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ARTICLE

"When the Music's Over" then "Dancing with a Partner Will Help You Find the Beat"

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Abstract

Responses to brain injury sit in the intersection between neuroscience and an ethic of care, and require sensitive and dynamic indicators of how an individual with brain injury can learn how to live in the context of a changing environment and multiple timescales. Therapeutic relationships and rhythms underpinning such a dynamic approach are currently obscured by existing models of brain function. Something older is required and we put forward narrative types articulating outcomes of brain injury over various periods and starting points in time. Such storytelling challenges a static neuropsychological paradigm and moves from an ethics that focuses on patient autonomy into one that is reflective of the cognitive supports and therapeutic relationships that underpin ways that the patient can re-find the beat that proves the music is not over.

Keywords: brain injury; neuroscience; care ethics; brain function; patient autonomy; therapeutic relationships

The joint authorship of this paper came from a debate about whether the famous line from a Doors' song "when the music's over" can serve as a good metaphor for the loss of rhythms of life that occur after closed and particularly repeated closed head injury. The argument is whether that metaphor needs to be extended, because the inner dynamism of an existential self continues after a brain injury. It may falter, stammer or pause, but the brain-injured self will continue to move through time—just as music does. However, it is likely to need some help to get started again, and so the metaphor has been extended using the much less famous line from Neil Diamond "Dancing with a partner will help you find the beat." Brain injury marks the ending of a carefree song, but the song then repeats itself like a theme or a leitmotif associated with all the new cycles of life that restart after brain injury. There may be small variations in the song, it may happen slowly or bit by bit; the theme may be taken up by new instruments and voices, there may be changes to the rhythms, lyrics, and tunes, but they are all recognizably part of the original music, identified with that one person. The lessons of neuroplasticity are never more evident than when an individual with serious brain injury finds a way to pick up the pieces of their identity and weave these rhythms and lyrics back into a song that reverberates with earlier parts of their lives. What is described in this paper is a way of understanding the experience of starting the music again in terms of how neuroscience intersects with an ethic of care.

Gillett has discussed such brain injuries before in this journal and recalled the evidence about closed head injury which has been neglected in favor of studies utilizing the latest neuroscience techniques and a model of brain function which focuses on identifiable deficits of neurocognitive function.[1] Closed head injury is elusive because the lesions involved, particularly in minor levels which are not repeated, do not show up as distinctive and measurable neurocognitive defects but as a loss of the cohesive function of the brain as it adapts to the world. Historically, the focus on localized anatomical damage has meant that a

holistic dynamic approach tends to be overlooked. For example, the Paced Auditory Serial Addition Task (PASAT) is a dynamic and sensitive indicator of the neurocognitive defect involved.[2] It represents the kind of approach that is neglected in recent writing on the subject of closed head injury which favors high-profile techniques of neuroscience investigation and research. The negligence of dynamic approaches in the assessment of brain injury is a matter of ethically problematic influences by entrenched political and commercially driven agents in modern medicine.[3] For these reasons, it is timely to relate the problem of closed brain injury to underlying cognitive neuroscience and its latest research paradigms. Such paradigms can be traced back to a theorist, who might himself have been influenced by injuries to the dynamic brain for which he felt some historical and familial responsibility. Walter Freeman Jr was the son of the infamous lobotomist.

The brain is now proven to be a dynamic system constantly modifying itself to deal with a changing environment.[4] In this task, it is not alone but rather has the means of benefiting from the experience of other brains through natural language.[5] The human brain has developed this last ability to high, and elsewhere in the animal environment unattained, levels because of language through which humans have developed a means of co-defining and transmitting adaptive timescales, joint experience, and strategies for combined action between individuals in an environmental niche. The device underpinning this ability is the grammatical modification of natural language. In schematizing and abstracting from experience, it condenses that experience into forms that can be communicated with both precision and dynamic flexibility.

The brain is in an ongoing interaction with the world which is itself constantly changing, partly as a result of what the brain enacts with the aid of linguistically framed intentions. This means that representation, meaning, and thought form an interlocked triad, no one of which can be studied or theorized in such a way that the influence of the other two is cut out. This dynamic and constantly changing interaction is not well dealt with by models based on machines and objects which can be physically delineated and remain relatively fixed in their composition. A dynamic and analogue interaction (abstracted from and schematized by grammar), in which the three components are changing over time and mutually affect one another within a variety of time values, will not fit any formal and definitive model. What is more, crude or more complex mechanistic operations cannot unravel the rhythms of dynamic changes in the world that the agent enacts.

In the midst of all of this informal and bidirectional influence, there are multiple timescales. For example, there are the biological timeframes such as: (1) the microseconds of cerebral interaction; (2) the minutes and hours and decades of a life; (3) the generational years of a species' earthly survival; (4) the centuries of biological and ecological change; (5) the millennia of epigenetic evolutionary development; (6) genetic adaptation; and (7) the aeons of geological change forming new habitats and niches for evolutionary exploitation. There are also more traditional ways of experiencing the internal rhythms of activities, such as the circular labor needed to sustain life, the linear work that has a beginning, middle, and end, and finally, the spiral which integrates the circular and linear in a world that is evolving and moving forward. The spiral is the representation of transformation and the journey toward a dynamic future, where the past is also a reference point and informs the future. It can be understood by the Māori proverb "Ka mua, ka muri," when means "walking backwards into the future."

These timescales encompass a wide range of paces of change in a dynamic self-modifying system. Unfortunately, it is the relationship with time and timing that becomes interrupted by a brain injury. The disruption of time is not well dealt with by many existing theories of brain function. Therefore, we need a dynamic model of the brain as continually alternating modes of information gathering and adaptive response. At the base level, this style of understandings is available through the work of Walter Freeman Jr. and is a relatively recent model of brain function.

The Model of the Dynamic Brain

Freeman's model depends on the brain engaging with its ecological context open-endedly and in a holistic way with frequent switches into established rhythms of interactive responding.[6] These rhythms

modify the environment through motor action and monitor the resulting changes. Thus are established patterns of behavior that the organism can slip in to and adaptively shape itself to the demands of its context. When functioning in these patterns productively and gaining the rewards that the environment offers it is, in Aristotle's terms, experiencing a kind of *eudaimonea*.

In a very real way, this is the immediate aim of action and adaptation because these patterns are part of life going well and the individual achieving patterns of behavior that serve it well. Those of us who have used operant conditioning to train various organisms have used this fact in our experiments and it is a more realistic version of psychological theory than that which foregrounds reward and punishment. What is more, the problem of satiation or near satiation does not confound the results because it is frequencies of behavior and established rhythms of responding that move the system forward in their path predicted by ethology. For anyone versed in psychological and naturalistic varieties of learning theory that is a very satisfying synthesis. This coheres well with findings in diffuse head injury, its monitoring and sequelae in the lives of those who suffer from such a syndrome. It also explains why the PASAT is such a sensitive test of the initial injury and then provides a means for assessing recovery. It explains why therapeutic interventions that are based on tracking, picking up, and calling out the underlying rhythm of an identity are so powerful.

Gillett has previously outlined in this journal the long history of cognitive neuropsychology focused on closed head injury and repeated concussions.[7] For years, the nature of that injury escaped international attention obscured by increasingly sophisticated techniques of demonstrating localized brain lesions or dysfunctions. Freeman's research changed all that.[8] Concussion victims struggled to put their problems into words that would be understood and connected to conceptions of brain injury by those who were conversant with the current literature in the field of brain imaging. In fact, imaging is a poor medium for demonstrating the problem and the dynamic test developed by Dorothy Gronwall shows the lesion and explains why it is so devastating.[9] The lesion is diffuse and the effect is on both the open-ended reception of information and the recruitment of a suitable rhythm of response which will enable the person to return to useful function in everyday life with its varied and holistic challenges. The lesion is dynamic and functional showing itself when an integrated and ongoing performance is required which recruits sensory and cognitive abilities in an extended way.

The cycle of hearing a stimulus, manipulating its information content cognitively and then discarding that stimulus from working memory and processing the next one in the same way as a rhythm of response is subjectively demanding, continuous, and insistent. Even as a student, deeply interested in neuropsychology taking part in the development of the PASAT, it was hard to be working for any period at the limit of one's ability to engage integrated brain function in a rhythmic and repeatable way.[10] Having dealt with many brain-injured patients over the years, recalling that experience was invaluable in understanding what they were trying to tell and struggling with the problem that it did not fit the lesions that an increasingly sophisticated knowledge of brain imaging techniques was able to cope with.

Most people who work with brain injury are likely to recall patients who vividly illustrate the problem of brain injury narratives that do not "fit" with the brain imaging techniques available. In writing this paper, we debated and discussed the different kinds of narratives that we have experienced. For example, the neurosurgeon (first author) can remember tragic cases. For example, the child of 9 or 10 years who suffered a closed head injury in a car accident, who seemed to have a relatively optimistic prognosis initially since the imaging did not reveal any major lesion. Sadly, he slowly but steadily declined because of a malignant brain swelling. Another case was a young executive in his 30s, who seemed to have only suffered a moderate concussion. But this was illusory and he could not return to his work nor could he sustain his marriage. These narratives feel sad, and create a narrative of pessimism about the prognosis following brain injury. One cannot be a patient forever and still have a sense of the value of one's own life, but that is almost the fate that drives many closed head injury patients to suicide. Faced with the impossibility of "going on" and in the satisfying way conducive to *eudaimonea*, the future looks bleak for such a person and their refusal of the hurdle facing them is understandable; any horse galloping toward such an obstacle and cruelly crippled when in full stride would do the same.

The second author (an occupational therapist) remembers other narratives, based on ethnographic research involving families of people with severe brain injury.[11] The emphasis in these narratives is about the intersection between care and a hopeful prognosis, almost regardless of the severity of the brain injury. These are recounted here as a series of types, based on the age when the brain injury occurs.

The first narrative is about an "old brain injury" and describes a young man who sustained his brain injury at the age of five when he was knocked off his tricycle. He nearly died, and after this became aggressive, unfocused, and unpredictable. He was expelled from every school, and by his teenage years, his parents were struggling to keep him out of prison. Eventually, the family was given a small sum as compensation, which they used as a deposit for a house. It was not plain sailing, but he gradually bought one house after another. By the age of 40, he was married with two children in a stable happy family.

The second narrative is about a brain injury that occurred at age 17, in a motorbike accident. The young man had just finished school and was immediately left behind by his cohort who were all transitioning to work and study. He lost all capacity for motivation (adynamia), but his family employed a therapist and a team of carers to keep him going every single day. They got him into supported employment and he kept that job for over 20 years. His superpower was always his capacity to relax into philosophical conversations with anyone who was prepared to chat.

The third narrative is about a brain injury that occurred to a carpenter aged 35, as a result of a car accident. He could never work again, but over many years, he created beautiful art that expressed who he was as a person with brain injury. Even though his wife left him, he was able to sustain supportive relationships with his children and many good friends until eventually, he married again after 20 years.

In the fourth and final story, the brain injury happened to a 70-year-old man at the end of an illustrious academic career, as the result of both a car accident and a series of strokes which led to aphasia and reduced mobility. His old students found that he had an extraordinary capacity to instantly recognize them and could continue conversations that he had started with them over many years. He, in turn, found that he could engage in writing and conversations that constantly affirmed his sense of self.

What all of the above narratives demonstrate is the way that care and loving attention for the individual with a brain injury can become a prosthesis for intention and imagination. Those who make themselves answerable to that individual can provide cognitive and emotional supports for the small snippets of sensory information that allow brains to imagine possible futures, and to help them select the sensory stimulations that can become guides for chosen actions.[12] The abilities and virtues involved in providing such care include attentiveness, sensitivity, and the capacity to respond to needs.[13] Those who care are engaged in a practice and knowledge as holistic as the range of considerations supporting Wittgenstein's analysis of the mind and behavior.[14] Whereas the academic content of such knowledge is often regarded as marginal, yet it is central to the reality of life in the world and for compassionate healthcare.

Through storytelling about brain-injured lives that are meaningful and satisfactory, we can move beyond a static neuropsychological paradigm, into one that is appreciative of the rhythms of life that get expressed over time. Such stories tell us that patients can find connections in their brain that are diffuse and holistic and allow them to engage with what is happening around them, both in personal and more extended terms only if the functions of their brain can be temporarily outsourced through care. Such care can be given by family, friends, and health professionals who are prepared to pause, to carefully witness, and to support the re-arrangement of bits and scraps of former identity into something recognizable to the self and others. Conversely, the person with brain injury who is unsupported by close relationships with people who make themselves answerable in this way may have a trajectory toward tragic loss of self. Working with such individuals is a constant reminder that the capacity to know oneself as a unified and dynamic being is always acquired through relationships.

The Scientific Problem in Time and Space

The neuroscientific basis of closed head injury and the disruption of dynamic brain function that results from it needs to be understood and articulated to create pathways of care that are responsive to these

scientific facts. Normal adaptive human life, as was understood by Aristotle, is never fixed in its functions in biographic or historical time. The noninjured brain is relatively well adapted to find a rhythm of resonating with the world around it, which can be fitted into and learned from, enabling ongoing revisions and updating of those lessons in dynamic ways. This is exactly the kind of adaptation of which patients with diffuse closed head injuries, even when they are mild, are incapable of achieving by themselves. Therefore, ways of understanding need to include dynamic, contextual, and relational observations of how the person with brain injury manages tasks and transitions over time.

The person with brain injury is rarely able to put their dynamic problems into terms that neurosurgeons and neuroscientists are conversant with. It can be particularly disconcerting when those who study and seem to know all about the way the brain functions do not recognize the disruption that is occurring. Our experience tells us that the effects of many brain injuries are overlooked because they are diagnosed initially by experts who can only function with a model that requires neuroimaging. At its extreme, closed head injury is lethal and requires medical intervention, but a majority go on to live long lives and the disruption of life is profound, as bewildered and dysfunctional patients will demonstrate over and over. When it strikes down fit boys and men, girls and women who are thrown out of the well-adapted calling that they have chosen or would have chosen, the effect is dramatic, especially so when met with an inability on behalf of neuroscientists to show the deficit using the most advanced technology. Something older is required, not merely in terms of well-documented research, but also in terms of empathy, itself essential to the rhythm of the therapeutic relationship. Our modern formulations of ethics, with a focus on patient autonomy, do not serve us well in this regard as the neurocognitive abilities of the patient, underlying autonomy, are at the heart of the deficit that is causing the problem.

The human brain has an extensive neuro-cognitive capability able to cope with a changing world and the rhythms of one's own and others' activity within it. The neurological function involved is suitably dynamic and inclusive, adaptable in the face of changing demands and a holistic field of interactive activity. Although this mode of function is evident in lower animals it is raised to an outstanding level by language and the changing rhythms of human life attuned to culture and ecological settings. Traumatic brain injury can be devastating because it widely disrupts the extensive connections between incoming information and settled patterns of adaptation. What is needed here is a holistic relationship in which the patient's being-in-the-world is understood and the resonance with that dynamic relationship is patiently and empathically restored. It is through dynamic relationships that the patient finds ways of picking up the recognizable pieces. A brain injury does not mean that the music is over. However, it can mean that the music is paused and that the rhythms and tunes may need to be carried by other instruments (and relationships) until such time as the existential self, which is music's "prime mover" can find a way into the rhythms of time again.[15] What the individual with brain injury needs are relationships that can help them to re-find the beat, which proves to themselves and others that the music is not over. The knowledge that underpins this kind of practice is most likely to be evoked by storytelling about the context and integrity of whole lives lived with brain injury.

Notes

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