

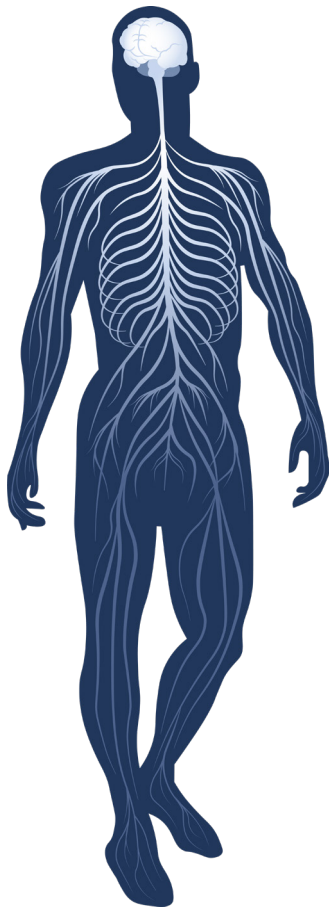
# The Traumatic Stress Research Consortium (TSRC)

at the Kinsey Institute, Indiana University

March 2023

## Measuring Autonomic Symptoms with the Body Perception Questionnaire

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### Table of Contents

Disrupted by Danger Responses: How the Nervous System Reacts and Recovers.....	2
BPQ Evidence Base.....	3
Tracking Autonomic Symptoms in Practice.....	6
Supporting Trauma Therapy with the BPQ.....	8
Consortium and Membership Information.....	9
References.....	12

When we encounter a threat, shifting into a survival gear overrides typical body functions so that we have a better chance at living through a situation. But if a person's nervous system spends a lot of its time in survival mode, which can be caused by sustained stress or traumatic experiences, the body's functions can become disrupted in a chronic way.

In previous newsletters, we reported on

findings from our therapist and client surveys related to questions from the Body Perception Questionnaire (BPQ), a self-report measure of body symptoms that can be caused by chronic threat reactions. In this newsletter, we will go into more detail about this tool that allows therapists to track ways in which a client's body functions are impacted by stress or trauma, giving clues to what autonomic states a client is experiencing.

# Disrupted by Danger Responses: How the Nervous System Reacts and Recovers

The autonomic nervous system is a network of neurons that branch from the brainstem and spinal cord through the body. Through this interconnected brain-body infrastructure, we can manage functions across the body. Most of these functions are outside of conscious control, maintaining coordinated body activity to allow the “business as usual” that we need for life such as supporting digestion and keeping blood pressure within specific limits. However, this autonomic maintenance is sensitive to changes in current conditions and prepares the body for anticipated needs. When a person moves into a defensive state, the autonomic nervous system can override the typical ways that organs work in order to prepare for a threat response. For example...

*Imagine you are crossing the street when you are startled by a loud noise. Instantly, your breathing speeds up and becomes more forceful. This lets your body boost its oxygen intake and get rid of carbon dioxide more quickly, providing power to mobilize in the moment if you need to. Your eyes dart around to locate the source of the sound, your breath now fast and shallow, body ready to act. What caused the noise? Are you in danger? As you scan the scene, you notice a car down the street whose tailpipe has backfired. All good, no danger. Snapping out of your sudden heightened alertness, you can resume crossing the street. Because there is no need to mobilize a defense, this is a good time for your autonomic nervous system to wind down. You arrive at the park, and sit on a bench to wait for your friend, with whom you made plans to meet here.*

*When your friend arrives, you greet her and start to catch up about your day. As you are speaking, you notice that you have to keep pausing to catch your breath in the middle of sentences. You are still breathing those same fast, shallow breaths that started when you were startled by the loud sound. This tells you that your autonomic nervous sys-*



*tem is stuck in the defensive response. Like many functions of the body, respiration shares multiple roles. Breathing is not only critical for exchanging oxygen and carbon dioxide to maintain the body, but we also use the air pressure from our exhalation to produce speech. In this moment, the defensive reaction overrides the need to coordinate speaking. Your speech feels choppy and strained, with pauses partway through sentences to catch your breath. While it was useful in the moment of orienting to danger and preparing for a response, now that shallow breathing is getting in the way of clear speech with your friend.*

Defensive reactions involve many parts of the body. In addition to changes in breathing that help fuel mobilization, they also include the heart, which speeds up and beats harder to circulate blood, and the gut, which may have its digestive functions suppressed to allocate resources to other parts of the body. All of these functions and their changes to immediate needs are coordinated by the autonomic nervous system. Just like the startle at the crosswalk, if they continue to be set on survival mode over the long term, they can be difficult to ignore and affect day-to-day life.

The Body Perception Questionnaire Autonomic Symptoms Form (BPQ20-ANS) was developed to measure experiences of these types of body disruptions. This questionnaire asks how often certain disruptions in functions are felt in day-to-day life. High scores indicate more disruption of

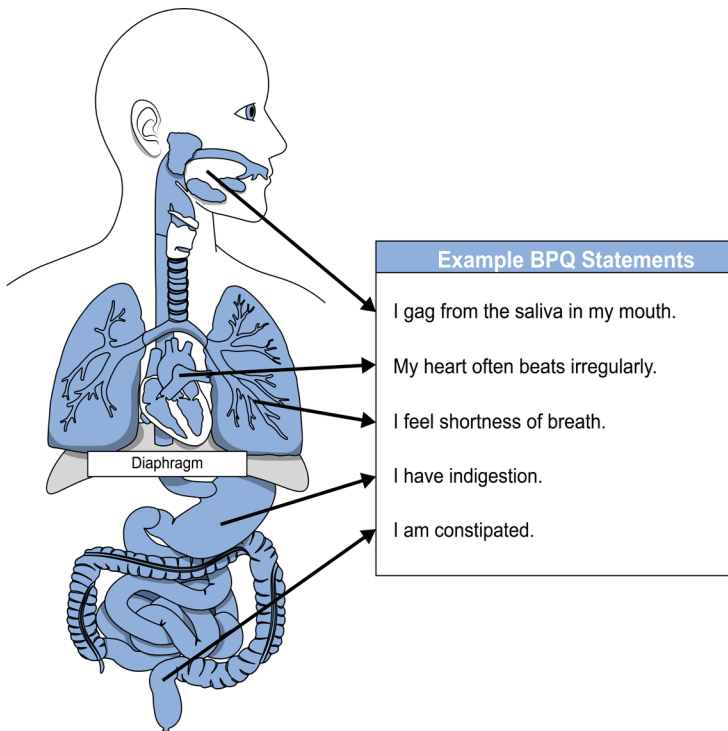
typical organ function. Though any one disruption can have an individual cause (for example, shortness of breath may be caused by poor air quality), when disruption in multiple functions over time are combined in a single measure, they can provide an overall picture of a person's autonomic state.

## BPQ Evidence Base

The Body Perception Questionnaire (BPQ), first developed and introduced by Stephen Porges in 1993, has been widely used in research to study autonomic symptoms and awareness of body sensations. Over the past years, researchers at the TSRC and partner sites around the world have studied it using psychometric techniques, which describe how measurement works. Common questions that are addressed by psychometric studies are validity (how accurate is an instrument for the thing it is meant to measure) and reliability (how consistent a measurement is when it is repeated under the same conditions). To better understand the BPQ autonomic symptom scale, researchers

have also conducted studies to understand whether experience with body noticing affects results, how the scale behaves in different languages, and its association with trauma.

When it was initially developed, the BPQ had 122 questions, and multiple subscales within it to capture different aspects of body stress responses,<sup>1</sup> including the autonomic symptoms subscale, which we are focusing on in this newsletter. Over the course of repeated psychometric studies, the BPQ was refined to be more streamlined and simplified, resulting in the BPQ-Short Form which is now the primary version in use. This newsletter will focus on the autonomic symptoms section (BPQ20-ANS) which has a well-established research base and may be particularly useful for clinicians. This form, along with other versions of the BPQ, can be found on the [TSRC webpage](#).



### Validity: How does the BPQ compare to sensor-based measures of autonomic activity?

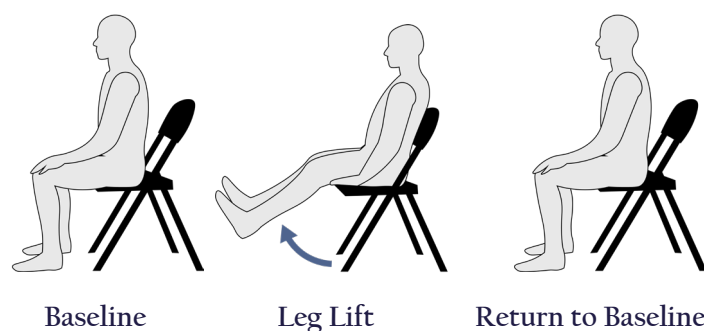
While the BPQ was informed by knowledge about how organs are controlled by the autonomic nervous system, it is an important validation goal to be able to show that scores on it are related to the way that people's autonomic nervous systems work. A recent study led by TSRC researchers explored the question of validity by comparing BPQ20-ANS scores with non-invasive sensors of

autonomic activity. The study focused on a simple maneuver: a set of exercises during which a sitting person lifts their legs so that they are parallel to the floor, holding them still for 30 seconds, and then sets them down to rest. During a simple maneuver like this, the autonomic nervous system needs to make adjustments to provide metabolic resources to leg and core muscles to support the lifts. Repeating the maneuver several times can test autonomic adjustments to the needs of the moment.

In the study, participants performed these leg lifts while they had their vital signs monitored. One of these measures was respiratory sinus arrhythmia measured from an electrocardiogram (ECG), which provides information about the strength of parasympathetic “calming” effect on the heart. A second measure of electrodermal activity, which provides information on sympathetic mobilization, was observed using a set of sensors on the fingers to measure sweating. The use of these two signals provided information about the parasympathetic and sympathetic branches of the autonomic nervous system, which can work together to adjust to metabolic needs.

The results showed that study participants who experienced few autonomic symptoms measured on the BPQ20-ANS had well-organized physiological responses. In these participants, the parasympathetic and sympathetic autonomic branches worked together to support mobilizing metabolic resources during lifts, then returning back to normal once their legs were on the floor. However, participants who experienced more everyday autonomic symptoms had less flexible responses. Though they could mobilize when they needed the strength to lift their legs, their sympathetic activation did not turn off when their legs were resting on the floor. This tells us that a person who experiences autonomic symptoms may be more likely to get stuck in a mobilization state and

may have difficulty returning to calm rest. Participants in the study at the very highest scores did not have a consistent coordinated response in either their parasympathetic or sympathetic branches, which suggests they may have particularly high levels of dysregulation. Overall, the results of the study tell us that autonomic symptoms may exist on a gradient. Low levels of symptoms suggest efficient and flexible autonomic adjustments to needs, moderate levels suggest difficulty with calming the body after mobilization, and high levels suggest dysregulation.



### Reliability: How consistent are scores on the BPQ?

Because challenges change from day to day, autonomic symptoms may fluctuate too. However, the BPQ is intended to capture some stable patterns of autonomic responses (see [“Tracking Autonomic Symptoms in Practice”](#) for guidelines on how to time assessments and how to interpret small changes). Though there may be some fluctuations in autonomic symptoms over time, the BPQ has been found to be reliable when the same person fills out the questionnaire on multiple occasions when they are not receiving an intervention that is designed to influence their autonomic activity.

### Trauma and autonomic symptoms.

Experiences of chronic threat or adversity may contribute to re-tuning the autonomic nervous system so that it is more responsive to danger. Though these adaptations can help identify and

quickly respond to danger, they place a person at risk of experiencing more disruption in the activity of their organs during day-to-day life. Studies consistently find that those with trauma histories report high levels of autonomic symptoms on the BPQ. For instance, autonomic symptoms are more common among people who had maltreatment experiences in childhood, such as sexual and physical abuse.<sup>2,3</sup> In addition, experiencing more autonomic symptoms during in the first months of the COVID-19 pandemic was associated with having more prior adversities in life and to active PTSD symptoms.<sup>4</sup>

### Experience Effects.

Research shows that having formal training for noticing body sensations does not affect patterns of responding on BPQ20-ANS. To study this, researchers used a statistical method called factor analysis to study inter-relations of responses. Factor analysis helps determine how a questionnaire is scored and guides interpretation of subscales. If the results of the factor analysis are different in one group compared to another, it suggests that the scale needs different scoring and potentially different interpretation when used with these groups. In a study of mind-body practitioners, whose training and practice includes close attention to body sensations, the BPQ factor structure was consistent with general populations from other studies. This indicates that scoring and interpretation can be consistent whether clients are experienced or new to tracking body sensations.<sup>3</sup>

### Translations.

The BPQ has been translated into over a dozen languages. The currently available translations are hosted on the [TSRC webpage](#). Several research studies have been conducted on BPQ translations - including Spanish, Italian, and Chinese.



So far, all have been found to have similar psychometric properties like factor structure, reliability, and validity.<sup>5,6,7,8</sup>

### Interested in helping with a translation?

The TSRC hosts a [free archive of BPQ translations](#) that make it accessible to a larger international user base.

If you are interested in conducting a translation, please contact Dr. Jacek Kolacz ([jkolacz@iu.edu](mailto:jkolacz@iu.edu)).

## Tracking Autonomic Symptoms in Practice

There are a number of reasons why a clinician may want to track autonomic symptoms over the course of therapy. Doing so provides an opportunity to check in on threat and safety states with limited need to connect with autobiographical memories and layering psychological meaning. If a particular treatment is intended to help manage threat states and better regulate toward safety, then tracking autonomic symptoms may help provide a simple, standardized method to assess whether the client is benefiting from the intervention. Clients may fill out the BPQ20-ANS during therapy sessions, while waiting for their appointment, or on their time outside of session. Once a client completes the questionnaire, the guidelines below can be used to score and interpret the results.

### How do I score the BPQ-20 ANS?

The BPQ20-ANS is scored by adding up the individual responses for each question. It is possible that some clients may have reasons for skipping a particular question. Scoring is most accurate when responses are as complete as possible. If a client has skipped a question, you can follow up to see whether the omission was intentional. In some cases, a client may simply have not noticed that they missed reporting one of their answers. If a client is uncertain about how to answer, you can encourage them to provide their best guess. However, if a client thinks that they cannot respond to one of the questions accurately, it is better to leave that question unanswered than to have the client make a random guess. You can use your best judgment to determine whether their uncertainty is because they did not notice the sensation (in which case they can mark “never”) or if there was something preventing them from reporting accurately.

Once the client has completed the questionnaire, the scores can be added up and calculated in three subscales. The first a measure of total autonomic symptoms. These can be further

broken down to distinguish symptoms above the diaphragm (supra-diaphragmatic) and symptoms below the diaphragm (sub-diaphragmatic; mainly reflecting problems with digestion). In research studies, supra- and sub-diaphragmatic symptoms tend to be highly correlated, meaning that symptoms are usually higher or lower in both areas.

It is common for people to experience some sensations of autonomic symptoms throughout their daily life so some scores higher than 0 are expected even if the person does not have chronic threat responses. These low scores may still be very low and not of clinical significance. To contextualize the scores, they can be compared to a general adult U.S. population by converting to percentiles (see scoring manual on [BPQ webpage](#)). A high percentile means that a person is experiencing more autonomic symptoms than that percentage of a typical sample. For example, a supra-diaphragmatic symptom score of 37 is in the 70th percentile. That means that client has autonomic disruption of typical function more frequently than 70% of general population sample

## How far apart should I space measurements?

It is a good idea to give clients a time frame to report on, particularly if you are administering the BPQ repeatedly. Specifying a time window and using it consistently can help to make measurements standard. If you want to track a single client, you may use a consistent time window so that you are clear about the length of time that the client is reporting on during each measurement (for example, “Over the past week”, “Since our last session”). Likewise, if you are collecting data on multiple clients and want to be able to compare them to one another, using consistent instructions on the length of the reporting window will make comparisons between them easier to interpret.

Typical time windows range between 1 week and 1 month. When deciding on the measurement spacing, it is important to avoid overlapping measurement windows. For instance, if you are repeating the assessment every week the reporting window should not be more than 1 week. Consideration should also be taken to structure measurement around events, such as the start of a new therapy. There is a trade off in the length of the reporting window. Longer windows allow for more opportunity to observe situations where autonomic disruptions occur, but - on the other hand - longer windows may be less reliable due to limitations of memory.

## What factors can explain scores?

Physical symptoms may have many possible causes. While chronic threat responses may be one, it is also important to rule out other reasons that a person may be experiencing symptoms. Some diseases and medications may specifically affect organs that are controlled by the autonomic nervous system or change autonomic function itself. Medications such as anticholinergics affect the signaling of the vagus nerve. In some cases, the medication creates a “chicken-or-the-egg” problem, where it is unclear whether the autonomic symptoms (or chronic threat responses) are managed by the medication or are caused by it.

If you are comparing client change over the course of therapy, tracking autonomic symptoms with the BPQ20-ANS may still be informative and valid regardless of other influences. As long as a client’s medical conditions and medication use is stable, changes in autonomic symptoms over time can be a useful measure of changes in autonomic threat response patterns.

If you are interpreting results for a client who has a high score from a single measurement (for instance, an intake), it may be important to rule out causes due to medication or medical condition before concluding that the symptoms are caused by chronic threat responses. If you have questions about your client’s medication, you can be in touch with your client’s medication manager or psychiatrist. However, even if clients are on medication or have a disease that impacts the autonomic nervous system, they may still benefit from interventions that help to manage chronic defense states and may demonstrate improvements.

## How much change is reliable?

Although scores on the BPQ have been found to be reliable, there are expected fluctuations that might occur between measurements, even if the person's underlying autonomic state regulation has not changed. Some of those small differences may be due to slight changes in how a person responds to each question when asked again. Others may have to do with differences in a person's demands from one observation window to another. There are no absolute cut offs for where a score may be reliable, but a rule of thumb may be that a change has to be more than 5 percentile points to be considered different from the last measurement.



## Supporting Trauma Therapy with the BPQ

Much of the experience of chronic threat states occurs beneath everyday awareness. This can pose challenges for trauma recovery because a client may sense something doesn't feel right but struggle to pinpoint it, or may be so used to feeling these disruptions that they may not notice them. However, the long-term effects can be felt in the automatic body processes that maintain our moment-to-moment well-being and our responses to everyday challenges.

The BPQ provides a tool for trauma therapists and clients to bring subconscious experiences into conscious, explicit awareness. By establishing a client's autonomic symptom baseline, the persistence and intensity of the body's survival states can be tracked over time. Discussions about

body reactions can also help with acknowledging threat and trauma when the client may have strong, protective boundaries that make conversations on this topic difficult. For some clients, these conversations may also help reduce the burden of shame and blame for behaviors that originate in automatic physiological reactions and patterns. For clinicians using modalities that include education about body responses and improving awareness, the BPQ may be used alongside standard therapy practice to support awareness of threat-related sensations. Tracking these underlying patterns of threat response can help the trauma therapist build a better understanding of a client's journey in pursuit of healing.



# About the Consortium

The TSRC is an international group of clinicians and researchers studying the science of safety and connection. We are committed to furthering our understanding of the personal trajectories of trauma survivors, including mental and physical health, social wellbeing, resilience, and personal meaning. Our research orientation is grounded in Polyvagal Theory, developed by Dr. Stephen Porges, which explains how threat can retune our autonomic nervous systems into states of defense.

## Our Team



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## 2022 Membership Review

We now have 968 members  
in the TSRC network, with  
68 new members joining  
in 2022

## Ways to get involved with the consortium

**Invite your clients to share their  
experiences:**

We continue to welcome new participants for our worldwide client survey. We invite you to help your clients share their experiences. [Access the online survey.](#)

**Help grow our membership:**

Invite your colleagues to join the TSRC network. Register at [trauma@indiana.edu](mailto:trauma@indiana.edu)

## Correction to Last Newsletter

Our [last newsletter](#) has been corrected in the online archive to provide credit to Liza Morton and Nicola Cogan of the University of Strathclyde for their work to develop the Neuroception of Psychological Safety (NPSS) questionnaire.

## Thank You to Our Donors

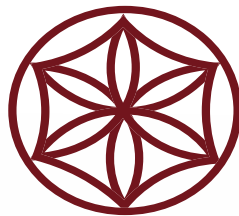
The consortium is grateful to the United States Association for Body Psychotherapy (USABP), the Dillon Fund, the Chaja Foundation, Dr. Christopher Walling, and two anonymous donors for generous gifts in support of our research and outreach mission.

## Subscription Information

You are receiving this newsletter because you are an active member of the Traumatic Stress Research Consortium (TSRC). If you wish to unsubscribe, please follow the link at the bottom of the email you received from us.

## Contact Us

Email us at [trauma@indiana.edu](mailto:trauma@indiana.edu) or learn more at <https://www.traumascience.org/>



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## References

1. Porges S. W. (1993). Body Perception Questionnaire. Laboratory of Developmental Assessment, University of Maryland.
2. Kolacz, J., Hu, Y., Gesselman, A. N., Garcia, J. R., Lewis, G. F., & Porges, S. W. (2020b). Sexual function in adults with a history of childhood maltreatment: Mediating effects of self-reported autonomic reactivity. *Psychological trauma: theory, research, practice, and policy*, 12(3), 281. <https://doi.org/10.1037/tra0000498>
3. Jokic, B., Puric, D., Grassmann, H., Walling, C. G., Nix, E. J., Porges, S. W., & Kolacz, J. (2022). Association of childhood maltreatment with adult body awareness and autonomic reactivity: The moderating effect of practicing body psychotherapy. *Psychotherapy*. Advance online publication. <https://doi.org/10.1037/pst0000463>
4. Kolacz, J., Dale, L. P., Nix, E. J., Roath, O. K., Lewis, G. F., & Porges, S. W. (2020a). Adversity history predicts self-reported autonomic reactivity and mental health in US residents during the COVID-19 pandemic. *Frontiers in psychiatry*, 11, 577728. <https://doi.org/10.3389/fpsyt.2020.577728>
5. Cerritelli, F., Galli, M., Consorti, G., D'Alessandro, G., Kolacz, J., & Porges, S. W. (2021). Cross-cultural adaptation and psychometric properties of the Italian version of the Body Perception Questionnaire. *PloS one*, 16(5), e0251838. <https://doi.org/10.1371/journal.pone.0251838>
6. Poli, A., Maremmanni, A. G. I., Chiorri, C., Mazzoni, G. P., Orrù, G., Kolacz, J., Porges, S. W., Conversano, C., Gemingnani, A., & Miccoli, M. (2021). Item Reduction, Psychometric and Biometric Properties of the Italian Version of the Body Perception Questionnaire—Short Form (BPQ-SF): The BPQ-22. *International Journal of Environmental Research and Public Health*, 18(7), 3835. <https://doi.org/10.3390/ijerph18073835>
7. Wang N, Ren F, Zhou X. (2020). Factor Structure and Psychometric Properties of the Body Perception Questionnaire—Short Form (BPQ-SF) Among Chinese College Students. *Frontiers in Psychology*, 11:1355. <https://doi.org/10.3389/fpsyg.2020.01355>
8. Cabrera, A., Kolacz, J., Pailhez, G., Bulbena-Cabre, A., Bulbena, A., & Porges, S. W. (2018). Assessing body awareness and autonomic reactivity: Factor structure and psychometric properties of the Body Perception Questionnaire-Short Form (BPQ-SF). *International journal of methods in psychiatric research*, 27(2), e1596. <https://doi.org/10.1002/mpr.1596>