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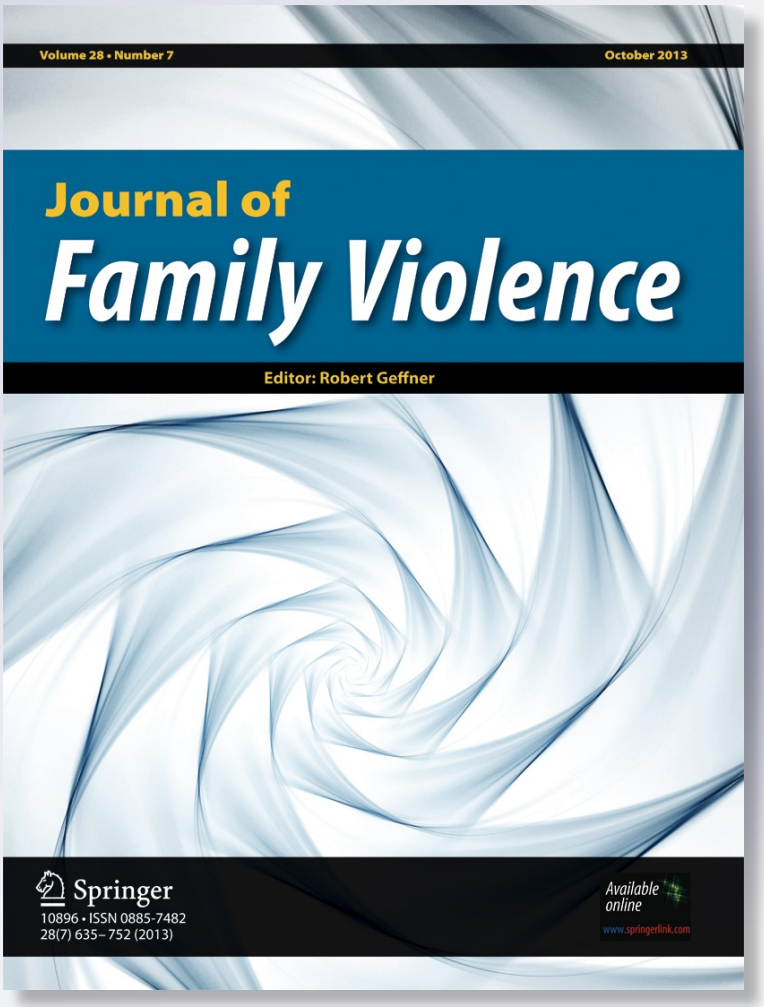

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Can the Body Change the Score? Application of Sensory Modulation Principles in the Treatment of Traumatized Adolescents in Residential Settings

Elizabeth Warner · Jane Koomar · Bryan Lary · Alexandra Cook

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Abstract There is a compelling need for varied "trauma specific" treatment models for children and adolescents with complex trauma in residential treatment whose affect and behavioral dysregulation disrupts daily living and impedes treatment engagement. This conceptual paper introduces exploratory applications of sensory motor approaches to the treatment of affect and behavioral dysregulation. Sensory Integration, a specialization within occupational therapy (Ayres 1972, 2004) provides knowledge of the sensory motor systems and strategies for sensory modulation that addresses arousal regulation, which underlies this dysregulation. The article describes three clinically supported approaches to the use of sensory modulation in residential treatment sites: use of sensory rooms; use of sensory integration occupational therapists at residential treatment sites; and a trauma psychotherapy that utilizes sensory motor strategies to improve regulation and support trauma processing.

Keywords Residential treatment · Adolescence · Affect regulation · Sensory motor · Sensory modulation · Sensory integration

Author Note Since the writing of the article, Dr. Jane Koomar passed away on February 24, 2013 after a three-year struggle with cancer. Her significant contribution to the SMART model was to collaborate in addressing the problem of regulation for traumatized youth through understanding sensory modulation. However, her contribution to her own field of Sensory Integration Occupational Therapy was her abiding commitment and major professional achievement. The founder of a thriving clinic, now known as OTA The Koomar Center, located in Newton, Massachusetts, she also contributed to the flowering of the field of Sensory Integration through clinical work, teaching, research, collaboration with colleagues across the country, and continual exploration of new ways to bring together the worlds of occupational therapy, mental health, and neuroscience to address questions about sensory processing. She had a special interest in attachment and worked with Dan Hughes, Ph.D. to address the profound effects of loss on the development of the human being.

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There is a compelling need for new and varied "trauma specific" treatment models that work in residential settings for youth with complex trauma (Knoverek et al. 2013; Zelechoski et al. 2013). The children and adolescents that come to residential treatment almost universally have developmental histories laced with traumatic exposures (Briggs et al. 2012). A trauma-informed framework of understanding is the essential starting point (Ford and Blaustein 2013; Hodgdon et al. 2013). Beyond that, interventions specifically targeting the after-effects of trauma are needed to promote healing (for emerging models see Brown et al. 2013; Habib et al. 2013; Hodgdon et al. 2013; Kagan and Spinazzola 2013). This conceptual paper introduces new exploratory, clinically supported applications of sensory motor approaches to the treatment of affect and behavioral dysregulation; and points the way to future treatment model development and the empirical study required to test these applications in real-life residential treatment settings.

Adolescents and children in residential treatment centers have an extraordinarily high prevalence of trauma in their histories. In a study at one Midwestern residential treatment site serving children up to the age of 13 (Brady and Caraway 2002), investigators found the average number of traumatic

exposures experienced by residents was three, with 34 % having four identified trauma types. In addition, 68 % had primary caregivers with alcohol or substance abuse problems, and 85 % had three or more so called "transitions in caregiving," which represent significant losses or disruptions in attachment. By the time of adolescence, the prevalence has risen. In preliminary data collection at residential treatment sites in Massachusetts run by the Justice Resource Institute, over 90 % of the youth in these residential settings have experienced at least one traumatic event, with over three-quarters of the youth in these residential settings experiencing multiple types of trauma exposure (Hodgdon et al. 2013). Finally, in the National Child Traumatic Stress Network (NCTSN) study of 11,076 children and adolescents receiving either non-residential community-based and residential treatment services, adolescents in residential treatment had an average of six *types* of trauma exposures (Briggs et al. 2012).

With this kind of complex trauma as a routine part of the adolescents' developmental histories, the findings of the NCTSN study regarding level of functional impairment is not surprising. Close to 80 % of these adolescents have behavior, academic, and attachment (relationship) problems; and 30 to 40 % injure themselves, think about or attempt to kill themselves, abuse substances, or do something that engages the police.

The effectiveness of adolescent treatments is of utmost importance; yet, the existing data suggests we have a long way to go. In the Brady and Caraway study (2002), 95 % of the residents already had residential treatment stays prior to the current placement, suggesting the ineffectiveness of many available treatments. Furthermore, in one study of outcomes in residential treatment (Boyer et al. 2009), only half of the children showed any clinical change, and of those, 63 % made positive change, but 37 % deteriorated. The best predictor of outcome was the number of different types of trauma a child had in his or her background: the greater the number of types of trauma the greater the likelihood of deterioration. With the passing years, the compounding effects of ongoing and untreated symptoms only exacerbate the problems (Terr 1991). PTSD and other traumatic sequelae do not spontaneously remit, nor do they reliably improve with treatment as usual.

What to Target in a "Trauma Specific" Treatment: New Modes of Regulation

Clinical experience with children and adolescents whose early lives have been punctuated by multiple traumas such as: early loss, disturbed caregiver systems, emotional, physical and sexual abuse and various forms of neglect, suggests that these adolescents show impairments across developmental domains (Cook et al. 2003, 2005). Attachment systems are disrupted, affecting all relationships, cognitive functions develop unevenly, and biological systems are impacted such that acute and chronic somatic problems ensue.

However, the domains of affect and behavioral regulation are often most severely impacted and have a contaminating effect on all other functions. Adolescents with affect dysregulation appear highly labile, reactive, impulsive or withdrawn, depressed, numbed, or dissociated. Behavioral controls are poor and are reflected in the multiple diagnoses with which these adolescents are labeled such as Conduct Disorder, Oppositional Defiant Disorder, and Anti-Social personality. Both the affect and behavioral dysregulation lead to problems in daily living with other people that result in disruptions from schools, homes, and community life.

Even as the many disciplines involved in work with child abuse and neglect are recognizing the pervasive and insidious way in which all aspects of an adolescent's development are impacted and as the importance of affect regulation is recognized across psychiatry and psychology in various forms of pathology (Bell and McBride 2010; Conklin et al. 2006; Gross 2007; Schore 2003; van der Kolk and Fisler 1994), the treatment modalities have lagged behind in addressing the most basic problems of regulation. Psychotropic medications are increasingly utilized with children to treat problems of dysregulation evident in extreme tantrums, aggression, and oppositionality as well as depression and withdrawal. Because of the inadequate diagnostic framework for sequelae of complex trauma in children and adolescents, the psychopharmacological approach is often scattershot and the result may be an overmedicated child or adolescent. It is not uncommon for therapists in residential treatment centers to find their clients on three to six psychotropic medications ranging from stimulants, to selective serotonin reuptake inhibitors (SSRIs), antipsychotics, and mood stabilizers. In many cases, the medications are chosen to target dysregulations of behavior and mood.

Psychiatry and psychology have relied heavily on psychotherapeutic approaches that are language based. Psychodynamic psychotherapy, cognitive behavioral therapy, group therapies, and dialectical behavior therapy all rely primarily on verbal communication as an avenue to change. In the child therapy world, popular therapies include cognitive behavioral therapies, play therapy, and to a lesser extent, expressive therapies. For these forms of therapy to succeed, the child must be sufficiently regulated, organized, grounded and present, such that language, imagination, and symbolic expressive function can emerge.

Traumatized adolescents' daily lives are disrupted by periods in which emotional states are overwhelming, and the resources or tools for managing these intense feelings are limited or nonexistent. The resulting behavior, which is often reactive, appears disorganized and without controls or inhibition. Many, if not most, of the adolescents in residential treatment sites show problems with this kind of dysregulation, and are often placed outside of family life specifically for this reason.

As van der Kolk elucidated in his now classic article, *The Body Keeps the Score: Memory and the Emerging Psychobiology of Post Traumatic Stress* (1994), traumatic experience leaves a deep imprint on a person's psychobiology. According to empirical evidence and the evolving trauma theory, the underlying arousal regulation that produces affect and behavioral regulation through the sympathetic and parasympathetic nervous system is chronically overstimulated by the stress response system of the hypothalamic pitiuitary adrenal axis (HPA), which is either in overdrive or in complete shut down. In the corresponding states of hyperarousal (overdrive) or hypoarousal (shut down), prefrontal cortex (PFC) functions of symbolic thought and the executive functions of inhibition, working memory, and cognitive flexibility (Diamond 2002, 2006) are not available. The HPA system is driven by the subcortical structures of the brainstem and the limbic system and there is poor integration of "doing, thinking, and feeling." As a result, effective language and cognitive functions such as problem solving, are not available when the adolescent is in these states. While a teen may talk, the words are often not integrated with his or her experience. When people in their lives try to respond, negotiate, or make sense, they become frustrated by the lack of coherent verbal exchange. This leads to frustration, control struggles and feelings of inadequacy on the part of caregivers.

In residential settings, staff often find adolescents will readily engage in an argument about a daily routine, or limits set, but are not able to truly negotiate a resolution when angry or depressed. The adolescent's words may seem driven or empty and often do not correspond to the current context. The therapist's or residential staff's efforts to talk may lead, instead, to emotional storms, e.g., stomping off, tantrums, or complete withdrawal. In the third author's residential site, these problems led to a reorganization of the pass system. Passes were earned by the teens to go off grounds for shopping, visiting with family, etc.

However, withholding a pass for an anticipated off grounds trip would lead to great dysregulation on the part of the adolescent, during which any kind of dialogue, understanding, or compromise was impossible. It became clear that the pass system did not increase learning but instead caused an unintended increase in emotional and behavioral disruption. This program also found that incentive systems which require the executive functions of working memory, planning, linkage of cause and effect, and awareness of one's own actions were not particularly effective in helping residents change behavior. The therapist or milieu staff can benefit from understanding that the PFC is 'turned off' and that other systems – in many cases, the sensory motor systems of arousal regulation - must be engaged in order for the teen to regain calm and a sense of groundedness, to re-organize and to effectively interact. Only when the adolescents are not hyperaroused (in high distress) or hypoaroused (shutdown) will they be able to hold a meaningful dialogue.

Turning to Sensory Integration for Regulation Tools

Sensory Integration (SI), a specialization within the field of occupational therapy (Ayres 2004), has drawn attention from many people working with children and adolescents in outpatient clinics and residential treatment settings (Champagne 2006, 2008, 2010b; LeBel et al. 2010; Cheng and Boggett-Carsjens 2005; Champagne and Tewfik 2010) as well as inpatient hospital settings (Champagne and Stromberg 2004). The contributions of this field have widened the horizons of mental health, offering both a different knowledge base and a different set of skills that have proven to be useful for improved regulation. Specifically, knowledge of the sensory motor systems and strategies for sensory modulation have been useful in addressing arousal regulation, and the manifest affect and behavioral dysregulation seen in traumatized people.

Almost 40 years ago, A. Jean Ayres, the pioneer of this field, was prescient when she said the body and the mind are one:

> "As the natural developmental association between sensory input and psychic experience becomes understood, the two forms of therapy may profit from joining forces. What is rocking and being cuddled other than tactile and vestibular stimulation plus an interpersonal relationship? Are not the neural traces for the sensory and the social aspects of the experience laid down as one in the brain? Are not many of the child's important emotional experiences in the first 5 years of life closely associated on an experiential and therefore neurological basis with their sensorimotor equivalents?" (Ayers 1972, p.266)

With a more complete knowledge of the sensory and motor systems and their effect on arousal regulation, occupational therapists (OTs) specializing in Ayres Sensory Integration (Ayres SI) have offered new paths to psychotherapists in the mental health world for helping traumatized people to learn to regulate.

While solid empirical data on the effectiveness of SI with traumatized populations is limited, one study adapted a protocolized SI program using vestibular, visual and auditory input as a "bottom-up" approach to the symptoms of complexly traumatized adults (Kaiser et al. 2010), and found positive changes in Total Scores Self Perception, Affect/Impulse Regulation, and Alterations in Meaning on the Structured Interview for Disorders of Extreme Stress (SIDES). This small study, while preliminary, supports the logic of clinical exploration of SI with adolescents.

Sensory Integration has informed therapeutic approaches to adolescents in several different ways, and with particular power in residential treatment settings. In one setting, sensory input is seen as a valuable regulating tool, and is offered as a resource in a variety of ways on the unit, e.g. attending to each child's sensory needs through the Sensory Diet (Wilbarger

1995) or developing a Sensory Room. In other settings, OTs consult to residential staff and teachers about regulatory strategies that can be incorporated into daily life and daily tasks based on individual resident's particular sensory profile and needs. OTs also provide direct occupational therapy intervention to improve foundational sensory motor skills needed for success in learning and behavior. In a third setting, the sensory motor systems involved in playful and active engagement are used as a regulatory tool in a trauma therapy and facilitate trauma processing.

With new sensory motor regulation tools, the adult caregivers can more effectively help adolescents learn new ways of self-regulation. Furthermore, in psychotherapy, the therapist can more effectively address the necessary component of trauma processing when tools of regulation are readily available to the therapist and the client in the moment-by-moment work of a therapy session. By being able to tolerate the more intense emotions associated with trauma processing, adolescents can address traumatic issues while staying regulated.

A Sensory Room in a Locked Residential Setting: Sensory Diet and Reduction of Restraints

Cohannet Academy is a seventeen-bed all-girls intensive locked residential treatment program for severely traumatized adolescent girls ages 13 to 19 years old. This program, affiliated with the Justice Resource Institute (JRI) based in Massachusetts, is contracted with the Massachusetts Department of Mental Health (DMH-MA), and accredited by The Joint Commission. Cohannet Academy began working with the DMH-MA over 10 years ago on a joint venture that strives to reduce and eventually eliminate the need for restraints in statewide programs (Commonwealth of Massachusetts 2006; Department of Mental Health of Massachusetts, (DMH-MA) 2000; Champagne 2003a, 2006, 2007, 2010a, b; Champagne and Stromberg 2004; Lebel 2006; LeBel and Champagne 2010), This was also in accordance with an agenda at the federal level (U.S. Department of Health and Human Services (USDHHS), Substance Abuse and Mental Health Services Administration 2003). As a part of this initiative, Cohannet Academy began exploring the use of sensory-based treatment interventions in an effort to help develop safe and effective strategies for residents to manage and regulate physiological and emotional experiences (National Association of State Mental Health Program Directors 2003). This approach fits well with the unit's overarching "ARC" child complex trauma framework which focuses on Attachment, Regulation and Competency as three core domains impacted by trauma (Blaustein and Kinniburgh 2010; Hodgdon et al. 2013). At all times, these tools are utilized on a voluntary basis by residents, and are available at most times of their day.

Sensory Diet

During the initial implementation of sensory-motor interventions, staff began working with each resident individually to develop her own "sensory diet" (Wilbarger 1995) to address the frequently experienced sensory sensitivities and to improve a sense of groundedness in one's body. This included the purchase of "sensory tool boxes" for each resident to have in her room to access when dysregulated (DMH-MA 2000; Champagne 2003a, 2006, 2010a, b; Champagne and Stromberg 2004). This process starts at the pre-admission meeting when residents are interviewed to find what is currently helpful. Some of the items are immediately purchased so on the day of admission they are available for the resident in her room. During the course of their intake, residents also complete a "plan for safety" that identifies various up and down regulation strategies that they find helpful (Blaustein and Kinniburgh 2010). As the sensory interventions have evolved, and as residents progress through phases of treatment, plans for safety also get modified and adapted (Champagne 2003a, 2006). The benefits are immediately apparent and staff reports that these tools are very helpful to engage and practice with the residents.

Sensory Room: The "Getaway"

Staff wanted to expand sensory modulation interventions offered in the program. An unutilized space on the unit was renovated into a larger sensory room (Champagne 2003a, b, 2006), which the residents decided to call the "Getaway". This space provided a safe and structured environment where residents could practice and rehearse skills to use when they might be in higher arousal states on the unit. Included were items geared towards the five senses: 1) touch - baskets of tactile and manipulative hand held games, lotions to rub on their skin, pillows to arrange for comfort; 2) smells - different bottles of scents the girls spray on their pillows at night; 3) taste - different types of candies or chewing items for taste; 4) hearing - a surround sound system with a variety of relaxation CDs; and 5) visual - many different types of lighting that the residents can maneuver however they find helpful. The space was designed to be easily replicable for the residents after discharge so all items purchased in the room are affordable and found at places like Spencer Gifts or Walmart.

The "Comfort Zone"

After utilizing the "Getaway" space for group therapies, and individual and family sessions, the tremendous benefits of having such a space in the program became clear. Staff requested a second space on the bedroom side of the unit where they could spend more time with residents practicing some of the sensory skills on a one-to-one basis. They named this

sensory modulation room the "Comfort Zone". This room has a sensory cart that stores items similar to the Getaway: body socks (spandex full body coverings), CD players with relaxation CDs, weighted blankets, games, puzzles, lotions, scented sprays and wrist and ankle weights (Champagne 2003a). These items address the five senses mentioned above as well as providing the addition of items for our "hidden sense" of proprioception, our muscle and joint sense, such as ankle weights, and movement in a body sock, to help us feel grounded as well as calmed.

Staff regularly sit with a resident and practice up and down regulation strategies in the "Comfort Zone" as a means to rehearse and utilize sensory interventions. There are other times the staff find residents need more outlets for managing energy when in higher arousal states. For some of these occasions, residents will wear ankle and wrist weights and skateboard or rollerblade up and down the hallways. These types of activities provide them with extra deep pressure and strong proprioceptive challenge that help down-regulate and ground them. In addition, the movement activities provide input to a second "hidden sense", the vestibular system in our inner ear. As we observe in infants, many types of movements performed in a rhythmical manner may be highly regulating. All of these strategies are used voluntarily by residents and are never required by staff. However, under these conditions, residents often seek their preferred sensory items in order to calm or ground themselves.

Since implementation of sensory interventions in 2005, the program began tracking the reduction in restraints as a target measure. A 68 % reduction in restraints was observed from fiscal year 2005 to 2006, a 26 % reduction from fiscal year 2006 to 2007 and a 3 % reduction from fiscal year 2007 to 2008. Feedback from residents and their families indicates that having sensory spaces for them to practice and rehearse as well as the ability to replicate the spaces at home has been one of their most successful interventions in the treatment. While there has not been further empirical evaluation of this methodology, implementation of a JRI system-wide assessment system will make within group (youth in residential treatment) comparisons possible in the near future.

On Site Occupational Therapy Consultation and Direct Occupational Therapy Intervention with Ayres Sensory Integration

The most integrated use of sensory integration intervention involves having an occupational therapist certified in Ayres SI on site as a consultant or staff member. For example, Occupational Therapy Associates –Watertown (OTA-Watertown – now known as OTA The Koomar Center), under the direction of the second author with occupational therapy staff, has set up occupational therapy programs in three different schools for adolescents. At the Brandon School in Natick, MA, a residential school for boys ages 7 to 17, grant funding was obtained to hire occupational therapists to train all therapeutic, educational and residential staff in sensory integration theory and sensory modulation techniques and strategies (Koomar and Bundy 2002; Miller and Summers 2001; Williams and Shellenberger 1994). Introducing OT to a residential setting begins with making some structural changes to the unit. Sensory equipment was added to the classrooms as well as the residences. Classrooms set up sensory comfort zones or "cozy corners," with a variety of sensory-based pieces of equipment from which to choose.

When students require spaces for regulation outside of the classrooms, quiet rooms are available for their use. The quiet rooms are provided with mats for the floors (that can also be formed into "tents" or other small spaces), bean bag chairs, manipulative tactile and proprioceptive materials, and a chin-up bar for older students for whom"working out" feels more acceptable as a strategy to regulate arousal levels. The Brandon students helped choose the wall colors of sand and blue to simulate a "calm beach" scene. The OT works with educational, therapeutic, and residential staff to help in the selection of appropriate activities and environments, and to make changes as student needs change.

Almost immediately, with the addition of sensory strategies, the use of restraints was decreased by 80 to 90 %. The positive changes in student behavior reported by the staff created a further opportunity to secure more funds to set up an occupational therapy treatment room in one of the residences. As documented in the NCTSN study (Briggs et al. 2012) academic impairments are common. Many of the students experience cognitive, motor and organizational difficulties that are manifestations of underlying sensory integration problems, in addition to their trauma symptomatology. The boys can now be referred for the full extent of sensory integration based occupational therapy to address sensory modulation needs, sensory discrimination, postural, ocular and bilateral motor coordination problems, as well as praxis, which is the ability to plan and sequence new and non-habitual activities.

The occupational therapists provide one-to-one and small group sessions in the OT room, as well as consultation during activities of daily living such as dressing, eating, grooming, social skills, sports, and all core educational activities. Employing these sensory and motor strategies contributes to improvement of skills in these areas and creates tools for residential and home life as well as school accommodations for their difficulties. This expanded approach allows the students to more fully explore these strategies to create permanent sensory motor changes supporting all areas of function. The OT room is 14' by 20' and is equipped with both suspended swings as well as non-suspended equipment to address sensory integration issues. A predominance of the

equipment is designed to address the three body senses: the tactile, proprioceptive and vestibular senses.

Now that the school has the ability to offer both direct and consultative occupational therapy, occupational therapy can be added to the students' Individualized Education Plans (IEP) and special education funding can be obtained. In addition, a research project is underway to investigate the relationship between sensory profiles as measured by the Sensory Profile (Brown and Dunn 2002) and trauma symptoms. More specifically, research will examine if there are any specific patterns of sensory avoidance, seeking, sensitivities, or low registration in relation to trauma symptom patterns, such as dissociation, hyperarousal, intrusive and avoidant symptoms.

At the Gifford School in Weston, MA, a day school for pre-adolescent and adolescent girls and boys ages 8 to 20 with special needs, including learning and behavior difficulties, an OT consultation model was established in 2005. Services within this model were designed to use the OT room as a place to learn what strategies are most beneficial and then to utilize these strategies in the classroom or break rooms. The OT room was outfitted as a sensory motor area, with equipment provided for motor exploration and regulation of arousal. In contrast to a typical sensory integration focused OT treatment area, equipment for use did not include suspended swings. This helped to simplify and streamline the staff education and OT consultant oversight of the use of the room.

The room included equipment to address the body senses such as weighted blankets, Bosu balls for jumping and balancing, multiple crash cushions, large truck tire inner tubes for stacking to create both hide-aways and targets for jumping into, accordion mats for creating private spaces and for receiving whole body self-directed "squeezes". Following training by the OT, education staff as well mental health clinical staff began to take children for "sensory break" times in the OT room during which students selected (often with assistance) materials and activities to help them regain or retain an arousal state that would allow them to participate in the social, academic, and physical aspects of the school day. Notably, students often became more relaxed and interactive in the context of comfortable, appropriate, individualized activities. Psychotherapists also began using the room, when it was available, for conducting psychotherapy sessions and found that students would more readily engage in the therapy process while using equipment for regulation such as sitting on a large cushion, wrapped in a weighted blanket, inside a stack of inner tubes, or on a therapy ball while bouncing.

Most recently, inspired by the outcomes at the Brandon and Gifford schools, Youth Villages-Germaine Lawrence Campus (GLC) in Arlington, MA, a private residential and day school for adolescent girls ages 12 to 18 with serious emotional and behavioral issues, including substance abuse, eating disorders, and other forms of self-harm, has contracted with OTA-Watertown to develop a program to address sensory modulation difficulties for their students. As at the other two schools, the program will include training sessions for residential, academic, and therapeutic staff, as well as for administrators in Ayres SI theory and sensory modulation techniques. It will also include consultation between staff and the OT to assist the staff to create sensory comfort zones, and to develop appropriate, sensory-modulating activities for the students and residents.

In addition, GLC has referred students who exhibit severe distress and disruptive behaviors to OTA-Watertown for in-depth sensory integration-based OT evaluations to determine if the girl has Sensory Processing Disorder (SPD) in addition to trauma symptoms. A detailed description of the girl's sensory modulation and sensory motor coordination and related praxis issues can be documented and then addressed through on site OT consultation and/or off-site direct OT intervention at OTA-Watertown. Frequently, SPD can underlie behaviors that are part of other diagnostic categories, as is often true for trauma diagnoses (Cheng and Boggett-Carsjens 2005). The aim of the GLC program is to better understand the needs of these students, and to develop a direct care, sensory-integration-based model for the students who are most in need of support. Their sensory integration focused OT program is designed to grow over time, as staff and students observe positive results from the sensory-based strategies that are being introduced. Ideally, all mental health settings for adolescents would hire an occupational therapist to work in tandem with psychotherapy and educational staff in developing a variety of models that can fully address all of the students' sensory integration needs.

A Trauma Therapy for Adolescents: Sensory Motor Arousal Regulation Treatment

Sensory Motor Arousal Regulation Treatment (SMART) was developed for use in an outpatient clinic setting as trauma psychotherapy for children and adolescents (Warner et al. 2010, 2011). It has been piloted as a psychotherapy model in three Massachusetts adolescent residential settings serving youth ages 12 to 22 with histories of complex trauma, significant behavioral and emotional difficulties, and in some cases, major mental illness, as well as therapeutic schools for children and young adolescents in Maryland and Kansas. The treatment development goal was to add power to a trauma psychotherapy by more effectively addressing the problems of affect and behavioral dysregulation which disrupt the daily lives of these traumatized children and adolescents and challenge their caregivers and psychotherapists. With the regulation that occurs through the use of some basic sensory motor input tools and therapist skills, the processing of traumatic experience and of daily life problems is better supported and facilitated.

The SMART team drew on the rich understanding of the developing sensory motor systems offered by occupational therapists certified in sensory integration in order to more specifically use sensory input and movement to help adolescents regulate. It was hypothesized that as the regulation of arousal improved, it would be possible to more easily reach the adolescent through more conventional means, including dialogue. In addition, the first author's clinical experience with autistic children using sensory motor activity to improve body awareness, behavior organization and interpersonal contact (Miller and Miller 1989) informed the search for a sensory motor lens and equipment that would afford the right kind of therapeutic opportunities. Since OT has clinically demonstrated that arousal regulation improved with the appropriate sensory motor input tailored to the child's specific need, our clinical finding of improved regulation was not a surprise.

However, our hypotheses about outcome were vastly under-rated. With improved regulation, the capacities for self-expression, affect awareness and identification, and executive function in the therapy session surprised even experienced therapists. Consequently, the work of processing trauma and addressing attachment dynamics suddenly became easier. The model shifted to show the continual interplay of regulation with trauma processing over the course of the therapy.

The SMART Therapy Room

A prototype therapy room that would be replicable in other mental health clinic settings was designed at the Trauma Center at JRI in Brookline, Massachusetts. The SMART team therapists wanted to afford safety, space and equipment for freedom of movement and playful engagement. In the adolescent residential sites, the SMART rooms have utilized available rooms that are larger than a typical office to allow for movement and utilization of some basic equipment (described below). In some cases, a gym space is accessed for even greater movement opportunities.

In consultation with the second author, a sensory integration OT, the room was designed to provide opportunities for exploring each of the three core body senses: the vestibular, the proprioceptive, and the tactile systems (Warner et al. 2011). These three systems are routinely involved in organizing and calming activities from infancy onward, and have been found to be crucial in regulation of arousal state. Over a period of experimentation with children and young teens in this new therapy space, and the opportunity to study through viewing videotaped therapy sessions, the SMART team noticed the ways in which children and adolescents spontaneously seek movement and sensory input in a manner that is naturally regulating for them. For example, one girl shied away from balance equipment but settled quite naturally into a soft bounce on a large physioball and a gentle toss of a weighted ball back and forth. Her therapist knew how to mirror her choice and with a startling quickness the girl began a conversation about a difficult topic: her ambivalent feelings about seeing her mother.

The outpatient clinic room is approximately 14' by 17' wide, allowing sufficient space for motor exploration. A gym mat was installed on the floor and movable 3' × 5' gym mats were utilized for safety, protection against the walls, and construction of smaller spaces for children to go into. Simple equipment, commonly found in gyms and play spaces, such as physioballs, a mini-trampoline, a low balance beam, a balance board, a tunnel, stepping stones, and blankets, as well as equipment commonly found in sensory integration based OT rooms such as large crash pillows filled with chunks of foam, a "walrus" air pillow, pieces of spandex and spandex body socks, a sensory shaker (bag of balls to climb inside) and 10 and 20 pound weighted blankets were included in the room. These pieces of equipment are tools for regulation as well as equipment for play, and thus serve other goals of a trauma therapy. Some other types of equipment commonly utilized by sensory integration OTs such as suspended equipment were not selected as impractical for reasons of safety, training and funding. Most importantly, the central goal with the use of this basic equipment is to improve arousal regulation, and does not encompass the broader praxis goals of sensory integration occupational therapy. Adaptations of the space to meet adolescent needs are ongoing. For example, placement of a comfortable couch or beanbag seating in the room to allow for easy transitions to more teen typical conversational style is being implemented. Finally, and importantly, a videotaping system was installed so that sessions could be taped for therapist training and supervision, parent guidance, SMART team learning, and model development.

The room available at the Trauma Center at JRI happened to be located off the waiting room, and young clients frequently looked through the door and eagerly asked therapists if they could go in. The invitation to jump, to bounce, to crawl, and to create dramatic play was an "affordance" (Jenkins 2008) of the space. The initiation into therapy suddenly seemed easier for children who otherwise were distrustful, hypervigilant, and fearful. In the current pilot project in two residential treatment centers, the rooms also draw the attention of the adolescents in an invitational way and residential staff expresses interest in using the space with the teens in their care. Adaptations to teens are ongoing in this process of treatment development. Unlike traditional psychotherapy spaces, the rooms do not have desks, lamps, computers or other items adolescents must be careful to avoid and not damage in any way. All of the equipment in the SMART rooms is available for engagement.

Training Therapists

The psychotherapists who joined the initial team brought a background in trauma theory, child development, and various

child therapy approaches. The second author, an occupational therapist and developmental psychologist, consulted to the team in how to apply her knowledge to this treatment. Child and adolescent trauma therapists participated in initial trainings in observing and identifying the sensory motor systems in a depth not offered in most psychology, social work, or counseling training. While the use of sensory integration within OT goes well beyond what psychotherapists have background to utilize, the goal was to share tools regarding sensory modulation for arousal regulation, a part of sensory integration intervention that might practically work in psychotherapy. In addition, continual videotape viewing of sessions provided the ground for further education in the sensory motor systems and observation of how individual clients sought regulation through the use of the body and sensory motor input.

In training, a SMART psychotherapist's new learning started with experiencing the equipment for oneself and discovering the effect of various kinds of sensory motor inputs on one's own regulation. For instance, sitting on a physioball, and bouncing slightly has a different effect on the nervous system than sitting in a chair. Walking on a low balance beam organizes the attention and awareness of the body differently than simply standing. Experiencing some guided compression between two large foam filled crash pillows or feeling the weighted blanket on one's legs or abdomen provides new information about what might be calming for some people, or for others, uncomfortable and dysregulating. Along with this experimentation, therapists were guided in skills of attunement, collaboration, and tracking of experience that would promote regulation and enhance the awareness of the child. In the residential sites, this kind of experiential learning was crucial to teaching therapists and the residential staff about the use of the basic tools of regulation. Furthermore, this style of learning underscored the message that one's own self-regulation and self-awareness is essential to providing therapy.

Videotaping of therapy sessions has been a central tool for the development of the SMART model. Caregivers or guardians are given a consent form that indicates options for use of videotape for clinical, supervisory, teaching and/or research purposes. In residential treatment settings in which a portion of the residents has court-involvement, use of videotape is precluded for those cases. However, videotape learning has been vital for several purposes: client assessment and therapeutic planning, therapist learning and supervision, OT consultation, training and education, and development of the model. In addition, careful use of videotape has greatly enhanced psychoeducation and clinical intervention with caregivers as a tool to increase their understanding of regulation as well as self-awareness and self-reflection (Steele and Steele 2005).

Armed with a framework, personal experience with the equipment and training consultation, residential treatment therapists began to use the SMART room to see children in trauma therapy. In ongoing clinical consultation using videotape as a basis, the therapists more fully integrated the treatment approach over a 6 to 12 month period of time. The SMART team continued to view videotapes together with the OT to identify the kinds of sensory motor input that seemed to be up-regulating and down-regulating for individual clients in order to feed back to the clinicians in their consultations. In this manner, videotape became the requisite method of teaching and supervision for this therapy that relies on non-verbally or body-based intervention.

Adolescent use of SMART

Adolescents in a SMART therapy use the opportunity for sensory motor engagement through use of the equipment in many creative ways. With the therapist's support, the adolescents explore their own experience of different postures, movement, and rhythms to see what it feels like. This serves the primary goal of improving self-regulation. However, it also serves the goal of improving body awareness and 'befriending' the body, a distinct problem for people who have been physically and sexually abused. In some cases, they use the equipment and the movement afforded as an avenue and support to talk to the therapist about their daily lives as well as their traumatic experiences, like the girl who gently bounced, sitting on a physioball, while talking to her therapist about visiting her mother. In other instances, the equipment offers a non-verbal way to address difficult interpersonal dynamics. For example, a therapist reported that her client repeatedly asked personally intrusive questions and did not respond to verbal limits on this behavior. In the SMART room, the girl lay over the large inflated 'walrus' pillow talking to her therapist. When the girl intentionally tumbled over towards the therapist, it was suggested that the therapist could mirror her client, rocking on another pillow while they talked, thus placing a concrete boundary, while carefully maintaining the interpersonal contact.

In others moments, the adolescent self-regulates while coping with potentially 'triggering' interaction such as engagement with a parent. A therapist encouraged a mother to use the equipment along with her daughter, looking for ways to help them better relate to each other without the usual emotional outbursts, anger and conflict. Without instruction, the teen sat in a beanbag chair, holding a large cushion to her abdomen, while listening to her mother's description of an experience in which both mother and child had been frightened by a dog. The teen girl's self-regulating strategy was effective and she was able to tolerate her mother's verbal trauma processing of the event. Similarly, the mother self-regulated by actively using the equipment while talking. When the session ended, the mother wondered if anything had happened; the absence of conflict and anger was a new and puzzling experience.

The practice of SMART requires important therapist skills, and a theoretical framework in order to incorporate these regulation tools into a trauma therapy. However, the improved

regulation made possible through applying sensory modulation techniques to arousal regulation facilitates trauma processing and empowers a more effective integration of experience.

Discussion

Clinical experience with residential treatment sites seeking to reduce restraints and better ways to address the emotional and behavioral regulation problems of their residents, and trauma therapists needing to address the core issue of regulation have supported further exploration of some effective new tools. Current empirical data to support claims of effectiveness is scant and correlational: restraints of clients reduced in particular residential units after introduction of these sensory modulation strategies. This reduction met a policy goal of the Department of Mental Health in Massachusetts. However, firmer empirical data to support claims of effectiveness of these innovative approaches is required going forward and will be forthcoming.

In the meantime, sensory integration theory and sensory modulation techniques, supported by appropriate staff training and consultation, offer us innovative strategies for improving affect and behavioral regulation in traumatized adolescents. There are multiple ways in which sensory motor strategies can be incorporated onto a residential unit. Providing a sensory space on the unit would be the starting point to begin using sensory input as an affect and behavioral regulation tool. Having a sensory integration occupational therapist on-site would greatly strengthen and expand the staff's ability to make use of the sensory equipment through on-going consultation, clinical assessment, and assistance in planning and executing interventions in the milieu and in classrooms. Lastly, sensory motor techniques can be utilized within psychotherapy for traumatized adolescents to regulate arousal, to more effectively process trauma and to hold difficult conversations about daily life. The dance between arousal regulation and trauma processing is the heart of this psychotherapeutic approach (Warner et al. 2011).

As these tools were shared with multi-disciplinary teams in residential treatment sites, there were additional benefits. Restraint reduction led to a reduction in feelings of ineffectiveness and vicarious traumatization in staff. Most importantly, the adolescent who has more control over behavior and emotions feels less powerless and more in control. In addition, these more effective regulation tools will support adolescents' readiness for interventions such as Trauma Affect Regulation—Guide for Education and Therapy (Ford and Hawke 2012), and other cognitive behavioral approaches such as trauma-focused cognitive behavioral therapies that require cognition and language. At present, the effectiveness of these sensory modulation tools remains a strong clinical finding in adolescent residential sites, and points to the possibility of applicability to latency aged children. The documented restraint reduction reported by program directors gives face validity to these types of new approaches. Outcome data collection in JRI sites is underway to ascertain the effectiveness of SMART. Future research is recommended to establish evidence for which clinical models, using these important tools for regulation, provide the most effective method for helping traumatized adolescents return to family and school life. If effectiveness can be established empirically, mechanisms by which these sensory motor tools work can be studied.

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