

EDITORIAL

We are very excited to launch the first edition of the International Journal of Neuropsychotherapy (IJNPT). The aims and scope of this Journal is to be an open access, online journal, sharing quality research in the fields of Interpersonal Neurobiology, Neuroscience and Brain-based therapies.

Neuropsychotherapy is a relatively young science with strong roots in neurobiology and psychotherapy stretching back to the early twentieth century and the origins of modern neuroscience and psychotherapy. Neuropsychotherapy focuses on therapeutic processes developed specifically to address a range of mental health issues and thereby improve quality of life. Although a strong emphasis is placed on the neural correlates – the neuro-chemical, neuro-electrical and neuro-structural markers – of presentations, the focus is not reductionist but rather on the interconnectedness of neural systems and interpersonal neurobiology. New insights into the social brain, and the treatment of personal and interpersonal challenges, are now regularly being discovered in this innovative field. The International Journal of Neuropsychotherapy proudly embraces the dawn of this new paradigm in neuroscience and psychotherapy: the “Decade of the Brain” has evolved to the next phase – the focus on applied neuroscience.

The IJNPT has a strong Advisory Board where each member is a highly distinguished researcher in this field. We invite scholars to contribute to the Journal and submit papers for publication. All articles are peer reviewed and will be uniquely identified with a digital object identifier (DOI). Submissions should conform to the International Committee of Medical Journal Editors guidelines for biomedical journals available online at http://www.icmje.org/urm_main.html.

This first edition of IJNPT focuses on neuropsychotherapy and epigenetics as well as redefining bullying from a neuroscience perspective.

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DEFINING BULLYING: THE ROLE OF NEUROBIOLOGICAL MARKERS.

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Summary

“Bullying” is a widely used term that is mostly linked to some form of harassment – be it emotional, verbal or physical. These definitions always refer to specific behaviours (the perpetrator perspective) and the emotional and physical harm they inflict (the victim perspective). Although some definitions of bullying refer to physical harm as one consequence, it is noteworthy that no definition specifically refers to neural changes, despite a large body of evidence that shows the detrimental effects on neurochemical production, changes in neural functioning, and neural damage.

This paper explores some core definitions of bullying and key neurobiological markers linked to bullying. These markers are:

- The neurodevelopmental indicators (genetic markers)
- Neurochemical markers
- Neuro-structural markers

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Introduction – bullying and neuroscience

Despite the common use of the term, many countries (such as the UK and some States in the USA) still do not have a legal definition for bullying. When bullying is conducted by a group, the term “mobbing” is used to describe the act/process. In the workplace, bullying is often referred to as “abuse” or “peer abuse” although some researchers (e.g., Fuller, 2006) call it “rankism”.

Sugden et al. (2010) define bullying as follows:

Bullying is the act of intentionally and repeatedly causing harm to someone who has difficulty defending him or herself, and is a relatively wide-spread school-age phenomenon. Being the victim of bullying is associated with a broad spectrum of emotional problems; however, not all children who are bullied go on to develop such problems.

However, this definition only refers to the perpetrator perspective and the emotional, but not the physical, consequence of bullying within the victim perspective.

Batsche and Knoff (1994) define bullying as a form of aggression in which one or more students physically and/or psychologically (and more recently, sexually) harass another student repeatedly over a period of time. This definition only focuses on the behaviour pattern from the perpetrator perspective, however. Similarly, the definition given by Olweus (1994) also focuses only on the behaviour/perpetrator perspective:

I define bullying or victimization in the following general way: A student is being bullied or victimized when he or she is exposed, repeatedly and over time, to negative actions on the part of one or more other students. It is a negative action when someone intentionally inflicts, or attempts to inflict, injury or discomfort upon another—basically what is implied in the definition of aggressive behavior. Negative actions can be carried out by physical contact, by words, or in other ways, such as making faces or obscene gestures, and intentional exclusion from a group. In order to use the term bullying, there should also be an imbalance in strength (an asymmetric power relationship): the student who is exposed to the negative actions has difficulty in defending him/herself and is somewhat helpless against the student or students who harass. Legal definitions invariably focus on the behaviour of the act of bullying. For example, the Queensland Government defines workplace harassment as a situation

where a person is subjected to behaviour, other than sexual harassment, that:

- is repeated, unwelcome and unsolicited
- the person considers to be offensive, intimidating, humiliating or threatening
- a reasonable person would consider to be offensive, humiliating, intimidating or threatening.

Workplace harassment can be committed by:

- an employer
- a worker
- a co-worker
- a group of co-workers
- a client or customer, or
- a member of the public.

Workplace harassment covers a wide range of behaviours ranging from subtle intimidation to more obvious aggressive tactics, including:

- abusing a person loudly, usually when others are present
- repeated threats of dismissal or other severe punishment for no reason
- constant ridicule and being put down
- leaving offensive messages on email or the telephone
- sabotaging a person’s work, for example, by deliberately withholding or supplying incorrect information, hiding documents or equipment, not passing on messages and getting a person into trouble in other ways
- maliciously excluding and isolating a person from workplace activities
- persistent and unjustified criticisms, often about petty, irrelevant or insignificant matters
- humiliating a person through gestures, sarcasm, criticism and insults, often in front of customers, management or other workers
- spreading gossip or false, malicious rumors about a person with an intent to cause the person harm.

Management action may be considered as workplace harassment where it is used:

- primarily to offend, intimidate, humiliate or threaten workers
- to create an environment where workplace ha-

harassment is more likely to occur

What is not workplace harassment?

- A single incident of harassing type behaviour
- Reasonable management action taken in a reasonable way
- Acts of unlawful discrimination, vilification or sexual harassment. (See Queensland Government, Department of Justice and Attorney-General, Code of Practice, 2004, for a full description of workplace harassment as used in Queensland.)

The Australian Human Rights Commission (2004) defines workplace bullying as:... the repeated less favourable treatment of a person by another or others in the workplace, which may be considered unreasonable and inappropriate workplace practice. It includes behaviour that intimidates, offends, degrades or humiliates a worker.

Workplace bullies tend to utilise the power that goes with their status, skills or position; both men and women can be the targets and/or the perpetrators. It can occur between a worker and a manager or supervisor, or between co-workers and the bullying behaviour can range from very obvious verbal abuse or physical assault to very subtle psychological abuse. Behaviours may include:

- physical or verbal abuse
- yelling, screaming or offensive language
- excluding or isolating employees
- psychological harassment
- intimidation
- assigning meaningless tasks unrelated to the job
- giving employees impossible jobs
- deliberately changed work rosters to inconvenience particular employees
- undermining work performance by deliberately withholding information vital for effective work performance.

Bullying is a complex phenomenon involving biological, psychological and social systems. For this reason, a clear understanding of bullying requires an interdisciplinary approach. Moreover, due to its complexity, any reductionist attempts to provide a comprehensive explanation of bullying will most likely not

succeed. In this paper I focus on the neurobiological markers of bullying; at the same time, however, I am constantly mindful of the close interplay between neural development and the environment. The recent development of the field of epigenetics provides the scientific basis for the integrative model.

A phenomenological perspective on bullying underlines a question many researchers and therapists have asked, namely, “Why do some people who were exposed to bullying develop unhelpful emotional, behavioural and neural changes while others do not?”

The developing brain and bullying – genetics

Effective neural proliferation requires two key ingredients – a healthy genetic pool and an enriched environment. Both are vital to facilitate the development of a healthy brain that has the capacity to survive, problem solve, excel, establish interactions, and flourish. Traditionally, genetics and the environment were seen as unrelated, in line with the Darwinian theory of natural selection. In this view, natural selection is the result of the evolution of genetic make-up through the survival response – or what has been called “survival of the fittest”. Building on this analogy, bullying can be thought of as a form of natural selection where the weak will perish and the fittest survive. This process ensures a stronger genetic make-up that will enhance the superiority of the species. In 1809, Jean-Baptiste Lamarck suggested another theory whereby an organism acquires certain traits by adapting to the environment and the offspring subsequently inherit these traits. This theory is commonly seen as the birth of the study of epigenetics – the interdependent link between genetics and the environment. In his introduction to the study of epigenetics, Adrian Bird describes this process as: “The structural adaptation of chromosomal regions so as to register, signal or perpetuate altered activity states” (Bird, 2007, p. 397).

Studies on receptor and transporter genes, like serotonin and dopamine, show that there are different variables of the same gene that may increase wellness or increase risk. For example, the serotonin transporter gene (SERT) has two variables due to a polymorphism in the gene promoter of the gene (5-HTT). The specific region of the serotonin transporter has specific variants – a shorter (S) allele and a longer (L) allele. The (S) allele has less transcriptional efficiency and the (L) allele more effective transcriptional efficiency. The implications of this are that these genetic factors either enhance or reduce the risk of being

confronted by an adverse situation such as bullying. For example, fMRI studies indicate that the (S) allele is associated with enhanced amygdala activation due to environmental danger. The (S) carrier also picks up/learns fear quicker and retains fear for longer, and is therefore less likely to be extinct from the pre-frontal regions of the brain. On the other hand, people with the (L) variant have a stronger tendency to activate selective avoidance to threat. This response – which may also be attributed to more effective cortical connectivity – has been dubbed the “look at the bright side of life approach” (Sugden et al., 2010).

Avshalom Caspi and colleagues hypothesized that a polymorphism in the monoamine oxidase A (MAOA) gene could perhaps explain (at least in part) the reason why some people who are maltreated develop criminal behaviour patterns but others do not develop these patterns of behaviour. This hypothesis is based on analyses of a very large database compiled for the Dunedin Multidisciplinary Health and Developmental Study (Caspi et al., 2002). In another groundbreaking study, Kevin Beaver and colleagues linked two dopamine receptor genes, a dopamine transporter gene and the serotonin transporter gene, to genetic resilience factors to victimization (Beaver, Mancini, DeLisi, & Vaughn, 2011). The group analyzed data from the Add Health study – a longitudinal study of a representative sample of American youths enrolled in 7th grade (middle/junior high school) through to 12th grade (high school) during 1994-95. Of the more than 90,000 students who participated in the study, detailed in-home interviews were conducted with 20,745 youths and 17,700 primary carers, which formed the basis of in-depth analyses of the youth's social relationships, family life, and involvement in risk-taking behaviours. All three genetic measures were found to be statistically significant predictors of resiliency (Beaver et al., 2011). A serious limitation of the study acknowledged by the authors is the failure to include an examination of the interaction between environments and genes in the prediction of resiliency, for example, the extent to which enriched environments shifted the genetic expression. In a timely article, Avshalom Caspi developed a powerful argument for a much closer interdisciplinary collaboration to study gene-environment interactions (Caspi et al., 2006).

The Darwinian perspective would view these differences as predispositions of the natural selection process. Traditionally, genetic predispositions were considered to be fixed, predetermined entities that are inherited and can predict the trajectory of wellness or risk (Ouellet-Morin et al., 2012). More recently, studies on genetic predisposition to risk point to the role

of the environment in enhancing or reducing risk (genetic expressions). A significant proportion of these expressions are facilitated in the first 10 months after birth (Uher & McGuffin, 2010). A study by Shen and Battersby (2000) which indicated that genetic risk may not express when safe, enriched environments are provided during the early stages of development supports this view. In this study, a group of Macaque monkeys were bred with two strands of short (S) serotonin transporter alleles, however, they never expressed the risk because they were raised in a safe, enriched environment (Shen & Battersby, 2000). This finding indicates quite strongly that links between the genetic variables and the environment set the trajectory for neural development.

Human development and a higher code of survival (other than a mere physical baseline survival) are shaping our destiny. A threatened organism only survives by choosing one of two actions, that is, “avoid” (protective measures) or “approach” (expand measures). To illustrate this concept, consider that trees grow taller and other organisms in the environment with lesser capacity must find alternative solutions to adapt. Similarly, animals that cannot compete with more powerful competitors develop systems of protection to survive, for example, hunting in packs. Seen from this perspective, it can be said that the entire ecosystem operates in avoid or approach patterns.

From an epigenetic perspective, managing bullying is a moral choice. It is a choice we make to enhance certain neural developments and to inhibit other powerful neural mechanisms. In our society the moral, philosophical – even spiritual – choices we make are quite clear: we oppose a process of natural selection based on basic (primitive) neural patterns of survival. As humans, we prefer our species to be inclusive rather than exclusive, to maximize the neural development of all, rather than allow the aggressive survival response of some. Unfortunately, the moral choice is not always clear – the grey area presenting in our cultural environment (which we might see as survival of the fittest) has much to answer for in terms of favouritism at work or college, job (or research!) applications, promotions, professional and personal relationships, even human, animal and environmental rights. Opportunities for various forms of discrimination are endless.

Bullying and neurochemicals

The search to understand the predictors, risk factors and effects of bullying has inevitably led to a wide range of studies that link bullying with neurochemical changes. As a result, integrating biological markers in

research into bullying to maximize intervention outcomes has provided significant new insights. A major obstacle that has, up until now, restricted the study of the biological markers of social behaviours has been the difficulty of obtaining biological data, which is an intrusive process and often too far removed from real-life situations. More recently, however, saliva samples have been used to provide a non-invasive window to utilizing at least some biological markers. For example, saliva can be used to test hormones like testosterone, cortisol and dehydroepiandrosterone (DHEA) (Hazler, Carney, & Granger, 2006; Rossouw, 2012).

The role of testosterone as a biological marker in relation to social behavioural factors has been extensively studied. This hormone is directly linked to physical and sexual changes, such as increase in body mass as well as changes in appearance. The impact of “modifiers” is also important, where the environment seems to play a significant role in regulating the effect of testosterone. For example, Booth and colleagues found that testosterone-related behaviours were dependent on or “modified” (moderated) by the child-parent relationship, thus suggesting an indirect rather than direct relationship between testosterone and behaviour (Booth, Johnson, Granger, Crouler, & McHale, 2003). A major challenge in all testosterone studies is to establish a baseline, not least because there are significant differences between male and female production of this hormone.

For several reasons cortisol seems to be an attractive hormone to consider in studies of bullying. Unlike testosterone, cortisol is produced in the same quantities in both males and females. Furthermore, changes at puberty do not affect the production of this hormone. Finally, it should be noted that cortisol, as an end-product of the stress (fight/flight) response, is a stable chemical to study. In fact, the only major variation with cortisol is the change in production that occurs during the diurnal cycle. Cortisol levels shift rapidly and the efficacy of interventions can therefore be easily measured. When a person experiences a threatening situation, cortisol levels rise, the efficacy of the immune system slows down, and open (cortical) learning systems are compromised to maximize management of the threat. Stressful events also lead to increases in cortisol production. Cortisol is produced in the adrenal glands along with other stress chemicals like adrenalin. Its role is to push the body into hyper-alertness, hyper-activity, and increased physical responses such as increased heart rate to maximize the distribution of the stress chemical throughout the body. Cortisol also plays a role in the initial stress activation – it flows back into the initiator of the response,

the hypothalamus, to regulate further stress responses, and “turn off” the stress signal. The implication is clear – the introduction of a stressful situation will result in an increase in cortisol. Overproduction of cortisol can lead to hypercortisolemia, which predominantly affects the pituitary and can lead to a variety of diseases like muscle weakening and wasting, high blood pressure, increased abdominal fat deposition, immune dysfunction, steroid-induced diabetes, and cardiovascular disease. Another serious consequence may be the eventual fatigue and failure of the adrenal glands.

Researchers have found significant differences between cortisol levels of students who experienced incidental bullying and those who experienced regular bullying. In line with their predictions, incidental bullying leads to increased cortisol levels (Booth, Granger & Shirtcliff 2008) whereas students who are bullied regularly have lower cortisol levels than their non-bullied peers (Vaillancourt et al., 2008). The authors of these studies hypothesise that chronic exposure to bullying leads to down regulation of cortisol production, due either to physical desensitization or “cortisol burnout”, or both (Carney, Hazler, Oh, Hibel, & Granger, 2013). The higher order presentation of this condition is anxiety and/or depression disorder. Richard Hazler and his colleagues have also suggested that biological markers like cortisol be included not only in studies that analyse intervention outcomes but in regular psychotherapy practice as well (Hazler, Carney & Granger, 2006).

The last of the saliva testable hormones is dehydroepiandrosterone (DHEA). This hormone acts as protector in the system of overexposure to cortisol and has a positive correlation with memory learning systems and facilitation of new behaviours (Wolf & Kirschbaum, 1999). The intercorrelation between cortisol and DHEA may provide helpful insights into bullying behaviour and its effects on victims of bullying. At The University of Queensland we are currently investigating this in terms of in-group and out-group experiences as well as in relation to bullying.

Bullying and neural structures

A number of neural structures have been found to be directly affected by bullying. These structures are the amygdala, hippocampus, corpus callosum, anterior cingulate cortex and prefrontal cortex.

The role of the amygdala is (among others) to provide a first-line response to potentially harmful sensory triggers. Activation of down-regulation of unpleasant sensory stimuli and up-regulation of

safety is an essential hallmark of enriched environments which encourage the normal development of the amygdala. This means the amygdala will activate survival responses in the appropriate context without over-activation – a discriminative activation of bias in processing to enhance survival. Bullying up-regulates the fear system and leads to heightened amygdala activation (Viding, McCrory, Blakemore, & Frederickson, 2011). Over-activation of the amygdala also leads to an increase of racial stereotypes, as a consequence of lesser stimulation of the frontal cortical regions (Phelps et al 2000). Stimuli that are normally salient are activated in the amygdala because they are ambiguous or unpredictable (Whalen 2007).

The hippocampus is the powerhouse for short term memory, facilitation of new memory paradigms, neural plasticity and, ultimately, neurogenesis. A well-developing hippocampus is essential for effective maturation of the entire neural system. Overexposure to compromised environments and intense or chronic stress leads to an overproduction of cortisol which has an adverse effect on hippocampal functioning. This is confirmed in a recent study by Rosanne Thomas and colleagues which found that exposure to acute psychological stress (like bullying) reduces the survival of new neurons (neurogenesis) in the hippocampus (Thomas, Hotsenpillar, & Peterson, 2007).

The corpus callosum provides a critical link between the deep brain structures and neural hemispheres. Martin Teicher and colleagues found a direct correlation between exposure to peer verbal abuse and abnormalities in the corpus callosum (Teicher, Samson, Sheu, Polcari, & McGreenery, 2010) while social rejection and social pain impaired the structural integrity of the anterior cingulate cortex –the dorsal anterior cingulate cortex (dACC) in particular. This means that bullying up-regulates the more primitive fear-based and survival systems and compromises activity in the frontal (especially right frontal) cortical systems due to the detrimental effect of bullying on the dACC. This also has significant implications for neural development of the higher order cortical regions such as the prefrontal regions. In addition, the ability to develop a moral code based on caring and empathy is compromised when the dACC is affected (Eisenberger, Lieberman, & Williams, 2003). It should be noted, however, that an fMRI study by Catherine Sebastian and colleagues found increased activity in the orbito-frontal regions but not the dACC (Sebastian et al 2010). The authors of this study speculated that this difference could be the result of a shift in methodology used rather than . Despite the marginal shift in regional activation, therefore, the implication

of both studies is the same – bullying and/or social exclusion changes the neural circuitry. In their study, noted previously, Viding and colleagues indicate that bullying behaviour has significant implications for the onset of anti-social behaviour patterns (Viding, McCrory, Blakemore, & Frederickson, 2011) and others have noted an increased risk of major depressive disorder (Masten et al., 2011).

The prefrontal cortex, especially the right prefrontal cortex, plays a vital role in the development of the social brain. Lesions/damages to this part of the brain result in major changes in behaviour which directly affect social appropriateness and wellbeing. The story of Phineas Gage, a railroad worker who was severely injured by an iron rod that damaged his right frontal lobe, is frequently cited as a classic example of changes in behaviour as a result of damage to the prefrontal region of the brain. Although he survived the accident his personality changed dramatically (Adams 2009). A more recent example is patient “EVR” who, at age 35, underwent resection of a bilateral orbitofrontal meningioma involving **excision** of the orbital and mesial cortices. After the operation his intellectual abilities were unchanged but his social conduct and decision-making ability were significantly compromised (Saver & Damasio, 1991).

Summary

Bullying informs various aspects of the – it changes neurochemical activation, inhibits neural proliferation and causes neuro-structural changes. These changes set a new trajectory of neural functioning and provide the basis for changes in mood, cognition and behaviours. Recent developments in neuroscience provide the platform for assessing bullying from a neural perspective. It also provides a platform for assessing the efficacy of interventions. In any definition of bullying, the neural impact on victims needs to be considered.

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