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Research Article

Limbic Responses of Empathic Concern in Physicians

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Empathy encompasses cognition, emotion, and motivation, from which different behaviors arise, such as empathic concern, which is essential for physicians and has neural bases including structures from the limbic system. The aim of this research was to understand the limbic responses involved with the empathic concern of physicians in front of patients. This is a review manuscript. Areas of executive attention (superior frontal gyrus) and understanding the mental state (medial prefrontal cortex and temporoparietal junction) were shown to be activated in physicians in a situation of empathic concern with their patients. There was no activation of the insula or anterior cingulate gyrus. Physicians clinically demonstrate that they react in such a way that regulates the emotional processing of pain. Functional activation of brain areas of executive attention and understanding the mental state in physicians, during a situation of empathic concern with their patients, suggests that technical knowledge and experience acquired facing pain modify their limbic responses. The control of the perception of pain in physicians seems to be necessary for reasoning, assistance to others and empathic concern.

Keywords: neuroanatomy; limbic system; empathic concern; physicians.

Introduction

Empathy refers to a complex way of understanding the other based on the recognition of their emotional state (Eisenberg et al., [1]). It is crucial in social relationships since it has features linked to cognition, emotion and motivation (Decay, 2020). The same author explains that although each of the three components mentioned have anatomical and functional distinction, the development of empathy requires an interaction between them, such as the ability to understand the other's perspective (cognitive), the sharing of emotions (emotional) and empathic concern (motivational).

Empathic concern is characterized by the motivation to take care of the well-being of others and the perception of their needs and is the main empathic behavior responsible for pro-social attitudes (Singer and Klimek [2]). For this reason, it is essential in the interaction between health professionals and their patients, demonstrating that it contributes to the optimization of treatments, maintenance of the mental health and improvements in the economic sustainability of health systems (Trzeciak, Roberts and Mozzarella [3]).

Hippocrates (460 - 377 BC) defended the idea that love for humanity was at the core of the practice of medicine (Weir et al.,[4]). In this sense, empathic concern has been associated with therapeutic benefits, adherence to treatments, satisfaction with

consultations between patients and physicians, and reduced claims for medical negligence (Bird et al., [5], Gleichen and decay [6]; Halper [7], Huntington and Kuhn [8]). However, without emotional regulation, the empathic experience can lead to burnout syndrome, characterized by emotional exhaustion and reduced sense of accomplishment, or impairment of the physician's pro-social attitude (Azhar et al., 2017, Isobel and Angus-Lappin [9]), facts that lead us to understand that the balance between the inhibition of negative emotions and empathic concern is a challenge for these professionals (Decety [10], Gleichgerrcht and Decety [6]).

Empathy is mediated by neural circuits that include regions of the limbic system and cortical areas (Decety and Meyer [11], Thomas et al., [12]). Structures involved with empathic concern are, for example, prefrontal cortex, basal ganglia, ventral tegmental area (Weisz and Zaki [13]), amygdala, periaqueductal gray matter (Marsh, [14]) and hypothalamus (Cowell and Decety [15]). Therefore, the neural bases of empathic concern in physicians appears with relevance in the physician-patient dyad, corroborating with advances in medical education and clinical practice (Decety and Fotopoulou [16]; Weiz and Zaki [13]).

Taking into account the importance of empathic concern among health professionals, as observed in the relationship between physicians and their patients, and the role of limbic, cortical and subcortical areas in this behavior, the question is: what are the limbic responses involved in situations of empathic concern of physicians in front of patients?

The main objective of this research was to understand the limbic responses involved with empathic concern of physicians in front of patients. The specific objectives were to identify the limbic areas involved with the empathic concern of physicians in front of patients and explain this empathic behavior in the interaction between physicians and patients.

Material and Methods

This is an exploratory research as it "provides an approximate overview of a given phenomenon" and bibliographical, as "it is developed from material already prepared, consisting mainly of books and scientific articles" (Moreira and Caleffe [17]), which involved bibliographic survey, reading, logical organization of the data, subject discussion and writing. The inductive method was used. The data were collected from Science Direct and Pubmed databases, libraries and websites of many research institutions, universities and academic and scientific sites. The associated descriptors were: empathy, empathic concern, compassion, emotion regulation and heath care, physicians, doctors, clinical empathy, medical practice, medical education, medical students and limbic system, prefrontal cortex, neuroanatomy, neuroscience, insula, parahippocampal gyrus, hypothalamus, perception, personal distress, burnout, clinical outcomes.

Results and Discussion

Limbic Areas and Empathic Concern of Physicians in front of Patients With regard to cortical areas, regions of the prefrontal cortex have been related to empathic concern, such as the orbitofrontal and ventromedial region (Ashar et al., [18], Feldmanhall et al., [19], Klimecki et al., [20]). In a study with functional magnetic resonance imaging (fMRI), a group of 25 female participants was monitored by watching videos that depicted human suffering, before and after undergoing compassion training (Klimecki et al., [21]). The results showed that compassion training significantly increased the activation of areas such as the ventral striatum, subgenual anterior cingulate cortex and medial orbitofrontal cortex. These three regions have been related to parental care (Statheran et al., [22]), reward system and positive emotions (Kontaris, East and Wilson [23]). In fact, the data showed an increase in the rate of positive emotions experienced by participants after watching the videos.

Notably, the medial orbitofrontal, pregenual anterior cingulate cortex and ventromedial prefrontal cortex areas were shown to be active by fMRI in the brain of physicians who were well evaluated by their patients using the CARE scale (Consultation and Relational Empathy), which showed a correlation with the level of empathic concern of physicians, assessed by the Interpersonal Reactivity Index (IRI) (Jensen et al., [24]). This assessment was carried out during consultations in which physicians applied a supposed pain treatment to patients. These data indicate that the demonstration of empathic concern and activation of brain areas related to compassion and the reward system are important factors for a successful clinical encounter. On the other hand, no relation was found between good results on the CARE scale and areas related to empathy for pain and perception of negative emotions, such as the insula and the middle cingulate cortex (Lamm, Decety and Singer [25]). Therefore, the authors suggest that the empathic components of sharing negative emotions related to the insula and the middle cingulate cortex have no significant relevance for a successful doctor-patient relationship.

Corroborating this idea, the research by Klimecki et al., [21] also proposes that the exercise of empathic concern reduces the activation of areas of empathy for pain. After compassion training, a significant decrease in anterior insula and anterior middle cingulate cortex activation was observed. This change was related to an important drop in the index of negative emotions experienced by participants after watching the videos. The authors conclude that training for compassion, due to its effects on the nervous system, has the potential to reinforce positive emotions when faced with the perception of others' suffering. In this bias, Klimecki et al., [21] comment that such training can be important in preventing burnout syndrome and improving prosaically behavior.

Several studies indicate that physicians frequently exhibit the behavior of empathic concern as consequence of the emotional

experiences of others' pain, when compared to non-physicians. An example is the study by Cheng et al., [26], which suggests that the technical knowledge and experience acquired by physicians modify their limbic responses, leading to greater control of pain perception. The assumption comes from a research with fMRI involving 28 participants, in which areas related to aversive stimuli and empathy for pain were less activated in physicians, compared to controls, while those related to cognitive functions had significantly greater activation in the former Cheng et al., [26]. Among the areas with less activity in physicians, anterior insula, middle cingulate cortex, somatosensory cortex, supplementary motor area and the periaqueductal gray matter, one of the main regions related to the processing of fear and anxiety, are highlighted. The last three regions mentioned are associated with aversive stimuli and empathy for pain (Akitsuki and Decety [27]; Decety, Michelska and Akitsuki [28]; Hayes et al., [29]).

In the group of physicians, those areas that had significantly higher activation, compared to the control group, were related to cognitive empathy, such as executive attention, cognition and understanding the mental state of the other (superior frontal gyrus, medial prefrontal cortex and temporoparietal junction) (Decety and Lamm [30], Lamm, Decety and Singer [25], Molenberghs et al., [31], Oliva et al., [32]). As studies indicate that people have voluntary control over the neural mechanisms of processing the emotions of others it seems that these behaviors include voluntary components (Jimenez et al., [33]).

In the study of Jimenez et al., [33], 23 participants were invited to watch emotional Hollywood scenes while being monitored by fMRI. When oriented to behave in an emotional detached way, a mentalization behavior was described, especially due to the activation in the temporoparietal junction, pre-cuneus and ventromedial prefrontal cortex. The authors conclude that it is possible to voluntarily change the way the nervous system reacts to the perception of others' emotions; if individuals are properly instructed, they can learn to use cognitive rather than emotional empathy to understand the other.

Another neural region intensively activated in physicians in the study of Cheng et al., [27] was the parahippocampal gyrus, which is associated with memory (Luck et al., [34]). This area, as a component of the limbic system, is related to the processing of emotions (Decety [35]). The same author comments that this system has extrinsic connections with the prefrontal cortex and anterior cingulate cortex, involved in the regulation and evaluation of emotions. Cheng et al., [26] explain the increased activation of these regions of emotion regulation in physicians' brains as a necessity inherent to healthcare professions, due to their constant contact with human suffering. According to them, it is because fear and personal stress are not features associated with empathic concern and prosocial behavior, but with self-centered aversive responses that can cause physical and psychological harm. Thus, as commented by Decety et al., [10], without emotional regulation mechanisms, physicians would probably experience great anxiety and personal stress in face of the suffering of others, which would interfere with their ability to treat.

A recent cross-sectional study that assessed the levels of empathy of 201 caregivers of patients with dementia through the IRI, reinforces the idea that prioritizing cognitive empathy is important in clinical practice (Jütten, Mark and Sitskoorn [36]). This is because, among caregivers, no statistical significance was found between depression and cognitive empathy, while there was a positive relation between anxiety and emotional empathy. Furthermore, caregivers with considered normal levels of cognitive empathy had more symptoms of depression than those with high levels of cognitive empathy. In the control group, however, statistical significance was found both between depression and cognitive and emotional empathy, as well as between anxiety and emotional empathy, suggesting that empathy has different effects on the caregiver in contrast to an individual not involved with that function. The authors propose that these results are relevant to clinical practice and psychoeducation strategies, which should aim to increase the capacity of mentally adopting the other's perspective and reducing the tendency to share others' emotions.

When compared the neural reactions of physicians in different contexts of relationship with patients, significant differences were also found in the activated areas. Physicians were analyzed by fMRI in three different situations: observing individuals in pain while applying a supposed analgesic treatment; observing the same situation, but without the possibility of treatment; and a control condition, by observing patients without pain (Jensen et al., [24]). The treatment situation, compared to the others, led to greater activation of the ventrolateral prefrontal cortex and dorsolateral prefrontal cortex, temporoparietal junction and posterior superior temporal sulcus. The dorsolateral prefrontal cortex, as well as the temporoparietal junction and the posterior superior temporal sulcus are areas related to various cognitive and attention functions, especially when linked to contexts of social interaction (Patel and Sestieri and Corbetta [37], Weissman, Perkin and Woldorff [38]).

The ventrolateral prefrontal cortex has been associated with the expectation of pain relief and regulation of pain and negative emotions in the context of the placebo effect (Zubieta et al., [39]). Many studies indicate that this region, instead of directly modulating nociceptive signals, exerts control over brain circuits through neurochemical mechanisms, generating an expectation of pain relief that results in its indirect modulation (Lieberman et al., [40], Petrovic et al., [41], Wagner, Scott and Zubieta [42]). This information suggests that, as highlighted by Jensen et al., [43], not only patients, but also physicians, show a behavior of expectation of pain relief during treatment.

In the same mentioned study, the ventral striatum was activated in the brain of physicians in all three situations, but showed significantly greater activity in the control condition compared to untreated pain observation, as well as in the pain treatment condition compared to control. Since the ventral striatum is part of the dopaminergic reward system, the conclusion of the study is that these different reactions are related to the physicians' expectation of pain relief. Corroborating this idea, Decety and Porges [35] found an increase in ventral striatum activity while participants imagined helping people in distress.

Empathic Concern in Physician and Patient Interaction

The medical literature proves the fundamental role of empathy in clinical practice, which is even reflected in best therapeutic results when empathetic physicians conduct treatments. As an example, two studies found a correlation between physicians' empathy, assessed by Jefferson Empathy Scale, and more promising results in the treatment of patients with type 2 diabetes mellitus (Canale et al., [44], Hojat et al., [45]). Patients of empathetic physicians had fewer metabolic complications, reduced glycated hemoglobin and lower levels of LDL cholesterol in the blood.

In addition, a survey with 350 participants identified that the clinical empathy perceived by patients with a common flu during consultations had a significant relation with the duration and severity of the disease, as well as changes in the immune system itself (Rakel et al., [46]). Patients from physicians best rated by CARE empathy scale had a softer flu of shorter duration, as well as a greater rise in the cytokine IL-8. The authors suggest that this better recovery in the group of patients who had an empathic care is due to the greater experience of positive emotions by these individuals, which may have positively affected their immune system. Corroborating this idea, there are studies that evidence that negative emotions, such as stress, can impair immune function and make individuals susceptible to infections and other diseases (Bernardo et al., [47], Cohen et al., [48], Salleh [49]).

Another tested benefit of empathy in the health field is the effect of medical empathy on patients' perception of pain. In a study with 30 healthy participants, nociceptive thermal stimuli were applied to their hands during three different situations: listening through headphones to empathic, neutral and non-empathic comments (Fauchon et al., [50]). Perceived pain intensity was assessed by participants using a Visual Analog Pain Scale, evaluating pain between 0 (no pain) and 100 (worst possible pain). A reduction in perceived pain intensity only occurred when individuals listened to empathetic comments. The authors conclude that receiving empathic care, such as listening to comprehensive and sensitive comments can significantly reduce the intensity of pain experienced by patients and this finding is of great value for clinical practice. Corroborating this idea, several authors have indicated that empathy is a fundamental attribute of physicians in the treatment of patients with chronic pain, including several therapeutic effects (Budd and Volpe [51], Gallagher [52], Roche and Harmon [53], Tait [54]).

Other benefits of a good physician-patient relationship as a result from empathy, such as early diagnosis, good patient satisfaction and adherence to treatments, have been identified by several studies (Beach, Keruly and Moore [55], Flickinger et al., [56], Hojat et al., [45]; Kim, Kaplowitz and Johnston [57], Walsh et al., [58]). Furthermore, benefits to physicians themselves are pointed such as reduced claims and lawsuits for medical negligence (Lamothe et al., [59]), professional satisfaction, less stress and reduced risk of burnout syndrome (Lamothe et al., [59], Thirioux, Birault and Jaafari [60], Thomas et al., [12], Yuguero et al., [61]).

However, despite empathy importance, physicians often have lack of empathic behavior and miss many opportunities to demonstrate empathy (Easter and Beach [62], Levinson, Gorawara-Bhat and Lamb [63], Morse, Edwardsen and Gordon, [64], Pollak et al., [65]). In addition, several studies show that there is usually a significant decline in the levels of empathy among medical students throughout the graduation, especially and surprisingly at the time of the course when students are closer to patients (Cheng et al., [26]; Hojat et al., [45], Li et al., [66], Neumann et al., [67]; Newton et al., [68]).

Although most studies confirm the existence of a decline in empathy among medical students (Newton et al., [69]), there are disagreements regarding this issue. Some studies found no significant difference in empathy levels over time among medical students and others even observed an increase (Akgün et al., [68], Blanco et al., [70], Handford et al., [71], Quince et al., [72]). A possible explanation for these divergences between results is given by Blanco et al., [70] and Akgün et al., [69], whose studies were carried out in Spain and Turkey, respectively, which argued that the empathetic behavior of students can vary between countries and universities due to different cultures and teaching methodologies.

It is important to emphasize that the physicians' own assessment of their empathy does not measure all aspects of empathy in the physician-patient relationship. Bernardo et al., [73], for example, in their observational cross-sectional studies with 945 and 566 participants, showed, respectively, that there is no significant correlation between the assessment of empathy made by the physicians themselves (by the JSPE scale and IRI) and that one evaluated by the patients (through the CARE scale and JSPPPE - Jefferson Scale of Perception of Empathy by the Patient).

However, perhaps one of the most important reasons for the divergent data in this area is, as pointed out by Hojat et al., [74], the lack of clarity in the definition of empathy and characterization of its different facets. Decety [75] agrees that the great number of empathy concepts circulating in the literature has created serious problems, limiting the progress of the study of empathy in medicine. Pedersen [76], in his critical review involving 206 publications on

empathy and medicine, found that, in many studies, empathy is not even defined. Even in those that have a definition, most authors do not provide a clear explanation of how the cognitive and emotional aspects of empathy are related to this concept.

A qualitative study carried out in Japan involving 13 participants using questionnaires about the conceptual understanding of empathy by medical students and residents, suggests that the decline in empathy throughout the graduation is primarily in the emotional component (Aaomatsu et al., [77]). The authors reported that with the increase in the clinical experience of students, there seems to be a reduction in the affective components of empathy, which are replaced by a greater relevance of the cognitive component. Thus, Aaomatsu et al., [77] argued that the decrease in empathy throughout medical graduation reported in several studies does not mean a decrease in empathy in fact, but in its emotional component. The authors suggest that because many studies do not consider the different components, especially cognitive empathy, it is possible that medical empathy is underestimated.

The research mentioned above found that most residents attributed the difficulty in demonstrating emotional empathy to an insensitivity towards the patients' suffering, which led them to feelings of guilt. Therefore, an ignorance of the dynamics of empathy components can result in physicians low self-confidence, which can negatively affect their performance and professional success (Eva and Regehr [78]).

In this sense, researches similar to that of Youssef et al., [79], with quantitative measures and a larger number of participants, are especially relevant. The authors explored, through a cross-sectional study involving 669 medical students from the Caribbean, their empathic profile over five years of medical training. The differential of this research was the investigation of the correlation between the JSPE (scale used in most of the works to quantify empathy among medical students) and two other instruments: the "Reading the Mind in the Eyes" test. Test (RMEt), which assesses the cognitive component of empathy; and a test to quantify the emotional component of empathy, particularly regarding empathic concern, the Toronto Empathy Questionnaire (TEQ).

The results obtained by Youssef et al., [79] demonstrated a significant decline in student empathy through the JSPE throughout the graduation, which was also observed through the TEQ. As for the RMEt, cognitive empathy was preserved over the years of the course. Furthermore, a significant correlation was found between the JSPE and TEQ scores, and virtually no correlation between that with the tRMe. Thus, considering that the TEQ mainly measures the emotional aspects of empathy, the authors suggest that the decline in empathy among medical students, widely demonstrated in the literature, is probably mainly due to a drop in the emotional aspects of empathy involved in empathetic concern without loss of cognitive empathy, which would not necessarily be something negative in the context of the medical profession. According to the authors, the decline in the emotional side of empathic concern could be due to a greater regulation of sharing emotions by students, which would allow the best of their cognitive functions and preservation of their own emotional integrity.

In fact, as Schwan [80] argues, many authors have indicated that the ideal empathy in medicine is when there is a predominance of the cognitive component, that is, the ability to understand the perspective of the other, being the physician's ability to regulate emotional factors a desirable and even fundamental feature. As Decety (2011) explains, paying attention to the suffering of the other can cause emotional exhaustion and burnout syndrome, which, ironically, can reduce the physician's ability to alleviate the suffering of others.

Weisz and Cikara [81], with the aim to understand this phenomenon, selected studies that associated the different facets of empathy with the burnout syndrome and found that empathic concern and cognitive empathy are related to the reduction of risk of occurrence of this syndrome and emotional exhaustion (Thomas et al., [12], Omdahl and O´Donnell [82], Paro et al., [83], Von Harscher et al., [84]), while the sharing of emotions is related to the increase of this risk (Gleichgerrcht and Decety [6], Wolfshohl et al., [85], Von Harscher [84]).

Corroborating with this ideia, a recent study carried out in Portugal with 229 physicians and 268 nurses found that, during the COVID-19 pandemic in the country, in which these professionals were highly overloaded, cognitive empathy was a protective factor against emotional exhaustion, especially in physicians, while sharing emotions was a risk factor for both physicians and nurses (Correia and Almeida [86]). Emotional and cognitive empathy values were measured using the Portuguese adaptation of the Short Version of the Basic Empathy Scale, which has a questionnaire with three items for the affective facet and four for the cognitive one.

This does not mean, however, that the emotional aspects of empathy are not relevant, especially those related to empathic concern (Weisz and Cikara [81]). Schwan argues that emotions related to empathic concern are essential to medical care, and, according to him, there is no clarity regarding the need to share emotions. Weisz and Cikara [81], on the other hand, state that, far from being harmful, the sharing of emotions is an essential aspect of social functioning and may also be important in the clinical context. After all, it has been associated with higher levels of relational satisfaction, greater ease and motivation to engage in collective actions and increased performance in-group situations (Barsade [87], Goldenberg et al., [88]). Furthermore, compared to other components of empathy, sharing emotions, as the first element of empathy to develop in the ontogeny of the human being, is the most automatic and natural, which means that it can help to quickly develop the behavior of helping the other (Weisz and Cikara [81]). Therefore, Weisz and Cikara [81] also argue that the sharing of emotions should not be dismissed as a bad thing, but combined

with emotion regulation strategies that allow them to increase their desirable outcomes and reduce undesirable ones.

In this bias, even the regulation of emotions may not be beneficial, having physiological and psychosocial costs (Decety, 2011). Studies have already shown, for example, that it can impair communication, reduce mutual trust and increase blood pressure (Butler et al., [89]). Therefore, emotional empathy should not be completely avoided, given that, according to Decety et al., [90], there is no evidence that the emotional connection always produces emotional disturbance for the physician. The authors emphasize that the components of empathy interact with each other, so that it is not possible to isolate just one of them for a complete and beneficial experience of empathy, having already been shown that the physician's emotional involvement can improve their cognitive accuracy and affective understanding Decety et al., [90].

This complex relationship between empathic components and their benefits was evidenced in the research by Lamothe et al., [59], which evaluated emotional and cognitive components of empathy in 294 general practitioners, investigating its relationship with the risk of burnout. Emotional and cognitive aspects were measured using the TEQ and JSPE (items referring to adopting the other's perspective), respectively. The results showed that, when there was little cognitive empathy, empathic concern did not influence the prevalence of burnout. On the other hand, for those physicians in whom there was a high level of cognitive empathy, the percentage of burnout was significantly reduced when there was also high levels of empathic concern. The authors concluded that when physicians are able to understand the patient's perspective, their emotional reactions and prosocial behavior reduce the risks of exposure to stress.

According to Decety (2011), physicians have the challenge of finding the ideal balance between cognitive and emotional resources that allow them to share and understand the patient suffering. This task requires effort and training, especially because empathy, in the clinical context, is difficult to exercise and mainly requires cognitive flexibility and great capacity for self-regulation (Gleichgerrcht and Decety [6]).

Given the drop in empathy levels during medical school and the lack of understanding of its facets, many authors advocate the need for educational interventions that involve training for empathy. As demonstrated by Kelm et al., [91], although knowledge in this area is still limited, taking together high-quality studies on the subject, there is a strong indication that physicians' empathy can be increased through interventions. Allied to this, it is essential the training of communication skills in the curriculum of medical schools, because, regardless of the level of sharing emotions between physicians and patients, the essential part of a successful clinical encounter seems to involve the expression of empathic concern through verbal and non-verbal language (Kelm et al., [91], Decety [75], [92]).

Conclusion

Empathy is mediated by neural circuits that involve cortical and subcortical regions, especially from the limbic system, which can be modified by technical knowledge acquired during medical training by the personal experiences of the professionals. These changes can appear as a protective mechanism against burnout syndrome, stress or anxiety, as an emotional regulation in the front of others pain, as well as from the predominance of cognitive empathy and empathic concern among the emotional components of empathy.

The studies mentioned in this manuscript have shown that brain areas functionally related to cognitive empathy were active in physicians during clinical care, such as superior frontal gyrus, medial prefrontal cortex, temporoparietal junction, parahippocampal gyrus. Areas responsible for empathic concern, such as the medial orbitofrontal prefrontal cortex, anterior cingulate cortex and ventromedial prefrontal cortex, seem to be linked to successful clinical practices. Those areas attributed to empathy for pain, perception of negative emotions and sharing of emotions, such as the anterior insula, supplementary motor area, periaqueductal gray matter and middle cingulate cortex, when functionally preponderant, appear not to be beneficial for the relationship between physician and patient and even make difficult the medical care.

The data show that the practice of empathy by the physician is beneficial for both the professional and the patient, however, this behavior seems to decline among medical students throughout the graduation. It is suggested that this decline occurs due to the development of emotional regulation by students and a lack of development of others emotional components of empathy, which would not be harmful to the profession. Knowledge of the components of empathy involved in this phenomenon is scarce and other research are important to expand this subject.

The in-depth understanding of empathy and its application in the clinical practice can promote the development of educational interventions in medical schools in order to strengthen the physician-patient relationship, which can help the patient treatment. The delimitation of what belongs to you or the other in this relationship and according to the features of empathy, can protect professionals against emotional conditions that can lead them to exhaustion. Furthermore, the study of brain areas associated with empathy and its dissemination among different scientific fields enables the understanding of behavioral changes with potential application in clinical practice.

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