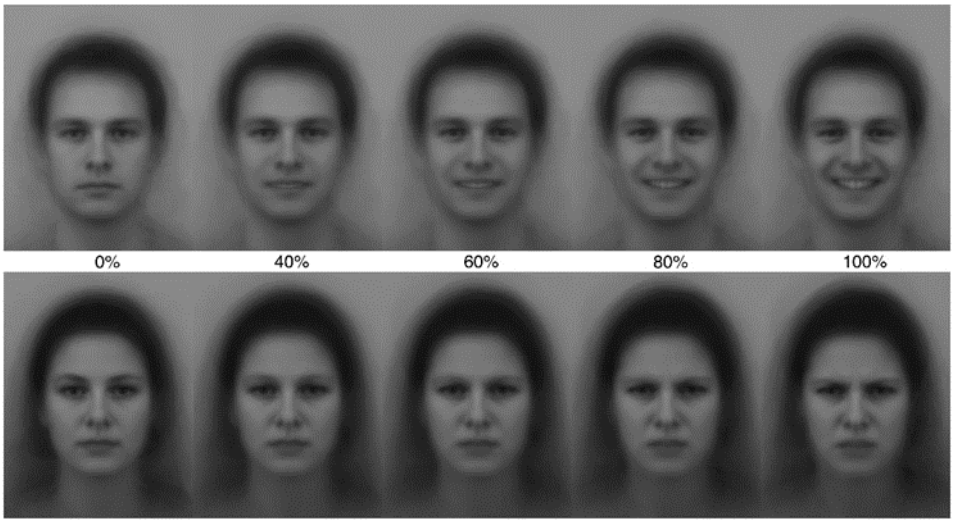


Figure 1: Example of the visual stimulus used, based on the Karolinska Directed Emotional Faces (KDEF), Lundqvist, Flykt, and Öhman (1998).

Participants were shown each image in a random order, and the electrical signals from different regions of the brain were recorded and mapped onto a circle of emotional episodes, more commonly referred to as the Russell circle of emotions (Russell and Barrett, 1999). See figure 2.

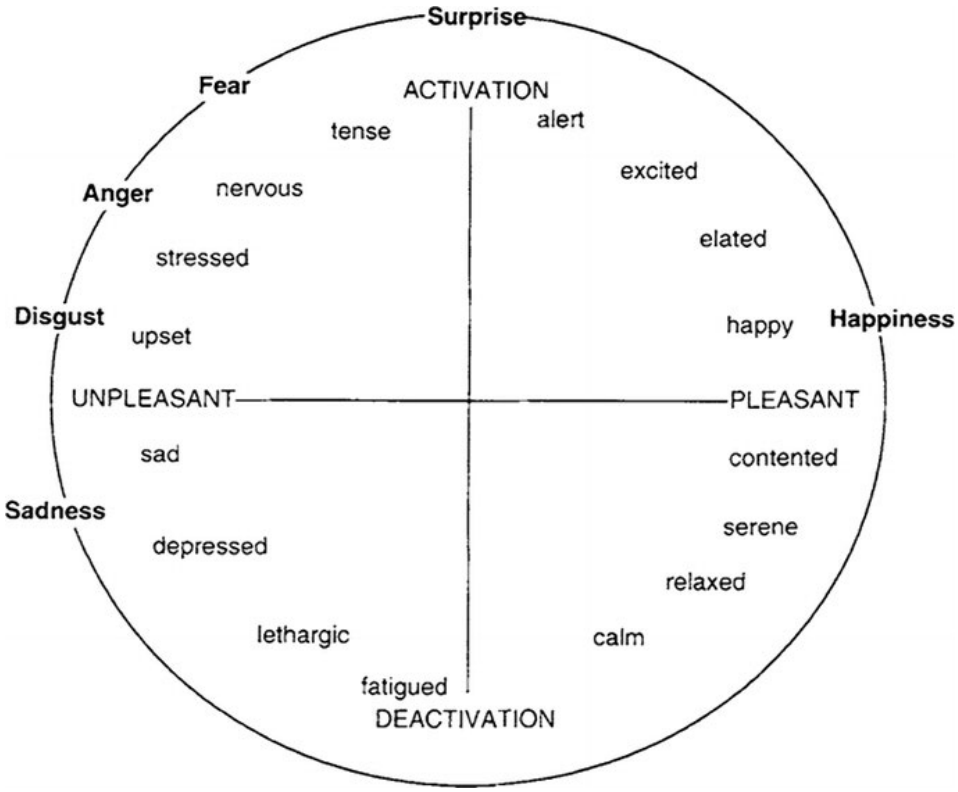


Figure 2: Russell Circle of Emotions (Russell and Barrett, 1999)

Results from the EEG identified the region of the brain, which responded to the visual representation of the emotion and the strength of the electrical signals indicating the level of intensity felt by the emotion.

The second stage of the research was for the participants to see the same seven randomised images, but this time, they had to report what emotion they believed they had visualised and the intensity of it on a self-reporting scale. For each face presented to participants, they were given 7 visual analogue scales, one for each possible emotion. The scale was a continuum from low to high. Participants had to select the appropriate scale, based on the emotion they believed they were being shown and mark the intensity of the emotion. This approach is the same as that often used in healthcare to assess pain. The advantage of this approach is that it removes issues associated with quantification of different points. For example, the difference in intensity between point 3 and 4 on a scale. However, the Stanford Pain Scale is an attempt to include tangible descriptions assigned to each numeric value. It is important to note that the study had to be conducted in this order to avoid the risk of bias of the electrical signals in the brain, due to already having seen the images.

As already discussed, emotions are generated in the brain (Adams, 2001; Preston and de Waal, 2002; Decety and Jackson, 2004; Shamay-Tsoory, Aharon-Peretz and Perry; 2009 and Marsh, 2018). Self-reporting questionnaire can only be used to report emotional feelings, which are expressed emotional manifestations in our body

incurring sensational changes picked up by self-awareness, such as anger, sadness and joy. This report is the awareness and externalising of the sensation based on what the person perceives the emotion to be. Self-reporting techniques cannot measure involuntary responses to emotions, typically called *emotional experiences* which are generated in the brain. To capture and measure involuntary responses to emotions bio-metric techniques need to be applied. The advantage of the methods used in this study is the reduction in the risk of misattribution of feeling to an emotion. This misattribution has been famously recorded in Dutton & Aron's (1974) suspension bridge experiment. Participants felt the same physiological conditions, increased heart rate and sweaty palms, but mistook the emotion of fear for one of desire (see also Kenrick & Cialdini, 1977; Kenrick, Cialdini, & Linder, 1979).

Hall, Andrejewski and Yopchick (2009) found that sensitivity in social interactions (encompassing an individual's ability to successfully infer and interpret another person's emotions) is positively correlated with many social skills. Examples of these skills are the ability to adjust to new or foreign cultures, effectiveness in the workplace, and the quality of relationships that can be built.

Consequently, the importance of such methods as described in this paper, cannot be underestimated. As companies search for new ways to improve performance, increased interest has been found in the developments of emotion-sensing technologies (ESTs) and software fuelled by artificial emotional intelligence. Although we are still in the early days, research shows that these technologies, which read such things as eye movements, facial expressions, and skin conductance, can help employees make better decisions, improve concentration, and alleviate stress (Whelan et. al., 2018). While important privacy issues need to be addressed, the opportunities are significant.

Results and discussion

This section of the paper presents and discusses the results from both the EEG measurements and the self-reporting questionnaire. These are going to be discussed in parallel to ensure that the results are contextualised based on overall results, gender and then age.

Table 2 provides details of the results of participants ability to recognise emotions as measured through the EEG system and recorded on the Russell circle of emotions. What this table shows us, is that overall females more accurately recognise the emotions compared to men, 3.55 compared to 3.44.

	EEG							
	Afraid	Angry	Disgusted	Happy	Neutral	Sad	Surprised	**Overall**
Overall	3.41	3.34	3.24	3.65	3.76	3.02	3.95	3.48
Male	3.41	3.32	3.19	3.59	3.66	2.96	3.94	3.44
Female	3.4	3.37	3.32	3.74	3.91	3.1	3.97	3.55

Table 2: Results from the EEG study. The scale is from 0 to 5, with a higher score representing a more accurate identification of emotion automatically by the participants' brains.

Looking at the individual emotions, both male and female participants were able to recognise a surprised emotion however they both struggled with sadness. Albeit males more so than females.

When this is compared to participants scores on the self-reporting questionnaire (table 3), we can see that the scores are lower.

	Self-reporting (survey) questionnaire							
	Afraid	Angry	Disgusted	Happy	Neutral	Sad	Surprised	**Overall**
Overall	2.79	2.87	3.51	3.33	3.35	2.92	3.51	3.18
Male	2.72	2.88	3.43	3.29	3.29	2.98	3.58	3.17
Female	2.91	2.84	3.63	3.38	3.44	2.83	3.4	3.2

Table 3: Results from the participants self-reporting questionnaire.

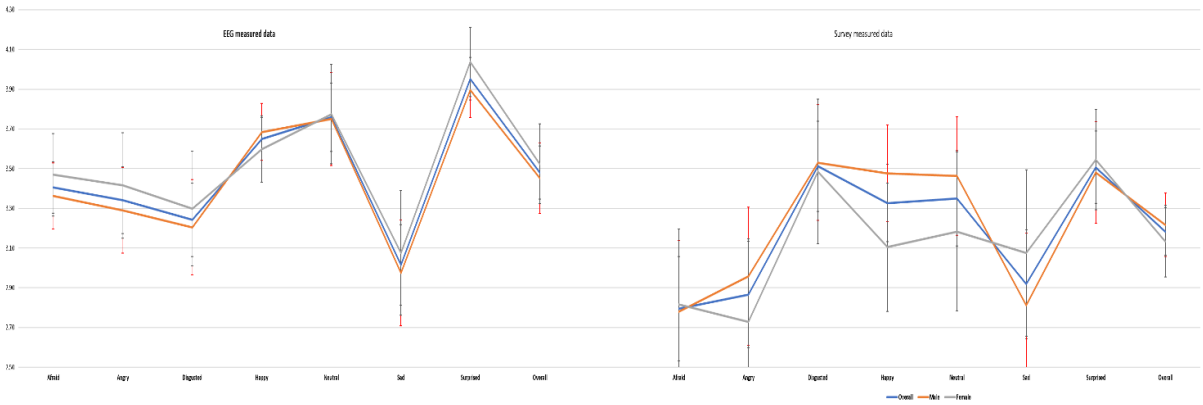
Overall, there was a 0.3 difference between the self-reporting questionnaire and EEG results. This suggests that measuring involuntary responses from the brain is a more accurate way of identifying emotions than using a self-reporting questionnaire. This is because different regions of the brain are used responding to different forms of empathy (Eres, Decety, Winnifred, Molenberghs, 2015). Furthermore, the data suggests that while women more accurately recognise emotions than men in the self-reporting questionnaire, both men and woman score lower in the questionnaire than in the EEG assessment. Therefore, we can summarise that overall, using EEG to measure involuntary responses in the brain is more accurate in both men and woman within the study.

It is worth noting that all participants seemingly struggled to identify emotions of sadness when undertaking the EEG assessment, and sadness and afraid when self-reporting. Conversely, the emotions of happy and surprised were equally recognised using both EEG and self-reporting methods.

Statistical analysis was also undertaken. In particular, the standard deviation test was conducted to ascertain the extent to which participants differ from the mean value for the entire cohort and by gender. The figures suggest that there was little difference in the variation between the overall Survey measurements (0.12) and the EEG measures (0.13). Female survey responses showed the lowest variation at 0.58 overall. Within individual emotion tests, the EEG, however, showed much less variation, with the surprised emotion measured at 0.53 variation for males, compared with 1.0 for males. The highest variation with the EEG measure was 0.94 for disgusted, which was much higher for the Survey responses at 1.15. These figures overall show a much higher variation within individual EEG measurements compared to the Survey measures.

Further analysis included the calculation of confidence intervals (CI) at 95%, to compare the EEG and Survey measures for the entire cohort and by gender. Overall, the 95% CI value for the EEG was 0.13 [3.35, 3.61] and for the Survey was slightly lower at 0.12 [3.06, 3.30]. Whilst measurements with the EEG were more accurate, there is more variability in the Confidence intervals.

The Lower confidence level of the Empathy measured with EEG is overlapping with the Upper confidence level of the Empathy Level measured with the Survey only for the emotions of Disgusted, LL (Lower limit) EEG 3.06 UL (Upper limit) Survey 3.74 and Sad, LL EEG 2.81 UL Survey 3.19.



Graph 1: Confidence intervals based on EEG and Self-reporting measurements.

There is an overlapping of intervals for Male participants with lower-level EEG of 3.27 and an upper level with the Survey of 3.30. Only the emotions of Afraid and Surprised do not share limits between EEG values and survey values.
Previous investigations suggested that high levels of empathic abilities are directly associated with an enhanced emotional response (Singer et al., 2004; Maffei et al., 2019) but most studies use students as participants. While this study also uses students, the participants used here are part-time and in leadership roles within their profession. The use of EEG to explore empathy is in its infancy having previously relied on self-reporting questionnaires. However, as this paper demonstrates EEG is more effective in recognising empathy. The implications of which are yet to be explored due to the paucity of applied studies in this field.

Conclusion

Within this study we have demonstrated that the ability to recognise emotions is more accurately measured using EEG techniques compared to participants using self-reporting surveys. However, it is important to acknowledge the implications of this. Further work is needed to replicate this study in order to acertain with some certainity the validity of using such approaches more generally. This is not to suggest that the methods employed in this paper are not valid. More so, that more work is needed to determine the generialisability of our findings. The use of postgraduate students who are also working professionals in this study suggests that a more nuranced understanding of empathy is needed. This is particularly important for those students who are or will go onto occupy leadership roles, such as the MBA

students in this study. It has previously been reported by Lambert (2020) that middle leaders have a deficit of emotional recognition skills, in part due to the task- versus people-focused nature of their role. From the perspective of the student, it is important that they recognise emotions because as Hughes et al. (2005) suggest developing leaders with high emotional intelligence (EI) is key to individual and organisational success. If students understand their level and ability to recognise emotions then they are in a position to improve and increase their job-related performance (Erdogan & Boz, 2020). While not wanting to overstate the impact of this study, the findings could be interpreted more generally in a way to encourage those in academia and leadership positions to reflect on how they are developing emotional empathy to develop individuals who can respond more empathically with those with whom they interact.

The more studies, like this one, that highlight this issue, the more emphasis academic staff will place on this when designing course content. However, work in this area is in its infancy and further work need to be undertaken to develop the use of neuroscientific-based techniques for applied applications such as this study. Taking the findings of this research forward would add to the limited number of studies in this field. Future research needs to replicate this study in order to ascertain whether similar results are achieved. Additionally, work to ascertain whether there are differences significant differences in the ability to recognise empathy between different occupational sectors. This would potentially provide a granular level of detail that could be used to support individuals more effectively.

Acknowledgements

Centre of Business Excellence, of the School of Economics and Business, University of Ljubljana.

References

Adams, F. (2001) Empathy: neural imaging theory versus simulation debate. *Mind Language*. 16, 368-392.

AL-Abrrow, H. A. (2018). The effect of perceived organisational politics on organisational silence through organisational cynicism: Moderator role of perceived support. *Journal of Management & Organization*, 1-20.

Bales, R.F. (1958) *Task roles and social roles in problem-solving groups*, in Readings in Social Psychology, eds E. Maccoby, T. Newcomb, and E. Hartley (USA: Rinehart & Winston), 437–447.

Bass, B. (1990) From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics*. 18(3), 19-31.

Bass, B. M., & Avolio, B. J. (1994). Transformational leadership and organizational culture. *The International Journal of Public Administration*, 17(3-4), 541-554

Bayram, H., & Dinç, S. (2015). Role of transformational leadership on employee's job satisfaction: The case of private universities in Bosnia and Herzegovina. *European Researcher*. Series A, (4), 270-281.

Decety, J. (2010) The Neurodevelopment of Empathy in Humans. Developmental Neuroscience. 32(4), 257–267.

Decety, J., Jackson, P. (2004) The functional architecture of human empathy. *Behavioral and Cognitive Neuroscience Reviews.* 3, 71-100.

Dionne, S. D., Yammarino, F. J., Atwater, L. E., & Spangler, W. D. (2004). Transformational leadership and team performance. *Journal of Organizational Change Management*, 17(2), 177-193.

Dolder, P. C., Schmid, Y., Müller, F., Borgwardt, S., & Liechti, M. E. (2016). LSD acutely impairs fear recognition and enhances emotional empathy and sociality. *Neuropsychopharmacology*, 41(11), 2638-2646.

Drimalla, H., Landwehr, N., Hess, U., & Dziobek, I. (2019). From face to face: the contribution of facial mimicry to cognitive and emotional empathy. *Cognition and Emotion*. 33(8), 1672-1686.

Dutton, D.G.; Aaron, A. P. (1974). Some evidence for heightened sexual attraction under conditions of high anxiety. *Journal of Personality and Social Psychology*. 30 (4), 510–517

Eginli, A. T., & Tas, N. O. (2019) *Gender Differences in Empathic Communication: A Study with Postgraduate Students in Faculty of Communication*. Contemporary Approaches in Social Science Researches, 435.

Erdogan. K., Boz, H. (2020) Development of hospitality and tourism employees' emotional intelligence through developing their emotion recognition abilities, *Journal of Hospitality Marketing & Management*, 29(2), 121-138

Eres, R., Decety, J., Winnifred, L., Molenberghs, P. (2015) Individual differences in local grey matter density are associated with differences in affective and cognitive empathy. *NeuroImage.* 11, 7 305-310

Fan, Y., Duncan, N., de Greck, M., Northoff, G. (2011) Is there a core neural network in empathy? An fMRI based quantitative meta-analysis. *Neuroscience & Biobehavioral Reviews*. 35(3), 903-911.

Gallese, V. (2007) Before and below 'theory of mind: embodied simulation and the neural correlates of social cognition. *Philos Trans R Soc Lond B Biol Sci*, 362. 659-669.

Geng, Y., Zhao, W., Zhou, F., Ma, X., Yao, S., Hurlemann, R., ... & Kendrick, K. M. (2018). Oxytocin enhancement of emotional empathy: generalization across cultures and effects on amygdala activity. *Frontiers in neuroscience*, 12, 512.

Gleitman, H., Gross J., Reisberg, D. (2011) *Psychology.* UK: Norton & Company.

Goleman, D. (1995). *Emotional Intelligence.* USA: New York.

Hollin, C. (1994) Forensic (criminological) psychology. In Colman, A. (Ed), *Companion encyclopaedia of psychology.* UK: Routledge.

Hughes, M., Patterson, L., & Terrell, J. (2005) *Emotional Intelligence in Action: Training and Coaching Activities for Leaders and Managers*. USA: John Wiley & Sons.

Kendrick, D. T., Cialdini, R. B. (1977). Romantic attraction: Misattribution versus reinforcement explanations. *Journal of Personality and Social Psychology*, 35, 381–391.

Kendrick, D. T., Cialdini, R. B., & Linder, D. E. (1979). Misattribution under fear-producing circumstances: Four failures to replicate. *Personality and Social Psychology Bulletin*, 5, 329–334.

Lambert, S. (2020) Emotional awareness amongst middle leadership. *Journal of Work-Applied Management.* (pre-print edition)

Lundqvist, D., Flykt, A., & Öhman, A. (1998). The Karolinska Directed Emotional Faces – KDEF, CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet,

MacLean, P. D. (1967) The brain in relation to empathy and medical education. *Journal of nervous and mental disease* 144, 374-382.

Maffei, A., Spironelli, C., & Angrilli, A. (2019). Affective and cortical EEG gamma responses to emotional movies in women with high vs low traits of empathy. *Neuropsychologia*, 133, 107175.

Marsh, A. (2018) The neuroscience of empathy. *Current opinion in behavioural sciences.* 19, 110-115.

Matsen, J., Perrone-McGovern, K., & Marmarosh, C. (2020). Using event-related potentials to explore processes of change in counselling psychology. *Journal of Counseling Psychology*, 67(4), 500–508.

Psychogios, A., Dimitriadis, N. (2020) *Neuroscience for Leaders*. UK: Kogan Page.

Preston, S. de Waal, F. (2002) Empathy: Its ultimate and proximate bases. *Behavioural brain science.* 25, 1-71.

Russell, J., and Barrett, L. (1999) Core Affect, Prototypical Emotional Episodes, and Other Things Called Emotion: Dissecting the Elephant. *Journal of Personality and Social Psychology*. 76(5), 805-819

Shamay-Tsoory, S., Aharon-Peretz, J., Perry, D. (2009) Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Journal of Neurology.* 132, 617-627

Singer, T., Seymour, B., O'Doherty, J., Kaube, H., Dolan, R., Frith, C. (2004) Empathy for pain involves the affective but not the sensory components of pain. *Science.* 303, 1157-1161.

Smith, A. (2006) Cognitive empathy and emotional empathy in human behaviour and evolution. *The psychological record.* 56, 3-21.

Tamayo, C. A., Rizkalla, M. N., Henderson, K. K. (2016). Cognitive, Behavioral and Emotional Empathy in Pharmacy Students: Targeting Programs for Curriculum Modification*. Frontiers in pharmacology*, 7,(96), 1-8.

Walumbwa, F. O., Avolio, B. J., Gardner, W. L., Wernsing, T. S., & Peterson, S. J. (2008). Authentic leadership: Development and validation of a theory-based measure. *Journal of Management*, 34, 89–126.

Whelan, E., McDuff, D., Gleasure, R., vom Brocke, J. (2018). *How Emotion-Sensing Technology Can Reshape the Workplace*. MIT Sloan Management Review. USA: MIT. Available online: https://shop.sloanreview.mit.edu/store/how-emotion-sensing-technology-can-reshape-the-workplace