Nightswimming • Pure Research • Final Report

"The Study of Kinesthetic Transference in Performance, 2019"

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This Nightswimming Pure Research project was conducted at the University of Toronto's Centre for Drama, Theatre, and Performance Studies in the Luella Massey Studio Theatre from October 24 to 26, 2019. Thank you to the Centre for its support and collaboration on Pure Research. This report published August 2020.

For more information on Pure Research, please visit **nightswimmingtheatre.com.**

Brian Quirt – *Artistic Director* | Brittany Ryan – *Producer* | Olivia Shortt – *Associate Producer*

I. Introduction

This is a preliminary report of our 2019 Pure Research study on *Kinesthetic Transference in Performance*. Our goal was to examine the impact of the practice of **interoceptive awareness** by performers on the physiology of audience members. To achieve this, we asked performers trained in ***The Batdorf Technique*** to perform a short movement solo with, and without, applying the conscious practice of **interoceptive awareness** to their performances. Each performance was viewed by three to four audience members who were connected to biosensors measuring their electrocardiogram (ECG), heart rate (HR), electrodermal activity (EDA) and facial electromyograms (EMG). HR was derived from ECG in real-time. EDA is representative of eccrine activity. EMG was recorded from corrugator and zygomaticus. Micro-facial expressions can be indexed via these EMG measurements. HR and EDA measurements correspond to arousal. The EMG measurements correspond to valence. All measures were recorded in synchrony to the ambient environment and performances.

We are incredibly grateful to Nightswimming for the opportunity and support to conduct this study, to The University of Toronto for providing the beautiful *Luella Massey Studio Theatre* as the research site, to Kansas State University for additional travel support and ethics review, to Biopac Systems, Inc. for the use of the measurement systems, and to nD::StudioLab for research protocol staging.

The study generated large quantities of biometric data which are currently being analyzed and will later be presented in a full research report. Due to the volume of data and the nearly infinite ways in which it can be examined, this process will take some time to complete. When finished we will share the research report or article with Nightswimming. The purpose of this report is to describe the study, its hypothesis, methodology, and tools used, as well as some initial discoveries.

II. Background

The Batdorf Technique (TBT) is a training system designed to help practitioners increase their presence and emotional range as performers, developed by Erika Batdorf through 30 years of performance and pedagogical research.

The early stages of the training in **TBT** are called ***Interoceptive Awareness in Performance (IAP)*** and are focused on developing the capacity for interoceptive awareness. Practitioners learn to consciously feel sensations from the involuntary systems of the body – breath, blood flow, temperature, pain, pleasure, digestion, etc. – in a structure that allows for the exciting and safe inclusion of emotional discovery. ***IAP*** gives the practitioner simple and concrete tools to stay 'present' and reawaken their physical awareness alone, and with others.

As the practitioner develops reliable access to awareness of these specific types of interoceptive sensation, they move into the next phase of the training: ***Kinesthetic Transference in Performance (KTP)***.

KTP systematically trains practitioners to maintain and 'juggle' conscious awareness of interoceptive sensations with sensory and exteroceptive awareness while *doing* other things, e.g. performing structured choreography, memorized text, singing, or making eye contact. Eventually, practitioners can consciously modulate the "kinesthetic state" that is being communicated to an audience.

A. Pure Research: "Kinesthetic Transference in Performance Study I" (2007)

In 2007, with the support of a Nightswimming Pure Research Grant, Erika Batdorf, Kate Digby and Denise Fujiwara conducted a three-day study to investigate aspects of deep, conscious interoceptive awareness as a technique that can be acquired and developed. That research was guided by a number of questions: 1) Can performers control their ability to affect an audience kinesthetically?; 2) If yes, then is it possible to articulate in detail what the performers are doing when they 'affect' the audience?; and 3) Is the performer's 'control' of kinesthetic transference measurable in any way?

We conducted this experiment by having three performers each show two different performance excerpts twice (with the most minimal context possible – no music, story, lighting). The performances were videotaped from behind the performer, so that both the performance and the audience are visible in the documentation. The audience held their hand over their heart as a constant, uncovering their heart with a simple hand gesture when "moved" or "compelled". Analysis of the data confirmed that the audience identified as feeling "moved" or "compelled" in the moments when the performers reported feeling most "interoceptively aware". We concluded that deep physiological awareness, specifically interoceptive awareness, does enable performers to kinesthetically transfer more effectively than when not present.

This study was instrumental in advancing the development of **The Batdorf Technique** in several ways:

1. It facilitated greater clarity around the principles of compelling non-verbal performance;
2. It facilitated greater clarity in the language used to describe the principles of effective interoceptive awareness;
3. It allowed The Batdorf Technique founder and practitioners to trust that there was indeed a measurable outcome of the application of this technique to live performance work.

Read more about our first *Kinesthetic Transference in Performance* study in this interview with Erika Batdorf and Kate Digby.

B. Evolution of The Batdorf Technique

The increased confidence and clarity resulting from the 2007 Pure Research study prompted Erika Batdorf and Kate Digby to systematize the training in The Batdorf Technique even further, particularly the advanced work of ***Kinesthetic Transference in Performance*.** Together they developed a teacher training program and a summer institute with the goal being to increase the number of performers trained at the advanced level of TBT so that more learning could occur through a larger community of practitioners. When the first Pure Research study was conducted there were only four individuals considered advanced practitioners of TBT, one of whom was too distant geographically to easily participate in research studies or ongoing training. In 2019, there was a pool of 15+ from which to choose. In addition to the systematic training work, Digby and Batdorf also collaborated on ensemble performance works integrating TBT to be able to develop the technique in application with a group of advanced practitioners.

C. Expansion of the Research Team

In 2015, Batdorf and Digby were introduced to Alan Macy, Biopac Systems Research Director, with whom, in addition to Mark-David Hosale, York University Computational Arts Professor, they formed a research collective: *Performance, Art, and Cyber-Interoceptive Systems (PACIS).*

The first endeavor of PACIS was to host the *Movement and Emotion as Computational Interfaces Workshop* (MECI) at York University in Toronto.

At *MECI* we began using biosensors to measure the heart rate, breath rate, eccrine response, skin temperature, and micro-facial muscle movements of both TBT practitioners and audience members observing their performances. Although a formal study was not conducted, a quick survey of the data collected indicated that audience members had the highest incidence of eccrine response activation (measured via EDA) when observing performers with the highest level of expertise in implementing The Batdorf Technique in live performance, and conversely,

the lowest incidence of eccrine response when observing performers with the least amount of expertise in TBT, even when adjusted for the relative virtuosity of their performance pieces.

The eccrine glands are the major sweat glands in the human body. They are located all over the body, but found, in highest density, on the palms of the hand and soles of the feet. Eccrine gland activity is indexed by the measurement of skin conductance. The higher the skin conductance, the more extensive the eccrine activity (skin sweating). Skin conductance increases with increased participant arousal (degree of excitement).

III. The 2019 *Kinesthetic Transference in Performance* Pure Research Study

A. The Research Questions

This study, using biosensors to measure audience physiological response to a series of performances by actors trained in *The Batdorf Technique*, seeks to answer the following questions:

1. Is there a measurable difference in the impact on the audience's physiology, specifically heart rate, eccrine response, and/or micro-facial movements, when the audience witnesses a performance that integrates interoceptive awareness (understood according to the practice of ***The Batdorf Technique***), versus the same performance material without the integration of interoceptive awareness?

2. If so, what is/are the difference(s)?

As we began to construct the parameters of this study, we looked back to the previous studies and our ongoing experience teaching and practicing *The Batdorf Technique*. Our approach was greatly enhanced by the addition of Alan Macy to the team given his expertise in psychophysiological measurement and analysis.

We decided to present a series of short performances by practitioners of *The Batdorf Technique* and measure aspects of the audience members' physiology associated with valence (range from negative to positive) and arousal (range from boredom to excitement). For this study we chose to measure the electrocardiogram, heart rate, eccrine response and micro-movements of two facial muscles – corrugator and zygomaticus. Since the performers would naturally have a range of degrees of expertise with the practice of integrating interoceptive awareness into live performance work, we felt it was important that each performer offer both a consciously interoceptively aware, or "loaded", performance, as well as an un-interoceptively aware, or "unloaded", performance of the same material.

B. Actor Preparation

We identified six advanced practitioners of *The Batdorf Technique* who were available during the dates of the study and for a series of rehearsals/practice sessions leading up to the study, all with TBT training that extended beyond the year-long introductory course offered through York University.

Batdorf designed a simple five-minute silent solo performance of un-virtuosic, "pedestrian" movement. An intentional effort was made to strip the performance of anything that might be obviously exciting to the audience. There are no relationships being built on stage, there is no eye contact, no direct address, no sound, no lighting, no 'content' communicated verbally, no dynamic choreography.

The six performers learned the score of this performance piece – sit in a chair looking at something, stand up, walk towards what you were looking at, then walk back. Drop into a squat, look at the chair you started in, sit in it, stand again, walk to the back of the chair, lean on it – and rehearsed it over a series of eight sessions with Batdorf. They subsequently worked to synchronize their timing to give as much consistency to the performances as possible. And then they practiced integrating conscious interoceptive awareness via application of *The Batdorf Technique* into a version of the performance, while also striving to retain the ability to perform that same piece without accidentally entering a state of deep interoceptive awareness when not intended. Through consultation with the actors about the nature of their performance work, a decision was made that in addition to the movement blocking, the performers would use an acting score of thought articulation in both the "loaded" and "unloaded" performances.

In the process of preparing for the study, the performers realized that it was difficult to perform the piece "unloaded" after performing it "loaded". This led to a hearty discussion about whether it was accurate for us to name the performances as such since a performer can intend to be "loaded" but be unsuccessful, and conversely, a performer can intend to be "unloaded" yet accidentally begin to drop into the interoceptive awareness practice. For this reason, we decided to incorporate a system to measure the relative degree of successful integration of TBT interoceptive awareness of ALL the performances, whether or not they were loaded.

Three TBT teachers were available during the period of the study. These teachers, or 'expert observers', watched the performances and coded them according to eight interoceptive metrics at twenty-three distinct points/durations within the five-minute performance. Each performer also recorded a self-analysis of their relative success on the same eight interoceptive metrics during the same twenty-three distinct points/durations. Only the performers knew which of their own performances was 'loaded' or 'unloaded'; the expert observers were coding blindly in order to eliminate potential scoring-bias.

(Note: performers and audience-participants remain anonymous, in keeping with protocols for research subjects.)

C. Study Design

We planned for the study to have twelve performances, six each of the 'loaded' and 'unloaded' types. Each performer would give one of each type, and the performances and performers would be organized in a random sequence so that neither the expert observers nor the additional researchers knew which performances were 'loaded' during the data collection phase. The day before the start of the study we made the decision to reduce to 10 performances, by five performers since we had 37 audience-participants registered.

Almost all performance sessions had four participants, but three had only three participants. Four biometric measurements associated with either valence or arousal were taken from each participant's heart rate, eccrine response, micro-movements of the corrugator muscle, and micro-movements of the zygomaticus muscle. These measurements were performed in accordance with Russell's 1980 paper "A Circumplex Model of Affect" (Russell 1980).

After completing a self-report 'manikin' form to indicate their relative valence (range from displeasure to pleasure) and arousal (range from boredom to excitement) on scales of 1-10, audience-participants had their biometric data collected for 15 minutes: a five minute pre-performance baseline measurement, five minutes of performance measurement, and five minutes post-performance baseline. The performances were videotaped so that there was an exact time correlation between the biophysical data and the performance event. Upon completion of the post-performance baseline data collection, the participants filled out the same manikin forms again, circling images to indicate their perceived arousal and valence.

D. Participant Selection

Nightswimming invited participants to join the research study, reaching out to their networks including University of Toronto students, while performers also shared the information with their networks. It can be assumed that these groups had an uncommonly high percentage of theater goers; however, conscious effort was made not to invite participants with prior exposure to TBT, or TBT training.

Participants who responded to the call were randomly assigned to groups, so they did not know in advance who would be performing, what would be done in the performance, nor did they get to select the time of day or date of their participation.

E. Data Collection

When participants arrived at the Luella Massey Studio Theatre of the University of Toronto, they were met by Nightswimming staff and directed to the basement where they received a brief introduction to the project, including informed consent about their participation in the research project. Those who chose to continue were asked to sign consent forms and

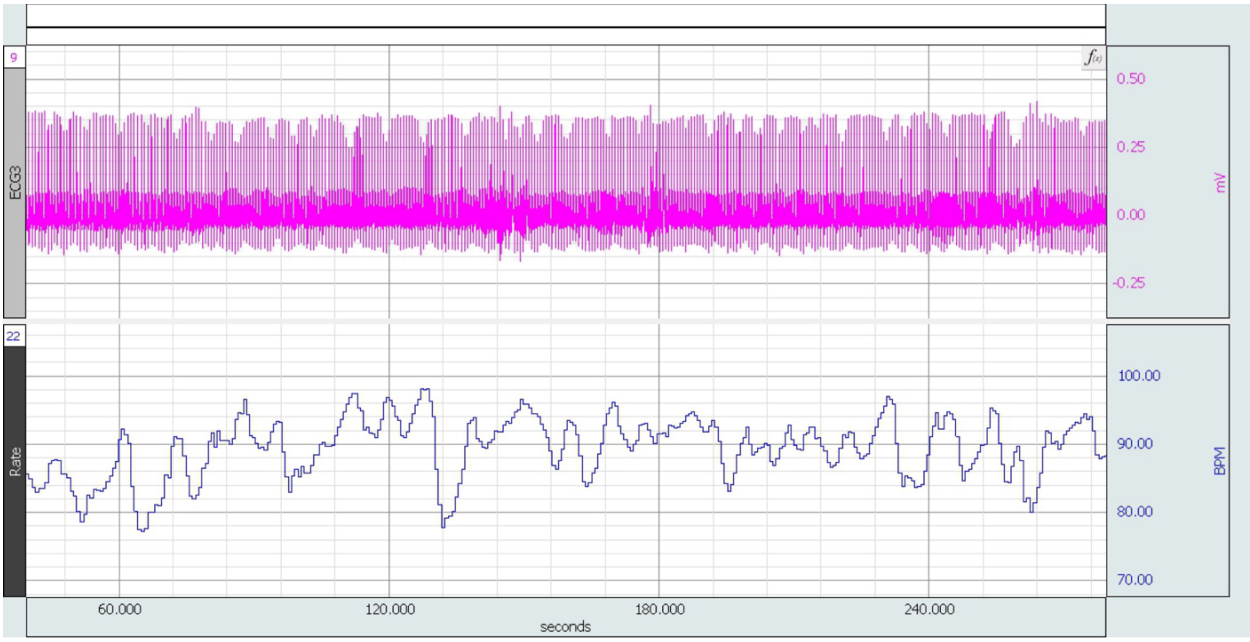
proceeded to apply electrodes to their skin in preparation for connection to the biosensing equipment. Although questions were many and excitement was high, most discussion happened post-performance in order to reduce as much bias as possible in the participants expectations of what they were about to witness.

Participants were then led upstairs to the theatre. The main curtain was closed and participants were asked to sit in the four chairs, aligned in a row at five meters from the stage. They were asked to complete a self-report manikin form about their perceived valence and arousal and then were connected to the biosensing equipment. Every effort was made to make the wiring as non-invasive as possible. Once all four participants were connected, and the biometric data was transferring to the computer, the measurement period began.

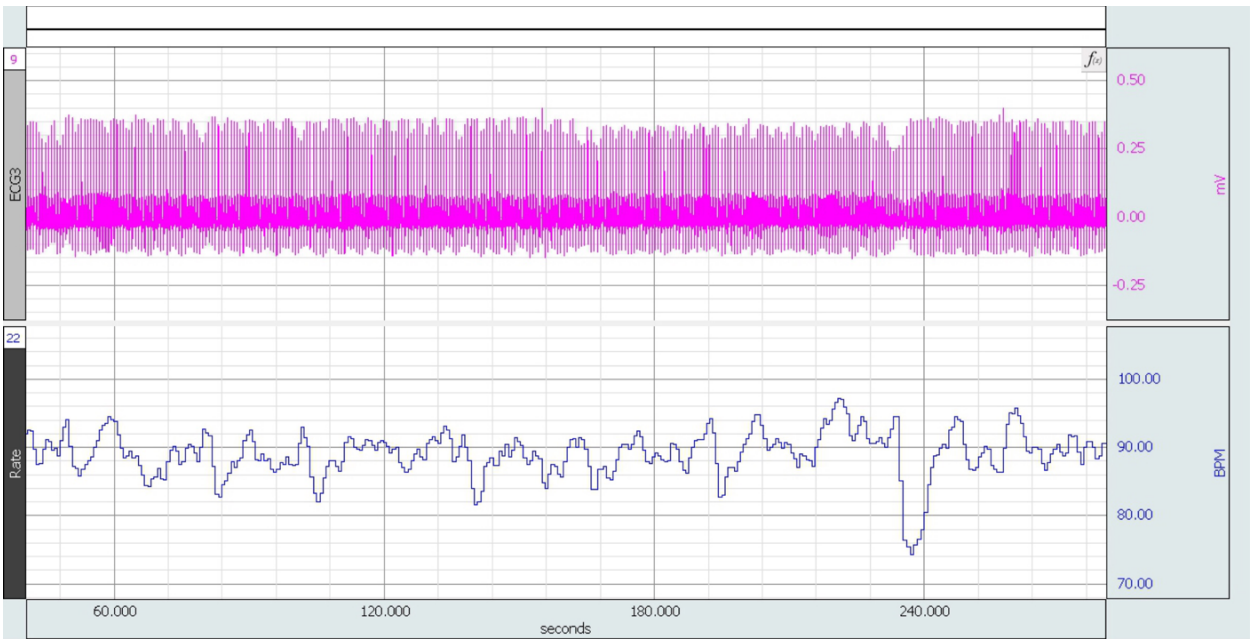
We recorded the audience-participants' data during a five-minute pre-performance baseline, which led directly into a five-minute performance, followed by a five-minute post-performance baseline. Once again, the measurements we chose to take were based on the Russell Circumplex Model of Affect, and therefore related to the understanding of human emotion.

All biophysical measures were performed using the MP160WSW physiological data acquisition system from Biopac Systems, Inc. The system included the following physiological measurement amplifiers: 1 of ECG100D, 1 of EDA100D, 2 of EMG100D. Disposable Ag/AgCl electrodes were used for all measures. The MP160WSW software "AcqKnowledge" was employed for both data collection and analysis on a standard Windows laptop computer.

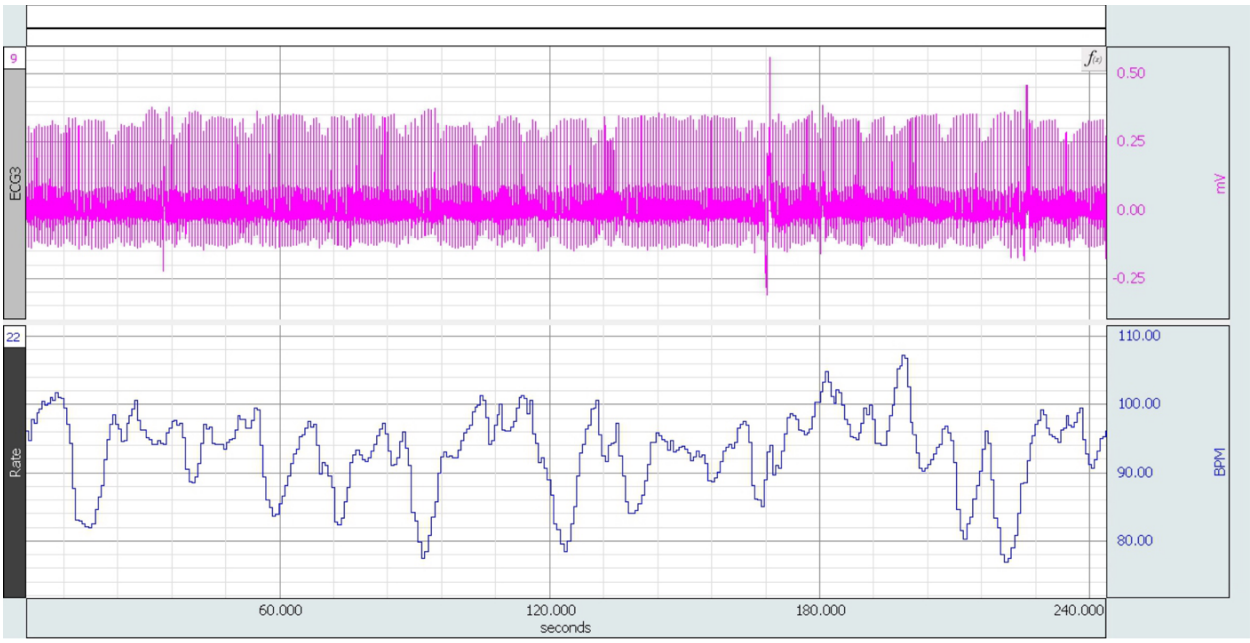
F. Data Examples



Pre-Baseline period measurement of ECG and HR: HRV = 4.90 BPM



Performance period measurement of ECG and HR
: HRV = 3.75 BPM



Post-Baseline period measurement of ECG and HR
: HRV = 5.85 BPM

In the above graphs, a single observer's (participant's) ECG and HR are isolated for the three measurement periods, Pre-Baseline, Performance and Post-Baseline. The Heart Rate Variability

(HRV) measurement is performed over the measurement period (roughly five minutes). The HRV is calculated as the standard deviation of the HR over the measurement period.

Interoceptive Scores/Ranking of the Performances

By averaging the expert observers' 'interoception' scores for each interoceptive factor at 23 key moments in the performance, and then adding these to create a total or "sum", each of the ten performances was given an "interoceptive score".

Fig. 1: Preliminary Chart ranking the 10 performances from most interoceptively "loaded" to least*

Performance #	Actor #	Loaded/ Unloaded	Interoceptive Sum	Interoceptive Mean	Interoceptive Median	Standard Deviation
10	4	Loaded	259	11	11	1.7
2	3	Loaded	253	11	10.5	2.1
6	4	UN	240	10	10	1.8
9	1	Loaded	233	10	10	1.5
5	5	Loaded	227	9.9	9.9	1.8
4	2	UN	217	9.4	9.3	1.1
8	2	Loaded	210	9.1	9	0.9
3	5	UN	205	8.9	8.9	1.2
7	3	UN	200	8.7	8.7	0.8
1	1	UN	196	8.5	8.7	0.8

* Please note that the 23 moments that were scored were of different durations, while the data processing method used for this initial report allots each 'moment' the same weight. Our plan is to review all video footage to give each of the 23 scores a durational percentage and then re-calculate the sums, means, medians, etc.

We can then combine this data with the data from the audience members to look for whether patterns emerge between the physiological data of the audience during (and after) the 'loaded' versus 'unloaded' performances.

IV. Preliminary Thoughts Regarding Analysis

While full analysis is not yet complete, there are some initial interesting and provocative observations.

In the above participant's case, the HRV is highest in Post-Baseline and lowest during the Performance. Generally considered, this typically means that the participant's level of arousal was highest during the performance and lowest in Post-Baseline. Another interpretation of this

data is that the participant's focused attention, during the Performance, resulted in a circumstance where the brain kept the heart's rhythmic behavior more constrained, thus decreasing HRV. In Post-Baseline, the brain "let go" of the heart's behavior, so the heart started to seek out homeostasis within the body, thus increasing HRV.

In addition to exciting insights emerging from the biometric data, we found the process of preparing the actors for the study resulted in some important discoveries that are already informed the evolution of **The Batdorf Technique**, and our future research plans, yet again...

- In the process of trying to sync the timing of all six performers so that the duration of each aspect of the performance piece would be similar no matter which actor was performing, they discovered that they measure time, or 'count' physiologically. One actor discovered they 'counted' in heart beats, while others realized they count in breath cycles. This new awareness subsequently made it difficult to perform the piece without some awareness of blood flow/pulse and/or breath.

- In an effort to reduce all aspects of the performance other than simple, non-virtuosic stage movements, an internal acting "intention" score, and the variable of interoception (or not), the actors attempted to strip emotion from their performances. Several actors discovered that elimination of emotion reduced their capacity for interoceptive awareness.

- Other actors found it almost impossible to inhibit visible emotional signals (e.g. tears, vocal sounds) while 'loaded' interoceptively.

- It was extremely difficult for all of the performers to do the interoceptive work without vocal release. For the purposes of the study the intention was to perform silently, however, this made it very difficult for several of the performers to 'load up' their interoceptive awareness.

- The actors discovered that it was significantly easier to 'load up' when they all were practicing the interoceptive awareness at the same time, raising the question of whether they were potentially 'kinesthetically transferring' to each other -- something that has been experienced and anecdotally recorded for years in TBT training and practice.

- The actors discovered that when they warmed up effectively within the structure of The Batdorf Technique, it was difficult to do the work 'unloaded', leading them to believe that warming up assists with interoceptive awareness.

- The actors discovered that it was much harder to do the 'unloaded' following the 'loaded' performances as there tended to be residual interoception that would be triggered by repeating the same 'exteroceptive' choreography/staging.

Future Directions

Over the next year, we will continue to analyze the data recorded during the Pure Research study. Some areas which we feel invite further exploration include:

- The examination of Heart Rate Variability (HRV) in relationship to the Interoceptive score of the performance. Does the fact that a performer employed the practice of TBT in their performance result in a measurable difference in the HRV of the audience members, as compared to performances in which the performer was not employing, or was less successful at employing, TBT;

- Examining the biometric data at specific moments in the performance, selected for examination because the performer and all expert observers agreed it was a successful moment of TBT Interoceptive Awareness;

- What did the performers learn about the practice of TBT in this research context and how does it impact future training in TBT.

Again, we are incredibly grateful to Nightswimming, Brian Quirt, Brittany Ryan, and the entire Pure Research team for the opportunity to conduct this study and we look forward to sharing more as further results become available.

Works Cited

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*(6), 1161–1178. https://doi.org/10.1037/h0077714