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**INTERNATIONAL JOURNAL OF  
NEUROPSYCHOTHERAPY**

**IJNPT**

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**Volume 5, Issue 1 (2017)**

**ISSN 2202-7653**

# INTERNATIONAL JOURNAL OF NEUROPSYCHOTHERAPY

## Aims & Scope

The International Journal of Neuropsychotherapy (IJNPT) is an open access, online journal that considers manuscripts on all aspects of integrative, biopsychosocial issues related to psychotherapy. The IJNPT aims to explore the neurological or other biological underpinnings of mental states and disorders to advance the therapeutic practice of psychotherapy.

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# Editorial

**Nita Grayson**

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Welcome to the latest edition of The International Journal of Neuropsychotherapy!

Firstly, I'd like to acknowledge that this edition has been a long time in the making and I thank you for your patience as we updated our process and our editorial team changed. Rest assured that we are on track to publish regularly again.

I'd like to take this opportunity to thank our outgoing Editor, Matt Dahlitz, whose hard work and dedication has made IJNPT what it is today.

IJNPT is an open access journal, meaning it's free for anyone to download and the hard work of our authors is shared as far as possible. All of our back issues are available to download and share at any time.

Lastly, I'd like to encourage you to submit an article for publication in a future edition of IJNPT. If you have an article ready to go, are thinking about maybe starting something or just want to know more, please send me an email at [communications@mediros.com.au](mailto:communications@mediros.com.au)

Happy reading,

Nita Grayson

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# Reviewing Misophonia and its Treatment

Christopher Pearson<sup>1</sup>

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**ABSTRACT** Misophonia can be modelled as a process of five components initiated by a sensory experience. It is typified by an initial physical reflex followed by an undesirable emotional response. It may be present in as much as 18% of the population and is not simply an issue of sound sensitivity; the process being initiated by visual and kinaesthetic sensation in many cases.

A number of approaches to treatment may be listed, each having its own proponents. The process of sequent repatterning has been developed by recognising the neuroscience that underpins both the condition itself and the changes necessary to successfully treat misophonia. Pragmatic choices have been made by recognising simply 'what works' and setting aside paradigms that do not. The result is a person-centred and scientifically-based therapy model that has proved itself durable and effective working with clients both face-to-face and remotely (online).

The results of cases treated to date are reviewed and potential next steps considered.

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## REVIEWING MISOPHONIA AND ITS TREATMENT

This piece begins with a review of the condition that has come to be known as misophonia, its neurological basis and its presentation. This text then moves on to the treatment of misophonia: a discussion of the therapeutic interventions that were developed to provide genuine benefits to clients. Considering effective therapy for misophonia, the neuroscience underpinning the step-wise approach of sequent repatterning is described. There then follows a review of 197 cases completed to April 2017.

The term misophonia was applied to the condition described by Jastreboff and Jastreboff (2001) as “abnormally strong reactions of the autonomic and limbic systems” but recognising it only in the auditory domain (Jastreboff and Jastreboff, 2002).

Misophonia can be modelled as a process of five components, with three key elements, initiated by a sensory experience. It is typified by an initial physical reflex, then followed by an undesirable emotional response (Dozier, 2015). See Figure 1.

Misophonia is considered by some to be uncommon and many members of misophonia Facebook groups engaged with awareness initiatives on Rare Disease Day (Rare Disease Day, 2017) at the end of February 2017. However, the condition may be present in at least 18% of the general population (Dozier 2015a). It is certainly not simply an issue of sound sensitivity. The process has been recognised as being initiated by visual and kinaesthetic sensation, in many cases over years. Some therapists have noted clients having gustatory and olfactory issues – I have recently encountered a lady with a strong shame emotional response to orange zest.

That sensory experience – what many refer to as a trigger – begins a process that completes with a negative emotion. Again, that emotion is often typified as being rage or anger. Yet

experience demonstrates that it may be any of a range of negative emotional experiences including the prevalent anger and rage, but may be shame, guilt, disgust, anxiety, too.

Between the experiential element – the trigger – and the emotional element is the physical reflex (Dozier, 2017). Indeed, this physical reflex has been recognised by a number of researchers and therapists as well as those experiencing misophonia – it has led to some referring to misophonia as a CARD, a conditioned aversive reflex disorder, and referenced in the subtitle of the first edition of Dozier's book in 2015, cf. Although this reflexive phenomenon varies between individuals it has been shown to be present and detectable in at least 94% of individuals with symptoms of misophonia and in response to specific sensory stimulation. This estimate was validated by a study conducted by Morrison and Dozier in 2016 (Dozier, 2017).

The two remaining components are the neurological links, one leading from stimulus to reflex and the other from reflex to emotion: the neural pathways.

It seems clear that if any one of the components is removed or deactivated the process will not complete and the symptom will be quenched.

The physical reflex can be a key to recognising misophonia and certainly is a differentiator of this pathology.

We model the process of misophonia as an activation of the limbic brain leading to an activation of the H-P-A axis and down-regulation of cognitive thinking processes. Some work has been completed in imaging response in misophonia and more formally establishing the brain basis of the condition (Kumar, 2017).

A number of approaches to treatment may be listed. Each has its own proponents. Some of these, and in no particular order, are listed here:

- CBT – cognitive behavioural therapy
- DBT - dialectical behaviour therapy

- TRT – tinnitus retraining therapy
- Neurofeedback
- Trigger tamer – dealing with each individual auditory experience and based on Neural Repatterning Technique (NRT)
- Traditional, suggestion-based hypnotic work
- Sequent repatterning
- Others which promote well-being, reduce stress and anxiety and some which rely upon avoidance

Of these, trigger tamer (Dozier, 2015b) and sequent repatterning are two that have been developed specifically with the treatment of misophonia in mind.

The severity of misophonia and its response to therapeutic intervention is often measured using either or both of Misophonia Assessment Questionnaire (MAQ-2) (Misophonia Assessment Questionnaire, 2017) and Amsterdam Misophonia Scale (A-MISO-S) (Amsterdam Misophonia Scale, 2017).

Both assessment documents are based firmly in the auditory domain although sensory-neutral versions are presently in evaluation.

MAQ-2 and A-MISO-S are probably the only generally accepted measures in international and cross-disciplinary contexts.

## SEQUENT REPATTERNING

Sequent repatterning is a bottom-up approach to therapy. It is presented as a programme of therapy usually planned over eight weekly sessions. Misophonia does not appear in any DSM and, almost exclusively, those we treat are self-referred and fund therapy themselves. So therapy that can be budgeted for is an important start to the process. Making it affordable is another key to accessibility.

Working with a programme allows us to define a very clear structure for the therapeutic process – a framework that begins with a linear process of introduction, history-taking and explanation to

inform the client. We call this the pre-therapy sequence. It is followed by a foundation session that is all about safety, comfort and, very much, the moment of now.

Sequent repatterning is often referred to as sequent repatterning hypnotherapy for misophonia. It was established some time ago that traditional, suggestion-based hypnosis does not provide enduring positive change in misophonia. Hypnosis does, however, provide an ideal platform from which neuropsychotherapeutic change can be achieved. It allows individuals to enter a nurturing, comfortable, and safe state of mind in an enriched environment, receptive and ideal for learning.

The therapist may also choose from a range of useful hypnotic phenomena; in sound-response misophonia, for instance, auditory hallucination can be especially effective. It has been shown that eliciting auditory hallucination in children especially and in adults (Olness and Gardner, 1981, p. 28) is exceptionally straightforward and can be beneficial in first learning sensory down-regulation and then establishing enduring limbic change in much the same way that virtual reality interventions may be used.

Sequent repatterning consists five closely integrated steps which match the elements of core needs (Roussow, 2014, p. 57.) and which are interpreted as shown in Figure 2

- Foundation
- Alliance
- Inner world
- Reframe and refocus
- Outcomes – future pacing

In the first session, which follows pre-therapy interaction, client and therapist make a joint commitment to a programme of change. It is an experience that quite clearly changes client and therapist and leads towards the outcome the client desires. It also provides an initial opportunity to establish a hypnotic state and for the client to experience its potential.

At this point we – client and therapist – consider the road ahead. We can often talk to clients about therapy as a journey but, in this context, I will often suggest it is, perhaps, an expedition because an expedition is not the same as a journey (where there is likely a predetermined direction, with familiar land-marks and reliable way-points). If we think of those who sought the source of the Nile, for example, they knew where they were: standing by an estuary with the sea behind them and a river in front of them. And they knew what it was they were going to find: a hole in the ground from which water sprang.

But they did not know how far they would travel, they knew little of what they would encounter on the way – mountains or valleys, forest or desert. They had to gather all the resources they might possibly need, whatever the circumstance. To do that they first had to create a base camp. That is exactly what the foundation session intends: to build a base camp and identify the resources needed for the expedition.

Only with this foundation firmly in place can we begin to next address the elements of personal change, firstly those emotions that are attached to a client's uncomfortable response to specific sensory events. I always will avoid using the word, trigger, if I possibly can. As a word, it says so much to a client that we should avoid bringing to our conversation.

## RESULTS

Table 1 summarises cases treated by me between 2013 and April 2017. Two documents used to assess severity – A-MISO-S and MAQ-2 – were used in assessment and progress monitoring. The arithmetic average improvement, as measured by MAQ-2, exceeds 50% reduction in symptoms. Similar outcomes have been anecdotally reported by other sequent repatterning practitioners. There are some clients who have experienced a transformational change of 100% symptom remission.

Of 204 individuals committing to therapy, 197 completed a programme of sequent repatterning. Seven (about 3%) dropped out and mostly early on in the process.

A small number did not benefit significantly from therapy: taking a 20% reduction in MAQ-2 as a minimum for significance, 4% fall into that group, of which 3% improved by less than 10%. That said, this seems a low proportion of those treated and none recorded a higher MAQ-2 on completion than on initial assessment.

The therapy is planned over eight sessions although the programme was extended to at least ten consultations in slightly less than one third of cases.

Because these are clinical interactions with clients, consistency of follow up is determined by each individual's willingness to respond to requests for information. Of the 197 individuals completing the programme, 101 returned MAQ-2 scores six months later. The plot of results, showing all cases in Figure 3 may be compared with Figure 4 which shows only results for clients who completed therapy and also returned six-month follow-up assessments.

The close correlation suggests that we might reliably infer that the six-month data may be representative of all cases.

## DISCUSSION

While the table of outcomes (Table 1) provides a summary of clients' progress and the box and whisker plots (Figures 3 and 4) show numerical measures of symptomatic change, we should be clear that we are affecting the feelings of individuals, their lives and the lives of those with whom they interact. This review considers the outcomes of a clinical process and not a research study. Follow-up data at six months cf is useful. I would prefer to have further follow-up data at one year and two years. However, the rate of reply to emails is very low over extended periods.

What we might expect in terms of response to sequent repatterning is shown in Figure 5. It shows that the Foundation Session – following on from an engaging pre-therapy sequence – is often followed by an immediate and significant reduction in MAQ-2 sum score.

Parts Work, usually introduced during session three, precedes a second and pivotal point in therapeutic benefits. Parts Work, interacting with emotional metaphors as some refer to this process, is clearly the initiator of transformational change in a number of cases. Figure 5 should be viewed as being representative of how a person might respond and may be interpreted as confirmation that the

sequence of interventions employed in sequent repatterning is, in this context, effective. Sequent repatterning is subject to on-going critique and its outcomes reviewed within a community of therapists: its refinement and its development continues as its deployment is extended and further case data are collected.

I welcome opportunities to further study the onset and ongoing pathology of misophonia and to collaborate with others in research. I continue, too, to support Misophonia Institute. The mission of the Misophonia Institute is to improve awareness in both general public and amongst health-care professionals as well as encouraging research, training and ethical practice.

## FIGURES

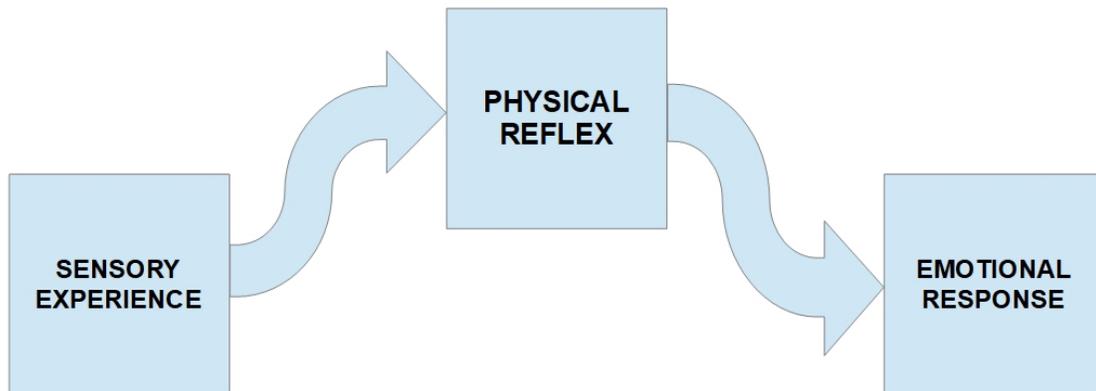


Figure 1 - Misophonia modelled as a process of five components

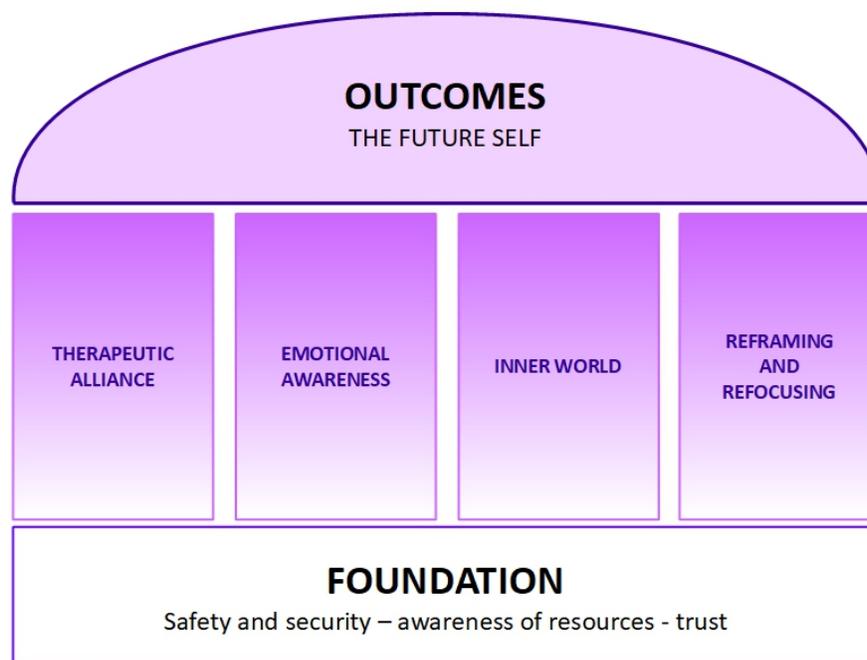


Figure 2 – Meeting core needs in an integrated approach to therapy

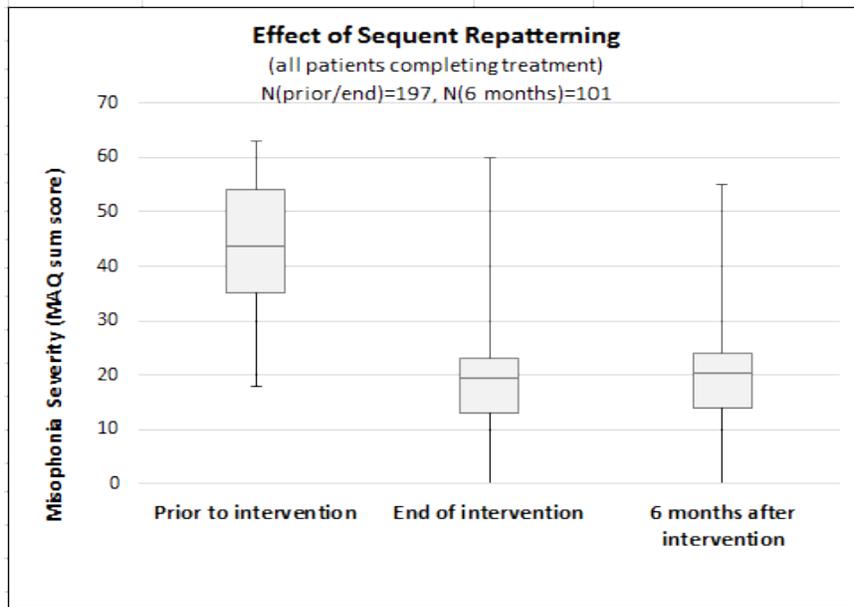


Figure 3 – Results recorded in all cases treated with six-month follow-up data for 101 cases

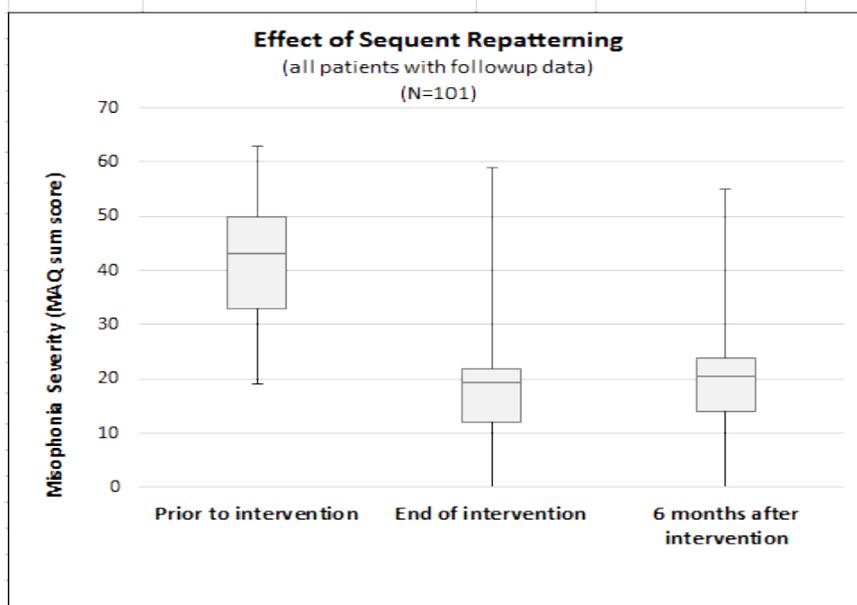


Figure 4 – Results recorded in 101 cases with six-month follow-up data

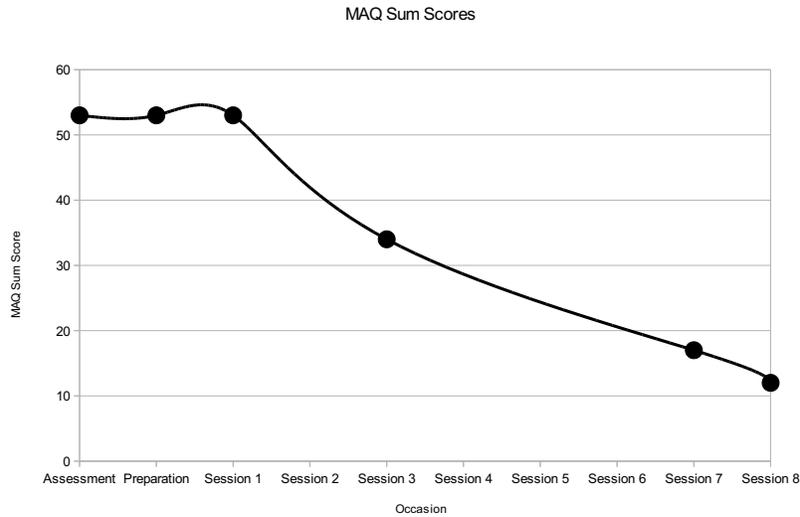


Figure 5 – a typical response to sequent repatterning therapy

## TABLES

Table 1 – Summary of results

	Number	Percentage
<b>Top-level summary of completed cases</b>		
Average change as MAQ-2 reduction		55
<b>Case summary</b>		
Total	204	100
Completed	197	97
Incomplete	7	3
<b>Low responses</b>		
Less than 20% reduction in MAQ-2	8	4
Less than 10% reduction in MAQ-2	6	3
MAQ-2 increasing during therapy	0	0
<b>Extended programme</b>		
Cases at 10 sessions	59	29

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# The S.A.F.E model and neuroscience: Working together in negotiation

Ellana Iverach<sup>\*1</sup>, Pieter Rossouw<sup>2</sup>

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**ABSTRACT** This paper explores how our current understanding in neuroscience and neurobiology can enhance the effectiveness of Police negotiation. Research has identified Police negotiation utilised in crisis situations is effective in reducing violence and achieving peaceful resolutions. This effectiveness is attributed to the use of communication to bring about changes in behaviour and subsequently a change in the outcome of a crisis situation. Understandings from neuroscience can be utilised to enhance the communication strategies in Police negotiation, specifically in regards to an individual's neurological functioning in times of stress and trauma, and how interpersonal communication shapes a person's understanding of the world, decision making and behaviour. Through this paper the neuroscience concepts of Triune model of the brain, mirror neuron system, consistency theory and basic needs are explored and applied to police negotiation. The paper utilises the S.A.F.E. model of Police negotiation to demonstrate the application of neuroscience to negotiation, and offers a framework to utilise neuroscience in negotiation.

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## INTRODUCTION

Negotiation as a technique was introduced to policing in 1972 after a team of American Police completed the first Negotiation Training course (Hammer, 2007). Prior to this, crisis and hostage situations were managed with tactical based responses. The development of negotiation teams was initiated by emerging views that despite the number of benefits to tactical responses, there was an unacceptably high causality rate (Baruch & Zarse, 2012; FBI Negotiator Team, 2014; Hammer, 2007).

Over time, negotiation as a technique evolved from being hostage-focused to crisis-focused (Jianqing, 2014). This occurred as research identified that the minority of negotiation situations were terrorism acts, politically motivated or involved hostages, while around two thirds were described as involving individuals in a heightened state of emotional distress (Hammer, 2007; Miller, 2005; Thompson, 2014).

Currently research is continuing to support negotiation as an effective approach in reducing violence and achieving a peaceful resolution (Grubb, 2010). Over the years a number of models and strategies have been developed, all with the aim to enhance effectiveness and minimise injury or life loss (Jianqing, 2014). Current research has not identified a single superior model, rather a number of models have been identified as effective (Grubb, 2010; Jianqing, 2014). A commonality among effective models is the focus on communication (Grubb, 2010; Jianqing, 2014).

The field of neuroscience has the potential to further assist and enrich the current models and approach to negotiation. Understanding in neurobiological functioning highlights significant changes in the brain and neural functioning in situations of stress and trauma (Rossouw, 2014). In addition, neuroscience identifies the key role interpersonal communication plays in shaping a person's understanding of the world, ability to make rational and safe decisions, and in facilitating

change in behaviour (Rossouw, 2014; Siegel, 2010). Using neuroscience to better understand responses to stress and trauma plus what influences a person's perception and to facilitate change will ultimately assist the processes and aims of negotiation.

Despite the current focus on negotiation, very little research in terms of the neuroscience involved has been conducted. This study explores some of the key concepts from negotiation as well as neurobiological perspectives, and points towards some essential aspects that need to be incorporated to maximise peaceful resolution in negotiation.

## THE S.A.F.E. MODEL AND NEGOTIATION SITUATIONS

One model that is supported as being effective for negotiation is the S.A.F.E. model developed by Hammer and Rogan in 1997 (Grubb, 2010). The S.A.F.E. model focuses on the role of communication in influencing the behaviours of the subject and outcome of situation (Hammer, 2007). It is a strategy-based approach to aid crisis negotiation and management of critical incidents (Hammer, 2007). Both research and real world application were used to develop and refine the model. This means it is flexible and allows for further evolution as required.

The S.A.F.E. model is based on four Frames, or dimensions, that the negotiator team use to gather and interpret information. The Frames include: Substantive Demands, Attunement, Face and Emotional Distress, which make up the S.A.F.E. acronym (Hammer, 2007, 2008). Substantive Demands focuses on building an understanding of the subject's demands, which are the situationally-related and objective wants or needs (Hammer, 2007). This includes assessing if they are central or peripheral to the subject's needs and if they are hardening or softening over time. Attunement is defined as the vulnerability one extends to another party and expectations around cooperation (Hammer, 2007). Attunement is tracked by level of cooperative versus competitive behaviours

observed in the subject when they are engaging with the negotiator (Hammer, 2007). Face identifies the importance of how people wish to be perceived; either as an individual or as a group (Hammer, 2007). Research has shown that individuals will forgo rewards or insist on demands in order to maintain Face (Ting-Toomey, 1994). Emotional distress compromises an individual's ability to cope and problem solve (Hammer, 2008). This Emotional Distress Frame focuses on reducing distress to assist the subject to engage in rational negotiation (Hammer, 2007).

The S.A.F.E. model proposes three steps for the negotiator team to implement the Frames (Hammer, 2007, 2008). These steps are dynamic and interactive, meaning information is added throughout the process and the negotiation team needs to adjust accordingly. The first step is for the negotiator to identify the predominant S.A.F.E. Frame of the subject. This involves identifying what Frame the subject is primarily communicating in. For example, are they sensitive to how they are perceived by others? If so, the Face Frame would be predominant, or, are they focused on demands and bargaining (which would make the Substantive Demands Frame the focus)? The second step is for the negotiator to match their predominant S.A.F.E. Frame to the subjects. This involves communicating in the Frame that is predominating for the subject and using Frame-specific strategies to de-escalate the subject's arousal. For example, if the subject was experiencing heightened emotion that limited their ability to manage the current situation, the negotiator would work in the Emotional Distress Frame and engage the subject in discussion around their current emotions. The third step is to shift the subject within the Frame. The negotiator engages in this step as interaction progresses and de-escalation occurs. This involves the negotiator exerting influence over the subject and in turn influencing the outcome.

As identified, the role of communication is central to effective negotiation and the S.A.F.E. model (Hammer, 2007). For this reason communication skills are fundamental. Key

communication skills include a person's ability to use persuasion and infectious language, and their fluency in thinking and speech (Jianqing, 2014). Interestingly, eloquence has not been shown to be crucial for effective communication (Jianqing, 2014). Active listening skills such as open ended questions, paraphrasing, emotional labelling and reflection are also fundamental skills (Vecchi, Van Hasselt & Romano, 2005). These skills allow the negotiator to gather and interpret information to then implement the three steps of identify, match and shift.

The negotiation team usually consists of a Primary who communicates directly with the perpetrator, a Secondary who supports the Primary and assists with information flow, a Note Taker who documents communication and key additional information, and the Team Leader who manages team members and reports to Forward Command (Baruch & Zarse, 2012; Hammer, 2007).

Negotiation situations are inherently unstable and volatile, especially during the initial stage (Czopp, Appel & Zeligman, 2014; Hammer, 2007). The initial stage involves a subject who is experiencing a heightened level of distress or emotional arousal, and expressing intent to harm themselves or others. This triggers a police isolation and containment response, which includes barricades and visible police resources such as accoutrement and tactical vehicle (Jianqing, 2014). The first contact between the police and subject can be a point of indifference, with the subject wanting police to leave while the police ask them to surrender (Norton & Petz, 2012). These factors can increase the distress or emotional arousal of the subject, exacerbating the unstable and volatile nature of the situation (Hammer, 2008).

The initial containment steps also influence how the subject perceives police which may result in the subject perceiving police as working against them, confirmation of the negative stereotypes of police, reduced sense of being validated or understood and creation of attribution errors (Hammer, 2007, 2008). These interaction dynamics further reduce the subject's sense of

safety and control, leading to an increase in emotional distress.

As the negotiation progresses it continues to have unstable and volatile aspects (Norton, & Petz, 2012). Such aspects include the subject's demands, hostage release or surrender, and situational or environmental changes (Norton, & Petz, 2012; Czopp et al, 2014). In addition, research has identified that though there are often similarities between negotiation jobs, such as the subject experiencing distress related to an interpersonal dispute, being male or having a criminal history, each situation has unique aspects (Czopp et al, 2014). The S.A.F.E. model accommodates the unique aspects by allowing information relevant to the current situation to be gathered and used.

Negotiation situations have a number of challenges outside the direct negotiation process. These challenges include organisational pressures from management to speed the process up or follow tactical options, the need to switch from operational to negotiation mind frame, and management of fatigue or arousal (Norton & Petz, 2012; Thompson, 2014; Jianqing, 2014). Negotiators can also experience situational challenges such as technology faults, being mobile, or difficult working environments such as extreme weather conditions (Thompson, 2014). Strategies identified to address the challenges include training and skill development that incorporates a theoretical understanding of negotiation, case examples, practice with using negotiation equipment and regular refresher training through role plays (Baruch & Zarse, 2012). The importance of experience using negotiation equipment was emphasised by Norton and Petz (2012). Norton and Petz (2012) also identified the importance of a set structure for setting up equipment, working to establish relationships with tactical teams and Forward Command staff, and having a planned and practiced arousal management strategy. The S.A.F.E model gives the negotiation team a structure to work in to address the initial perceptions, volatile and unstable aspects of the situation and to respond to a changing and dynamic situation (Hammer, 2007).

## PRINCIPLES OF NEUROSCIENCE APPLICABLE TO NEGOTIATION AND THE S.A.F.E. MODEL

Information from research into neuroscience has the ability to enhance the effectiveness of negotiation processes and implementation of the S.A.F.E. model. The Triune Model of the brain developed by MacLean (1990) proposes that the brain develops in three phases. First is the Primitive or Reptilian phase which includes the brain stem region and regulates bodily functions such as heart rate, breathing rate and sexual function. The second phase is the Paleomammalian or Limbic system. The limbic system includes the amygdala, hippocampus, hypothalamus and basal ganglia. This system is also called the emotional brain and responds to environmental cues regarding safety. The final phase is the Neomammalian or Neocortex; this is where executive functioning occurs, such as sensory perception, spatial reasoning, conscious thought, language and generation of motor commands. Ongoing research has identified that the Triune Model does not sufficiently explain the complexity of brain development, although the concept of the brain developing in a sequence and with these three phases is supported (Newman, 2003; Seigel, 2010).

Research has continually shown that in times of distress or perceived threat to safety the deeper systems, Reptilian and Limbic, will override the more advanced executive cognitive systems of the Neocortex (Rossouw, 2014). When the deeper systems are operating, the brain is working from implicit memory through the brain stem, medulla and stress response systems. During this time the cognitive or executive functions are under-functioning or down regulated (Rossouw, 2014). Research into cortical blood flow supports this change in areas of brain activation when a person is distressed or their safety is threatened (Pissioti et al., 2003). Positron emission tomography (PET) scans have identified that during panic there is a decreased blood flow to the Neocortex and increased flow to the deeper regions (Rossouw, 2015). Without blood supply to the cortex, the ability to access

emotion or stress management skills, and problem solving is reduced (Rossouw, 2015).

This understanding of the brain's development and functioning suggests that a bottom-up approach rather than a top-down approach would be more effective in the negotiation context. A bottom-up approach establishes a sense of safety and down regulates the survival or fear response by addressing physiological responses and establishing alliance, then moving to cognitive approaches (Chiesa, Serrretti & Jakobsen, 2013). Top-down approaches focus on cognitive interventions aimed at the Neocortex and executive functions to shift the deeper regions (Rossouw, 2014). If cognitive and executive functions are down regulated, then the effectiveness of top-down approaches is reduced (Rossouw, 2014).

In the negotiation context, subjects often display a level of distress or agitation, meaning the more primitive brain systems are activated and the cognitive and executive functioning are down regulated. When an individual is operating on primitive brain systems, the display of impulsive action, risk-taking behaviour and social disconnection is more likely. A bottom-up approach focuses on addressing safety, i.e. the physiological responses and presentation of distress, then uses cognitive skills to shift the subject to a new outcome. Once the cognitive and executive functions are up regulated, problem solving, rational action and engagement is more likely. The S.A.F.E. model aligns with a bottom-up approach - the four Frames and three steps create a space to address safety, physiological response and distress, then moves to cognitive functions for shifting the outcome.

We can look at the Emotional Distress Frame to identify how the S.A.F.E. model uses a bottom-up approach. This Frame requires the negotiator to acknowledge, directly address and track emotions expressed by the subject (Hammer, 2007). Using a bottom-up approach within this Frame includes skills such as active listening, using open ended questions, paraphrasing and emotion labelling, and supportive communication, such as encouraging discussion

of problems and feeding back understanding (Vecchi, Van Hasselt, & Romano, 2005; Hammer, 2007). This enables the negotiator to identify and respond to the subject's primary emotions, in turn reducing activation of deeper regions. For example, if the primary emotion is sadness, the negotiator will emphasise the subject is not alone, or if it is fear, the emphasis should be on threat reduction (Hammer, 2007).

The bottom-up approach also applies as a strategy for the whole negotiation team. The negotiation team need to be able to walk into a new and unfamiliar situation, make sense of it quickly and keep a "calm mind" among the chaos (FBI Negotiation Team, 2014; Hammer, 2007). The team needs to be functional and capable of influencing an outcome (Hammer, 2007). This requires the negotiator to communicate with the subject and gather information through listening, observing and attending, and the team to support with information gathering and strategy development (Czopp, et al., 2014; Hammer, 2007). To do this the team needs access to their collective executive functioning skills such as interpreting information, problem-solving, decision making and evaluation. In order to maintain executive functioning the negotiator needs to manage their own arousal which is best achieved with knowledge of a bottom-up approach. Arousal management includes controlled breathing and grounding activities, and enhancing one's sense of safety and control.

Another key aspect of neurological functioning that influences arousal and distress management is the mirror neuron system (MNS). The MNS is automatically activated when an individual observes a person carrying out actions or expressing emotions and sensations (Gallese, Eagle & Paolo, 2007). This is not a direct mirror copy of emotions or sensations, as the name suggests, as it also incorporates the observer's past experience and beliefs around the intent of the other's behaviour (Rossouw, 2013). Research indicates that information in the MNS is transferred from deeper regions towards higher cortical regions, a bottom-up pathway (Rossouw, 2013). This means information

travels from sensory input to a Limbic MNS then up to a premotor MNS. The MNS plays a key role in negotiators building rapport and the Attunement Frame.

The Attunement Frame of the S.A.F.E model is grounded in the basic human response in the rule of reciprocity (Hammer, 2007). This rule occurs due to neurological functions such as the MNS. The rule of reciprocity identifies that during interaction, like behaviour tends to be reciprocated, meaning behaviour indicating cooperation is likely to encourage cooperation in the other (Hammer, 2007). During negotiation situations many actions indicate competitive behaviour, such as the arrival of tactical units, requests to surrender and setting police containment lines. The MNS system of the subject will be triggered in response to this and they are likely to respond with a similar level of competitiveness. The negotiator has the challenge of demonstrating cooperation to encourage cooperative behaviours in the subject. This can be done through the Attunement Frame by building a common language, use of cooperative language, and finding common interests (Hammer, 2007).

It's not only the neurological processes that impact negotiation, the mental functions that occur as a result of our neurobiology also have an impact. Mental functioning can be understood through the consistency theory (Grawe, 2007; Dahlitz, 2015). Consistency occurs when our mental processes, including goals, perception, and intentions match the information we are receiving from the external environment (Grawe, 2007; Dahlitz, 2015). Maintaining consistency has a low demand on our neurological functioning, therefore is a desired state; it's defined along a continuum of congruence through to incongruence (Grawe, 2007; Dahlitz, 2015). Congruence is when our goals and mental functioning match our perception of reality, while incongruence is when there is a mismatch. Incongruence is linked with stress responses and also key in an individual's ability to change behaviour or to learn (Rossouw, 2013).

Incongruence can be defined as controllable or uncontrollable. Controllable incongruence is when the mismatch is perceived as manageable and executive functioning skills and the Neocortex remain activated (Grawe, 2007; Rossouw, 2013). Controllable incongruence facilitates small steps towards a particular outcome, this is called patterns of engagement and leads to a shift in behaviour (Grawe, 2007; Dahlitz, 2015). Uncontrollable incongruence is when the mismatch is perceived as unmanageable and the deeper regions of the brain associated with the stress response are activated. Uncontrollable incongruence promotes an increased level of distress and a protective response, leading to patterns of avoidance which inhibit change and safe outcomes in the negotiation context (Grawe, 2007; Dahlitz, 2015).

In the negotiation process the aim is to move the subject from their original plan to one that is peaceful and maintains the safety of all involved (Hammer, 2008). As stated above, rational thinking and problem solving occurs when the subject's full brain is functioning, therefore it is important to build a sense of controllable incongruence in the subject. The Frames within the S.A.F.E. model assist with creating controllable incongruence. At a broad level the S.A.F.E. model emphasises the need to operate in the subject's predominant Frame (Hammer, 2007). This builds a sense of progress, being understood, and control in the subject which is helpful in building controllable incongruence. The Subjective Demands Frame encourages strategies such as breaking down demands into smaller steps or working to meet periphery demands, all which gives information to the subject that progress is occurring and that the situation is manageable (Hammer, 2007). Work in the Emotional Distress Frame creates an interaction where the emotions are identified and managed, which enhances controllable incongruence (Hammer, 2007).

We can also use neuroscience to examine the profile of the subject in order to understand possible neurological functioning and subsequent behaviour. In profiling we look at the

age of the subject, the duration of distress experienced by the subject, the intensity of the distress and the proximity such as closeness of relationship (Fergusson, Woodward & Horwood, 2000). When the subject has experienced distress for a significant part of their life, for longer duration, at high intensity and is linked with close relationships, the impact of stress on behaviour is likely to be greater. For the negotiation team, having an understanding of the subject's history with regard to these four areas (age, duration, intensity, proximity), can give indicators around possible stress responses and the level to which these are engrained neural pathways or simply situational triggers. A thorough review into the role of profiling is beyond the scope of this article and the S.A.F.E. model primarily focuses on current interaction dynamics. Though, it is worth noting the ability for neuroscience to incorporate this information to understand current interaction dynamics.

## NEUROSCIENCE AND BASIC NEEDS

Studies in neuroscience have led to the development of five key basic needs which are the drives, or motivation, behind behaviour. The basic needs include; safety, attachment, sense of control, pleasure maximisation/pain minimisation, and self-enhancement (Grawe, 2007; Rossouw, 2014; Dahlitz, 2015). The fulfilment of these needs is crucial for wellbeing and development and central to negotiation (Grawe, 2007; Rossouw, 2014). When these needs are met, in both the subject and negotiator, progress towards a safe and peaceful resolution is enhanced.

The basic need of safety is based on our ongoing, fundamental neurological process to assess our external environment for threats and potential dangers (Rossouw, 2014). If a threat is perceived, the Limbic system initiates an autonomic stress response leading to a fight, flight or freeze response (Henson & Rossouw, 2013). The negotiation team needs to maintain their own sense of safety and assist the subject in building their sense of safety in order to reduce the Limbic response and encourage activation of the Neocortex. The basic needs of safety can

also be met through addressing the other basic needs, meaning that addressing these will also enhance up regulation of executive functioning (Rossouw 2014).

The second basic need is attachment. Traditionally attachment focuses on the connection the individual has with a primary caregiver or significant partner (Rossouw, 2014). In the negotiation setting this need is addressed with the assumption that the negotiator becomes the primary attachment figure for the subject during the process. Attachment needs refer to our basic human reliance on others and need to feel a sense of connection with others. In the context of negotiation this need is appropriately described as connection. Meeting of the need to connect will down regulate the Limbic response and encourage up regulation of executive functioning.

The need for a sense of control relates to the need for our perception of reality to be consistent with our goals (Rossouw, 2014). This includes having the sense of a number of options which we are free to act on in order to achieve our goals (Rossouw, 2014). Since there are many factors that reduce the subject's sense of control in a negotiation situation, it is important for the negotiator to build this sense of choice.

Pain minimisation and pleasure maximisation identifies our drive to avoid unpleasant or painful states and increase the likelihood of pleasant experiences (Rossouw, 2014). What the individual sees as pleasure or pain is dependent on how they perceive the information in their environment (Dahlitz, 2015). When perceptions and goals align, and there are no competing attentions, there is a sense of pain reduction and pleasure maximisation (Rossouw, 2014). The need for pain minimisation and pleasure maximisation is linked to the dopamine system (Salamone, 1994). When we experience pleasure, dopamine release helps maintain energy and motivation towards completing or maintaining such activities (Salamone, 1994). When individuals are experiencing distress or pain, avoidance of such situations leads to

dopamine release (Salamone, 1994). When describing pain minimisation/pleasure maximisation and the dopamine system in the negotiation context, it can be labelled as a subject's or negotiator's 'motivation'.

The final need is self-enhancement. This need is based in the conscious awareness of ourselves and our ability to view ourselves reflectively (Dahlitz, 2015). As with other needs, this need is influenced by the individual's perception of the environment and the overarching need for safety (Dahlitz, 2015). An individual may not be motivated to maintain a positive self-view because having a negative self-view, (such as low self-esteem) may actually serve a need by reducing the risk of further esteem degradation. With regard to the negotiation context, the need of self-enhancement may be expressed through the subject's focus on situational outcome. Challenges to the subject's outcome focus can threaten their sense of safety and therefore trigger down regulation of executive functioning and up regulation of Primitive and Limbic systems.

### **INTEGRATING S.A.F.E WITH THE BASIC NEEDS**

In the negotiation context these five basic needs can be addressed within the S.A.F.E. model for both the negotiator and subject. Appendix 1 gives a graphical representation of this integration. First it is important to identify that of the five needs, safety should always be addressed and enhanced first. Without basic safety the ability to address other needs and progress towards a peaceful outcome is compromised. The need for safety can continually be enhanced as other needs are addressed.

Following on from establishing safety, neuroscientific findings and the S.A.F.E. model work in conjunction to address the remaining needs. Specifically, neuroscience identifies working with needs that are predominant for the individuals and their unique situation. Similarly the S.A.F.E. model emphasises matching the approach with the subject's predominant Frame.

According to neuroscience models, once the need of safety, connection, control and motivation are met, the emphasis is shifted to an outcome focus (Dahlitz, 2015). In the negotiation context this is when Attunement is established, distress is reduced and the negotiator works with the subject towards a new perspective on how the situation will progress. The S.A.F.E. model identifies this as the third step, when the negotiator starts to work to shift the subject to a new outcome (Hammer, 2007). This progression is demonstrated graphically in Appendix 1.

With regard to the subject and their basic needs, the negotiator working within the S.A.F.E. Frames can facilitate meeting their needs. For a sense of safety there are a number of possible threats the subject may perceive. Such threats include: presence of tactical units and police accoutrement, being asked to surrender, loss of escape plan, distressed hostages or, fatigue, hunger, and thirst. In addition, the subject may see their original plan as a means to safety, so the negotiator working to adjust the plan directly threatens the subject's sense of safety. Safety can be met through the negotiator exploring with the subject how the cordon is also designed for their safety as well, explaining to the subject that tactical units will not approach and removing physical discomforts such as moving to shade or putting on lights.

The subject's need for connection can be met through strategies in the Attunement Frame such as building a common language, expressing concern and consideration for the subject's wellbeing and not using containment and tactical strategies to increase anxiety. This shows cooperation to the subject, which increases the likelihood of cooperation from them. This need can also be met through meeting periphery demands.

The need for control is greatly compromised for the subject with the use of barricades and denial of demands. They can also perceive inconsistency between their circumstance and goals due to factors such as: the assumption that demands would be met immediately, not predicting that actions would lead to a large

police response or hostages not responding as desired. The negotiator can help the subject meet this need through the Subjective Demands Frame. This includes asking about and exploring demands, acknowledging demands and showing that demands are important by working to break down and meet them rather than dismiss them. In addition, the use of language is key in creating the sense of control and choice. Phrases such as “let’s find a way forward” compared to “surrender” create ongoing discussion and the sense of choice.

In the negotiation context, challenges to the motivation need can include the current triggers for emotional distress and preconception that dealing with police will be a painful experience. This need can be addressed through the Emotional Distress Frame. This Frame creates a space for the subject to express emotions and for the negotiator to assist with addressing the subject’s emotions. Reducing the sense of distress and highly aroused emotions may shift dopamine release to encourage motivation towards a solution.

The need of outcome can be supported by the negotiator through strategies in the Face Frame. Here the negotiator can validate the subject’s self-perception or down playing of undesirable behaviour. Using information gained through the Face Frame and coupling it with the Subjective Demands Frame, the negotiator can shift the demands to a safe and peaceful resolution in a manner that creates a new self-perception for the subject.

For the negotiating team, all five needs are important and when met lead to a higher level of performance and efficiency. The need of safety can be met through each team member having a sense that they can manage their safety, both physically and emotionally. This includes physical position such as the Primary being in close proximity to the Secondary, the Primary not placed in a vulnerable or exposed position and the Team Leader being able to move between negotiation cell and Forward Command without difficulty.

The need for connection for the negotiation team is met through support from team-mates, acknowledgment of strengths and confidence that support will follow as events unfold. In addition for the negotiator, once a connection starts to build with the subject, this need will increasingly be met.

The need for control can be met by external and emotional means. Externally it is met through the negotiation team knowing they can manage the situation, having options for negotiation pathways and with the subject meeting requests made by the negotiator. Emotionally, a sense of control is gained through effective skills in arousal management. In addition, a sense of control is enhanced when the negotiation team members have confidence that each can perform their own role.

The motivation need can be met through the negotiation team members having a strong ability in managing their own arousal and emotions. The final need of outcome is met through each member of the team having a sense that they are prepared for their role through training and experience, and having confidence in themselves to perform their role effectively.

The basic needs can also be applied to situational factors. In regard to situational factors, the need of safety can be met through police containment lines, removal of other people from the area and protection from inclement weather. The need of control is met in a similar way to safety, with the addition of factors such as equipment set up and deployment, and pre-arranged communication pathways between teams. The needs of connection, motivation and outcome are less applicable to the external environment or situation.

## CONCLUSION AND FUTURE DIRECTIONS

Negotiation situations are unique, complex and dynamic. The S.A.F.E. Model (Hammer, 2007) provides an evidence and strategy based approach with flexibility to accommodate individual aspects of varying situations.

Research in neuroscience aligns with the S.A.F.E. Model and can further inform the negotiation team in their approach, strategies and use of the Frames. This in turn can enhance the effectiveness of the team's approach and possibility for a peaceful resolution. The relationship between neuroscience and negotiation processes has not been explored in detail and further research would build on our current understanding and the utility of their connection.

As stated earlier, a number of negotiation models have been identified as effective (Grubb, 2010). Exploring how neuroscience can be applied to other evidence based negotiation models, such as the Behavioural Influence Stairway model or the Crisis Bargaining Model will allow negotiators working with different models to also apply neuroscience principles to enhance their work (Vecchi, et al, 2005; Donohue, 1991).

This article explored the application of neuroscience to non-terrorism negotiation

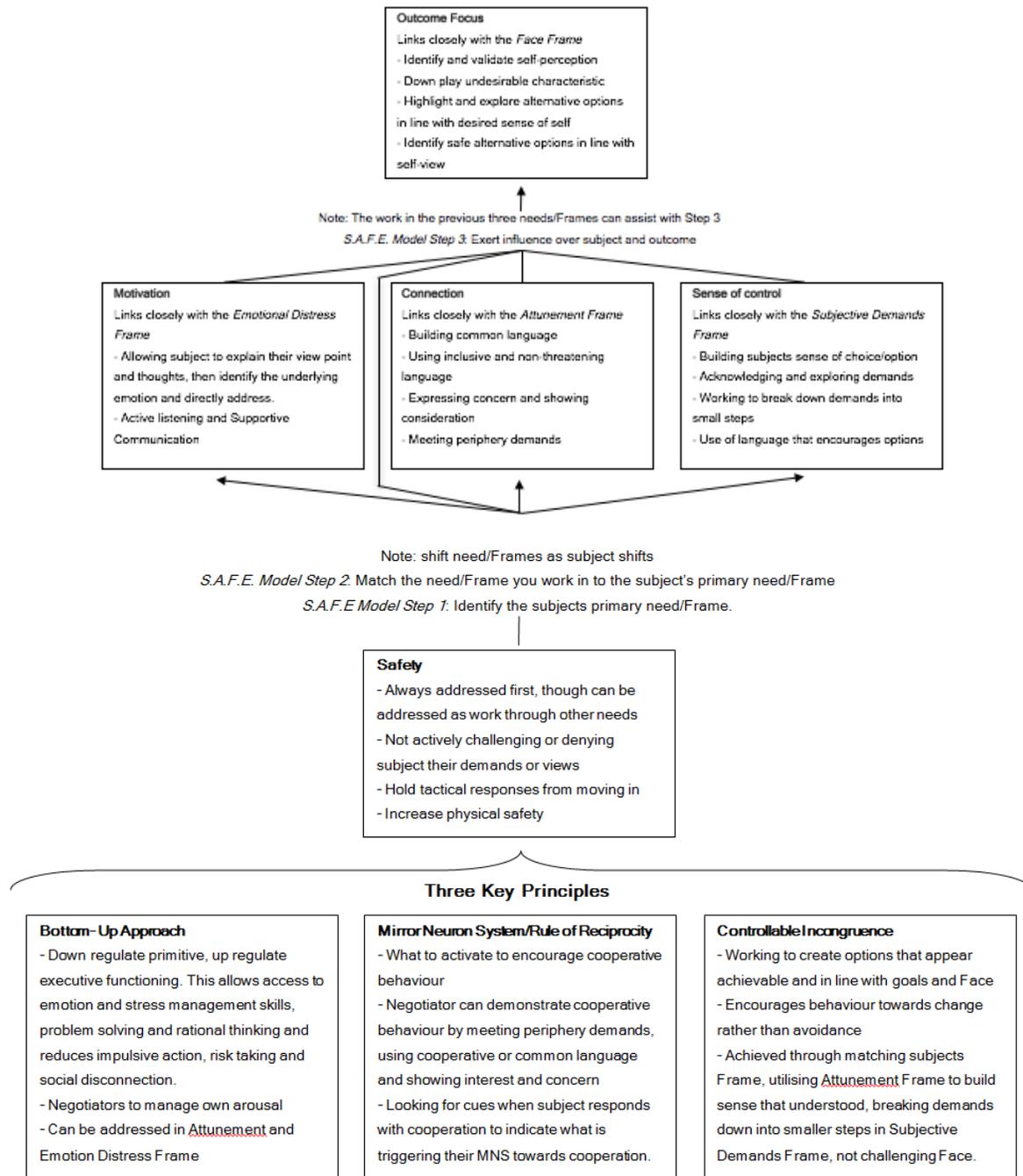
situations. Though there are some similarities with the role neuroscience plays in terrorism or non-terrorism based negotiation, there are also a number of key differences that can impact the approach Police or Military negotiations take. A specific exploration into the neuroscience of terrorism negotiation would be beneficial in informing the Police or Military responses for both planning and decision-making.

For neuroscientific principles to be applied in real world situations, the negotiation units first need to be trained in theoretical knowledge and the means to apply this to their work. Therefore, development of a training model is very important. Then, to ensure that neuroscientific principles are adding to and enhancing the negotiation process, a review of its implementation needs to be conducted. After this we would have more confidence in describing how neuroscience and negotiation can work together to deliver safe and peaceful outcomes.

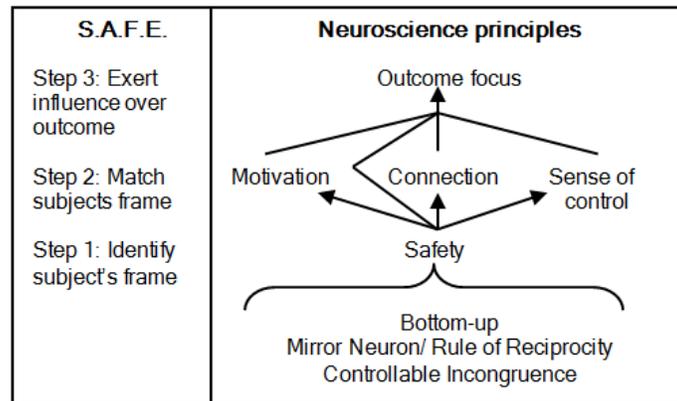
## APPENDICES

### APPENDIX 1: Guidelines for integrating neuroscience and S.A.F.E. Model: Application of principles

APPENDIX 1. Guidelines for integrating neuroscience and S.A.F.E. Model: Application of principles



## APPENDIX 2: Guidelines for integrating neuroscience and S.A.F.E. Model: Cue card



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# Predictive 6 Factor Resilience Scale – Domains of Resilience and Their Role as Enablers of Job Satisfaction

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**ABSTRACT** Continuing from previous research on the Predictive 6 Factor Resilience Scale (PR6), this study provides further domain-level validation in addition to investigation of resilience as an enabler of job satisfaction.

**Methods:** A multi-stage testing format was employed using a group of primarily professional adults (n=617). Domain-level scales were developed through ratings from the research panel. Validation data was collected through an online measurement device. Multiple versions of the scales were tested for internal consistency, with scales retained, modified or rejected based on resulting scores. From this, domain-level scales were finalised, an extended 50-item resilience scale (PR6-50) was developed, and the 16-item PR6 was revised. Analysis was conducted against the Brief Index of Affective Job Satisfaction (BIAJS) and demographic data.

**Results:** Scales for each domain were validated with good internal consistency (>0.70). The PR6-50 showed high internal consistency (0.9372), while the revised 16-item PR6 showed improved internal consistency (0.8398). Resilience results showed a correlation of 0.536 (P value <0.001) with BIAJS, while the Vision domain showed the highest correlation at 0.607 (P value <0.001).

**Conclusion:** The result strengthens the internal consistency and domain validity of the PR6, as well as establishing an extended version (PR6-50) for further resilience research and clinical purposes. The relationship of resilience to job satisfaction, in particular the Vision domain, provides additional pathways for exploration to improve employee engagement and performance in organisations.

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Rossouw, J.G., Rossouw, P.J., Paynter, C., Ward, A., Khnana, P. (2017). Predictive 6 Factor Resilience Scale – Domains of Resilience and Their Role as Enablers of Job Satisfaction. *International Journal of Neuropsychotherapy*, 2(1), 25-40. doi: 10.12744/ijnpt.2017.1.0025-0040

Automation advances now stretch beyond manufacturing and agriculture, and increasingly into service jobs traditionally considered as secure careers. A study by Oxford university estimates that 47% of jobs may be automated in the next two decades (Frey & Osborne, 2017). The impact of automation on developing countries may be up to 85% (Frey et al, 2016). Faster technological advances bring with it increased uncertainty about one's own future. Increasing personal resilience provides psychological skills and techniques to manage uncertainty and adapt faster to a changing environment. Understanding resilience at a deeper level for each domain (Rutter, 1985; Olsson et al, 2003) and their relevant relationships provides more effective ways for organisations to train and develop resilience capacity in people, as resilience can be improved throughout life (Herrman et al, 2011). This illustrates the growing importance of resilience as a critical life skill for a time of rapid change.

The Predictive 6 Factor Resilience Scale (PR6) published in 2016 described the overall validation of the scale as a resilience psychometric (Rossouw & Rossouw, 2016). Domains were identified through their neurobiological foundations building on work from Davidson on the emotional styles of the brain (Davidson & Begley, 2012). Theoretical foundations were explored in relation to other major resilience scales (Windle et al, 2011) to construct a meta-model of resilience. Research identified that physiological health hygiene factors also contribute to the resilience construct. These include nutrition, exercise, and sleep hygiene factors. Approach and avoidance motivational factors were shown to have a positive correlation and impact on internal consistency, adding a predictive component through prediction of future goal achievement (Jackson et al, 2009).

Primary objectives of this study are as follows:

1. Conduct further domain-level validation of the PR6 model, constructing separate domain

2. Compile an extended version of the PR6 for future research projects.
3. If relevant, revise the 16-item PR6 to increase overall and domain-level consistency.
4. Correlate resilience to job satisfaction to determine relevant relationships.

In addition, areas for further investigation were identified in the previous research paper which will be revisited. These include gender differences where females scored higher in Health, while males scores slightly higher in Tenacity and Reasoning. Differences in resilience scores over age groupings could not be validated due to insufficient data in the original research. Expectations were for resilience to stabilise with additional data, and therefore will be revisited. Sleep hygiene indicated lower correlation with resilience. Consequently, this research expands sleep into component factors to investigate relative importance. One Collaboration item related to working with others also indicated lower correlation with overall resilience, leading to further investigation.

## METHOD

### Research design

To achieve the research objectives, individual domains were built out as separate scales to measure each component of resilience. Item generation was conducted with the named panel of researchers in accordance to the thematic concept and theoretical foundation of each resilience domain. Items were combined alongside research references and justification. All original items of the PR6 were included as a standard measure. Excluding demographic and job satisfaction items, 101 items were developed.

Item development was approached from the perspective of domains as representatives of the neurobiological constructs. Each domain therefore presents a thematic construct for practical intervention. Interaction between the domains is expected, however their continued

separation is valuable for further treatment development. Each domain is investigated separately relating to its theoretical foundations, allowing further granularity for enhancing resilience overall.

A review round commenced where the research panel cross-examined all of the 101 items. Each reviewer ranked items on a confidence level of their contribution to the domain. Through multiple review rounds, items were discussed and revised until ratings were finalised. Resulting ratings were aggregated for each item to produce an overall confidence score.

Confidence scores were used to produce two extended test scales which also included the original PR6 items for comparison. The first was a High Confidence (HC) scale constructed from the items with the highest scores, maintaining a balance of positive and negative scored items. Each domain, including Momentum was allocated six items, except for the Health domain which was allocated 11 items to further investigate health hygiene (particularly sleep) factors. A second Wildcard (WC) scale was constructed by swapping the two lowest-scoring items from the HC scales with the next two items below that. The aim of the WC scale was to test a wider range of items without extending the overall test scale sizes beyond practical limitations for organizational application.

The HC and WC versions of the domain-level scales were then tested for validity. Scores were compiled and a progression determination was made based on relative scores. Where needed, modifications to the scales were applied until sufficient internal consistency was achieved. This included the addition of items for low consistency domains to conduct a deeper search as needed. For these domains, item omission analysis was conducted to establish acceptable internal consistency scores.

Following the multi-stage testing format, the domain-level scales were established and the combination of the domains were tested as an extended version of the PR6 (TESTPR6). Internal consistency was tested alongside demographic and other dimensions. Domain-level relationships were tested, including correlations to the original PR6 (OPR6) to determine potential adjustments. The extended domain-level scales were then analysed for highest internal correlation, taking the top two items (balance of positive and negative items, except for Health) and were proposed as revised items for the 16 item PR6 where they represent an improvement on previous values.

The Brief Index of Affective Job Satisfaction (BIAJS) developed by Thompson and Phua (2012) was chosen as a measure to correlate with resilience factors. This BIAJS was chosen due to its comprehensive validation and reliability as a job satisfaction measurement. Our interest is in determining a potential relationship between resilience and job satisfaction, as well as determining which domain of resilience is a stronger enabler of job satisfaction.

Positive Impression Management was also tested through the inclusion of items to potentially control for this effect. Of interest is Crowne and Marlowe's (1960) social desirability scale and its intent to measure the desire of a person to be presented in a positive light. This effect may result in individuals artificially inflating scores on the resilience scale due to social desirability. A mitigating factor within this study is that confidentiality is assured for each participant, reducing the need to inflate scores that others will not see. We include items for consistency measurement related to alcohol use to potentially measure differences and inconsistencies in scoring. Analysis may reveal further exclusion criteria to refine results. We note that Crowne later criticized the use of his original scale to 'decontaminate' study samples (Crowne, 1991), as well as criticism from others (Odendaal,

2015). We also note that Positive Impression Management is generally not a feature of resilience psychometrics, potentially relating to difficulty in attaining meaningful insights. Data analysis is conducted with this in consideration.

### **Resilience and the basic needs**

Adding to the foundation of the resilience domains, we propose connections to the four basic needs identified by Epstein. He suggested that there is no single basic need for psychological functioning, but instead that there are four basic needs of relative equivalence (Epstein, 2003). The four basic needs provide further explanatory power to the diversity of the resilience domains, indicating inputs into one or more of the basic needs. Domains contribute to the needs through positive affect, while ineffective functioning of a domain can produce negative affect to the relevant need. An individual's skill in implementing the relevant resilience domain therefore determines their ability to contribute positive affect to the basic needs.

Maximisation of pleasure and minimization of pain is the first basic need. It draws on the work of Dollard and Miller (1950), and also Freud (1909) at an earlier stage. Through the individual's experience of predominantly pleasure or pain, a basic belief is fuelled about whether or not the world is a malevolent or benign place. A belief that the world is benign adds to optimism, while the opposite may produce pessimistic attitudes. We summarise this need for pleasure and the avoidance of pain as the need for *Motivation*.

Control and orientation is a need for a sense of stability and predictability related to the world in which we exist. This includes concepts such as controllability and justice existing in the world, indicating a sense of meaningfulness. As Epstein (2003) viewed this need, the opposite is a sense of "unpredictability, uncontrollability, and lack of justice" (pg14). This builds on the work of

Rogers (1951), and gives rise to a belief of relative meaningfulness or meaninglessness of one's life. We summarise this as the need for *Control*.

Relatedness is the need for stable and secure relationships with others with whom we can form meaningful connections. Epstein (2003) references work from Bowlby (2008) as a basis for this need through his founding concept of attachment theory. A basic belief regarding whether people are trustworthy and loving vs untrustworthy and rejecting develops based on relatedness experiences through life. We summarise this concept as the need for *Connection*.

Self-enhancement is the need to improve the status of the self. Work from Kohut (1971) and Allport (1961) contribute to the concept of personal growth and improvement. Related beliefs cover whether the self is viewed as competent, worthy, moral and strong, vs incompetent, unworthy, immoral and weak. We summarise this as the need for *Self-esteem*. Relationships to resilience is considered.

### **Resilience and Neuropeptide Y**

Neuropeptide Y (NPY) has been implicated previously as being inversely related to the stress response (Zhou et al, 2008). Subjects with major depressive disorder (MDD) have also been shown to have less NPY, and that a genetic variation or lower NPY expression predisposes to MDD (Mickey et al, 2011). This has led to conclusions that NPY upregulation has an anxiolytic effect, lowering the stress response when released at higher levels (Morgan, 2002). Research on special forces military personnel during enemy capture and interrogation training revealed that NPY has a protective effect against dissociation (Morgan et al, 2000).

Differences found between special forces and non-special forces personnel indicate that additional training results in greater release of

NPY, suggesting training provides additional resilience effects through NPY upregulation. Recent research provided additional support, showing that chronic stress leads to epigenetic dysregulation of NPY receptors (Lomazzo et al, 2017). Epigenetics provide a mechanism for fast, generational changes in genetic encoding. In relation to resilience, these changes may either provide the next generation with stronger resistance against stress, or instead predispose them to psychological diseases due to the experiences and actions of the current generation.

Generational changes have already been witnessed through a study on transgenerational transmission of post-traumatic stress disorder following the Tutsi genocide (Perroud et al, 2014). Inherited alterations were witnessed within the HPA axis, as well as lower cortisol levels than those who have not been exposed to the genocide. Cortisol and NPY release during stress are positively correlated, where NPY provides a reduced stress response. Epigenetic changes in NPY receptors and related neurobiology may contribute to generational changes in stress management. We hypothesise that resilience domains acting on NPY may encourage epigenetic changes that improve stress response. These epigenetic changes provide a mechanistic pathway to build resilience on a generational level, resulting in a measure of stress-inoculation for future generations.

### **Domains of resilience**

Details of the resilience domains and their neurological correlates are set out in the previous research. For the sake of clarity, a short overview is provided for each domain. Proposed relation of the resilience domains to the basic needs are explored.

Vision (VIS) refers to having a sense of purpose, clear goals, and the behaviour of goal-striving. Skills related to this domain includes an ability

to define and clarify goals worth striving for, prioritise between goals, develop congruence between goals, self-motivate, and a belief in an ability to achieve goals. VIS is suggested to contribute to all the basic needs. Goals define a sense of purpose and direction in life, contributing to the orientation component of Control. One's sense of purpose and goals also define whether there is engagement in pleasurable activities (need for Motivation), and also if there is engagement with others on a psychosocial level (Connection). Collectively, these support the outcome of Self-esteem enhancement and a sense of self-efficacy, suggested by Bandura (1988) to be a key component of social cognitive theory. This central nature of VIS crossing all basic needs leads to the hypothesis of VIS as potentially the most important domain of resilience. Neural correlates include the prefrontal cortex (PFC) as the centre for long-term planning and executive functioning. The ventral striatum plays a role in risk/reward cognition and reinforcement (Davidson, 2012), facilitating decisions between various goals as options available for pursuit. Hippocampal/PFC interaction play a role in higher-order meaning assignment to memories (Preston & Eichenbaum, 2013).

Composure (COM) concerns emotion awareness, emotion regulation and stress management. Skills related to this domain include emotional granularity, emotional reappraisal, self-calming through breathing and related techniques. As an emotional domain, COM factors into the need for Motivation through striving for pleasure and the avoidance of pain. The earliest identification of this was by Walter Bradford Cannon in 1929, noting that pain and suffering in this context activates the HPA axis, leading to a loss of emotional composure. The COM domain then refers to the ability of someone to regain and retain a sense of composure. HPA activation may also lead to a loss of personal control, or a reduction in Control as a basic need may lead to reduced

composure. Conversely, being able to maintain a sense of composure contributes to Control within the experienced situation. Related neural structures include the insula as an interpreter and processor of audio-visual signal integration, as well as interoceptive capabilities that enable cognitive emotional regulation techniques (Critchley et al, 2004). The insula has pathways to limbic structures such as the amygdala, enabling potential regulation of the HPA axis to achieve physical and mental composure.

Reasoning (RES) relates to problem-solving, resourcefulness and being ready for change. Skills related to RES includes cognitive abilities such as planning for adverse situations to mitigate outcomes in advance, challenging and changing beliefs through introspective questioning, and building one's own ability to be resourceful. This domain closely relates to the need for Control, striving to devise options available to act on to achieve goals, and also through planning to produce better solutions to problems to attain control over outcomes. This relates closely to one's internal map of the world and understanding of potential outcomes through cause-effect relationships. Neural structures include the enablers of logical thought such as Wernicke's and Broca's areas in their role to interpret and produce symbols and language for rational thought. PCF connection to the anterior cingulate cortex (ACC) in its role to screen for errors and optimise responses assist in rational learning and improvement (Peterson, 2014). Preparatory exercises and planning for adverse situations such as those practiced by the military align with RES skills. These have been shown to increase NPY release, providing an improved stress response and promoting resilience (Morgan et al, 2000).

Tenacity (TEN) relates to hardiness and perseverance. Skills include beliefs concerning optimism for the future and being persistent in the face of adversity. Research by Duckworth et al (2007) has indicated that the capacity to

persist has a higher correlation to goal achievement than intelligence. In this sense, TEN relies on the need for Control via orientation to know what to persist towards, while also contributing to Control through one's conscious ability to continue along the chosen path. This conscious decision not to give up may align internal reward systems towards chosen objectives, feeding into how the need for Motivation as pleasure aligns to achievement and pain to failure, or giving up. Perceptual changes effected by a conscious appraisal of stress in this context may reduce mortality, as indicated in research by Keller et al in 2012. Neural structures include the ability of the PFC to downregulate HPA activation to overcome adversity and sustain goal-directed activity. Dopaminergic neurons emerging from the ventral tegmentum play a key role in motivation required for persistence despite adversity and challenge.

Collaboration (COL) includes secure attachment, relationships, and maintaining social perceptions. Skills include one's social skills, ability to build support networks, awareness of social context and willingness to ask for help. COL relates most strongly to the need for Connection, combining the importance of support received and provided, and awareness of social context and perceptions. The functioning of this domain is therefore enabled through the basic belief that people are trustworthy and loving, therefore support is available when needed and it is worthwhile to support others in turn. Neural structures include the right PFC which has been implicated in the process of secure attachment (Schore, 2000). In particular, the orbito-medial PFC serves a crucial role in sensitivity to context, detecting social cues and changes in the environment (Schoenbaum & Takahashi, 2011). These may function in concert with the fusiform gyrus, responsible for interpreting visual signals to identify faces and related associations to identified individuals. Produced results include deeper understanding

of what support is appropriate from whom given the situation, where higher skills here aid in producing appropriate behaviour when facing challenges.

Health (HLT) includes physical hygiene factors such as quality sleep, healthy nutrition, and regular exercise, as well as perceptions regarding one's own health. Primary skills include the ability to research and understand which healthy habits to follow, the motivation to implement the habits, and the persistence to maintain these habits in the long term. HLT outputs to the need for Self-esteem enhancement, providing internal validation XXthat the self is worth looking after and to be enhanced through physical means, not just emotional. Key neural relationships within the HLT components related to the regulation of BDNF as an enabler of neuroplasticity, enhancing neurogenesis in the hippocampus, as well as increasing NDMA expression and AMPA release and expression during synaptic connection strengthening. Exercise is also shown to increase NPY, potentially further enhancing the stress response and aiding in resilience (Lewis et al, 1993; Morris et al, 1986; Lundberg et al, 1985).

### **Momentum**

Momentum (MTM) is a forward-looking measure, standing in contrast with the resilience domains that represent a point-in-time measurement. MTM measures approach and avoidance motivational schemas which have been indicated as a potential predictor of goal achievement (Jackson et al, 2009). The measure investigates individual attitudes toward future opportunities, appraisal of new challenges, problem-solving approach, as well as avoidance attitudes such as procrastination tendencies.

MTM in the previous research showed a high correlation with the resilience construct. We expand the items in the current research to

develop a specific approach/avoidance scale for further research and predictive analysis.

### **Study sample**

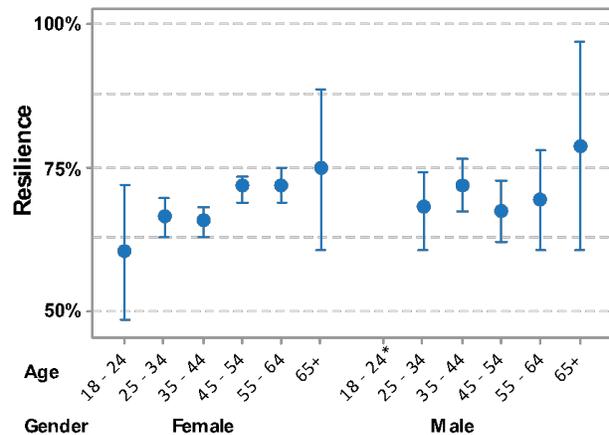
Participants for the study were recruited through workshops (primarily education and healthcare workers) and through an online survey using social media platforms (broader diversity of participants). Though the PR6 is currently used by students, eligibility for the research was set at 18 years or over. Incomplete surveys were removed from the study sample.

The overall study sample (n=671) was screened, with entries removed which were incomplete (n=46), under 18 years were removed (n=6), and a duplicate entry was removed (n=2). The remainder (n=617, 73% female) entered into data analysis. Median age was 43 (StDev 10.98). Demographic data was incomplete for some entries (n=7). Of the used sample, n=93 was entered into HC, n=98 was entered into WC, while the remaining n=426 proceeded on to TESTPR6.

## **RESULTS**

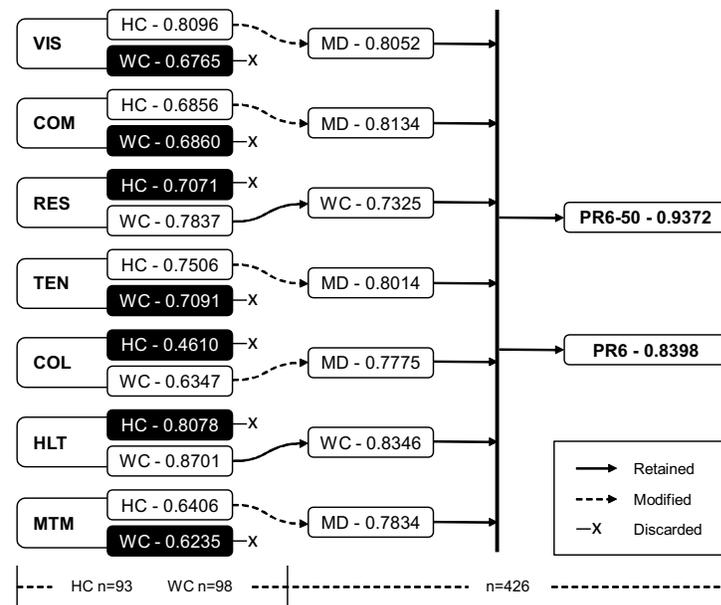
Comprehensive analysis using the OPR6 as a standard component of all samples collected indicated data normality of the population (n=617). Negatively scored items were reversed, then domain scores were calculated through the mean, averaging all domain means together to create the overall resilience scores. Scoring between 0 (lowest resilience) and 1 (highest resilience), the mean for the sample was 0.65215 (StDev 0.569) at a 95% CI ranging from 0.6409 and 0.6634. Internal consistency for the OPR6 was validated at an alpha of 0.8004. No significant differences were found between male and female populations. Age grouping reveals a statistically significant increase in resilience scores as age increases (Table 1, Fig 1 and Fig 3).

The BIAJS showed high internal consistency with an alpha of 0.9107 (n=617). Mean was 0.7404 (StDev 0.8383).



**FIG 1:** Interval plot – Resilience by age group and gender

\*Insufficient data to plot



**FIG 2:** Multi-stage testing of resilience models.

### HC & WC validation

Validation of domains within HC and WC were conducted to determine which domains to discard, progress or modify (Fig 2). HC sample (n=93) achieved an overall alpha of 0.9305, compared to the WC sample (n=98) which

achieved an alpha of 0.9202. HC VIS alpha was 0.8096 (vs WC VIS alpha = 0.6765) which was kept and modified due to one low performing item. HC COM alpha was 0.6856 (vs WC COM alpha = 0.6860) which was kept and modified with the addition of two items to investigate further. HC RES alpha was 0.7071 (vs WC RES alpha = 0.7837) which was discarded in favour of the WC model. HC TEN alpha was 0.7506 (vs WC TEN alpha = 0.7091) and was modified with a high performing item from the WC model. HC COL alpha was 0.4610 (vs WC COL alpha = 0.6347) which was discarded in favour of modifying the WC COL model with four additional items. HC HLT alpha was 0.8078 (vs WC HLT alpha = 0.8701) which was discarded in favour of the WC HLT model which was kept intact. HC MTM alpha was 0.6406 (vs WC

MTM alpha = 0.6235) which was

retained and modified with four additional items. Items added underwent panel scrutiny to determine consistency with theoretical underpinnings.

### TESTPR6 validation and refinement

Following modification, the second round of testing (n=426) was conducted on the composite TESTPR6 created from the retained and modified domains. Domains were targeted to finalise to six items each (three positive and three negative scored items), except for HLT which was targeted for ten items. MTM was also targeted to finalise to six items.

TESTPR6 domains alphas are as follows, targeting > 0.7. VIS alpha was acceptable at 0.8052. COM, after item omission to reach six items was 0.8134. RES alpha was 0.7325. TEN was 0.8014. COL at ten items prior to item omission analysis was 0.8261. Pure omission analysis aiming for highest alpha ended at 0.8284, though resulted in a narrower definition of COL with highly similar items. The authors

believe that a broader definition of COL to be more valuable in measurement and treatment, therefore undertook an item omission analysis focusing on broadness rather than pure alpha optimisation, reflecting views of other authors noting unnecessarily high alpha (Tavakol & Dennick, 2011; Sijtsma, 2009; Neuendorf, 2011). A broadness path for COL resulted in a final alpha of 0.7775. HLT alpha after one item omission resulted in a ten-item alpha of 0.8346. MTM alpha during omission analysis decreased significantly with each item removal, therefore a decision was made to retain the MTM scale to ten items resulting in an alpha of 0.7834. With these results, the domain and MTM scales were viewed as finalised and ready to contribute to the new extended scale.

Combining all the domain scales and MTM provided a final extended version of the PR6 with 50 items (six each for VIS, COM, RES, TEN, COL, and ten each for HLT and MTM). This version achieved a final alpha of 0.9372 with a mean of 0.6874 (SE 0.0264, StDev 0.5449), 95% CI 0.6744 to 0.7004 (n=426). This new extended 50 item scale is named as the PR6-50. See table 2 for the remaining item omission statistics.

**TABLE 1: Summary of Age Grouping by BIAJS and PR6-50 scores**

Age Group	N	PR6-50			BIAJS		
		Mean	SE Mean	StDev	Mean	SE Mean	StDev
<b>Female</b>							
18 - 24	9	0.604	0.0511	0.1533	0.7153	0.0552	0.1657
25 - 34	58	0.6614	0.0171	0.1306	0.7134	0.0305	0.2321
35 - 44	91	0.6563	0.0135	0.1292	0.7115	0.0224	0.2134
45 - 54	96	0.7135	0.012	0.1178	0.7747	0.0196	0.1918
55 - 64	52	0.7197	0.0159	0.1148	0.7825	0.0259	0.1871
65+	7	0.7486	0.057	0.1507	0.7946	0.0664	0.1757
<b>Male</b>							
18 - 24	3	0.348	0.157	0.272	0.542	0.182	0.315
25 - 34	17	0.6783	0.0322	0.1328	0.6324	0.0536	0.2208
35 - 44	41	0.7201	0.021	0.1343	0.747	0.027	0.1728
45 - 54	25	0.6733	0.025	0.1251	0.6725	0.0548	0.2738
55 - 64	20	0.6935	0.0407	0.182	0.7656	0.0415	0.1857
65+	6	0.7859	0.071	0.1739	0.813	0.116	0.285

### Analysis for PR6 revision

Domain-level representation within the 16-item PR6 can now be revisited to determine if

**TABLE 2: PR6-50 Item analysis**

PR6-50 Cronbach's alpha = 0.9372			Item ID	Type	Alpha if omitted
Item ID	Type	Alpha if omitted	COL (alpha = 0.7775)		
<b>VIS (alpha = 0.8052)</b>			49	Reverse	0.6986
8	Positive	0.7606	50	Reverse	0.7159
21	Reverse	0.7611	44	Positive	0.7391
39	Reverse	0.7635	3	Positive	0.7584
15	Positive	0.7717	37	Reverse	0.7625
31	Positive	0.7817	43	Positive	0.7789
2	Reverse	0.8087	<b>HLT (alpha = 0.8346)</b>		
<b>COM (alpha = 0.8134)</b>			13	Positive	0.8056
19	Positive	0.7615	20	Positive	0.8074
22	Reverse	0.7772	14	Positive	0.8077
47	Positive	0.7866	18	Positive	0.8119
4	Positive	0.7889	11	Positive	0.8139
35	Reverse	0.7927	30	Positive	0.8151
32	Reverse	0.7961	41	Positive	0.8174
<b>RES (alpha = 0.7325)</b>			28	Reverse	0.8329
25	Positive	0.6629	24	Positive	0.8333
5	Positive	0.687	12	Positive	0.8444
9	Reverse	0.69	<b>MTM (alpha = 0.7834)</b>		
36	Reverse	0.6999	23	Positive	0.7512
42	Positive	0.7112	48	Reverse	0.7569
29	Reverse	0.7183	46	Positive	0.7579
<b>TEN (alpha = 0.8014)</b>			40	Positive	0.7593
33	Reverse	0.7641	6	Reverse	0.7619
38	Reverse	0.7655	17	Reverse	0.7648
7	Reverse	0.7665	10	Positive	0.7672
26	Positive	0.7696	34	Reverse	0.7724
1	Positive	0.7706	27	Positive	0.7742
16	Positive	0.7882	45	Reverse	0.7811

different items provide higher correlation with the domains than the domain related items in the OPR6. To make this determination, we examined the OPR6 domain representative items as correlated against the new domain-level scales developed, then investigated different item combinations from the new domain scales

to find more highly correlated item combinations. Where higher correlated item combinations exist, these are replaced to revise the PR6. Item combinations are kept to one positively and one negatively scored item, except for HLT which retains four items as before to represent the various factors included in it.

The combination of one original item and one new item for VIS was noted to achieve a slightly higher correlation (0.891) compared to the OPR6 items (0.861). For COM, two new items produced a higher correlation (0.884) compared to the OPR6 items (0.658). An original and new item combination for RES showed a slightly higher correlation

(0.850) than the OPR6 items (0.8633). TEN correlation also improved slightly (0.860) through two new items compared to the OPR6 items (0.853). COL correlation improved through a new two-item combination (0.874) compared to OPR6 items (0.609). HLT correlation improved slightly (0.930) through replacement of one item compared to the OPR6 four items (0.925). MTM correlation improved slightly through the use of two new items (0.786) compared to OPR6 items (0.781).

Revised item combinations were then used to establish an overall revised 16-item PR6. Correlation of the original 16-item OPR6 to the PR6-50 is 0.945, while the revised 16-item PR6 correlates to the PR6-50 at 0.960, representing a small increase in overall accuracy. The new PR6 provides an alpha of 0.8398 (mean = 0.6695, SE = 0.0294, StDev = 0.6066, median = 0.6785).

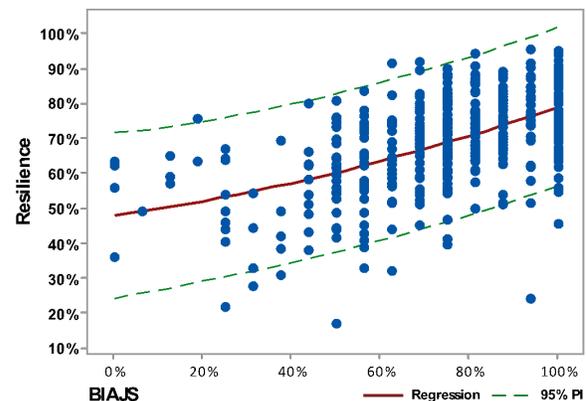
### Demographic analysis

Demographic data collected included age, gender, location, and occupation. Gender data revealed no significant differences. Female mean was 0.6858 (StDev = 0.5126, 95% CI 0.6716 to 0.7001), while male mean was 0.6921 (StDev = 0.6307, 95% CI 0.6626 to 0.7216). 73% of participants were in Australia, with participation from various countries as the remainder. No statistically significant differences were found between Australian participants and other participants.

Occupation data indicates potential trends, such as lower scores in Education professionals (n = 147, mean = 0.6715, StDev = 0.5208, 95% CI 0.65002 to 0.6927), compared to Healthcare workers (n = 69, mean = 0.6958, StDev = 0.5363, 95% CI 0.6636 to 0.7281), and Human Resource workers (n = 38, mean = 0.7077, StDev = 0.4871, 95% CI 0.6676 to 0.74767).

Age grouping indicates an overall increase in resilience as age increases. While female resilience increases over age is relatively

consistent, male resilience rates appear to decline somewhat past ages 45 through to 64. Males aged 18 – 24 had insufficient data to plot (Fig 1 and Table 1). Additional data is required to further validate.



**FIG 3:** Resilience vs BIAJS Regression

### BIAJS analysis

As an affective job satisfaction scale, the BIAJS provides insight into relationships with resilience and the individual domains of resilience, as well as resilience overall. Analysis of BIAJS results across the PR6-50 population (n=426) provided a mean of 0.7372 (between 0 and 1) with a StDev of 0.2099. Alpha for the BIAJS was high at 0.9174.

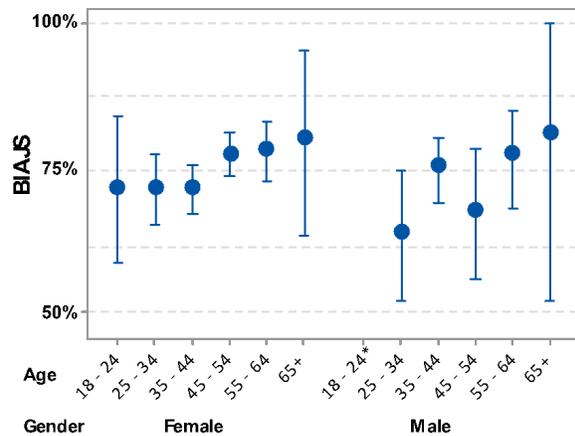
Regression analysis of PR6-50 to the BIAJS (Fig 3) yielded an R-Sq of 29.1% (S = 0.115). Correlation result is 0.536, indicating an overall positive relationship between resilience and job satisfaction. Domain-level analysis showed that the strongest relationship between resilience domains and the BIAJS is VIS (correlation = 0.607). Following that, MTM correlated at 0.490, followed by TEN at 0.418. VIS to BIAJS regression showed an R-Sq of 36.9% (S = 0.148).

Occupation analysis shows that Education and Healthcare workers have proportionately higher job satisfaction than Human Resource workers.

Education workers had a mean of 0.7623 (StDev = 0.1752, 95% CI 0.7337 to 0.7909). Healthcare workers had a mean of 0.7781 (StDev = 0.0225, 95% CI 0.7332 to 0.8230). Human Resources workers had a mean of 0.6842 (StDev = 0.2199, 95% CI 0.6119 to 0.7565) (table 3).

**TABLE 3:** Summary of Occupation by BIAJS and PR6-50 scores

Occupation	N	PR6-50			BIAJS		
		Mean	SE Mean	StDev	Mean	SE Mean	StDev
Education & Training	147	0.6715	0.043	0.5208	0.7623	0.0145	0.1752
Healthcare & Medical	69	0.69585	0.0646	0.5363	0.7781	0.0225	0.1871
Human Resources & Recruitment	38	0.70765	0.079	0.4871	0.6842	0.0357	0.2199
Professional - Other	155	0.70615	0.0414	0.5156	0.721	0.0194	0.2413



**FIG 4:** Interval plot – BIAJS by age group and gender.

\*Insufficient data to plot

Age grouping indicated an overall upwards trend in job satisfaction over age. Trending is similar to resilience scores, with males showing a reduction in job satisfaction scores at ages 45 – 55. Males aged 18 – 24 had insufficient data to plot (Fig 4).

### Consistency analysis

Consistency scores were generated by calculating the absolute value of the first consistency item minus the second, after reversing the negatively scored item. This produced a measure of inconsistency between the items. Dividing results by low inconsistency scores (0, 1, 2) produced an alpha for PR6-50 of 0.9378 (mean = 0.68325, StDev = 0.5488, 95% CI 0.6681 to 0.6984), compared to high inconsistency scores (3, 4) producing an alpha of 0.9356 (mean = 0.6997., StDev = 0.5331, 95% CI 0.6744 to 0.7250).

Consistency measures showed no direct relationships to any of the domains, nor BIAJS. Correlation with resilience was 0.063 (P value = 0.195), indicating no immediate relationship. The consistency measure yields a difference in mean resilience scores, however, analysis of the individual items provided greater clarity regarding underlying relationships. The first item (alcohol consumption) had no correlation with resilience (correlation = 0.005, P value = 0.916), while the second item (worry about alcohol consumption) had a minor inverse relationship with resilience (correlation = 0.114, P value = 0.018).

### DISCUSSION

Building on the original PR6 research, this study showed the development of individual scales for each resilience domain alongside a scale for MTM. The combination of the domain scales gives rise to the full 50-item PR6-50, intended for further research purposes. From these scales, revisions to the OPR6 resulted in the revised 16-item PR6, intended for continued practical use in organisations and clinical practice as a fast resilience measurement that provides insight into each domain of resilience, as well as a forward-looking component through MTM. Domain-level scales may be used together as the full PR6-50, or separately to investigate specific areas.

These scales represent a refinement of the PR6 and the resilience domains, allowing more accurate measurement of the individual aspects that contribute to overall psychological resilience. Following a multi-stage testing format, all scales show strong internal consistency. Consistency between the OPR6 and revised PR6 allow for continuity of

measurement, while providing a slight increase in overall accuracy for future results. In particular, revised COM and COL domain item combinations provide a stronger correlation to the full domain scales. Building on previous research, the COL items now focus on social skills and willingness to invest in new relationships, showing a higher relationship than prior items. Ongoing research indicate further potential neurobiological factors that contribute to certain domains, such as NPY acting through skills within RES, and also HLT factors.

Within the HLT domain, initial PR6 research indicated that sleep quantity may not be most directly related to resilience. Through this study, additional sleep factors were investigated, including ability to fall asleep, perception of sleep quality (being able to sleep well), and also waking up rested. Our analysis showed that the single sleep factor that most contributed to resilience is waking up rested, while the other factors did not significantly contribute. The overall HLT domain thereby now provides an insight into overall perception of health, nutrition habits, exercise regularity, and restfulness of sleep.

PR6 correlation with BIAJS provides evidence of a positive relationship between resilience and job satisfaction. In particular, the VIS domain showed the strongest relationship with job satisfaction.

A potential relationship may exist between age and resilience, showing that resilience improves with age. However, differences between male and female audiences suggest that additional data is required to draw conclusions. Lower participation at the early and later age groups limit analysis, while some dips through the age ranges were observed. A similar trend was observed with job satisfaction, including differences in gender behaviour. However, overlapping CI ranges preclude any meaningful conclusions thus far. Overall, individuals at any

age may exhibit high or low resilience as indicated by current measurements.

In line with the previous paper, there appears to be little difference overall in resilience across gender. Similarly, no statistically significant differences were found in any domain for gender. Occupation does appear to have more significant differences, such as Human Resource workers having more resilience, though lower job satisfaction. Contrast with Education and Healthcare workers (possibly more direct services), where job satisfaction is higher though resilience is lower. Differences between geographical regions provide no conclusive results.

Consistency scores provided a negative result, showing no clear benefit in subdividing responses by low to high consistency ratings. However, differences in items showed that worry about alcohol consumption may have a slight negative relationship with resilience.

## CONCLUSION

This research further adds to the validity of the PR6, and also enables further research through the more comprehensive PR6-50. HLT continues to show a strong correlation with resilience, improving internal consistency while showing additional theoretical mechanistic connections through NPY. This highlights that HLT isn't simply about maintaining physical appearance, but strongly about maintaining a healthy environment for the brain and mind to enable effective functioning of the resilience domains, acting as a foundation for resilience.

The relationship between resilience and job satisfaction may indicate that resilient people enjoy their work to a greater degree than less resilient people. Mechanistically, resilience may assist in creating a mindset through which an individual may derive greater satisfaction from their job, compared to someone with lower resilience. In particular, the strong relationship

between VIS and job satisfaction suggest several possibilities. First, an individual who has more clarity on their own sense of purpose and goals may be more adept at choosing an occupation aligned with their own goals. Second, an individual with this clarity may be able to better connect the goals of their occupation with their own goals, even where an intrinsic relationship might not directly exist.

We note that two VIS items (ability to stay motivated, and belief in ability to achieve goals) provide a 0.764 correlation with the PR6-50, providing a useful proxy for overall resilience purely from the VIS domain. Bandura (1988) viewed self-efficacy as one's belief in their own ability to do well, indicating that this might lead someone to put in greater effort to succeed. This, alongside the high correlation of VIS to job satisfaction, led us to propose that VIS is the most critical domain of resilience. Purpose, meaning and clear goals can therefore be seen as central to the implementation of the other domains of resilience, providing direction and guidance to navigate uncertainty. Difficult decisions and adverse situations can be managed through having greater clarity of personal goals and purpose, which is what VIS would provide. Therefore, all the other domains of resilience effectively work in service of the VIS domain, enabling the realisation of one's own *raison d'etre*. This is further supported by the basic needs, where VIS plays a role in all four of the basic needs – a greater influence than any of the other domains. The other resilience domains thereby provide additional skills and techniques through which an individual can realise their own purpose and goals, fulfilling the basic needs. Acceptance & Commitment Therapy (ACT) developed by Hayes (1999) aligns with the importance of VIS. To this effect, ACT incorporates the concepts of determining what is most important (Harris, 2006), followed by goal setting in alignment with values (Robb, 2007).

Bandura's (1988) work on social cognitive theory identifies factors influencing self-efficacy that connect to the resilience domains, further showing how interaction between the domains contribute to a belief in an ability to succeed. This fuels self-efficacy, underscoring the high correlation of the 'belief in ability to achieve goals' item to overall resilience. The first factor influencing self-efficacy is *experience*, relating to achieved skill mastery through practice. Experience bears close relation to the RES domain regarding mastery of planning for various challenges, COM in relation to practicing emotion regulation skills, TEN in practicing being persistent. The second factor is *modelling*, relating to how seeing others succeed increases our own self-efficacy. Seeing others fail then reduces our self-efficacy. Here, people within our proximity affect our own resilience, where seeing others with low resilience may reduce ours, or vice versa. The third factor is *social persuasion*, relating to direct encouragement or discouragement from others. Support networks that we build through the COL domain therefore needs scrutiny to determine the constructive nature of the network, screening at least for the removal of discouragement. The fourth factor is *physiological factors*, relating to the stress response (sweating, shakes, shallow breathing) and health factors (pain, fatigue), and how they influence our willingness to strive. These are present in the COM and HLT domains, providing a path to manage these symptoms proactively through focused training. All these factors affect self-efficacy, leading back towards the VIS domain supporting a healthy self-image and ability to achieve goals through a deep sense of resilience.

The positive relationship between age and resilience may suggest that wisdom gained over time aids in building the various skills that contribute to the resilience domains. It is not a given, however, that age necessarily increases resilience. The possibility exists that people from previous generations have higher resilience

due to cultural differences at the time. A longitudinal study is required to confirm that age is a causative factor in increasing resilience, and not generational differences. In addition, an individual at any age can show high or low resilience. There is no linear path that individuals progress on. Rather, someone may develop resilience at an early age, or they may never fully develop resilience. This highlights the critical need for resilience education across all the domains to build skills within those who may not build these skills naturally.

We note that the inability of the consistency measurement to provide a meaningful way to adjust for positive impression management may be in the item interpretation. However, the negative result does provide an interesting insight into the relationship between alcohol consumption and resilience. The total lack of relationship between alcohol consumption and resilience indicates that amount of alcohol consumed appears to not affect resilience (precluding alcoholism, which was not measured), while *worrying* about alcohol consumption appears to have an effect. Some level of anxiety or concern about one's level of control over alcohol consumption may indicate broader concerns about one's sense of control (as a basic need), affecting confidence as well as the implementation of the domains of resilience. However, the intention of this research was not specifically set out to measure the effects of alcohol consumption on resilience, so additional research is needed to investigate.

Further research is being conducted with younger age participants, which also includes intervention testing to validate ability to improve resilience early in life. Other future research includes deeper investigation into occupational and gender differences, as well as digital intervention methodologies for various cohorts. Ongoing testing of the six domains of resilience and their contribution to various improved outcomes are of interest. We propose the PR6 be

adopted to a greater extent in organisational and clinical application, alongside the PR6-50 for further research application.

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# Toddler Trauma

## Somatic Experiencing®, Attachment and the Neurophysiology of Dyadic Completion

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**ABSTRACT** *“Aleppo’s orphans replay their trauma with war games in the rubble” Hollie McKay foxnews.com (December 30, 2016.)*

A combination of Somatic Experiencing (SE) and Play Therapy can be effective interventions for post-surgical traumatized toddlers, using Rescue Role Play in a behavioral sequence to achieve neurobiological “completion” of autonomic, survival imperatives that have been thwarted through the experience of traumatic overwhelm.

Comfort-Seeking (CS), i.e., the toddler’s autonomic behavior of safety-orienting and running-to their Primary Attachment Figure (PAF) for soothing at times of threat arousal, is a phylogenetically ordered, neuro-motor, survival imperative (Levine & Frederick, 1997; Porges, 2011) that completes the toddler’s incomplete survival response (Levine, 2010; Levine & Kline, 2007) and renegotiates neuro-integration from primitive, lower brain, survival structures reconnecting with prefrontal social engagement systems (Siegel, 2012), thereby restoring whole brain neural integration and neurobiological homeostasis in the toddler’s nervous system. When CS is followed by PAF-Somatic-Attachment-Soothing (SAS), the toddler’s nervous system can regulate into Quiescent Attunement (QA), a state related to Quiescent Immobility (Porges, 2016; Kozłowska et. al., 2015) where attuned, secure-attachment in the Traumatized Attachment Dyad (tad) is restored, a phenomenon described as Dyadic Completion (DC).

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## INTRODUCTION

This article explores SE with Rescue Role Play with the intent of encouraging triumphant experiences for toddlers to redress neurobiological traumatic overwhelm that occurred at the point of fear-immobilization, in the absence of their PAF. It describes rescue role play within the theoretical constructs of SE, Polyvagal and Attachment theory in the resolution of Toddler Trauma to reconnect the toddler to his PAF in secure, attuned attachment.

Several new terms in the nomenclature of trauma therapy are proposed by combining descriptive terms from SE, Neuroscience, and Attachment theory. Two new theoretical, diagnostic classifications are offered to identify the neurophysiological phenomena of traumatic neuro-dysregulation and whole brain reintegration for traumatized toddlers within the Primary Attachment Dyad (PAD).

Following a literature review and definition of terms, a case study of Little Bill (LB), a 30-month-old, male child with a constellation of symptoms consistent with a diagnosis of Childhood Posttraumatic Stress Disorder, DSM-5: 308.81 (AMA, 2013) will be presented. LB was referred by his General Practitioner for "management of his emotional and psychological problems." Upon interview, it was discovered that LB had experienced post-surgical restraint trauma followed by a state of Tonic Immobility (TI) (Kozłowska, et al., 2015). This traumatic episode inhibited LB's CS behaviors in his then secure attachment to his mother. LB was described as "a normal healthy boy with no communication or behavioral difficulties until he experienced adenoid and grommet surgery." Seven months after his surgery LB's attachment relationship with his PAF had been compromised. His social and self-regulatory behavior had become dramatically dysfunctional.

## THEORETICAL FOUNDATIONS OF TREATMENT

Toddler trauma may be described as homeostatic disruption which involves disintegration of neurological communication between the major structures of the brain, where primitive subcortical brain structures hijack and dominate neural integration to drive survival along a flight/fight/freeze trajectory rather than a socially engaged, interpersonal neurobiological process (Levine, 1997; Siegel, 2012; Porges, 2011).

When attuned attachment is compromised in the PAD, psychopathological imperatives for the toddler can be catastrophic due to the neuro-developmental reliance the child has on their PAF for neurogenesis.

Theoretical principles of SE, Polyvagal and Attachment Theory offer insight on the therapeutic utility of toddlers *running-to* their PAF for neurocognitive/behavioral completion of thwarted flight/escape sequences. *Running-to* the PAF during traumatic activation when coupled with PAF-SAS (Somatic-Attachment-Soothing) may result in DC (Dyadic Completion); a reduction or cessation of attachment perturbation and traumatic symptoms. DC offers a hereto undiscovered phylogenetically ordered, therapeutic option for resolving Toddler Trauma.

The primacy of movement is essential in working with early and pre-verbal trauma. Motor patterns that have been thwarted, overwhelmed or incomplete will color the entire perceptual field of the child and later the adult (Levine 2010, 2015). Hence, transmuted these thwarted motor actions can greatly alter the children's pre-reflective sense of self.

The essence of our core, pre-conscious 'body-self' is explored from an analytic and psychodynamic perspective by Krueger (1989). Krueger exemplifies an emerging view in developmental theory: that the core (pre-conscious) 'body-self' comprises an aggregate experience encompassing a wide range of

(embodied) sensory, kinaesthetic and proprioceptive input. Craig (2002, 2009, 2001) has shown how critical body sensations (interoception) are central to core regulation and as such, to our sense of wellbeing. Indeed, Roger Sperry<sup>2</sup> (1952), made the distinct point that *the fundamental basis of perception derives from motoric potentiality*. It is through engaged movement that each infant generates a pre-verbal sense of “body-self” - a sense of bounded self with agency and power.

After a two-year follow-up, observations indicate that DC offered a behavioral-completion process that resolved LB’s trauma symptoms and restored secure attachment.

### **Comment on Nomenclature**

In response to advances in diagnostic neuroimaging, a paradigm shift in psychotherapy and developmental science from cognitive/behavioral to neurobiological has evolved (Schore, 2012; van der Kolk, 2014). New theories, psychotherapies and diagnostic and phenomenological terms are emerging. SE, a psychobiological model based on survival behavior of wild animals was developed by Levine in 1997. His foundational work precedes much of the new theoretical paradigms. Levine and Frederik (1997) and later Siegel (2010) and Porges (2011) and others proposed therapeutic phenomenon unknown to trauma therapists and an entirely new paradigm in trauma therapy emerged (Schore, 2012). The reader may recognize that there are multiple terms to describe phenomenon in the nomenclature. For example, Siegel’s (2012) Interpersonal Neurobiology, Porges’ (2016) Connectedness, Tronic’s (2007) Mutual Regulation Model, and Schore’s (2012) Interactive Regulation are all neurobiological descriptors of aspects of “Attunement” in attachment theory.

By generating phenomenon-specific terminology for SE treatment protocols, the authors seek to refine the nomenclature of trauma-based

psychopathology and to sponsor research initiatives that specify subtypes and broaden the range of effective interventions to treat toddler trauma.

Coined terms in this document generally combine theoretical descriptors within theories of SE, Polyvagal and Attachment Theory.

### **Key to Acronyms**

SE Somatic Experiencing  
CS Comfort Seeking  
PAF Primary Attachment Figure  
SAS Somatic Attachment Soothing  
*tad* Traumatic Attachment Dyad  
DC Dyadic Completion  
PAD Primary Attachment Dyad  
TI Tonic Immobility  
TA Traumatic Attachment  
TAD Traumatic Attachment Disorder  
DTD Developmental Trauma Disorder  
CRN Core Response Network  
QA/PAF-SAS Quiescent Attachment & Primary Attachment Figure-Somatic Attachment Soothing  
QI Quiescent Immobility

### **Coined Terms**

The following terms were necessary to define a neurobiological and attachment related process in a more nuanced form: Traumatic Attachment (TA); Traumatic Attachment Disorder (TAD); Attachment Perturbation; Attachment-Neuroception; Traumatized Attachment Dyad (*tad*); Comfort-Seeking (CS) & ‘*Running to*’; Attachment Soothing; Somatic-Attachment-Soothing (SAS); Quiescent Attunement (QA); Dyadic Completion (DC) and Rescue Role Play.

**Note to the reader.** *As the concepts offered are highly interrelated, a linear relationship when defining terms was not possible. To have a full appreciation of the use of terminology the reader may need to read all the definitions as a collective whole and return to the terms when reading the case study. A literature review is congruent with descriptive terminology and will enhance the reader’s appreciation of theoretical constructs.*

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<sup>2</sup>Pioneering neurophysiologist and winner of the 1981 Nobel Prize for Physiology and Medicine.

## Two new diagnostic classifications

### **Traumatic Attachment (TA)**

TA may be a specific, identifiable, trauma-related, subcategory of Attachment Relationships in Attachment Theory which describes the dynamic perturbations between the participants in a Traumatized Attachment Dyad (*tad*).

### **Traumatic Attachment Disorder (TAD)**

TAD encapsulates the dynamic interpersonal, neurobiological dysregulation processes of the *tad* after trauma for one or both participants that ultimately leads to psychopathology for both.

### **Trauma**

Trauma is not in the event but in the nervous system (Levine, 1997) and often occurs when threat immobilization, Freeze becomes coupled with Fear (Porges, 2011; Levine, 1997).

### **Patterns of Attachment**

Ainsworth (1978) identified three patterns of attachment; Secure Attachment, Anxious Attachment and Avoidant Attachment.

### **Disorganized Attachment**

Toddlers show confusion toward the PAF (Primary Attachment Figure) and may shift between Anxious and Avoidant attachment. The attachment relationship is characterized by harm, dangerous erratic behavior, and extreme lability by the PAF (Main & Solomon, 1986). Siegel (2012) observed that, “specific overwhelming events may produce marked effects on the developing mind”... where integrative function is compromised and trauma may produce... “a narrowing of the windows of tolerance for certain emotional states (such as anger, fear and sadness)” (p.330). When one is outside the ‘window of tolerance’ enervated action of the amygdala up-regulates limbic brain function into flight (fear), fight (anger), or fear/immobilization behaviors in response to trauma triggers. Within the window of tolerance, a person can fluidly regulate between excitation and relaxation without moving into extremes or getting fixated in any one pattern of repetitive maladaptive arousal (Levine, 1997).

### **Connectedness**

A biological imperative of neurobiological mechanisms that links social behavior to both mental and physical health (Porges, 2016). Reestablishing connectedness is fundamental to restoring secure attachment after trauma.

### **Attachment Perturbation: Stage 1. in the trajectory towards psychopathology**

Attachment Perturbation occurs when confounding behavioral/affective changes in the PAD disrupts *connectedness* after a traumatic episode where “the child’s dissociation in the midst of terror involves numbing, avoidance, compliance and restricted affect” (Schore, 2012, p. 266). Security in the attachment bond is eroded, allowing the evolution of ‘mutually dysregulating’ (Tronic, 2007) attachment perturbations. TA follows where “security of the attachment bond is the primary defense against trauma-induced psychopathology” (Schore, 2012, p. 293).

Diagnostically, Attachment Perturbation may be the first symptom reported by the PAF, manifesting in their inability to make sense of the toddler’s social and self-regulatory behavior. Early symptoms of trauma might easily be overlooked along the trajectory of evolving psychopathology resulting in misdiagnosis of neurocognitive and behavioral disorders rather than trauma induced disorders.

### **Traumatized Attachment (TA): Stage 2.**

TA is the early onset of subclinical psychopathology of Traumatized Attachment Disorder (TAD), Developmental Trauma Disorder (DTD) or Childhood PTSD. Perturbation in the attachment dyad includes the loss of secure connectedness, attunement, reciprocity, synchronicity, love and trust (Porges, 2016). TA may kindle the emergence of oppositional behaviors in one or both members of the PAD after a mutually dysregulating traumatic episode (Tronic 2007).

### **TA: a specific subset in Attachment Theory**

TA succinctly identifies the perturbing dynamics of the Traumatized Attachment Dyad (*tad*) and may be identified as a specific trauma based

subset of attachment rupture in Attachment Theory. Untreated, TA becomes entrenched and driven by traumatic perturbation as described in the Polyvagal Syndrome (Porges, 2016) which is the antithesis of secure attachment. Over time, TA becomes entrenched in the neural networks of both toddler and PAF where interpersonal neurobiological attunement that promotes healthy neurogenesis, synaptogenesis and myelinogenesis is compromised. This process, reinforced by ongoing mutually dysregulating behaviors in the PAD may develop into psychopathology for both.

**Traumatized Attachment Dyad (*tad*)** Stage 3. After a traumatic episode, the PAD devolves into subclinical symptoms of psychopathology that may be confounding and difficult to diagnose. The attachment bond departs from connectedness, neuroceptive attunement and security. *tads* may increasingly narrow the window of tolerance (Siegel, 2012) inhibiting capacity for integration and mutual regulation of arousal (Tronic, 2007). The developmental trajectory of the toddler's mind may evolve towards dysfunctional attachment styles (Schore, 2012, p. 263) that may be mutual and inclusive regardless of which partner in the dyad is traumatized (Tronic, 2007).

**Traumatic Attachment Disorder (TAD):** Stage 4. Toddler brains are developing structures dependent on the regulating brains of their PAF in a rapid growth ecology described by Siegel (2012) as an interpersonal neurobiological attachment dyad.

The attachment dyad is both fragile and robust under specific circumstance or situations, i.e., fragile to threat events where the PAF is unavailable to regulate fear arousal during threat activation and immobilization episodes; and robust in the interpersonal regulatory mechanisms of a "good enough" attachment bond with the PAF, (Brethererton & Munholland, In Handbook of Attachment, Cassidy & Shafer, Eds. (2008). TAD manifests though entrenched, mutually disruptive, behaviorally reinforced, emerging

symptoms of psychopathology driven by attachment perturbations and TA that significantly impact both participants in the dyad (Tronic, 2007). TAD includes loss of connectedness, synchronicity, reciprocity and neuroceptive attunement and requires therapeutic intervention to prevent pathological attachment style and individual mental health disorders for both participants.

### **Neurological Trajectory of Pathology**

The interpersonal neurobiology of attunement between PAF and child, "stimulate the neural activity that link differentiated areas to one another, which in turn...promote...neurogenesis, synaptogenesis, and myelinogenesis that...literally create a more integrated set of neural circuitry" (Siegel, 2010, p. 228).

If one or both members of the PAD are traumatized, then 'the trauma' is not only in the nervous systems of the individuals but is also in the interpersonal neurobiology of the PAD. Neurogenesis, synaptogenesis and myelinogenesis are compromised in the prefrontal social engagement networks and enervation of the amygdala impacting flight/fight/freeze networks of the lower brain develop disproportionately resulting in neurodevelopmental disorders (Schore, 2012: Siegel 2012).

Hijacked by an enervated amygdala, locked into a limbic brain survival loop of vigilance and/or immobilization, soothing and social connection in the dyad is thwarted and the toddler may not develop social engagement networks vital for survival or social interconnectedness.

DC (Diadic Completion) restores secure attachment and normal neurodevelopment resumes.

### **Neuroception**

Porges (2011) describes neuroception as "how neural circuits distinguish whether situations or people are safe, dangerous or life threatening" (p. 11). The neuroceptive features of DC may be an important aspect of healing from toddler trauma. Porges, (2016) hypothesizes that faulty

neuroception might lie at the heart of several psychiatric disorders. Traumatic, early life experience can compromise future neurodevelopment and neuroceptive capacity, and often manifest as boundary issues in adult psychopathology.

The traumatized infant cannot neurocept independently and their ability to regulate arousal for social engagement, even in nonthreatening environments, is compromised (Ogden, 2015).

### **Attachment Neuroception**

Levine (2007) asserts the PAF acts as the ventral vagal, social engagement, soothing system for an infant's nervous system until it is myelinated and can regulate itself. The PAF relays to the toddler whether situations and people are safe, dangerous or life threatening. Attachment neuroception is particularly relevant in toddler soothing during medical procedures where the toddler's unmyelinated neuro-survival networks cannot independently neurocept during experiences of pain, immobilization and fear.

Attachment-neuroception, a co-regulating process (Tronic, 2007), may be phylogenetically ordered as a survival behavior compelling the PAF, when stimulated by the distress cries of their infant, to seek proximity and initiate protection and soothing. Traumatic arousal of the "Fear and Defense Cascade" described by Kozłowska, et al., (2015) may be arrested by Attachment-Neuroception at the point of fear arousal thereby avoiding toddler trauma altogether, an important reason to have emotionally regulated PAFs involved in post-operative recovery.

### **Developmental Trauma Disorder (DTD)**

van der Kolk (2014) asserts that children who have experienced developmental trauma through abandonment, neglect or physical/sexual abuse, suffer from a specific array of clinical symptoms leading to DTD. Many crossover symptoms may promote misdiagnosis. Careful history taking can reveal the key defining elements of DTD that can occur within a traumatic episode which is often first observed as posttraumatic

attachment perturbation.

The authors propose that posttraumatic attachment perturbations might be included in the sequela of diagnostic criteria describing DTD.

### **Interoception**

Interoception is the ability to sense internal states and bodily processes (Craig, 2009; Porges, 2011). It is the bottom-up/top-down interoceptive, kinesthetic, proprioceptive, experience of internal states perceived "through interoceptors located on the heart, stomach, liver and other organs inside the body cavity" (Porges, 2011, pp. 76-77). In SE, therapeutic interoception involves guiding the toddler's attention to "instinctive, bodily based protective reactions when dealing with stress and trauma" (Payne, et al., 2015, p.1).

Interoception, involves the insula and anterior cingulate portions of the middle prefrontal areas of the brain connecting and becoming active (Craig, 2009). Siegel (2012) proposes that this integration process is related to self-awareness and "may be the gateway to becoming conscious of our emotions" (p.161).

### **Polyvagal Theory**

The Polyvagal Theory describes a phylogenetically ordered survival relationship between the 10<sup>th</sup> Cranial or Vagus Nerve, the Autonomic Nervous System (ANS), Sympathetic Nervous System (SNS) and Parasympathetic Nervous System (PNS). It is an enervated process of neuroception and interoception (Porges, 2016). The vagus nerve is the bridge between brain and body that mediates mobilization/immobilization and is also involved in neuro-regulation of the organs. Neuroception/Interoception involves the top-down (cortex) and bottom-up (Somatic/ANS) neuromotor regulation of three states of survival; Social Engagement, Danger and Life Threat.

### **Polyvagal Syndrome in Toddler Trauma**

Development of social engagement systems involves right brain function (Schore, 2012) and the ANS (Porges, 2011). The human brain evolved to survive dangerous and life threat

situations as a phylogenetic imperative for survival but simultaneously evolved social engagement systems for procreative pair-bonding and protection in groups. “To accommodate both fight-or-flight and social engagement behaviors, the new mammalian vagus evolved to enable rapid, adaptive shifts in autonomic state” (Porges, 2011, p.121).

### **The Polyvagal Network and Dyadic Completion**

Porges (2011) describes the polyvagal network as “phylogenetically ordered and *behaviorally linked* to social communication (e.g., facial expression, vocalization, listening), mobilization (e.g., flight/fight behaviors), and immobilization, (e.g., feigning death, vasovagal syncope, and behavioral shutdown)” (p.54). The behaviorally-linked process of mobilization in flight to safety i.e., safety orientation and *running-to* the PAF for attachment-soothing, is therefore a neurobiological platform for therapeutic intervention validated by evolution.

Forced immobilization, in a state of terror overwhelmed LB’s social engagement networks that shifted to SNS arousal such that he could not be soothed by his mother. In an escalating state of overwhelm, LB’s Dorsal Vagal branch of the PNS shut him down into a state of TI which impaired connectedness in his attachment with his PAF.

In contrast, if a toddler has access to their regulated PAF during or shortly after traumatic overwhelm, then mutual, affective, somatic, interpersonal and neurobiological soothing will follow in a phylogenetically honored, automatic evolutionary mechanism identified as DC.

### **Ventral Vagal System, Social Engagement**

Social engagement requires immobilization without fear, which involves the right emotional brain, the Ventral Vagal Complex and the social engagement networks of the cortex. Social engagement requires sympathetic arousal and oxytocin for states of pleasure and confrontation (Porges, 2011). Mediating pleasurable excitation and confrontation without moving into survival states of fight, flight, and freeze

allow humans to stay in connection during higher states of sympathetic charge. In threat situations, it also allows humans to vocalize as a first strategy of distress, rather than moving immediately toward a more primitive survival strategy of fight and flight (Porges, 2011).

Schore (2012) observes that the essential task of the first year of life is the establishment of a secure attachment bond between infant and primary care giver. This process is dependent on, “the mother’s sensitive psychobiological attunement to the infant’s dynamically shifting internal states of arousal” (p.75).

### **Hedonic Valences In SE**

Procedural memory initiates “*approach or avoidance*” or “*attraction or repulsion*” (Levine, 2015, p. 26). Hedonic Valences involving the motor cortex influencing the toddler’s orientation to safety and nourishment and avoidance of threat through “motor acts of stiffening, retracting and contracting” (p. 26). In SE for toddlers the therapist *observes for and tracks* the toddler’s hedonic valences to determine their levels of sympathetic (survival) activation towards Comfort-Seeking or threat avoidance.

### **SIBAM**

SIBAM represents Sensation, Image, Behavior, Affect and Meaning (i.e., cognitive interpretation) (Levine, 1996, 2015). These elements of experience are targets of SE interventions. For LB, fear (**Affect**), was observed as fixed action patterns of facial fear expression, bracing, contracting, retracting, fighting, fleeing, freezing and maintaining territorial boundaries in combination with the phylogenetically ordered survival (**Behavior**) of *running-to* his PAF for soothing, to discharge traumatic arousal states in the toddler’s Core Response Network (CRN). Repeated, titrated sequences of exploration of this sympathetic flight behavior for safely *running-to* the PAF followed by QA/PAF-SAS may complete survival responses and reinstate dyadic attunement, connectedness and (**Meaning**) in DC and secure attachment “I am safe, mummy will protect me.”

## Completion

“The drive to complete and heal trauma is as powerful and tenacious as the symptoms it creates. The urge to resolve trauma through re-enactment can be severe and compulsive” (Levine, 1997, p. 174). SE uses the term **completion** to describe therapeutic de-potentialization of extreme, arousal states following trauma that completes a biological defensive response (Levine, 2015; Payne et al., 2015). SE involves neurobiological activation of procedural traumatic memory that accesses polyvagal survival responses and then by titration, gently discharges and reorganizes, physiological survival energy that drives perturbation. This occurs through careful tracking and organization of arousal states that can reinstate implicit traumatic memories into hippocampal (autobiographical) timeline-like ordinary memories. The authors contend that the traumatized toddler’s ‘completion’ also must involve reinstatement of the attuned, secure attachment bond in the processes of DC.

## Quiescent Attunement (QA)

QA is an essential step in the process of DC that occurs when the toddler’s nervous system attunes to physical touch and directly accesses the feeling of their PAF’s regulation. QA is the toddler’s response to PAF-SAS after arousal and discharge of incomplete survival responses. QA is characterized by mutual stillness, whole-body muscle relaxation, and an obvious, blissful expression of attuned connectedness in relaxed safety, security and attachment-neuroception.

## Dyadic Completion

DC offers a new SE trauma intervention, engaging behaviorally based, action patterns of completion. This is evidenced in the case of LB by *running-to* his PAF for SAS after fear arousal where *running-to* is the toddler’s preferred movement pattern for completion.

Some toddlers may want to leap, crawl, roll or any other variation of sympathetically generated movement in their sequence towards DC. After titrated activation of traumatic memory, hedonic valence sequences may discharge through the toddler’s over-stimulated CRN. After discharge, QA /PAF-SAS reinstates attuned connectedness

and attachment neuroception.

For a child stuck in the survival sequence, the SE therapist can access fear arousal through tracking body-based hedonic valences of trauma-driven procedural memory. Initiation of the “fundamental organismic approach process” (Levine, 2015 p. 26) of DC i.e., *Running-to* as the behavioral element of SIBAM ensures that attuned connectedness is restored via PAF-SAS resulting in implicit trauma memories being shunted into the hippocampus as for normal narrative, time-line memories.

## THE SURVIVAL SEQUENCE OF DYADIC COMPLETION

LB was somatically tracked through his survival sequence to Exploratory Orientation. The trajectory of the survival sequence is as follows:

**Threat orientation**, the focus of the senses towards the source of the threat

**Fear arousal**, the neuro-emotional response to threat (real or perceived) is driven by sympathetic arousal toward flight/fight

**Survival orientation**, focus of the senses towards safety proximity (LB towards PAF)

**Comfort seeking**, fear, visual orientation, arm reaching and *running-to* the PAF

**PAF-SAS**, the PAF soothes LB with loving embrace touch, face to face, eye contact, soothing voice, stillness (QA) and/or gentle rocking

**Quiescent Attunement**, LB’s relaxed attuned stillness in the SAS embrace of his PAF

**Dyadic Completion**, Restoration of attuned secure attachment

**Return to Exploratory Orienting**, which is a relaxed but ready state. Exploring the environment, to engage in social relationships without overwhelm. Parasympathetic rest and digest, whole brain functioning is restored.

Levine (2015) asserts, “These compelling instinctual emergency responses play a crucial role in the formation and resolution of traumatic memories” (p.25), they are a vital component for future neurogenesis and psychosocial development.

### **Dyadic Completion: Theoretical Construct**

Toddler trauma derails secure attachment requiring a renegotiation of the disrupted PAD. It is hypothesized that perambulating toddlers can access and reinstate healthy whole brain integration through the neuro-motor functions of the CRN during Rescue Role Play of ‘escape from threat’ i.e., flight, manifest in *running-to* their PAF for safety in the journey towards DC. DC completes the behavioral survival responses of flight and connectedness (Levine, 1997). Secure attachment can be reinstated in the somatic impulses and motor sequences that emerge in the processes of PAF-SAS and QA. This process not only regulates the toddler’s overwhelmed polyvagal and CRNs but also reinstates the dysregulated interpersonal neurobiology of the secure PAD.

### **The Fear and Defense Cascade**

The Fear and Defense Cascade, Kozłowska et al., (2015) involves phylogenetically ordered neurobehavioral survival processes of “arousal, flight or fight, tonic or collapsed immobility” (p. 1). Kozłowska et al., hypothesize that “Freezing” is the “flight-or-fight response put on hold” (p. 3) and is initiated as the last survival resort to inescapable situations. For perambulating toddlers ‘unfreezing the flight response’ is a vital therapeutic intervention window between fear-arousal and DC, initiated by *running-to*.

While completion occurs in the CRN of the individual toddler, young children rely on the interpersonal neuroregulatory processes of QA/PAF-SAS to achieve DC. Simply put, the younger the child, the more reliant they are on PAF-Neuro-regulation to soothe fear arousal.

When a toddler is stuck in the defense cascade, therapeutic intervention by targeting procedural memory through the elements of SIBAM in SE offers a mechanism for individual neurological completion and restoration of attuned attachment.

### **The Core Response Network (CRN)**

The CRN comprises four subcortical structures including: the Autonomic Nervous System, the

Reticular Arousal System, the Emotional Motor System and the Limbic System. These systems “respond to environmental challenges prior to extensive cortical processing” (Payne, et al., 2015, p. 3). By inference, the toddler’s underdeveloped social networks are less likely to be involved in resolution of traumatic overwhelm whereas, somatic interventions involving proprioception, interception and kinesthetic-soothing are more likely to regulate their dysregulated CRN (Payne, et al., 2015) to reinstate parasympathetic states of attuned connectedness and attachment neuroception.

The Australian Childhood Foundation, (2011) writes that the Mutual Regulation Model (MRM) Tronic (2007), “consists of sensory stimulation, light and vestibular movement (rocking in a forward-backward manner), or proprioceptive movement, posture and the introduction of calming spaces are further activities that have been shown to promote sensory integration which influences neuroception of safety” (p. 5). Reinstating attachment-neuroception is a vital clinical intervention when treating the *tad*.

### **Primary Attachment Figure-Somatic Attachment Soothing (PAF-SAS)**

PAF-SAS is the spontaneous emergence or therapist-guided use of soothing-touch, voice and movement by the PAF to initiate connectedness and attachment neuroception which may also mutually regulate (Tronic, 2007) the CRNs of the *tad*. In gentle hands-on touch to areas of traumatic activation (bracing, contracting, freezing etc.), soothing (kinesthetic) cuddles and (proprioceptive) rocking the PAF offers comforting voice to reengage the toddler’s social networks. The PAF reinstates sympathetic/parasympathetic homeostasis resulting in down-regulation of polyvagal arousal networks of the CRN.

Toddler CS in the threat arousal sequence followed by QA/PAF-SAS is more than contingent communication (Seigel, 2004), it implies the urgency of a trauma/survival imperative. The urgent response to soothe a child’s distress cry, to protect, may also be a phylogenetically ordered survival mechanism.

The PAF's timely response is vital to regulate the toddler's state of sympathetic arousal and to ensure their own survival, embodied in the biological success of their genetic lineage. The observer only needs to witness a mother/child reconnecting during QA/PAF-SAS, as in the baby Jack demonstration by Levine (2012), see (Levine, 2015, p 90-91) to understand the affective intensity of healing attunement between the players in the PAD.

### **Rescue Role Play**

Rescue Role Play is the therapeutic conduit between the traumatic episode and DC. Resolution involves accessing procedural memories to "renegotiate" trauma (Levine, 2015, p. 37).

The re-working or renegotiation of a traumatic experience represents a process that is fundamentally different from traumatic play or re-enactment. Left to their own devices, most children, will attempt to avoid the traumatic feelings that their play evokes. But with guided play, *LB was able to "live his feelings through" by gradually and sequentially mastering his fear.*

Titration tracking of SIBAM using interoception accesses procedural memory and allows for discharge of excess physiological survival energy and completes protective imperatives (Payne et al., 2015). The traumatized toddler can "engage *innate movement programs* (action patterns), which are charged by evolution to carry out actions that are necessary for our survival and well-being" (Levine, 2015, p. 37) where *Running-to* may be a significant "*innate movement program.*"

A medical doll was used to stimulate survival responses and initiate LB's motor memory and agency for behavioral action. Survival responses may be objectified and titrated through rescuing a doll in play and *running-to* the PAF at points of activation. Using this stepwise renegotiation of the traumatic event and helping the medical doll LB was able to emerge as the victor and hero. A sense of triumph and heroism almost always signals the successful conclusion of a

renegotiated traumatic event. By following LB's lead (after setting up a potentially activating scene), joining in his play, and making the game up as we went along, LB got to de-potentiate his fear circuitry. In this example, it took minimal direction and support to achieve the *unspoken* goal of aiding LB to experience a corrective outcome. In this way, as LB's motoric potentiality changed, so did his embodied perception of the world, from dangerous to safe, exciting and inviting (Seigel, 2010; Porges, 2011).

The therapist's role in this process is to observe, track and titrate levels of activation (Levine, 2015). The SE therapist follows or guides play towards completion through emergent triumphant experiences where interoceptive/neuroceptive attachment processes reconnect the toddler in the PAD through CS and survival based neuromotor programs such as *running-to* the PAF. When a survival sequence is followed by QA/PAF-SAS, Attuned Connectedness and secure attachment in the PAD is reinstated in the sequence of DC.

### **Tonic Immobility (TI)**

TI is a cascade of autonomic neurological and physiological responses after heightened arousal that can include life threatening arrhythmias, decrease in temperature and respiration which is characterized by bradycardia combined with hypertonicity of skeletal muscles involving the neural circuits of the amygdala, hypothalamus, and periaqueductal grey (Kozłowska et al., 2015; Porges, 2011). "Victims describe subjective experiences of fear, immobility, coldness, numbness and analgesia, uncontrollable shaking, eye closure, and disassociation (derealization and depersonalization), as well as a sense of entrapment, inescapability, futility, or hopelessness" (Kozłowska et al., 2015, p. 10).

### **Quiescent Immobility (QI)**

Kozłowska et al., (2015) define quiescent immobility as "a state of quiescence that promotes rest and healing" (p.1). "Mammals immobilize themselves for essential prosocial activities, including conception, childbirth, nursing, and the establishment of social bonds"

(Porges, 2011 p. 14).

### **Quiescent Attunement (QA)**

QA was first observed by the primary author of this paper in the 'Baby Jack' demonstration video conducted by Levine (2012, 2015). After activation and completion Jack surrendered into the embrace of his mother for the first time, a physical, chest-to-chest melding between Jack and his PAF. It was a reorganization of the instinctual somatic attachment between new born and mother "after birth...heart against heart" (Fisher, 2017, p. 103). QA seems to carry the affective states of bliss in attuned reconnection. This process is even more dramatic in consideration of Jack's distress and physical bracing only moments before. In its most effective form the toddler lays chest to chest with the PAF in a complete state of QI, characterized by stillness and contentedness in an obvious attunement process. The authors contend that QA is an essential re-attunement of the attachment bond and necessary for DC.

### **THE SEQUENCE OF TODDLER TRAUMA AFTER SURGERY**

Postsurgical Toddler Trauma is often observed as a failure to thrive, oppositional behavior and affect dysregulation. It manifests in traumatic overwhelm and attachment perturbation which erodes attuned connectedness and attachment neuroception.

Trauma may occur because the underdeveloped toddler's nervous system interprets surgery as an inescapable, predatory attack (Levine, 2010) that can result in TI, "a terminal defense when flight or fight has failed" (Kozłowska, et al., 2015, p. 7). Toddlers require the regulated brain of their PAF in the process of neuropsychobiological attunement to regulate fear arousal. When an overwhelmed toddler's distress calls fail to elicit the required PAF-Attachment Soothing, TI may occur. Attachment perturbations that can develop into psychopathology may follow (van der Kolk, 2014).

Toddler trauma, even in secure PADs can result in attachment perturbation (van der Kolk, 2014) that may resist normal repair (Shore, 2012) where "disrupted attachment wires in a vulnerability to trauma" (Fosha, 2010, p. 43). Incomplete fear/immobilization episodes may compromise "hard wired emergency responses" and "hedonic valance" (Levine, 2015, pp. 25-26) where the traumatized toddler no longer perceives their PAF as secure. Attuned connectedness in the PAD is compromised. If attachment perturbation is untreated it may lead to psychopathology for one or both participants in the PAD (Tronic, 2007).

### **Theoretical Rational and Evolution of the Case Study**

Childhood trauma is routinely misdiagnosed (van der Kolk, 2014). In response to the growing prevalence of developmental disorders van der Kolk (2014) proposed the diagnosis Developmental Trauma Disorder (DTD), to identify children who have experienced developmental trauma as the consequences of traumatic attachment/disruption experienced in early childhood. DTD eloquently and succinctly identifies the trajectory of childhood psychopathology in the trauma based spectrum. The authors propose including '*early childhood post-surgical trauma*' on this list of diagnostic descriptors of childhood trauma-initiating events that may lead to DTD.

The authors offer evidence of congruence with DTD in the proposed diagnostic precursors of TA and TAD that inferentially precede the diagnosis of both Childhood PTSD and DTD when attachment perturbation evolves through an overwhelming fear/immobilization event. Charles Darwin first observed immobilization as contrary to optimal survival when he wrote "prolonged escape or avoidance behaviors would put the animal at a disadvantage" (Darwin, (1872) In van der Kolk, 2014, pp. 75-76). In other words, trauma is getting stuck in the implicit neurological firing of kindled avoidance/escape and fear/immobilization signaling (Levine, 1997). Shore, (2012) asserts that "attachment processes lie at the center of all human, emotional and social functions" (p. 27).

For overwhelmed toddlers, trauma may be healed when healthy neurodevelopment is reinstated through DC and secure attachment.

### **Misdiagnosis**

Childhood PTSD, and by inference postsurgical infant trauma, is often undetected or misdiagnosed as conduct disorders (van der Kolk, 2014) and is well established as risk factors in adult psychopathology (Schimmenti & Bifulco, 2015; MacDonald, et al., 2008). The pathological trajectory of toddler trauma is poorly understood by clinicians and often leads to misdiagnosis or the possibility of confounding multiple diagnoses of Neurodevelopmental, Neurocognitive and Conduct Disorders.

Mainstream acknowledgement of the growing prevalence of Childhood PTSD indicates the need for effective childhood treatments as well as expansion of intervention options and refinements on established therapies, such as SE (Levine & Kline, 2007; Levine, 2010), to address specific presentations.

### **DSM-5 Diagnostic Features of Childhood PTSD**

The APA in DSM-5 (2013) recognizes medical trauma in childhood PTSD, specifically "medical incidents that qualify as traumatic events involve sudden, catastrophic events, (e.g., waking during surgery, anaphylactic shock)" (p. 274). The authors propose that for postsurgical-recovery/waking toddlers when experiencing terror, pain, disorientation, immobilization and/or restraint (inescapable, predatorial attack), without a regulated PAF present to soothe them may also be considered a "*sudden, catastrophic event*" and therefore be included in DSM-5 Diagnostic Features for Childhood PTSD (p. 274).

The APA, in DSM-5 (2013) makes no mention of neurological antecedents for childhood trauma and makes no reference to the role of attachment in the neuroregulation of early life traumatic experiences. Similarly, the APA appears to have adapted an adult disorder to Childhood PTSD that was primarily introduced into DSM-III, (1980), due to the prevalence and

symptom consistency across war traumatized soldiers, historically and after the Vietnam War. Conversely, the diagnostic criteria for TA, TAD and DTD is based on observable features of attachment perturbation after trauma and considers neuro-developmental and attachment variables in the diagnostic criteria.

Modern attachment, neuroscience and trauma theorists, Fisher (2017); Levine (2010); Ogden (2015); Porges (2011); Shore (2013); Siegel (2012); Tronic (2007); van der Kolk (2014) recognize the link between neurophysiology, attachment and childhood trauma in developmental psychopathology. The authors propose that future diagnostic criteria must therefore consider post-trauma-perturbation, neurophysiology and attachment dynamics to identify, diagnose and treat early childhood trauma.

### **PAF Utility in Postoperative Recovery**

The authors propose that hospital surgical teams include procedures that allow PAFs to be present with their infants to prevent postsurgical trauma.

The assumption that the PAF will regulate a distraught child may not always hold true. Regulation of sympathetic responses where the PAF may be dysregulated, or emotionally unavailable and therefore of little use in regulating their toddler is a significant consideration. Psychoeducation for parents and preconditioning the toddler before surgery (Levine & Kline, 2007) is an obvious option. However, preparation may not always be possible as in the case of emergency surgery. Providing an *Attachment-postsurgical-nurse*, specially trained in somatic soothing may be one possible solution.

### **Prevalence of Childhood Trauma**

The APA in DSM-5 (2013) recognized that the prevalence of preschool childhood trauma may be underestimated because previous criteria were "insufficiently developmentally informed" (p. 276).

Early childhood trauma may be more common than previously understood given an estimated

eighty-five percent of adult mental health problems correlate to attachment disruptions in early or mid-childhood (Siegel, 2012).

Psychiatric medicine has recognized the significance of early childhood trauma in the long-term mental health of those impacted by expanding the diagnosis of PTSD 309.81 in DSM-5 (2013) to include children under the age of six. This inclusion into the mainstream of categorization of psychiatric illness, is a significant validation of the growing realization regarding the catastrophic impact of trauma on the mental health of children and the evidence that adverse experiences in early life can result in adolescent and adult psychopathology.

The Hunter Institute, the Australian Psychological Society (APS) in conjunction with Early Childhood Australia (ECA) published a position statement on 'The Importance of the Early Childhood Years' (Lawrence, et al., 2015) where they identified the significant role of relationships and the environment in brain development for early childhood. "Children who are born into chronic violence develop more connections in the part of their brain dedicated to fear, anxiety and impulsive actions"... making them..."hypervigilant and wary" (Moore, 2014, p.2). In Australia, it is estimated the 14% of children and adolescents aged 4-17 i.e., 560,000 children have clinically significant mental health issues (Lawrence et al., 2015) and 7% experience difficulties that are long-term (Australian Bureau of Statistics, ABS, National Health Survey, 2006).

Childhood trauma overwhelmingly emerges in the context of attachment perturbation due to PAF mental health issues. van der Kolk's (2014) predicted a 'tsunami' of developmental disorders emerging from infant exposure to PAF anxiety, depression, adult trauma presentations, drug or alcohol issues, influences of interactive screen technology, domestic violence, natural and man-made disasters such as war or famine as well as those precursors listed by van der Kolk, (2014) which highlights the scale of early childhood exposure to PAF trauma.

Developmental trauma is described by van der Kolk (2014) as "the hidden epidemic" (p. 149). Apart from SE (Levine, 1997, 2010, 2017), Sensorimotor Psychotherapy (Ogden, 2015) and Mindsight (Siegel, 2010), well developed, effective therapies that address child traumatic development and attachment have been limited, particularly for preverbal infants where brain growth is dramatic and verbal communication is limited (Tronic, 2007).

### **Secure Attachment and the Mutual Regulation Model (MRM)**

From observing Tronic's (2007) 'mother in still-face' perturbation demonstrations, it is evident that the PAF/infant interaction that governs infant emotional and neuro-regulation is dependent on mutually attuned, eye to eye, face to face, skin to skin, voice to voice, soothing behaviors between both parties in the PAD. Active, interpersonal, neurobiological and regulating attunement (Siegel, 2012) between infant and PAF, as Tronic proposes in "mutual regulation," is a model of dyadic attachment.

In a secure, PADs mothers were placed before their infant and requested to hold a 'still face' and remain unresponsive to the child. The child, when confronted with the still face of their mother, is quickly overwhelmed into distressed behaviors (such as turning away, arching, agitated tongue movements, drooling, and going slack). This interpersonal experiment highlights the significant reliance young children have on their PAFs to regulate affect and behavior with voice, face and touch. The rapid and dramatic affect-dysregulation that occurs for infants during mother-in-still-face directs speculation at two issues.

**Firstly**, if the impact of a few moments of unresponsive maternal-still-face in an otherwise secure PAD, can have such a dramatic dysregulating impact on the infant, what magnitude of attachment-perturbation can postsurgical trauma have on the traumatized toddler who does not receive PAF-Attachment-Soothing during fear/distress crying?

**Secondly**, by inference, when applied to post-surgically traumatized infants, the MRM may validate PAF psychopathology as a precursor to infant/toddler trauma. Further, a distraught and dysregulated PAF in the PAD, coupled with a traumatized toddler, generates massive attachment perturbation, a fertile platform for development of TA, TAD, DTD, childhood PTSD and PAF psychopathology.

### **Infant/Toddler Neurodevelopmental Distinctions**

The authors make a distinction between infants and toddlers.

An infant becomes a toddler when mid-brain neurobiological, limbic structures and motor functions manifest when the capacity to consciously use limbs to seek safety or avoid threat, are functionally available to the toddler. Perambulation, self-determined running from danger (flight) or *running-to* the PAF in CS indicates that the infant, from a neuro-functional and therefore survival point of view, has become a toddler.

### **Impact of SE on Attachment**

SE may reinstate homeostasis, connecting the prefrontal social engagement structures with sub-cortical survival structures of limbic and primitive brain (Levine, 2015). Homeostasis, is achieved by regulating and resetting

Parasympathetic/Sympathetic rhythms to integrate with prefrontal social engagement structures so that the traumatized toddler can interpersonally reengage. SE engages the autonomic/peripheral nervous system in the restoration of whole-brain reintegration after trauma (Siegel, 2012) which includes the CRN (Payne, et al., 2015) and the Polyvagal Network (Porges, 2011).

### **Talk Therapies: CRN, Defense Cascade and Response Flexibility**

The CRN is comprised of a ‘complex dynamical system formed by the subcortical autonomic, limbic, motor and arousal systems’ (Payne, et al., 2015, p. 1; Payne & Crane-Godreau, 2015). Kozłowska et al., (2015) has identified the

“Defense Cascade” as reactions broadly associated with flight, fight, freeze and immobility that are mediated by “a common neural pathway; activation and inhibition of particular functional components in the amygdala, hypothalamus, periaqueductal grey, and sympathetic and vagal nuclei” (p.1). Siegel, (2012) identifies ‘Response Flexibility’ as the ability to access incoming stimuli and to modify external behaviors. He goes on to describe, “the middle prefrontal cortex receives direct input from the sensory cortex, which is responsible for perception; the somatosensory cortex and brainstem, which register somatic sensation; the autonomic nervous system which controls bodily functions; the dorsolateral prefrontal cortex, involved in attentional processes; the medial temporal lobe, involved in explicit memory; and the associational cortex, involved in abstract forms of thought.” p. 169.

It is clear from the above descriptors that neuro-regulation is complex and not easily manipulated with cognitive (talk) therapies alone (Wylie, 2004). The immature toddler brain is developing social and survival networks that rely heavily on PAD neuroception even in times of safe, attuned connectedness. Talk therapies have limited capacity where the trauma is procedural for a preverbal toddler.

### **The Unique Sequential Role of SIBAM in Dyadic Completion**

In SE theory, the elements of SIBAM are targets for homeostatic coherence and individual neuro-regulation. *Running-to* the PAF may initiate the defense cascade sequence and resolve the first component of a neuro-physiological and behavioral completion sequence.

QA/PAF-SAS is the vital second component, Meaning Making for the Toddler “*I’m safe*” and for the PAF “*my child is safe and soothed.*”

This sequence regulates and completes the homeostatic process for whole brain integration, for both PAF and toddler that is necessary for neuro-regulation and secure attachment in the processes of DC. The return to secure attachment reinstates attuned connectedness and attachment-neuroception, resulting in resolution of toddler trauma.

Here, the phylogenetically ordered, neuromotor, survival, behavioral imperative of *running-to* the PAF for safety and corresponding QA/PAF-SAS validates SE theory, Attachment and Polyvagal Theories where **Dyadic Completion** is the mechanism of completion for the *tad*.

In SE attachment therapy “*Run to Mummy*” is a key therapeutic intervention for perambulating toddlers at the point of high sympathetic activation. The presiding therapist needs to focus on and track the toddler’s body movements, facial expressions and orientation behaviors including turning the head from threat arousal to PAF/CS during the two stages of the freeze response. Firstly, at the alert stage of perceiving threat, and then at the fear arousal stage. The timely encouraging comment of “run to mummy” may trigger the well-established CS neuro-motor structures to translate fear orientation/arousal into physical action for survival, encouraging a shift from freeze/overwhelm to flight, *running-to* the PAF for soothing and attachment-neuroception. The remainder of the sequence is driven by “instinctive, bodily based protective reactions” (Payne et al., 2015, p.1) within phylogenetically ordered deep brain survival structures.

### **TODDLER TRAUMA AND PROCEDURAL MEMORY**

Levine (2015), describes three broad categories of procedural memory, “learned motor actions, hardwired emergency responses, and *approach or avoidance of attraction or repulsion* (hedonic valences)” (pp. 25-26). Procedural memories can become compromising in trauma. “Traumatic memories are fixed and static” and are imprints in procedural memory of overwhelm that do not “yield to change” nor do they respond to new experiences as other memories do (Levine, 2015, p.7).

When observing Levine’s Baby Jack demonstration (2012, 2015), it is evident that Levine is focused on Jack’s nervous system and supported completion and discharge within his CRN (Payne, et al., 2015). After he assisted Jack in a hand push (behavioral completion of a thwarted defense), Levine directed Jack’s

attention to his braced back by placing his hand gently on the area of activation (promoting interoception). Shortly afterwards Jack relaxed into his mother’s soothing embrace allowing QA/PAF-SAS. Dyadic Completion is evident in the immediate and spontaneous aftermath of Jack’s QA. Jack’s hedonic valence for approach and avoidance shifted from threat arousal to Comfort-Seeking in QA/PAF-SAS. Jack and his mother automatically engage in an Infant/PAF interaction that can only be described as an attuned, interpersonal, neurobiological reconnection (Levine, 2015, p. 91) which is the end-game goal of DC. Jack and mother reset their secure attachment bond in a flood of oxytocin and touch driven attunement, described by MacGill (2015) as “one important component of a complex neurochemical system that allows the body to adapt to highly emotive situations” (p. 1).

Toddlers can, from a motor cortex and limbic brain perspective, actively determine their approach/avoidance strategies, giving veracity to their primitive survival motivational rudders (Levine, 2015). After *avoidance* of danger characterized by stress hormones and limbic brain override of social connection, the toddler can actively seek comfort and *approach* the source of soothing and neuro-attachment allowing recovery in QA/PAF-SAS.

The ensuing attunement and mutually regulating affect (Tronic, 2007) of the PAF’s neurobiological influence on the traumatized toddler’s overwhelm, is characterized by a shift from freeze to connectedness and social engagement (Porges, 2016). Furthermore QA/PAF-SAS increases oxytocin production for both participants. This process may be a vital phylogenetically ordered, neurochemical correlate of DC.

### **Therapeutic Mechanisms: Rescue Role Play and SE**

Completion was facilitated by a therapeutically attuned invitation to “*run to mummy*” at the point of trauma activation. Activation was accessed through titrated proximity to medical/surgical toys (see photograph 2.) that

evoked the thwarted procedural threat responses. Sympathetic arousal organized into running through identification with an anatomically correct doll (see photograph 1.)

Photograph 1



Photograph 2



### **Polyvagal Response to Fear-Immobilization**

Waking in pain, disoriented by anesthesia to an alien world of strangers, in a dysregulated state of low vagal tone in the Ventral Vagal Complex, (where shifts in vagal tone facilitate the processes of attention, motion, emotional expression and shifts in metabolic output) (Porges, 2011) toddlers seek comfort and soothing from their PAF with vocalization of distress, which engages the PAF's Ventral Vagal Complex which in turn encourages proximity and social engagement through facial expression, vocalizations and gestures that

regulates arousal. High vagal tone inhibits the SNS response of flight/fight and supports social engagement. In hyper-arousal and without the immediate, socially-engaging PAF-attachment-soothing/neuroception, a secondary survival response results in SNS activation of flight/fight. Unable to behaviorally complete the survival response such as running away from danger or *running-to* the PAF for safety, a third branch of the polyvagal network engages, i.e., the Dorsal Vagal Complex (DVC). When tone from the DVC is high, "immobilization and potential life-threatening bradycardia, apnea, and cardiac arrhythmias may occur" (Porges, 2011 p. 165). Failure to engage the PAF during this critical recovery and reorientation process after surgery is a fertile platform for attachment perturbation (Tronic, 2007; Schore, 2012; Ogden, 2015) and may initiate TA, TAD, DTD or childhood PTSD. From this point on therapeutic intervention may be required to resolve toddler trauma and restore secure attachment.

### **The Long-term Aftermath of Postsurgical Trauma**

Eventually pain subsides, pseudo-attachment is established and overwhelm is somewhat contained by PAF-Soothing. However, a stubborn legacy of the traumatic episode may manifest in activated neural imperatives for survival which are incomplete. Right brain emotional and procedural memory of the PAF, as a source of safety and survival is compromised and prefrontal structures employed in social engagement and PAF comfort-seeking are now heavily influenced by the subcortical, limbic brain. The amygdala, responsible for perceiving threat, is enervated and elevated in all aspects of interaction with the world and may have life-long influence on a person's fear arousal and vigilance (Rabinac, et al., 2011). A toddler may develop an altered perception of threat and safety as the social structures of the brain develop.

Vigilance may be easily triggered by ordinary events observable in oppositional behaviors, affect dysregulation and low tolerance to frustration (Levine & Kline, 2007). As the toddler becomes more socially

dysregulated, avoidance behavior and affect overwhelm occur more regularly. Affect dysregulation may evolve over time from minor intolerance to pathological overwhelm. This liability may be accompanied by intense or prolonged psychological distress i.e., tantrums or emotional numbing. Avoidance of trauma triggers such as routine first aid for cuts and scratches or visits to the doctor can become episodes of re-traumatization. If the toddler remains in high dorsal vagal tone or in collapse, medical intervention in the form of hydration and tube feeding may be required. Poorly understood, post-surgical toddler trauma can often be overlooked in therapeutic history taking leading to misdiagnosis such as Autistic Spectrum Disorder, Oppositional Defiance Disorder, Attention Deficit Disorder and Attention Deficit Hyperactive Disorder (van der Kolk, 2014).

### **Neuro-regulation and Memory During Dyadic Completion**

Heightened fear arousal can lead to an entrenched freeze, heightened vigilance and/or Dorsal Vagal Tone enervated by the amygdala and entrenched in procedural memory as Traumatic Attachment. Social connectedness is impeded when hedonic valences of avoidance are initiated.

Directing attention to physiological indicators of approach or avoidance (Levine, 2015) in threat arousal or Comfort-Seeking stimulates the toddler's neurostructural regulation. PAF-soothing-touch to areas of bracing initiates bottom-up whole brain integration by engaging the toddler's prefrontal social engagement/attachment systems to reconnect with their PAF in Dyadic Completion. A toddler's procedural memory of fear/immobilization/abandonment dissipates through discharge of survival energy in QA, reinstating attachment-neuroception and hippocampal implicit memory of the PAF as safe. The sequence of DC counteracts the dysregulating neuro-survival signature of vigilance and avoidance reinitiating connectedness and whole brain integration thereby limiting psychopathology.

DC might also initiate connectedness with new attachment figures and may offer therapeutic utility where biological attachment figures are no longer available.

**Dyadic Completion; Applied Theory**  
SE involves a process of Resourcing (attending to positive present experience/stimuli), Activation, Therapist-guided Interoception/Proprioception, Discharge, Completion, Neuro-regulation/Integration and Renegotiation of sympathetic/parasympathetic arousal (Payne & Crane-Godreau, 2015).

DC focuses on two nervous systems and the interpersonal neurobiological processes of the PAD, refining the SE process toward: Resourcing, Threat orientation, Safety orientation, Comfort -Seeking, *Running-to* the PAF, QA/PAF-SAS, Dyadic Completion, and Exploratory orienting. Dyadic Completion, as masterfully demonstrated by Levine (2012) in the Baby Jack demonstration, may be significant in the resolution of TA, TAD, DTD, and Childhood PTSD. At this juncture, SE, Polyvagal and Modern Attachment Theories can be applied to validate an elegant, time honored evolutionary sequence of comfort-seeking and attachment-soothing that can be replicated in clinical settings. SE practitioners unaccustomed to working with toddlers, neuro-psychotherapists and attachment-informed child therapists may have utilitarian access to therapeutic interventions inclusive of SE, Polyvagal and Attachment Theory to resolve Toddler Trauma.

### **PROPOSAL**

**To examine the therapeutic utility of combining SE, Attachment and Polyvagal theories in recovery of post-surgical toddler trauma. Through the medium of Rescue Role Play, Dyadic Completion will be assessed for therapeutic utility.**

## **LITTLE BILL (LB): HISTORY OF PRESENTING PROBLEMS**

### **Assessment**

Clinical interviews with both mother (M) and maternal grandmother (MG) confirmed a constellation of symptoms consistent with a differential diagnosis of Childhood Posttraumatic Stress Disorder (DSM-5: 308.81). LB was observed to have visible, self-inflicted bite marks on his right arm. At presentation, LB was perturbed and disorganized in the presence of his maternal attachment figure and slightly more attuned and secure with MG.

### **Referral**

No mention of postsurgical trauma was identified in the diagnosis of “psychological problems.” There was no previous history of behavioral problems or presentation of psychological difficulties. LB’s relationship with his father and parental separation did not feature significantly in any aspect of his history or presentation. M described LB as ‘a normal healthy boy with no behavioral difficulties’ until the surgery. Since surgery LB’s maternal attachment, social and self-regulatory behavior had become dramatically compromised.

### **Precipitating History**

M stated she was not in attendance to soothe LB post-surgically but, “I could hear his terrified cries,” which fostered considerable distress for her also. M was later informed that LB was physically restrained to prevent him biting the intravenous drip from his right arm. When reunited with LB, M reports she was unable to soothe him for some time and with considerable difficulty.

Five days after discharge, M returned LB to the hospital due to lethargy, weight loss and his refusal of food and fluids. Dehydrated and malnourished, LB was again restrained to insert a hydrating intravenous drip. In a terror/fight response, M describes LB being “held by three to four nurses with a pillow over his chest, arms and legs, a nurse on each leg and arms to insert the needle.” During this episode, M was proximally separated from LB, but visible to him. LB could not be soothed in his terror/fight

response. Already in a state of Tonic Immobility the second “inescapable attack” may be the more significant trauma by initiating low vagal tone of the VVC and high vagal tone of the DVC (Porges, 2011).

Restrained in an ‘inescapable attack’ and with his PAF in visual proximity but in an apparently passive (complicit) stance, may have altered LB’s perception of M as a source of safety and attachment-neuroception and may therefore be an initiator of LB’s attachment perturbation as evidenced by his disorganized attachment behavior towards her.

### **Diagnosis**

When assessed at separate interviews with both M and MG, LB’s observed and described symptoms met criteria for DSM-5 Childhood Posttraumatic Stress Disorder (309.81). Criteria was met under subsections A:1; B: 1,2,4 & 5; C: 1,2,3,5 & 6; D:1,2 & 5; E; & F.

PTSD was selected as best fit diagnosis because LB’s limbic system may have interpreted the restraint episode as a terminal assault as evidenced by his Tonic Immobility and shutdown presentation.

DSM-5 offers only scant symptomatic information under criteria F (p. 274), to explain neurological impairment and developmental delay which is often the dominant feature of childhood trauma with the most far reaching, life-long consequence for both child and PAF.

Because secure attachment is critical to good mental health TA, TAD and DTD may be more appropriate descriptors of childhood trauma. The key difference in diagnostic criteria between childhood PTSD and DTD, TAD are the dyadic perturbations so critical for understanding the loss of healthy neurodevelopment including loss of connectedness, synchronicity, PAD reciprocity and neuroceptive attachment. Combining attachment perturbations with Polyvagal Syndrome descriptors (Porges, 2016) offers significantly more diagnostic insight when treating early childhood trauma.

### **Presentation and Symptoms**

Since LB's consecutive terror/restraint and inescapable attack episodes, his behavior had become increasingly oppositional, defiant, aggressive and self-harming. Symptoms and aberrant behaviors included:

**Self-injurious behavior:** LB begun to bite himself to the point of bleeding mostly on the right arm in conjunction to increasing intolerance to frustration.

**Biting others:** LB began to bite his older brother (7 years) and other children in kindergarten settings. Biting occurred during normal childhood competitive situations.

**Tantrums:** LB had increasingly violent tantrums that escalated over time and ended in self-injurious biting. Prior to his surgery tantrums were rare and mild; biting was not part of LB's behavior.

**Sleep Disturbances:** Nightmares, nocturnal vigilance, delaying sleep onset, and early waking.

### **Impaired Relationships, Attachment**

**Perturbation:** LB's comfort seeking behaviors became disorganized in times of frustration. Emotional overwhelm transitioned quickly to rage. When LB would normally seek soothing from M prior to the trauma, he now avoided comfort-seeking and rejected M's attempts at soothing. Often LB would socially isolate. Evidence of LB's procedural memory shifts from approach to avoidance mechanisms became increasingly evident in oppositional behaviors towards his mother.

**Mood Dysregulation:** M described LB as "changed, not happy, agitated and fussy, intolerant to frustration, often angry and increasingly demanding for my comfort but I could never soothe him."

**Avoidance of Trauma Triggers:** LB would not allow any medical care including simple Band-Aid application or ointment for minor injury. When presented with a Band-Aid, LB would

become hysterical and highly resistant. He would run away or struggle and fight in panic if Band-Aid application persisted.

### **Secondary Attachment Figure**

LB had a secure, secondary attachment bond to his maternal grandmother (MG). MG attended several of the sessions with LB as M was a single working mother. MG became increasingly involved in LB's treatment. As LB's symptoms evolved, both M and MG became active in home based SE treatment. Several meetings were conducted with MG to strategize and teach rudimentary SE for home based interventions. Simple SE Rescue Role Play games with kinesthetic, interoceptive and proprioceptive touch techniques were offered to M and MG. Both caregivers were psychologically minded and motivated to resolve LB's attachment perturbations.

### **PROPOSED TREATMENT PLAN**

In SE theory, trauma is resolved when homeostasis is reinstated (Levine, 2010; Payne, et al., 2015). Homeostasis is achieved through regulation of the CRN (Payne, et al., 2015). The restitution of whole brain function in adults can be achieved in individual treatment with SE, however, for toddlers CRN regulation must often be conducted within the Traumatized Attachment Dyad to achieve DC.

### **Proposed SE Intervention Methodology**

The treatment plan set out to replicate Levine's intervention with Baby Jack with the goal of titrated Dyadic Completion. Replication focused on empowered 'pushing-away' (fight-completion) and '*running-to*' his PAF (flight-completion) for QA/SAS. LB accessed his sensations via interoception when playing with a doll as the patient. LB was observed for hedonic valences of *Approach and Avoidance* in his completion sequence where *running-to* represented escape and triumph over the 'inescapable predatorial attack'. This sequence completed survival imperatives and restored CRN function through QA/PAF-SAS in DC.

**Titration:**

Titration included gentle activation of the threat response cycle in Rescue Role Play with LB first soothing the doll and freeing the doll from ‘inescapable attack.’ This involved LB’s self-directed strategies to soothe and rescue the doll, undoing bandages and removal of the offending intravenous drip. It was initially hypothesized that this titrated, empathic rescue role play might precede the main discharge and completion event when LB may identify himself directly as the patient.

As it eventuated, LB declined to play **the patient** requiring a revised treatment strategy. Instead, LB successfully discharged his trauma through initiation of the self-protective strategy of *running-to* his PAF for comfort-seeking with corresponding QA/PAF-SAS.

With verbal encouragement, LB allowed himself to be soothed and physically surrendered to PAF-Soothing. The PAF was encouraged to “hold him gently until he is ready to disengage, place your hand on the braced areas of his back.” Chest to chest embrace was encouraged (but not required) in a game of Activation, Comfort-Seeking, *Running-to* and QA/PAF-SAS for DC.

## REVISED TREATMENT PLAN

The processes of Dyadic Completion should be spontaneous but may also may be encouraged. The toddler’s arousal/discharge process may benefit from verbal encouragement at the point of activation in the approach/avoidance sequence.

LB was apparently stuck in disorganized attachment (freeze), unable to seek PAF soothing. Approach valences were therefore verbally encouraged when LB’s SNS began to organize toward defense with a verbal cue of “*run to mummy.*”

**Rationale for Revised Treatment Plan**

The PAF “acts as the ventral vagal (soothing) system until the infant’s nervous system is myelinated and can begin to regulate itself” (Levine, 2007, p. 11.15).

During the second inescapable attack, LB could not engage in attachment-neuroception with M. LB’s limbic brain hijacked his prefrontal social engagement systems and overrode his neuroceptive attachment bond with M. It is possible that LB interpreted his mother’s apparently passive position to be complicit in the attack which generated attachment perturbation, explaining LB’s oppositional behavior towards M which was less evident towards GM. It is also possible that the oppositional behaviors stemmed from more generalized dysregulation in the CRN and displayed itself more prominently with his PAF.

However, the working hypothesis for treatment centered around M’s attempts to soothe being impeded by LB’s Traumatic Attachment to M. Treatment was therefore re-targeted at LB’s thwarted comfort-seeking behaviors at the point of fear arousal. LB’s PAF avoidance was a sign of sympathetic arousal at the beginning of a survival sequence. When LB displayed signs of activation, his phylogenetically ordered initial response was to orient towards his PAF followed by traumatic hesitancy (disorganized attachment) at seeking comfort from her, as evidenced by his Freeze. At this point, with orienting toward his PAF and SNS mobilization bringing him out of freeze, LB was gently encouraged to “*run to mummy.*” This verbal encouragement reengaged LB’s social networks, refreshing implicit memory of attachment-neuroception enough for him to ‘take a chance’ on PAF-Soothing. Verbal encouragement might have made the crucial difference to initiate comfort-seeking leading to the DC sequence.

## PROPOSED PROCEDURE

After initial settling and familiarization of the therapeutic surroundings LB would be introduced to the post surgically-prepped, doll and the toy Doctor’s Kit (see photograph 3 & 4) symbolizing LB’s trauma. Activation of trauma response would be followed by autonomic signs and verbal encouragement toward Comfort-Seeking.

Photograph 3



Photograph 4



### **First Level of Arousal: Activating traumatic memory for titration and discharge**

The therapist would introduce a medical trauma doll and initiate play toward soothing it. Coing and sounds of sympathy would be made as well as inviting LB to notice the plight of the “little boy who needs help.” This would naturally kindle LB’s threat response cycle within proximity to the traumatic memory. It would also Resource LB for the arousal event in the context of fostering his intrinsic empathy for another (self).

LB’s levels of arousal would be closely monitored for freeze or immobility responses. He would be encouraged to “*Run to Mummy*” when orienting towards his PAF or at the slightest defensive organization of SNS activation. Care would be taken to titrate LB’s

arousal with encouragement to seek comfort at the point when he came out of freeze. *Running-to* the PAF would discharge flight energy through behavioral completion. Each stage of arousal would include time for discharge, renegotiation and settling of LB’s Flight/Fight response and he would be allowed to set the pace of his involvement with the role play.

The PAF would be instructed to hold LB gently but firmly with emphasis on allowing him to control of the amount of attachment soothing he received. LB’s interoceptive awareness of his bracing through touch would initiate discharge of CRN through “interoceptive, kinesthetic and proprioceptive mechanisms” (Levine, 2010; Payne, et al., 2015) and initiate DC.

### **Second Level of Arousal**

Since his trauma, LB had been panicked by Band Aids and minor first aid. Hedonic valences were triggered with Band Aids and real surgical implements (see photo 5). LB would be encouraged to handle these real medical tools to soothe the doll’s ‘hurt’ by role playing medical care and applying the Band Aids to the doll. Play-first-aid with the doll was considered an empowered titration for activation of LB’s fear of medical procedures. This process would allow LB to reclaim a sense of agency where he was previously in a freeze response.

### **Third Level of Arousal**

LB would be invited to willingly dismantle the intravenous drip from the doll (therapist or PAF may have to do this first to titrate LB’s arousal). LB could apply soothing ‘medical treatment’ to the trauma doll in the form of bandaging and Band Aids and repeat these games until his interest extinguished.

### **Fourth Level of Arousal**

The therapist may then invite LB to access the trauma with himself **as the patient** - through play or story. Inviting the PAF to describe parts of the story is another possible treatment direction while monitoring and responding to LB’s reactions and responses.

It is possible that working through the fourth level of arousal could lead to traumatic overwhelm and re-traumatization. Therefore PAF-SAS requires at least a partial reinstatement of Secure Attachment. This would only be attempted if LB “allowed” or was actively engaged in the process. Rescue Role Play would include both the PAF and LB removing the mock intravenous drip from his arm thereby completing the survival process for LB and reestablishing a secure attachment with his PAF in Dyadic Completion.

### ANTICIPATED OUTCOME

It was hypothesized that Rescue Role Play and SE would provide a titrated journey through LB’s procedural trauma memory. The combination of these treatment protocols would complete LB’s survival sequences and subsequently reinstate secure attachment in DC. Procedural memory of trauma could then transpose to the hippocampus as a new narrative memory of successful completion and survival.

### TREATMENT SESSIONS

#### Session 1 & 2

LB was simply allowed to familiarize himself with the room, with minimal introductory communication with the therapist. The unprepped doll (see photo 1.) and the Play Medical Kit was present in the mix of toys (photograph 2.) but LB showed no interest.

Interaction with the therapist was increased to ensure a familiar and safe environment for LB to engage in the activation stage of Rescue Role Play.

#### Session 3.

The doll was prepared with post-surgery mock-up representing LB’s trauma including intravenous drip, bandages and Band Aids (see photograph 3). LB’s attention was drawn to the doll by the therapist who dramatically soothed the trauma doll, “Oh dear! What’s happened to this little boy?” followed by therapist removing the offending post-surgical apparatus, all the while vocalizing soothing and comfort to the

“hurt little boy.”

LB displayed intense and focused interest and traumatic activation while staying close to and soothed by his PAF (this intense interest is a good indicator that the Rescue Role Play is well targeted to the traumatic memory). GM was directed to place her hands on LB’s braced back to initiate interoceptive, kinesthetic and proprioceptive awareness while also vocalizing soothing sympathy towards the “hurt little boy.”

LB made several tentative approaches towards the doll but was encouraged by the therapist to, “run to GM” at the point of visible activation. Activation was indicated by immobilization, orientation to GM, fearful and worried facial expressions with slowed or stiffening body movements and hesitancy to approach the trauma doll. GM was ready with soothing hugs and interoceptive touch on LB’s braced back and shoulders in SAS. LB allowed short periods of surrender into Quiescent Attunement.

LB made his first hesitant successful approach with encouragement, “let’s help this little boy! Can you help him?” Being more engaged than afraid, LB mimicked vocal and behavioral sympathy towards the “hurt little boy” as he removed the mock surgical apparatus. LB’s first behavioral completion, rescuing the “little boy” by removing the offending postsurgical apparatus, was followed by his facial and body expressions of triumph, smiling, high-five with therapist and *running-to* GM which was reinforced by PAF-SAS hugs with periods of QA where LB surrendered into the hug. This process was repeated several times during the session.

LB independently and spontaneously commenced rescue-play without prompting and became fully engaged in fantasy play to “rescue the little boy.” After several rescues and for the first time since the surgery LB was happy to touch a Band-Aid and engaged in administering a Band-Aid to the ‘little boy.’ This was a breakthrough in his fear and avoidance response and evidence of LB resolving parts of his trauma. With each episode of activation and triumph the therapist encouraged LB to “*run-to*

GM” for hands-on touch and SAS. Often LB would not seem to notice SAS touch as he engaged in the rescue play. After several repetitions LB’s relaxed muscle tone indicated less need for soothing. LB readily engaged in the rescue work with the trauma doll and spent the entire session spontaneously, in self-directed play, going back and forward at moments of activation for hugs with GM with increased periods of QA.

When asked, LB would not allow administration of first aid to himself with Band Aids or bandages.

### Homework

GM instructed M in the rescue role play and purchased the same Play Medical Kit to continue rescue role play at home. After each session GM instructed M to replicate the rescue role plays at home.

### Session 4.

After initial settling in and replaying established rescue role plays from session 3, it was clear that LB was less activated and therefore less involved in rescuing the hurt boy.

As activation decreased, real but safe surgical instruments could be introduced (see photograph 5) as well as the use of real Band Aids which the therapist applied to GM. LB had previously panicked at the sight of Band Aids but surprisingly engaged in putting band aids on GM and the doll. Much of the session was spent in applying and reapplying Band Aids. LB repeated this rescue role play with Band Aids several times until he again lost interest and began playing with other toys.

Photograph 5



When Rescue Role Play with the doll seemed complete, the therapist invited LB to play “**the patient**” and have the therapist apply a Band Aid to his own small scratches. LB became strongly activated, resisted emphatically and immediately *ran-to* GM for PAF-SAS. As instructed GM soothed him with her voice, face to face gaze, chest to chest and somatic touch until LB settled and surrendered into the QA/PAF-SAS hug and again began to play after Dyadic Completion.

### Discussion Session 4.

LB’s panicked reaction to the suggestion of Band Aids administered to himself came close to traumatic overwhelm because it accessed a more significant activation of his traumatic procedural memory where an adult (perhaps much like LB’s surgical Doctors, embodied in the presence of the treating therapist) invited direct medical intervention. To avoid overwhelm, smaller steps should be taken, allowing the toddler to adjust to increased activation.

LB’s completion sequence was by then fully embodied in the physical presence of GM and embedded behaviorally as a Dyadic Completion process involving all five elements of SIBAM. When seeking safety, LB ran to GM in phylogenetically ordered renegotiation of his CRN. Established PAF-SAS and co-regulating QA reengaged his secure social networks with GM. He could be soothed and experience regulation of his fear arousal through SAS

gradually moving closer to DC and secure attachment.

For the remainder of the session LB was more hesitant around the surgical toys and avoided rescue role play or Band Aid application, preferring to play with other toys. This was interpreted as a form of self-directed titration in the trajectory towards DC. No further attempts were made to engage LB in direct medical play, allowing him to discharge flight/fight energy.

**Note:** LB was setting his pace for his trauma recovery and would not allow any Band Aid application to himself. This must be fully respected as a traumatized child will signal with distress behaviors on how far to proceed and at what pace.

Rescue role plays continued at home until LB finally allowed M to apply Band Aids to his arm for the first time. This was a significant milestone in LB's Dyadic Completion and reconnection with M.

#### **Session 5.**

LB again engaged in rescue work with the doll performing surgical procedures in play and repeatedly seeking reassurance and comfort from GM. LB did not move toward rescue role play with himself as "The Patient." LB was again setting his pace for regulation of his CRN. This was the last treatment session with LB.

#### **Follow-Up: Generalized Effect of SE**

After session 3, LB's biting behavior reduced to only occasionally and ceased altogether after the 4th session. Sleep returned to normal and oppositional behaviors normalized. Meltdown tantrums disappeared and LB returned to his previously contented and happy self.

DC in SE therapy reconnected LB in secure neuroceptive-attachment with M who conducted homebased Rescue Role Play to the point where LB allowed Band Aid application. Dyadic Completion in SE therefore had a significant generalized effect.

M reported that LB had cut his forehead in a fall and had to receive stitches in the local Doctor's

surgery. LB, with M's encouragement, willingly and calmly allowed the surgical procedure and at no time did he show agitation or up-regulation into flight/fight. Trusting in his now secure neuroceptive-attachment with M, LB could engage social structures of his neocortex in neuroceptive-attachment to accept M's reassurance in the necessity of the procedure. This is an indication of the transformative healing power of SE in Toddler Trauma when phylogenetically ordered, survival behaviors are employed in Dyadic Completion to reinstate secure attachment.

#### **ORIGINAL SE TREATMENT PLAN: REVIEW**

The SE therapeutic goal was for LB to behaviorally complete his survival imperative in an empowered, "pushing-away" and escape *running-to* his PAF for DC. However, pushing-away did not appear a component of what LB needed for his completion sequence. It is likely that empowerment was achieved symbolically by LB independently removing the offending intravenous drip followed by *Running-to* his PAF for QA-PAF-SAS and DC. DC was identified as a prominent key feature in renegotiating elements of his trauma. Traumatic procedural memory of inescapable attack was replaced with survival/triumph memory of secure, attachment-neuroception in DC with M and GM. Un-potentiated flight/fight responses were discharged in the SE sessions and the integrated connectivity of LB's CRN was restored. LB was then able to access and integrate social engagement networks with his survival limbic brain functions in homeostasis. The many confounding symptoms of attachment perturbation ceased and the threat of impending TA, TAD, DTD, and childhood PTSD were averted.

Separation from his PAF during and after the actual trauma is theorized to be a primary cause of LB's trauma. Neuroceptive reunion in the PAD was central to LB's recovery. The trauma was not in the event but embodied in LB's nervous system and the interconnected nervous systems of the PAD, which for toddlers is the

source of neuroceptive regulation.

It is argued that if LB and M had been permitted to experience surgical recovery as a dyad rather than LB enduring it alone there may have been no traumatic response. M may have soothed LB before the onset of overwhelm thereby averting the trauma. A regulated verbally soothing PAF, encouraging cooperation in a procedure is the embodiment of attachment-neuroception.

During SE titration, it was discovered that the actual regulating process involved the phylogenetically ordered completion process of *running-to* the PAF in Comfort-Seeking combined with QA/PAF-SAS. Toddler nervous systems although fragile and vulnerable in threat circumstance particularly where the PAF is unavailable to them, are equally resilient and robustly adaptable and responsive to somatic regulation. DC in SE for the PAD, offers a therapeutic medium and a mechanism to renegotiate and reconnect in secure attachment. Furthermore, DC may renegotiate and transpose traumatic procedural memories into an integrated narrative memory of survival and triumph.

During LB's hereto considered *incomplete* SE therapy (after session 5), LB experienced an accidental head wound requiring minor surgery involving injection and stitches to his forehead. This real life minor emergency eloquently validated the efficacy of DC in SE in what could have been another traumatizing episode. PAF-Attachment-neuroception in the face of further surgical trauma engaged LB's social networks in dyadic connectedness (trust) confirming the reinstatement of secure attachment-neuroception with M.

### **FURTHER GENERALIZED RECOVERY EFFECTS**

Several weeks after stitches were removed, again without traumatic activation, LB accompanied his older brother to the school dental bus where he voluntarily climbed into the dental chair and allowed a dental examination. For a toddler who had

suffered overwhelming trauma associated with mouth, throat and ear surgery, this was another significant validation of SE-Dyadic Completion as a tool in treating Toddler Trauma.

At three months' post-treatment, M reported another ear infection requiring LB's admittance to hospital. Prior to disembarking the car to enter the hospital LB stated "you're going to stay with me aren't you mummy?" to which M responded, "I will keep you safe and I will not leave you." LB again allowed ear, nose and throat examinations and surgical procedures by doctors in medical-threat circumstances without traumatic overwhelm. The secure-neuroceptive-attachment bond between LB and M had deepened through SE-Dyadic Completion and was secure enough to revisit trauma in a real situation without traumatic activation or overwhelm.

This affirming interplay between LB and M is a clear indication of the now secure neuroceptive-attachment bond between mother and toddler, where LB's nervous system had been integrated, returning to the pre-surgical state of secure-neuroceptive-attachment. Connectedness (Porges, 2016) between toddler and mother had been renegotiated through SE-Dyadic Completion utilizing the medium of the attachment dyad where LB's CRN, Polyvagal network and prefrontal social engagement networks were once again integrated in a secure interpersonal neurobiological attachment bond with M.

The therapeutic utility of SE-Dyadic Completion in Toddler Trauma and the dynamically regulating role of *running-to* the PAF for QA/PAF-SAS offers an alternative intervention process and an effective refinement to the SE therapy process within the "toddler" neuro-developmental stage of attachment. DC in SE may offer a treatment process to divert the course of Childhood PTSD and DTD allowing traumatized toddlers to develop healthy social engagement after traumatic overwhelm.

### **CONCLUSION**

Dyadic Completion combined with Levine's (2010), SE treatment for early childhood trauma (Levine & Kline, 2007), offers a modality consistent with modern attachment theory (Siegel, 2012; Schore, 2013), current neuroscientific theory (Porges, 2011, 2016; Schore, 2012; Siegel, 2012), and established child play therapy, validating the importance of secure attachment (Ogden, 2015; Tronick, 2007)

and behavioral completion in Rescue Role Play to address early childhood trauma.

SE-Dyadic Completion offers important considerations in both the prevention and occurrence of post-surgical, Toddler Trauma and resolution of TA, TAD, DTD and Childhood PTSD.

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