


**Interoception, The 8<sup>th</sup> Sense:**  
*Impact on Self-Regulation, Mental  
 Health & Social Connection*



Kelly J Mahler OTD, OTR/L  
[www.kelly-mahler.com](http://www.kelly-mahler.com)

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**Potential  
 Trigger  
 Warning:**

- You will be invited in this sessions to notice and reflect on your inner body signals.
- We will also briefly discuss trauma.
- Please participate in these activities in a way that meets your comfort level.

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**Your inner  
 experience  
 is always  
 correct  
 and valid.**

- There are **no wrong interoception experiences**. We all have very different inner experiences.
- Also, there are **no wrong words** to describe the sensations you might notice.
- It is okay to not know how you feel.
- It is okay to not want to share how you feel with others

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# What is Interoception?

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## The 8 Senses

**The Outside Senses**

- Ms. Visual
- Ms. Tactile
- Ms. Auditory
- Mr. Gustatory
- Ms. Olfactory

**The Inside Senses**

- Mr. Proprioception
- Mr. Vestibular
- Mr. Interoception

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## Receptor Locations for Interoception

Brain  
Ears  
Nose  
Muscles  
Stomach  
Bladder  
Feet  
Skin  
Hands  
Heart  
Lungs  
Mouth  
Eyes

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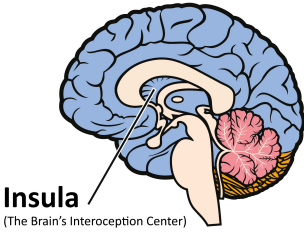
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### Interoception and the Brain



**Insula**  
(The Brain's Interoception Center)

Critchley et al., 2004

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### Interoception Helps Us Feel

Homeostatic Emotions			Affective Emotions		
Hunger	Fullness	Thirst	Excitement	Distraction	
Sensory Overload	Pain		Joy	Frustration	Calmness
Illness	Body Temperature		Fear	Safety	Sadness
Physical Exertion	Sleepiness		Love	Focus	Anxiety
Need for the Bathroom			Boredom	Energized	



Craig, 2002

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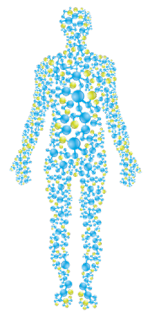
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### Interoception Defined



The **Sensory System** that gives us information regarding our **BODY-EMOTION** connections.

Craig, 2002

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Interoceptive Awareness (IA)



The ability to:

1. **NOTICE** body signals
2. **CONNECT** body signals to the emotion

 **Better Insula = Better Interoceptive Awareness (IA)**

Critchely et al., 2004

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Unique Inner Experiences



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*WE ALL HAVE UNIQUE INTEROCEPTION EXPERIENCES!*



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### IA: A Variety of Extremes

Body Signals	Characteristics
too <b>BIG</b>	<ul style="list-style-type: none"> <li>Strong</li> <li>Overpowering</li> <li>Too many body signals at once</li> </ul>
too small	<ul style="list-style-type: none"> <li>Muted</li> <li>Completely miss body signals OR only notice intense body signals</li> </ul>

(Mahler, 2019; Miller, Anzalone, Lane, Cermak, Osten, 2007; Endow, 2010)  
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### IA: a Sliding Scale

The diagram illustrates a sliding scale for five categories: Anxiety, Physical exertion, Hunger, Fullness, and Pain. The scale ranges from 'Too Small' on the left to 'TOO BIG' on the right. Each category has a colored bar with a vertical line indicating a point on the scale. A photograph of a young girl is shown on the left side of the scale.

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### IA Extremes

*Connected to Many Conditions*

Autism	Trauma Disorders
ADHD	Obsessive Compulsive Disorder
Anxiety	Panic Disorder
Depression	Suicide Attempters
Eating Disorders	Drug & Alcohol Addiction
Obesity	Chronic Pain Syndromes
Schizophrenia	Sensory Processing Disorder
Dementia	Self-injurious behavior

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## IA Extremes & Mental Health

### Interoception and Mental Health: A Roadmap

Salih S. Khalifa, Ralph Adolphs, Oliver G. Cameron, Hugo D. Critchley, Paul W. Davenport, Justin S. Feinstein, James D. Foxe, Sarah N. Garfield, Richard D. Lane, Wolf E. Mellinger, Alicia E. Meuret, Charles E. Nemeroff, Stephen Oppenheimer, Frederike H. Putz-Anderson, Olaya Peltzer, James L. Rhydy, Lawrence F. Schroyer, W. Ake Sorenson, Murray B. Stein, Klaus E. Stephan, Olmef Van den Bergh, Ilse Van Dieil, Andreas von Leupoldt, Martin P. Paulus, and the Interoception Summit 2019 participants

**Table 3. Diagnostic Symptoms and Clinical Signs Indicating Interoceptive Dysfunction in Some Psychiatric Disorders**

Psychiatric Disorder	Symptoms	Signs	Sample Studies
Panic Disorder	Palpitations, chest pain, dyspnea, choking, nausea, dizziness, flushing, depersonalization/ derealization	Elevated heart rate and/or blood pressure, exaggerated escape, startle, and flinching	(5,140,141)
Depression	Increased or decreased appetite, fatigue, lethargy	Weight gain, weight loss, psychomotor slowing	(142,143)
Eating Disorders	Hunger insensitivity, food anxiety, gastrointestinal complaints	Severe food restriction, severe weight loss, bingeing, purging, compulsive exercise	(72,98)
Somatic Symptom Disorders	Multiple current physical and nociceptive symptoms	Medical observations do not correspond with symptom report	(144,145)
Substance Use Disorders	Physical symptoms associated with craving, intoxication, and/or withdrawal (drug specific)	Elevated/decreased: heart rate, respiratory rate, and/or blood pressure, pupillary constriction, others (drug specific)	(101,146,147)
Posttraumatic Stress Disorder	Autonomic hypervigilance, depersonalization/ derealization	Exaggerated startle, flinching, and/or escape responses, elevated heart rate and/or blood pressure	(148)
Generalized Anxiety Disorder	Muscle tension, headaches, fatigue, gastrointestinal complaints, pain	Trembling, twitching, shaking, sweating, nausea, exaggerated startle	(149,150)
Depersonalization/ Derealization Disorder	Detachment from one's body, head fullness, tingling, lightheadedness	Physiological hypoactivity to emotional stimuli	(151,152)
Autism Spectrum Disorders	Skin hypersensitivity	Selective clothing preferences	(107,153,154)

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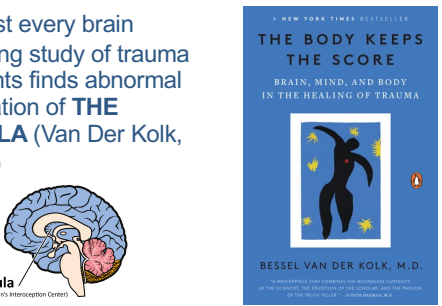
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## IA Extremes & Trauma

Almost every brain imaging study of trauma patients finds abnormal activation of **THE INSULA** (Van Der Kolk, 2014)



(Clausen, et al, 2019; Marusak, Etkin, & Thomason, 2015; Van Der Kolk; Ansell, Rando, Tuit, Guarnaccia, & Sinha, 2012; Herring, Phillips, Almeida, Insana, & Germain, 2012)  
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## IA Extremes

### Connected to Many "Non-Conditions"

- Over-focus on external life
- Little appreciation for the body
- Screen Time
- Behavioral Approaches



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**IA Extremes & Current Behavioral Approaches**

**A Focus on Compliance (further) Affects IA:**

A focus on compliance teaches a person to ignore their own body needs in order to comply with a demand and earn the 'reward'

**My natural coping strategies...**

- Sit on floor or on knees
- Click my tongue
- Rhyme words
- Jump, rock, spin, fidget, climb
- Flap my hands/arms
- Line up objects
- Smell my skin

**My replacement coping tools...**

- Disassociating
- Banging my head
- Pulling out my hair
- Over exercising (6-8 hours a day)
- Yelling to the point of losing my voice
- Cutting, pinching, hitting, starving myself
- Doing things until exhaustion or passing out
- Throwing up (sometimes up to 1000 times in one day)

*Kim Clairy OTR/L*  
[www.kimclairy.com](http://www.kimclairy.com)  
 Learning to Hide

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**IA Extremes**

*Possible Causes*

**Organic Causes:**

- Autism
- ADHD
- OCD
- Anxiety Disorders
- Depression

**Environmental Causes:**

- Trauma
- Busy Lifestyle
- Screen Time
- Little appreciation for body
- Behavioral Approaches

*Interoception is an EVERYONE thing.*

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**Interoception: Impact on Self-Regulation & Positive Mental Health**




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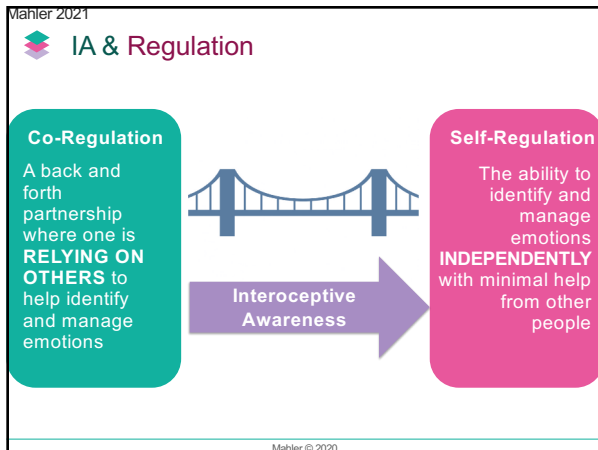
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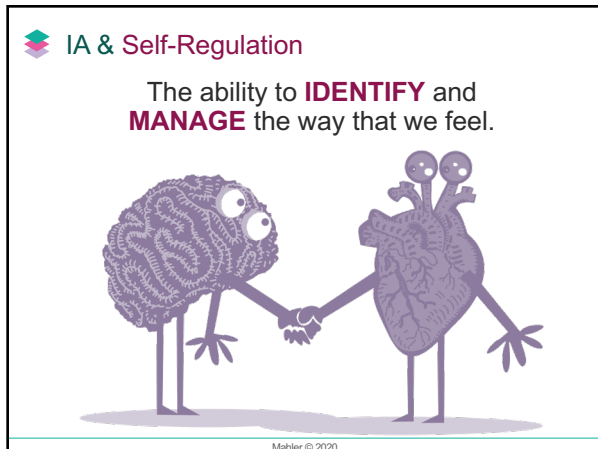
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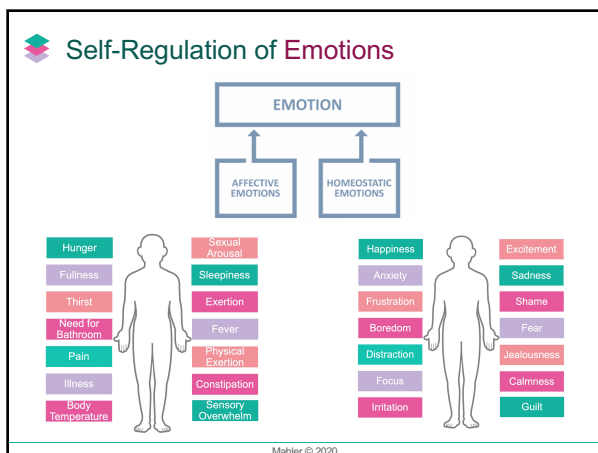
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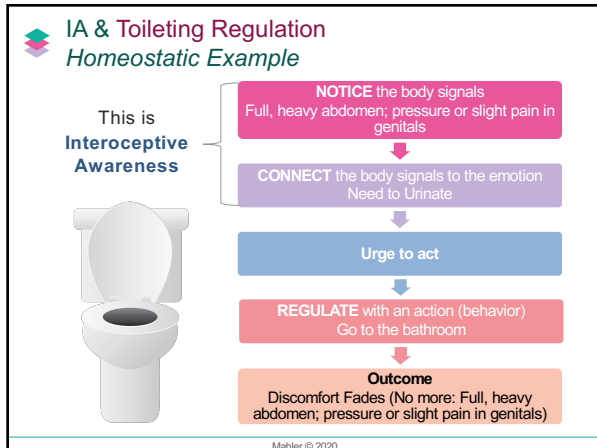
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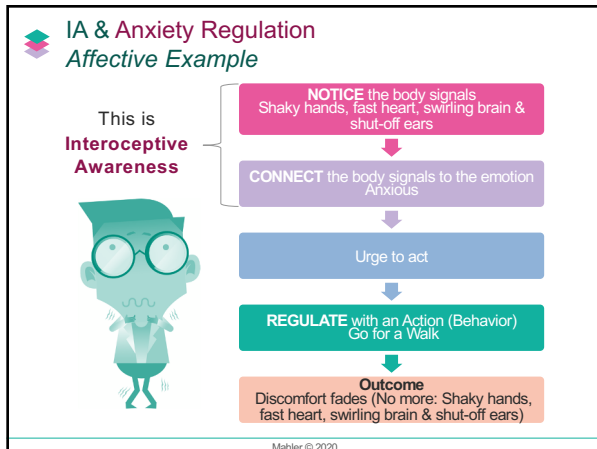
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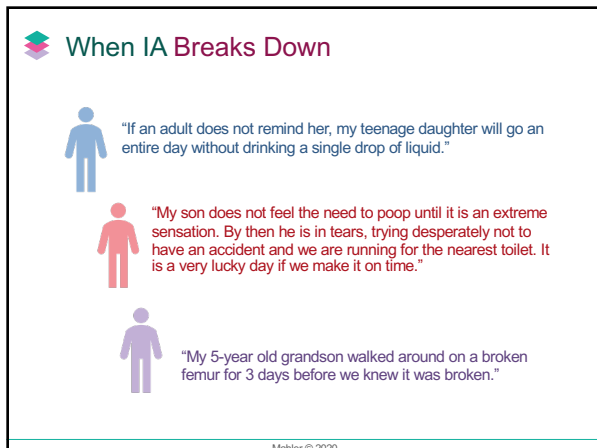
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### When IA Breaks Down

**"My son has been taught every single coping skill known to man: take deep breaths, go for a walk, ask for help, etc. But he doesn't feel the need to use these strategies in the moment. His school labels him as a 'major behavior problem', and sees him as 'oppositional' because he won't use the coping strategies they've taught him."**

**"I feel so many things inside my body at once. It is messy and chaotic. I can't make sense of it all."**

**"Before working on interoception, my anxiety seemed to come out of nowhere. I didn't feel it coming. All of a sudden, I would be overcome with anxiety-- screaming, shaking, crying. And then people would say things to me like "make a smart choice" or "pick a tool" or "use your words". Don't you think I would if I could?!?! This statements made me feel even more guilty --evidence that no matter how hard I tried, I was a failure."**

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### IA & Self Regulation

**NOTICE** the body signals  
Faster heart, clenched fists, tight muscles, louder voice

**CONNECT** the body signals to the emotion  
Angry

**URGE** to act

**REGULATE** with an action  
Go for a Walk

**Outcome**  
Discomfort fades (No more: Faster heart, clenched fists, tight muscles, louder voice, hot)

**Body** → **Emotion** → **Action**

**Body** → **DRY MOUTH & THROAT**

**Emotion** → **THIRSTY**

**Action** → **DRINK**

*The Interoception Curriculum*  
Kelly Mahler MS, OTR/L

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### Building IA can enhance existing Self-Regulation Strategies

#### The ZONES of Regulation®

<b>BLUE ZONE</b>	<b>GREEN ZONE</b>	<b>YELLOW ZONE</b>	<b>RED ZONE</b>
Sad Sick Tired Bored Moving Slowly	Happy Calm Feeling Okay Focused Ready to Learn	Frustrated Worried Silly/Wiggly Excited Loss of Some Control	Mad/Angry Terrified Yelling/Hitting Elated Out of Control

**NOTICE** Body signals & **CONNECT** Body signals to Emotion

*The Zones of Regulation, Leah Kuypers, (2011, Social Thinking Publishing)*

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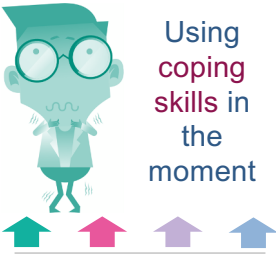
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Building IA can enhance existing Self- Regulation strategies



Using coping skills in the moment

NOTICE Body signals & CONNECT Body signals to Emotion

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The Vast Influence of Interoception: Impact on Social Connection



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IA & Social Connection



Perspective Taking:  
The ability to understand another person's emotions, thoughts, intentions, desires and ideas  
*Also known as Theory of Mind*

Frith & Frith 1999, 2009 Mahler © 2018

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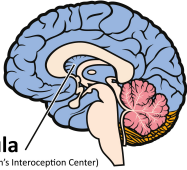
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**IA & Social Connection**

The INSULA:  
How Do I Feel?  
and  
How Do YOU Feel?



Insula  
(The Brain's Interoception Center)

Singer, 2009; Gu et al., 2013

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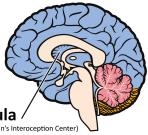
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**IA & Social Connection**

<p><b>People with Good INTEROCEPTIVE AWARENESS</b></p> <p>are better at reading body language &amp; facial expressions</p>	<p><b>People with good INTEROCEPTIVE AWARENESS</b></p> <p>score better on tests of TOM.</p>	<p><b>People with well-working INSULA</b></p> <p>are better able to detect the emotions of others</p>
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Insula  
(The Brain's Interoception Center)

Bird et al, 2010; Cook et al, 2013; Shah et al 2017

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**Theory of Own Mind**  
(Free blog/video)



**THEORY OF OWN MIND:**  
HOW TO HELP NEURODIVERGENTS BECOME THE MANAGER OF THEIR OWN EMOTIONS  
April 21, 2021 @ 10:00-12:00pm EST

Kelly Mahler, OTD, OTR/L      Peter Vermeulen, MSc, PhD

2 hours live instruction with Kelly + guest      Access to 3 exclusive downloadable resources  
2 weeks ongoing access to the recorded session      Certificate of completion

**REGISTER TODAY**  
KELLYMAHLER.COM

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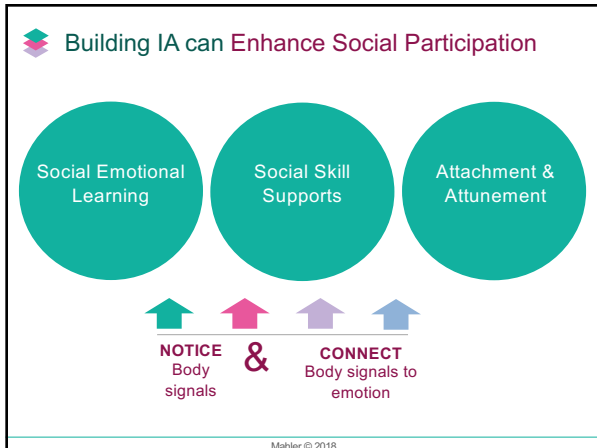
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**Interoception-Based Supports**

If you don't feel at home in your body, you will never feel at home in the world.  
 --Harari, 2018

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**The Established Evidence**

Interoceptive Awareness & Body Mindfulness

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 **The *Established* Evidence**



Why traditional body mindfulness may not be a match:

- Too abstract
- Requires a certain degree of cognition and attention
- Assumes a safe relationship with internal sensations

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 **IA Builders: *Definition***

**IA Builders**

Are a series of **carefully designed strategies**, rooted in concepts from mindfulness, used to develop IA in a sequential, playful and concrete manner

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




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 **IA Builders**

Squeeze your hands in a fist for 10 seconds. How do your hands feel while you are squeezing?

 Cold	 Warm	 Tight
 Loose	 Squeezing	 Fast
 Slow	 Sweaty	 Dry
 Messy	 Clean	 Sore

- Chunked into 1 body part at a time—slow build to the entire body
- Evoking stronger sensation--captures attention
- Playful & learning while doing—feels safe
- Visual & Language supports

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**A Framework for IA Builders**

[www.kelly-mahler.com](http://www.kelly-mahler.com)

**The Interoception Curriculum**

Includes exclusive access to 635 pages of downloadable instructional materials!

A Step-By-Step Framework for Developing Mindful Self-Regulation

Kelly Mahler MS, OTR/L  
Foreword by Ira Glovinsky, PhD

Fosters a process that allows each person to discover their own inner experience.

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**Before using IA Builders**

**Co-Regulation + Felt-Safety + Mutual Relationship**

*and Always Trauma-Informed*

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**IA Builder: Focus Area Experiments**

**Invitation to try:**  
Squeeze your hand in a fist for 5 seconds.  
How does your hand feel while you are squeezing?

Cold	Warm	Tight
Loose	Squeezing	Fast
Slow	Sweaty	Dry
Messy	Clean	Sore

**Considerations:**

- IA Builders are always an invitation, not a required demand
- Accept & Validate all responses
- Meet each learner's communication needs
- Make it playful
- Do with learners (not to learners)

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### IA Builder: Focus Area Experiments

**Invitation to try:**  
Blow on the back of your hand for 5 seconds. How does your hand feel when you are blowing?

**Considerations:**

- IA Builders are always an invitation, not a required demand
- Accept & Validate all responses
- Meet each learner's communication needs
- Make it playful
- Do with learners (not to learners)

Cold	Warm	Tight
Loose	Squeezing	Fast
Slow	Sweaty	Dry
Messy	Clean	Sore

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### IA Builder: Focus Area Experiments

**Invitation to try:**  
Shake your hands fast for 5 seconds. How do your hands feel when you are shaking them?

**Considerations:**

- IA Builders are always an invitation, not a required demand
- Accept & Validate all responses
- Meet each learner's communication needs
- Make it playful
- Do with learners (not to learners)

Cold	Warm	Tight
Loose	Squeezing	Fast
Slow	Sweaty	Dry
Messy	Clean	Sore

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### IA Builder: Everyday Focus Area Experiments

INTEROCEPTION - DAILY ACTIVITY LIST

www.kelly-mahler.com

Free: [www.kelly-mahler.com](http://www.kelly-mahler.com)

HANDS										
Going outside in hot/cold weather	Feeling finger foods	Playing with clay/playdough	Clapping	Playing in snow/sand	Washing hands	Washing on monkey bars	Carrying playground equipment	Checking in playground equipment		
Carrying a cart/book or handbag	Washing name on paper	Typing	Washing dishes	Washing a worm/old shoe	Catching a ball	Carrying a heavy load	Putting on hand lotion			
FEET										
In the bath/shower	Walking/rolling feet on carpet	Walking/rolling feet in grass	Walking on a balance beam	Standing on one foot	Kicking a ball	Jumping on a trampoline	Checking in playground equipment			
Going outside in hot/cold weather	Relaxing on the couch or chair	Putting on socks/shoes	Taking off socks/shoes	During a foot tickle	Wiping/scrubbing active play	Carrying a heavy load	Putting lotion on feet			
MOUTH										
Brushing teeth	Taking a sip of ice water	Taking a sip of warm tea	Eating a treat	Chewing with mouthwash	Chewing gum	Blowing bubbles	Blowing up a balloon			
Eating a crunchy snack	Eating soup	Eating a chewy snack	Putting on Chapstick	Eating a popsicle	Humming a song	Whispering with fingers	Sucking on ice cube			

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**IA Builder: Everyday Focus Area Experiments**  
*At School*

Consider your normal daily routines. What activities are you already doing that could serve as Focus Area Experiments? What activities might evoke a stronger feeling within the following body parts:

**Hands:**

- Writing
- Typing
- Clay/Playdough/Slime
- Manipulatives
- Handwashing
- Hand sanitizer

**Heart:**

- Recess
- PE
- Movement Breaks

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**IA Builder: Interoception Yoga Cards & Interoception Exercise Cards**  
*More Focus Area Experiments*


**CON**



How do your hands feel while holding this pose? Gently press each of your fingers into the mat one at a time. How do your hands feel while you press your fingers into the mat?

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**STANDING BICYCLE TWIST**



How do your hands feel during this exercise? Link your fingers together behind your head. How do your hands feel? Now unlink your fingers and rest your hands on the back of your head while continuing the exercise. Does this change the way your hands feel? Can you describe the difference?

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**IA Builder: Focus Area Experiments**  
**WHY it helps**



- Concrete meaning to interoception words
- Fun practice NOTICING and DESCRIBING interoceptive sensations
- Safe way to experience sensations



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 **THANK YOU!!**

*FOR MORE INFORMATION:*

- [www.kelly-mahler.com](http://www.kelly-mahler.com)
- Facebook-Interoception: The Eighth Sensory System



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