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DEVELOPING A TYPOLOGY OF STRESS REACTION PATTERNS AMONG INDIVIDUALS WITH AUTISM SPECTRUM DISORDER (ASD)

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ABSTRACT

Technological advances in both data acquisition and analytics have increased the usefulness and feasibility of employing idiographic methods in behavioral science research. While there are many advantages to employing an idiographic approach, one major criticism has been the lack of generalizability from single subject research to a larger population of interest. Developing a Typology of Temporal Patterns (TTP) is a novel method that can help address the issue of generalizability in idiographic research. TTP combines time series analysis and dynamic cluster analysis to form subgroups of individuals who share similar longitudinal trajectories. The present study demonstrates the usefulness of TTP by applying it to the study of cardiovascular arousal to environmental stressors in individuals with autism spectrum disorder (ASD). Secondary data analysis was conducted on heart rate data collected from 43 individuals with ASD exposed to a series of experimentally and systematically manipulated environmental stressors. Interrupted time series analysis was performed for each participant to examine individual-level heart rate patterns. The diversity observed across the interrupted time series results demonstrates a need to identify subgroups of individuals with similar heart rate patterns. Accordingly, dynamic cluster analysis was conducted on the heart rate time series data from the 43 participants. The first cluster analysis revealed a three-cluster solution (Low Cluster, Middle Cluster, and High Cluster) that was largely dominated by differences in heart rate level (or mean). A second cluster analysis, focused on shape and scatter of heart rate patterns, revealed two subgroups (Autonomic Stabiles and Autonomic Labiles) that differed in their patterns of heart rate reactivity to stressors and heart rate recovery during rest

conditions. Following the cluster procedures, a series of ANOVAs showed differences between the identified subgroups on a variety of time series variables. The findings provide support for the utility of TTP to evaluate idiographic data at both individual and subgroup levels, and suggest that cardiovascular reactivity is a useful index for identifying meaningful individual differences in the prevalent and heterogeneous population of ASD.

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INTRODUCTION

Technological advances in both data acquisition and analytics have increased the usefulness and feasibility of employing idiographic methods in behavioral science research. Telemetric devices that enable remote, unobtrusive, and continuous recording of behavioral, physiological, and environmental data have become readily available to behavioral science researchers (for review see Goodwin, Velicer, & Intille, 2008). Utilizing telemetric monitoring capabilities, researchers are able to move beyond traditional laboratory experiments and collect high-density data from individuals in real-world settings. Telemetric monitoring gives rise to intensive longitudinal data sets (Walls & Schafer, 2006) that lend themselves well to time series analysis, one of the most commonly used statistical methods for idiographic studies (Glass, Glass, Willson, & Gottman, 2009; Velicer & Molenaar, 2013). While time series analysis is a powerful tool for studying an individual over time, one challenge of idiographic research (and time series analysis) is determining generalizability of findings across subjects. Developing a Typology of Temporal Patterns (TTP) is a novel method that can help address the issue of generalizability in idiographic research. TTP is an approach whereby time series analyses are performed at the individual level and their patterns are subsequently combined using a cluster analysis to determine groups of individuals with similar patterns. The current study applied the TTP method to the study of cardiovascular arousal to environmental stressors in

individuals with autism spectrum disorders. It is the first example of TTP applied to interrupted time series designs.

Nomothetic vs. Idiographic Research Approaches

Nomothetic and idiographic methods represent two distinct approaches to psychological research. Nomothetic methods focus on group-level relationships between variables (inter-individual variability) and typically involve a large number of participants who are measured on a single (or few) occasion(s). Nomothetic designs and their respective statistical analyses are commonly taught and applied in social and behavioral science research. Examples include the analysis of variance (ANOVA), multiple regression (MR), factor analysis (FA), and structural equation modeling (SEM). Common themes of these and other nomothetic analyses include aggregated participant data, variation around group means, and a belief that given sufficient sampling methods, obtained results will generalize to a broader population of interest.

In contrast to nomothetic research, idiographic methods focus on patterns of behavior within a single individual (or unit) across time and in context (intra-individual variability). Idiographic designs typically involve repeated measurement of a single participant on a large number of occasions and can address different research questions than the more commonly applied nomothetic methods. Idiographic methods are particularly well suited for investigating patterns of change over time, addressing the effects of a planned or unplanned intervention, and detecting underlying naturalistic processes (Velicer & Fava, 2003). Another advantage of idiographic methods is the ability to conduct research in applied settings (e.g., schools, clinics, hospitals) where traditional between-subject (i.e., nomothetic) designs may not be

appropriate or feasible to implement (Morgan & Morgan, 2001; Galassi & Gersh, 1993; Velicer & Fava, 2003).

Generalization Issues

An important distinction between nomothetic and idiographic approaches is the manner in which findings are generalizable beyond a single study. Nomothetic designs have limited generalization across time or contexts for any one individual (i.e., limited intra-individual generalizability). Results obtained from group-level designs, based on averaged participant data, can be misleading and overlook meaningfully different patterns present in the data. Idiographic designs are limited in the ability to generalize from an individual to a general population (i.e., limited inter-individual generalizability). Generalization from idiographic research cannot be inferred from a single study; instead, researchers must employ alternative approaches to demonstrate generalizability. These approaches include systematic replication (i.e., 5+ replications) (Barlow & Hersen, 1984), meta-analysis, and pooled time series analysis (Hoeppner, Goodwin, Velicer, & Heltshe, 2007; Velicer & McDonald, 1991). Systematic replication provides logical inference whereas meta-analysis and pooled time series provide statistical inference. While these approaches can help increase generalizability to the group or population level, this is not always an important or meaningful goal of research.

Furthermore, examining the application of Ergodic Theorms in the behavioral sciences suggests that generalization of individual-level results to a larger population is rarely appropriate. Results from idiographic or intra-individual analysis will differ from those obtained from nomothetic or inter-individual analysis unless two

conditions specified by the Ergodic Theorems are satisfied: 1) each individual trajectory has to obey the same dynamic laws, and 2) each individual trajectory must have equal mean levels and serial dependencies (Molenaar, 2004). A number of recent studies provide empirical evidence that these conditions are extremely unlikely to be met in practice (Aloia et al., 2008; Goodwin, Intille, Albinali, & Velicer, 2011; Harrington Velicer & Ramsey, in press). One approach that addresses the generalization limitations of both nomothetic and idiographic methods is to focus generalization efforts on homogeneous subgroups within a population, rather than the entire population. Some researchers have combined time series analysis with dynamic cluster analysis to identify subgroups of individuals who share similar trajectories (TTP, i.e., Hoeppner, Goodwin, Velicer, Mooney, & Hatsukami, 2008).

Telemetric Monitoring

Telemetric monitoring (for review see Goodwin, Velicer, & Intille, 2008) has helped change the way researchers approach the intensive study of the individual from a largely qualitative approach to a more rigorous quantitative investigation. Telemetric devices that enable remote, unobtrusive, and continuous recording of behavioral, physiological, and environmental data are becoming readily available to behavioral science researchers (Goodwin, Velicer, & Intille, 2008). Utilizing telemetric monitoring capabilities, researchers are able to move beyond traditional laboratory experiments and collect high-density data from individuals in real-world settings. These devices give rise to intensive longitudinal data that require alternative analytic methods such as time series analysis, one of the most commonly used statistical methods for idiographic studies (Glass, Willson, & Gottman, 2009; Velicer & Fava,

2003). Time series analysis and interrupted time series analysis are similar to simple regression and analysis of variance (ANOVA), respectively, except that multiple observations per participant are used instead of single observations from multiple participants. In the case of interrupted time series designs, observations are compared from a single participant pre-and post-interruption (e.g., intervention).

Autism Spectrum Disorder, Stress, and Cardiovascular Arousal

One area where telemetric devices and idiographic statistical analysis have been employed is in the study of cardiovascular arousal to environmental stressors in children with autism spectrum disorders (ASD) (Groden et al., 2005; Goodwin et al., 2006). ASD is a general term for a broad spectrum of pervasive developmental disorders that include autistic disorder, Asperger syndrome, pervasive developmental disorders not otherwise specified, Rett syndrome, and childhood disintegrative disorder (DSM-IV-TR, 2000). ASD is characterized by qualitative impairments in social interaction and communication, as well as restricted interests and/or repetitive behaviors. The severity of symptoms and degree of impairment are highly variable across individuals, with impairments evident by age 3 (DSM-IV-TR, 2000).

Research suggests that characteristics of ASD, such as impairments in communication, socialization, and cognition, behavioral rigidity, and deficits in executive function can increase vulnerability and limit ability to cope with stressors (Groden, Cautela, Prince, & Berryman, 1994). Additionally, maladaptive behaviors commonly associated with ASD, including aggression, self-injury, tantrums, destruction of property, and stereotypy are often associated with stressful events (Howlin, 1998). These characteristics of ASD are likely to contribute to the high rate

of comorbidity between ASD and disorders associated with anxiety, fear, panic, and sensory processing (e.g., Goodwin et al., 2006).

Traditional assessments of stress and anxiety, such as self-reports and paper and pencil questionnaires, require verbal communication on the part of the respondent. Given the communication deficits associated with ASD, it is not surprising that these measures have limited utility in individuals with ASD. One solution to overcoming these challenges has been to directly measure stress, stress related anxiety, and arousal using physiological measures of autonomic functioning (Groden et al., 2005). One of the most commonly used autonomic nervous system (ANS) measures of stress is cardiovascular activity.

Groden et al. (2005) wirelessly measured cardiovascular activity (heart rate; HR) at baseline and during four potentially stressful situations in 10 participants diagnosed with ASD. The four stressful situations used in the study were adapted from the Stress Survey Schedule for Persons with Autism and Developmental Disabilities (SSS, Groden et al., 2001), and included engaging in a difficult task, eating preferred food, having a change in staff, and having unstructured time. The experimental protocol also included a baseline session, rest sessions in between each stressful situation, and a physical exertion task. For each participant, interrupted time series analysis was used to compare baseline HR responses to responses recording during each stressor phase.

All participants showed HR increases during the physical exercise task, demonstrating that all participants could show HR increases under physically demanding conditions. Two participants showed no significant HR changes to any stressors, while one participant showed significant HR changes to all four stressors.

All other participants showed significant HR changes to one stressor (n = 2), two stressors (n = 3), or three stressors (n = 2). Compared to baseline measures, the majority of participants displayed only significant HR increases to stressors; however, some participants displayed only significant HR decreases to stressors, and one displayed a combination of HR increases to some stressors and HR decreases to other stressors. Overall, results indicated cardiovascular arousal to all four stressors in some but not all participants. Additionally, individual differences in baseline measures of HR were observed. The majority of mean baseline HR measures fell between the 70 to 85 beat per minute (bpm) range but the mean baseline HRs for two participants exceeded 100 bpm.

In a separate study, using a similar protocol, Goodwin et al. (2006) extended the work of Groden et al. (2005). Cardiovascular activity (i.e., HR) was wirelessly recorded at baseline and during six potentially stressful situations in five children with autism and five age-matched typically developing children. In addition to the four stressors used by Groden et al. (2005), the Goodwin et al. study included being exposed to a loud noise and being exposed to a remote control robot. For each participant, interrupted time series analysis was used to compare baseline HR responses to responses recorded during each stressor phase.

On the basis of previous research, the authors hypothesized that, as a group, participants with autism would show greater magnitude of HR reactivity to a greater number of stressors than age- and sex-matched typically developing peers. This hypothesis, however, was not precisely supported. That is, the autism group showed statistically significant responses to stressors compared to baseline 22 percent of the

time, while the typically developing group showed statistically significant responses to stressors compared to baseline 60 percent of the time. The authors suggested that caution be used in the interpretation of this finding. Specifically, they acknowledge the potential for these findings to be taken as evidence that the autism group was less aroused than the typically developing control, but, importantly, point to group differences observed in mean HR during baseline and stress conditions as a possible alternative explanation. As a group, participants with autism, on average, had faster HRs during baseline (M = 96 bpm for autism group; M = 74 bpm for typically developing group) and during almost all stress conditions. HR responses for the autism group also showed less variance (approximately half) than the typically developing group. Overall, the results indicated that some individuals with autism may be in a general state of high arousal.

Current Study

The studies by Groden et al. and Goodwin et al. demonstrate the high level of within group variability often observed in ASD research. Purely nomothetic approaches to these data would obscure meaningful differences among individuals with ASD; however, purely idiographic approaches make it difficult to extend findings beyond any one individual being studied. The current study applied the TTP approach to extend the work of Groden et al. and Goodwin et al., by (1) performing time series analysis on additional participants and (2) combining idiographic and nomothetic approaches and attempting to identify homogenous subgroups within a sample of individuals with ASD.

CHAPTER 2

METHODS

Participants

Participants were 43 clients recruited from the Groden Center, a day program serving behavioral and academic needs of children with developmental disabilities, including ASD. Written consent was obtained from guardians of each participant prior to data collection. Only participants with a primary or secondary diagnosis of ASD made by a licensed psychologist were included in this study.

Setting

Secondary data analysis was conducted on HR data that were collected as part of a routine clinical in-take assessment at the Groden Center. Assessments took place in a sound-attenuated laboratory room. That room was equipped with a one-way mirror permitting discrete viewing from an adjacent observation room. A familiar staff member was present during the experiment to increase comfort with the experimental setting and procedures.

Instruments

HR data were collected using the LifeShirt (Vivometrics, Inc.). The LifeShirt is a noninvasive telemetric recording device that continuously (i.e., beat-to-beat) stores electrocardiograph (ECG) data on a portable battery-powered electronic recorder worn on the body.

Design

The study design consisted of 14 phases (see Table 1 for a detailed description of each phase). Each session began with an initial baseline phase (sitting quietly with a familiar person). After the initial baseline phase, participants engaged in six stress phases. Each stress phase was followed by a rest phase. A physical exertion phase was included to ensure that participants could demonstrate an increase in HR significantly greater than baseline. Phase order was held constant across participants. The amount of time spent in each phase differed somewhat across participants. All participants completed one of three timing protocols: 1) 5 minute Baseline/ 2 minute Stress phases/ 2 minute Rest phases (n = 27); 2) 5 minute Baseline/ 2 minute Stress phases/ 1 minute Rest phases (n = 6); and 3) 2 minute Baseline/ 1 minute Stress phases/ 1 minute Rest phases (n = 10). The shorter observation sessions were employed in younger children to adapt to their more limited attention abilities.

Analysis

Data Management. The following data management procedures were completed for each participant. HR measures were converted to 2-second averages, resulting in 30 HR observations per minute. Outlier removal was conducted in two steps. First, outliers were identified using box and whisker plots. Data values that fell below the 1st Quartile minus 1.5 times the Inter-Quartile Range (Q1 - 1.5 IQR) or above the 3rd Quartile plus 1.5 times the Inter-Quartile Range (Q3 + 1.5 IQR) were considered outliers and removed. This process was repeated for every phase (i.e., separate box and whisker plots were generated for the baseline, every stress phase, and every rest phase) until all data fell within Q1 - 1.5 IQR and Q3 + 1.5 IQR. Second, data were

plotted and visual inspection was used to identify any additional outliers that appeared to exceed normal limits of HR data. Specifically, values below 55 bpm or above 165 bpm were removed. This conservative approach was taken for outlier removal based on visual inspection to ensure as much consistency and objectivity as possible in data handling across participants. Outliers were subsequently treated as missing data.

Prior to data analysis, it was necessary to create participant datasets that met certain requirements of the planned analytic procedures. For example, dynamic cluster analysis requires that all participants have series of equal length. Given that participants experienced different timing protocols, the equal length requirement was violated. For each participant, the following steps were taken to create a dataset that met requirements of subsequent analyses: 1) The baseline phase was limited to 2 minutes (i.e., 60 observations). The last 2 minutes of the baseline was used for participants who had initial 5-minute baselines. 2) Transition times between phases were removed. 3) All Stress phases and all Rest phases were limited to 1 minute (i.e., 30 observations). The first 1 minute of data was used for participants who had greater than 1 minute Stress or Rest phases. These three steps resulted in data series of equal lengths across participants.

Finally, phase 14 (the Physical Exertion phase) was removed from all participant data. This phase had been included in the protocol as a validity check to ensure that participants could demonstrate an increase in HR significantly greater than baseline. Previous findings (Goodwin et al. 2006), as well as an initial check of the current study data, provided clear support that participants could demonstrate increases in HR significantly greater than baseline during the Physical Exertion phase. Aside from

serving as a validity check, this phase was of little interest to the current study and had the potential to have a strong and unwanted influence on the clustering procedures.

Time Series Analyses. Separate univariate time series analyses were conducted for each participant for the dependent variable HR. Plots of autocorrelation and partial autocorrelation were used to determine the most appropriate ARIMA model for modeling serial dependency in the data. The autocorrelation and partial autocorrelation patterns observed in the current study supported the use of an ARIMA (1, 0, 0) transformation. Following transformation, within-subject, interrupted time series analysis was employed to determine whether significant differences in mean HR exist between the initial baseline phase and every other stress and rest phase. Analyses were conducted using SAS Proc ARIMA.

Dynamic Cluster Analysis. Following individual time series analyses, dynamic cluster analysis was conducted to empirically identify potential sub-groups that display different patterns of HR over time (i.e., during baseline and across different stress phases). Traditional cluster analysis is a multivariate, exploratory technique that groups N subjects into homogeneous subgroups on the basis of a defined set of P variables typically measured on a single occasion. Dynamic cluster analysis, or time series-based typology, is similar to traditional cluster analysis in that N participants are grouped into homogeneous clusters; however, in dynamic cluster analysis groups are formed on the basis of a single variable measured at P occasions. In the current study, individuals were clustered based on the level (means), scatter (variances), and shape of their HR trajectories.

Analyses were conducted with SAS Proc CLUSTER using the squared Euclidean distance metric and Ward's clustering method (Ward, 1963). The Ward's minimum variance algorithm is one of several hierarchical agglomerative procedures that begin with each participant as a separate cluster and successively merge clusters until all participants are in a single cluster. The number of clusters retained was determined using a combination of several methods. Quantitative methods included cubic clustering criterion, pseudo F statistic, pseudo T-squared statistic, root mean square standard deviation, semi-partial R-squared, and R-squared. Dendogram analysis and cluster profile interpretation were also used to determine the most appropriate and theoretically meaningful number of clusters.

Missing Data. As a result of outlier removal (and to a lesser extent equipment error) many participants had some degree of missingness present in their data series. On average, participants had 3% missing data, with missingness ranging from 0-10%. For the time series analyses, missing data were estimated using the maximum likelihood (ML) procedure available in SAS Proc ARIMA. This procedure has been shown to be very accurate for ARIMA time series analysis with up to 40% missing data (Velicer & Colby, 2005). For the dynamic cluster analyses, a different missing data procedure was required (ML is not available with Proc Cluster). Prior to the clustering procedures, multiple imputation (MI) was performed in SAS (Proc MI) to estimate missing data. This procedure resulted in a complete dataset (no missing data) that could be entered into the Proc Cluster procedure in SAS.

CHAPTER 3

RESULTS

Time Series Analysis

Individual Results. Separate interrupted time series analyses were performed for 43 participants. Appendices 1-43 provide detailed summaries of the individual time series analysis results. The appendices include the following information for each participant: 1) a time series graph of HR across time (and phase); 2) a graph of mean HR by phase; 3) a table presenting HR descriptives by phase; 4) a table presenting interrupted time series analysis results; 5) a brief summary showing the number of statistically significant ($p < .05$) time series t-test results broken down by phase type (stress, rest, all) and direction (greater than baseline, less than baseline, different from baseline); and 6) a list of stress phases for which HR was significantly greater than baseline.

Detailed descriptions of the individual time series analysis results for two participants (participants #17 and #41) are provided as examples. Participant 17 (see Appendix 17) had a baseline mean HR of 98.6 (SD = 3.7) bpm. Both the Heart Rate across Time (and Phase) and Mean Heart Rate by Phase charts display the relatively flat HR pattern observed for participant 17. The Heart Rate Descriptives by Phase table presents the number of observations (N), mean HR (M), and standard deviation (SD) for each phase (includes baseline, stress, and rest phases). The Time Series Analysis Results table provides the parameter estimates for baseline level (L), first

order autoregressive term (AR1), and the difference in level (DL) between baseline and all subsequent phases. The baseline level (BL level) can be interpreted as the intercept of a straight line fit to the baseline data, or HR at the beginning of the session. The first order autoregressive parameter (AR1) is a measure of autocorrelation, or dependency in the data, at lag 1. The table also provides a summary of t-tests computed as part of the interrupted time series analysis and the effect size (Cohen's d) associated with each test. Participant 17 had a baseline level of 98.5 bpm, a 0.5 AR1, and showed no significant HR changes from baseline.

Participant 41 (see Appendix 41) had a baseline mean HR of 89.6 (SD = 5.0) bpm. The Heart Rate across Time (and Phase) and Mean Heart Rate by Phase charts show a more reactive HR pattern observed for participant 41. As seen in the Time Series Analysis Results table, participant 41 had a baseline level of 88.5 bpm, a 0.8 AR1, and showed significant HR changes from baseline to five phases. The Summary of Significant Time Series Results shows that HR was significantly greater than baseline for four stress phases and that HR was significantly less than baseline for one rest phase. The list of Stress Phases Significantly Greater Than Baseline provides a quick and easy summary of the specific stress phases that showed significant HR increases over baseline. For participant 41, those stress phases were Remote Robot, Unstructured Time, Eating Preferred Food, and Unfamiliar Person.

Total Sample (Group) Results. Thirteen summary statistics for the individual time series analyses are presented in Table 2. The series mean (Series M) is the arithmetic mean of all HR observations in the series and can be interpreted as the average HR for the series. The series standard deviation (Series SD) indicates how far, on average,

observations in the series deviate from the series mean. The baseline level (BL level) is the HR at the beginning of the session. The first order autoregressive parameter (AR1) is a measure of autocorrelation at lag 1 (see Figure 1 for the distribution of AR1 for the total sample). The pooled stress mean (Pooled Stress M) and pooled rest mean (Pooled Rest M) are the combined average HR for all stress phases and the combined average HR for all rest phases, respectively. The pooled stress mean vs. pooled rest mean (Pooled Stress vs. Rest M) is simply the difference between the pooled stress mean and the pooled rest mean, with positive values indicating higher average HR for pooled stress phases, and negative values indicating higher average HR for pooled rest phases. The pooled stress standard deviation (Pooled Stress SD), pooled rest standard deviation (Pooled Rest SD), and pooled stress standard deviation vs. pooled rest standard deviation (Pooled Stress vs. Rest SD) are similar to the pooled mean statistics previously described, but instead of average HR, standard deviation statistics provide a measure of variability in HR observed for different phase types (i.e., stress/rest). The average stress to rest change in mean (AVG Stress to Rest Change) is the average change in mean HR from every stress phase to subsequent rest phase. The number of stressors significantly greater than baseline (# Stressors > BL) is the number of stress phases for which HR was significantly greater than baseline ($p<.05$). Percent missing is the amount of missing data in the series after all data cleaning procedures were complete. The final row of Table 2 presents the total sample average for each of the summary statistics.

Table 3 displays the effect size (Cohen's d) associated with each of the t-tests computed for the 43 individual interrupted time series analyses. Positive values

indicate greater mean HR during the phase being compared to the baseline phase (e.g., a positive Cohen's d value reported for the Loud Noise phase indicates that mean HR was greater during the Loud Noise phase than during Baseline). Negative values indicate that mean HR was greater during Baseline. An asterisk next to the Cohen's d value indicates that the t-test was statistically significant at an alpha level of .05.

Figure 2 displays a box and whisker plot for the total sample mean HR by phase. The horizontal line in each box indicates the median HR for the entire sample for that phase. The bottom and top of the rectangular box represent the 25th and 75th percentiles, respectively. The whiskers (the lines that extend from the top and bottom of the box) represent the minimum and maximum values that are not outliers or extreme values. Outliers (values between 1.5 and 3 times the interquartile range) and extreme values (values greater than 3 times the interquartile range) are represented by circles.

The percent of participants with significantly greater HR during stress vs. baseline was calculated for each stress phase (see Figure 3). Eating Preferred Food was the stressor eliciting the most cardiovascular reactivity, with 24 participants (56%) showing significantly greater mean HR during the Eating Preferred Food phase than during Baseline. Difficult Task was the next most cardiovascular reactive stressor (49% of participants reacted), followed by Unstructured Time (33%), Unfamiliar Person (33%), Loud Noise (23%), and Remote Robot (19%), respectively.

Time series results varied greatly among participants and will be discussed further in terms of identified subgroups.

Dynamic Cluster Analysis

The diversity observed in the individual time series analyses suggested that subgroups of participants within the sample might display distinctly different longitudinal HR patterns. Dynamic cluster analysis was conducted to empirically identify these potential subgroups.

Cluster analysis classifies participants into groups based on level, shape, and scatter of the input (i.e., clustering) variables. The analysis is particularly sensitive to differences in level, and much less so to differences in shape and scatter (Dumenci & Windle, 2001). In order to examine patterns of level, shape, and scatter, two separate cluster analyses were conducted. The first analysis was conducted on (non-transformed) time series data from the 43 participants (i.e., HR time series data). The results from this analysis were dominated by differences in level (see Level-Based Clusters). Given that shape and scatter were also characteristics of interest, the time series data were transformed so that the series mean equaled zero for each participant, and the second cluster analysis was conducted on the transformed data. In other words, level was removed from the original data. Consequently, the results from the second analysis were dominated by shape and scatter (see Shape-based Clusters).

Level-Based Clusters. Dynamic cluster analysis was conducted on non-transformed time series data from the 43 participants (i.e., HR time series data). All quantitative methods for determining the number of clusters suggested a 3-cluster solution (see Figure 4). Visual inspection of the dendogram and cluster profiles (see Figure 5) also supported a 3-cluster solution. Figure 6 displays the three cluster averages across time and phase, as well as the total sample mean. The three clusters

represent three distinct patterns of HR largely based on level of the series: Low (n = 16), Middle (n = 21), and High (n = 6). The average series mean for the Low, Middle, and High clusters were 86.05 (SD = 4.5), 100.24 (SD = 4.4), and 118.80 (SD = 7.6) bpm, respectively. Figures 7 through 9 provide exemplars of the three level-based cluster profiles.

Low cluster members (n = 16, 37.2%) were characterized by a comparatively low series mean (86.05 bpm), a low baseline level (83.58 bpm), and low pooled stress and rest means (86.99 bpm and 85.53 bpm, respectively). The average first order autoregressive parameter was .48. On average, low cluster members had two stress phases during which HR was significantly greater than baseline.

Middle cluster members (n = 21, 48.8%) were characterized by a moderate series mean (100.24 bpm), a moderate baseline level (97.67 bpm), and moderate pooled stress and rest means (101.05 bpm and 99.97 bpm, respectively). The average first order autoregressive parameter was .57. On average, middle cluster members had two stress phases during which HR was significantly greater than baseline.

High cluster members (n = 6, 14.0%) were characterized by a high series mean (118.80 bpm), a high baseline level (119.08 bpm), and high pooled stress and rest means (119.61 and 117.97 bpm, respectively). The average first order autoregressive parameter was .67. On average, high cluster members had one stress phases during which HR was significantly greater than baseline.

A series of ANOVAs were conducted to compare the three level-based clusters on the 13 time series analysis summary statistics (see Table 4 for a summary of results). The ANOVAs revealed statistically significant differences between the three

level-based clusters in series mean, baseline level, first order autoregressive parameter, pooled stress mean, and pooled rest mean. Follow-up tests showed that all clusters were significantly different from all other clusters (i.e., Low < Middle, Low < High, Middle < High) on each of these variables, with the exception of the first order autoregressive parameter. While the pattern of results was similar for the first order autoregressive parameter (Low = .48, Middle = .57, High = .67), follow-up tests indicated significant differences only between the Low and High clusters. No significant differences were found between level-based clusters on any of the dependent variables measuring standard deviation, stress vs. rest changes in mean, or amount of missing data.

Shape-Based Clusters. Dynamic cluster analysis was conducted on the transformed (mean equals zero) time series data from the 43 participants. The quantitative methods for determining the number of clusters suggested several possible solutions (see Figure 10). Based on the quantitative criteria, 2-cluster, 3-cluster, and 4-cluster solutions were evaluated for further consideration. In the 2-cluster solution, a single participant made up the first cluster (participant # 11) and the remaining 42 participants comprised the second cluster. Similarly, in the 3-cluster solution, single participants made up the first (participant # 11) and second (participant # 22) clusters, and the remaining 41 participants comprised the third cluster. The 4-cluster solution consisted of the same single participant clusters (first cluster = participant #11, second cluster = participant # 22), a third cluster with 28 participants, and a fourth cluster with 13 participants. Visual inspection suggested that the two participants forming single participant clusters (participants # 11 and # 12) were likely

outliers, and a second shape-based cluster analysis was run after removing those two participants. Four of the six quantitative methods for determining the number of clusters suggested a 2-cluster solution (see Figure 11). Visual inspection of the dendogram and cluster profiles (see Figure12) also supported a 2-cluster solution. Figure 13 displays the two cluster averages across time and phase, as well as the total sample mean. The two clusters represent two distant patterns of HR largely based on shape and scatter of the series. These clusters were named autonomic Stabiles (n = 28) and autonomic Labiles (n = 13). Figures 14 and 15 provide exemplars of the two shape-based cluster profiles.

Stabiles (n = 28, 68.3%) were characterized by a lack of reactivity to stress phases and a lack of recovery during rest phases. This cluster displayed a small pooled stress mean vs. pooled rest mean difference (-0.16 bpm) and a small, positive average stress to rest change in mean (0.5 bpm), indicating a tendency for HR to be slightly greater during the rest phase following a stress phase. Overall, this cluster showed a more stable HR pattern across stress and rest phases. The average first order autoregressive parameter was .57. On average, Stabiles had two stress phases during which HR was significantly greater than baseline.

Labiles (n = 13, 31.7%) were characterized by a pattern of reactivity to stress phases and recovery during rest phases. This cluster displayed a large pooled stress mean vs. pooled rest mean difference (3.77 bpm) and a large, negative average stress to rest change in mean (-3.8 bpm), indicating a tendency for HR to be lower during the rest phase following a stress phase. Overall, this cluster showed a “react and recover” pattern across the stress and rest phases. The average first order autoregressive

parameter was .50. On average, Labiles had two stress phases during which HR was significantly greater than baseline.

A series of ANOVAs were conducted to compare the two shape-based clusters on the 13 time series analysis summary statistics (see Table 5 for a summary of results). The ANOVAs revealed statistically significant differences between the two shape-based clusters in series standard deviation, pooled stress mean, pooled stress mean vs. pooled rest mean, pooled stress standard deviation, pooled rest standard deviation, and average stress to rest change in mean. No follow-up tests were necessary, as only two groups (Stabiles and Labiles) were compared. No significant difference in the amount of missing data was found between shape-based clusters.

Combo Clusters. After the level and shape clusters were identified, each participant was given a combo cluster label that identified both the level and shape classification to which he or she belonged. The two participants previously identified as outliers were excluded from combo clustering. This resulted in six possible combo clusters: 1) Low-Stabiles; 2) Low-Labiles; 3) Middle-Stables; 4) Middle-Labiles; 5) High-Stabiles; and 6) High-Labiles. Table 6 displays the number of participants in each combo cluster. The combo cluster profiles are displayed in Figure 16. Figures 17, 18, and 19 display the Low- Stabile and Labile, Middle- Stabile and Labile, and High- Stable and Labile cluster averages, respectively. Figures 20 through 25 provide exemplars of the six combo cluster profiles.

CHAPTER 4

DISCUSSION

The present study combined time series analysis and dynamic cluster analysis to investigate cardiovascular stress reaction patterns among individuals with ASD. Interrupted time series analysis was conducted for each participant to examine individual-level HR patterns during a stress-rest study design protocol. The diversity observed across the interrupted time series results demonstrated a need to identify subgroups of individuals with similar HR patterns. Accordingly, dynamic cluster analysis was conducted to identify homogeneous subgroups of participants in the sample based on their cardiovascular reactivity. These subgroups represent different physiological stress reaction patterns and were used to further explore time series results. Specifically, a series of ANOVAs were performed to examine the relationship between the identified clusters and a number of time series variables. Statistically significant differences between clusters were observed for several relevant time series variables, providing support for the utility of this procedure.

Time Series Analysis

The present study used interrupted time series analysis to idiographically examine 43 replications of cardiovascular reactivity in individuals with ASD to a variety of potential stressors previously identified in the literature. An idiographic study of this magnitude adds to the current body of related literature by providing in depth individual analyses on a relatively large and heterogeneous group of individuals with

ASD. Previous research in this area has generally focused on nomothetic (i.e., group level) comparisons between individuals with ASD and typically developing controls. Group level analyses are based on averaged participant data and tend to ignore individual differences. The time series analysis results from the current study provide clear evidence that important differences exist between individuals with ASD, and that aggregated data poorly represents many individuals within the group.

Some of the most striking findings from these idiographic analyses were the diversity in baseline HR level and stress to rest HR patterns. Baseline HR levels ranged from 68.5 bpm to 133.2 bpm (mean level = 95.4 bpm). While dramatic, these findings are consistent with those previously reported in Groden et al. (2005) and Goodwin et al. (2006). Additionally, both studies reported extremely high baseline HR levels for some but not all participants with ASD. Average stress to rest change in mean HR ranged from -8.9 bpm to 4.6 bpm (mean change = -1.0 bpm). These findings reveal that, on average and across all stressors, HR significantly decreased from stress condition to rest condition for some participants and increased for others. The number of stressors reacted to (i.e., the number of stressors for which mean HR was significantly greater during the stress condition than during baseline) was also inconsistent across participants. Approximately 63 percent of participants reacted to 0 to 2 stressors; 30 percent reacted to 3 to 4 stressors; and 7 percent reacted to 5 to 6 stressors. The diversity observed across individual time series findings demonstrated a need for alternative approaches to traditional nomothetic methods in this context.

Time series analysis and idiographic approaches address some of the problems associated with nomothetic methods, however, there are several disadvantages that

typically accompany a purely idiographic approach. Common disadvantages of idiographic research include small sample sizes and inability to generalize from a single individual to a larger population of interest. The current study addressed both of these disadvantages. The issue of sample size was addressed by including 43 participants. To the author's knowledge, this study represents the largest idiographic study of physiological stress responses in individuals with ASD to date. The issue of generalizability was addressed by combining time series analysis with cluster analysis to identify subgroups of participants who exhibited distinct HR response patterns. When this approach is used, the goal of generalizing to an entire population is replaced by the goal of generalizing to smaller, more homogeneous subgroups.

Dynamic Cluster Analysis

Level-Based Clusters. The first cluster analysis, conducted on (non-transformed) time series data from the 43 participants, identified three groups that differed primarily by series level. The clusters were named Low, Middle, and High to describe their average level in relation to the other identified clusters within the sample studied. The cluster names are not intended to provide an indication of how the cluster compares to normal limits established for other populations of interest. These names were chosen solely to describe the position of a cluster in relation to others in this study.

The Middle cluster was the largest, with approximately 49 percent of the sample grouped into this cluster. The second largest cluster was the Low cluster, with approximately 37 percent of the sample. The High cluster was the smallest of the three clusters, with approximately 14 percent of the sample. Figure 6 clearly displays average HR across time and phase for the three clusters and the total sample. While

the Middle cluster appears to be well represented by the total sample average, the two other clusters (representing just over 50 percent of participants in the sample) are very poorly represented by the total sample average and would be largely overlooked by traditional group-level analyses.

A series of ANOVAs were conducted to investigate cluster differences on a variety of time series variables. The findings confirmed that the cluster analysis was dominated by differences in level. Statistically significant differences between the three clusters were found for all time series variables that represented the mean or level of the series to some extent (i.e., series mean, baseline level, pooled stress mean, and pooled rest mean). The statistically non-significant findings for all variables related to shape and scatter (i.e., series standard deviation, pooled stress standard deviation, pooled rest standard deviation, pooled stress vs. rest standard deviation, and average stress to rest change in mean) suggested that the cluster analysis, while informative regarding level based subgroups, did not capture other potentially meaningful patterns in the data. Given these findings, level was removed from the data (i.e., each series was transformed so that the mean was equal to zero) and a second cluster analysis was conducted.

Shape-Based Clusters. The second cluster analysis, conducted on transformed (mean equal to zero) time series data from the 43 participants, identified two groups that differed by trajectory shape. The clusters were named Stabile and Labile to describe the shape of the pattern observed for each cluster. As seen in Figure 12, the Stabile cluster displays a relatively smooth pattern across the stress-rest protocol. For Stabiles, HR remains consistent from stress to rest conditions. For some stress

conditions (e.g., remote control robot), Stabiles even showed an increase in HR from stress condition to rest condition, suggesting that rest conditions are not serving as HR recovery periods for all participants. This may be because Stabiles also did not show a pattern of HR reactivity (i.e., increased HR) to most stressors. Even when a significant HR reaction was observed for a stress condition (i.e., eating a preferred food), HR did not decrease during the following rest condition. Alternatively, the Labile cluster displayed a HR pattern of stress condition reactivity (increased HR) followed by rest condition recovery (decreased HR). This was most pronounced for the first four stress conditions (loud noise, remote robot, unstructured time, and eat preferred food).

The Stabile cluster was the larger of the shape clusters, with approximately 68 percent of the sample grouped into this cluster. The Labile cluster was considerably smaller, with approximately 32 percent of the sample. Figure 13 displays average HR across time and phase for the two clusters and the total sample. Again, the total sample average does a poor job of capturing the pattern observed for either cluster. While the total sample average better represents the Stabile cluster (most likely because of the larger number of participants in that cluster), neither cluster is well represented by the average. The unique patterns exhibited by each cluster would be difficult to uncover using group average techniques.

A series of ANOVAs were conducted to investigate cluster differences on a variety of time series variables. The findings provided further validation that the two clusters differed in HR stress to rest reactivity pattern (i.e., shape). Of particular interest were the significant findings for pooled stress vs. pooled rest mean and average stress to rest change in mean. The pooled stress vs. pooled rest mean variable

provides an overall indication of how HR activity during all stress conditions compares to activity during all rest conditions (i.e., mean difference between all stress conditions and all rest conditions). The average stress to rest change in mean reveals more about the back and forth pattern of each stress condition to its subsequent rest condition. The statistically significant differences found for these variables between the two clusters supports the cluster differences that were visually observed in the cluster profile plots (Figure 12).

Stabiles and Labiles also differed significantly on several variables that represent scatter (or variability) of the trajectories. Significant differences were found for series standard deviation, pooled stress standard deviation, and pooled rest standard deviation. However, given the differences is cluster size, caution should be used when interpreting these findings. While the pattern of ANOVA findings seem to suggest that the Stabile cluster displays less variability (i.e., standard deviation was significantly lower for Stabiles than for Labiles), it is also possible that the smaller standard deviations observed for the Stabile cluster are, at least in part, a function of having more subjects in that cluster.

Perhaps one of the most informative findings for future research was the non-significant finding between the two shape clusters for number of stressors greater than baseline. Given the patterns observed by the clusters, a tenable hypothesis would be that Labiles show increased HR over baseline for more stressors than do Stabiles. This hypothesis, however, was not fully supported. Instead, on average, both clusters had a mean of 2 stressors significantly greater than baseline. When interpreting these seemly disparate results, it is important to consider the difference between the number of

stressors greater than baseline variable and the variables for which significant differences between the two clusters were found. The former, a variable that summarizes the interrupted time series results, is concerned with changes observed from *baseline* to each subsequent stress condition (i.e., each stress condition is compared to the initial two-minute baseline phase). The latter, descriptive variables that were not specifically tested for with time series analysis, are concerned with overall mean differences in stress and rest conditions and the pattern observed from each stress condition to its subsequent rest condition. The decision to compare stress conditions to the initial baseline phase in the time series analysis part of this study was based on previous research that employed similar procedures (Groden et al. 2005, Goodwin et al. 2006) and mitigates against possible carryover effects in rest phases. In light of the current findings, however, future research in this area should consider employing several variations of interrupted time series analysis (e.g., individual stress conditions compared to baseline, individual stress conditions compared to its subsequent rest condition, pooled stress conditions compared to pooled rest conditions).

Combo Clusters. To the author's knowledge, this is the first study to date that employed two versions of dynamic cluster analysis and subsequently combined the results to form homogenous subgroups based on both level and shape of trajectory. The small cluster sizes that resulted from combining level and shape clusters made it difficult to make statistical comparisons between the combo clusters. However, it is worth noting that all possible combo clusters (six total) had cluster members. In other words, all three level clusters (High, Middle, and Low) were comprised of individuals

from both the Stabile and Labile clusters. This suggests that baseline HR alone is not a good predictor of stress/rest response patterns. For example, the High cluster, while small (n = 6), was evenly split with Stabiles (n = 3) and Labiles (n = 3). Therefore, knowing that an individual has a high baseline HR does not provide valuable information about the shape of his or her trajectory (i.e., stress/rest reactivity pattern).

From a methodological standpoint, the practice of conducting multiple dynamic cluster analyses to cluster the same group of participants on several different dimensions could offer several putative advantages. Given that dynamic cluster analysis classifies individuals based on a single variable observed over many occasions, the procedure is not well suited for multivariate research designs. Forming combo clusters from the results of separate cluster analyses, however, allows researchers to investigate multiple variables and further refine subgroups within a sample. While the current study used this technique to look at different dimensions of a single variable (i.e., HR level and shape), the procedure could easily be extended to research questions involving several different variables. For example, if both HR and an additional measure of the ANS (e.g., electrodermal activity data) were available, separate dynamic cluster analyses could be conducted and later combined to form a more complete picture of subgroups within the sample.

Limitations

One major limitation of the current study was that it was a secondary data analysis. Demographic and medical variables were unavailable to the author at the time analyses were conducted. This limited the variables available for establishing external validity. In addition to the time series variables used for external validity,

analyses involving age, gender, IQ, verbal ability, and medication information may have provided valuable information about possible differences between clusters. A follow up study is planned that will include demographic and medical variables as part of the external validation procedure.

A second limitation was the limited participant sample size. While the participant sample was very large for time series studies, it was quite small for cluster analysis. The small sample resulted in reduced power for the ANOVAs conducted to compare clusters on time series variables. A small sample also made it impossible to split the sample and attempt to replicate our cluster results on two separate samples. Replication is an important way to establish internal validity when an exploratory procedure such as cluster analysis is employed. Further studies are needed to replicate the current findings.

Lastly, the study protocol employed during data collection was not optimally tailored to the analyses performed for this study. Consequently, the original data was manipulated in several ways to fit the requirements of the current study. All changes made to the original data have been previously described in the Methods section; however, it is important to acknowledge that these changes to the data could have generated unanticipated consequences. Future studies that intend to follow the methodological approach outline in this study should plan ahead for the specific requirements dictated by the analyses employed. For example, establishing a protocol with equal phase lengths (i.e., the same number of time points) for each participant would reduce the amount of data reduction and manipulation needed to meet the equal series length requirement of dynamic cluster analysis.

Conclusions

The findings from this study have important assessment and treatment implications related to cardiovascular arousal and stress in individuals with ASD. Specifically, the present results suggest that treatment approaches and/or interventions tailored to homogeneous subgroups could be more effective than approaches designed for the notoriously heterogeneous population of individuals with ASD. For example, interventions tailored to individuals who fit the Middle-Labile subtype could include relaxation techniques to be used throughout the day, and especially before and after known stressors. Alternatively, interventions tailored to individuals who fit the Low-Stabile subtype might include short periods of physical activity to increase arousal level and facilitate attention and focus.

Developing a Typology of Temporal Patterns (TTP) is a novel approach that combines time series analysis and dynamic cluster analysis to form subgroups of individuals who share similar longitudinal trajectories. The present study demonstrated the usefulness of TTP by applying it to the study of cardiovascular arousal to environmental stressors in individuals with ASD. This method, however, is not limited to this particular area of study. As intensive longitudinal data becomes increasingly available, researchers will need to find a balance between idiographic and nomothetic approaches to data analyses. The current study provides an example of how the TTP method can help move the field towards that goal.

Table 1. Observational Design and Stress Task Descriptions

Phase	Task	Task description	Stress survey domain
1	Baseline	Seated in a comfortable chair	
2	Loud noise	Seated in a comfortable chair while a vacuum cleaner runs outside the room	Sensory/personal contact
3	Rest	Seated in a comfortable chair	
4	Remote robot	Seated in a comfortable chair while a remote control robot navigates around the room	Anticipation/uncertainty
5	Rest	Seated in a comfortable chair	
6	Unstructured time	Sitting in the room alone, given no other instructions than “We will be back in 2 minutes”	Anticipation/uncertainty
7	Rest	Seated in a comfortable chair	
8	Eating preferred food	Given a preferred food to eat	Pleasant event
9	Rest	Seated in a comfortable chair	
10	Difficult task	Seated in a comfortable chair and asked to mimic how the familiar person folds a towel	Changes/threats
11	Rest	Seated in a comfortable chair	
12	Change in staff	Familiar person leaves and person unfamiliar to the participant sits in the room	Unpleasant event
13	Rest	Seated in a comfortable chair	
14	Physical exertion	Riding a stationary bicycle	

Table 2. Time series analysis summary statistics for all individuals

ID	Series M	Series SD	BL Level	AR1	Pooled Stress *M*	Pooled Rest *M*	Pooled Stress vs. Rest *M*	Pooled Stress *SD*	Pooled Rest *SD*	Pooled Stress vs. Rest *SD*	AVG Stress to Rest Change	# Stressors > BL	% Missing
01	111.5	8.9	113.9	0.56	114.7	108.4	6.3	6.8	6.0	0.8	-7.2	1	6
02	94.9	11.1	89.5	0.50	93.5	96.8	-3.2	9.9	9.2	0.7	4.5	3	0
03	90.3	7.8	84.4	0.48	90.6	90.7	-0.1	7.6	6.7	1.0	1.0	5	7
04	82.2	9.7	80.0	0.50	83.4	81.5	1.9	6.9	7.9	-1.0	-1.7	2	1
05	104.2	8.1	104.8	0.65	103.5	104.9	-1.4	6.8	6.5	0.4	1.6	0	4
06	102.4	7.3	98.3	0.69	103.9	101.6	2.3	6.7	5.3	1.5	-1.8	4	0
07	98.9	7.8	99.5	0.40	97.4	100.7	-3.2	6.0	4.9	1.2	3.4	1	10
08	86.2	6.1	86.1	0.44	85.4	87.1	-1.7	5.6	5.4	0.2	1.8	1	6
09	72.4	7.3	68.5	0.66	72.0	73.4	-1.5	6.6	5.6	1.0	2.4	2	1
10	90.1	4.6	91.9	0.68	89.0	90.8	-1.7	2.9	3.7	-0.8	1.7	0	5
11	100.9	15.3	81.0	0.75	108.2	96.7	11.5	10.5	5.3	5.2	-8.9	6	5
12	106.0	6.7	104.9	0.48	107.8	104.6	3.2	5.4	6.2	-0.7	-3.3	2	2
13	120.4	8.4	115.4	0.74	124.0	118.1	5.9	6.0	6.5	-0.5	-5.5	3	0
14	132.5	4.7	133.2	0.86	133.9	131.2	2.7	4.0	2.4	1.6	-2.8	2	3
15	101.1	4.6	97.1	0.52	102.1	100.8	1.3	3.2	3.3	-0.1	-0.7	6	2
16	115.0	7.9	119.1	0.75	112.5	116.3	-3.8	4.0	7.3	-3.3	3.5	0	3
17	97.3	4.3	98.5	0.53	96.7	97.6	-0.9	3.9	4.1	-0.2	0.7	0	5
18	98.9	7.0	97.4	0.61	101.9	96.4	5.5	5.1	5.4	-0.3	-5.6	3	3
19	93.8	5.9	90.9	0.79	92.6	95.1	-2.5	3.7	3.5	0.1	3.2	2	9
20	107.9	10.5	105.7	0.47	109.9	108.8	1.1	6.9	8.7	-1.7	-0.5	1	6
21	83.8	9.4	79.7	0.50	85.4	83.0	2.4	5.9	7.3	-1.5	-1.8	4	0
22	97.5	12.9	96.4	0.62	97.5	97.7	-0.2	9.7	10.4	-0.6	0.5	2	2
23	120.2	5.6	120.6	0.48	120.0	120.2	-0.2	4.9	4.4	0.5	0.1	0	2
24	97.6	6.9	94.8	0.44	99.3	96.5	2.8	5.0	4.4	0.6	-2.6	3	2
25	87.6	6.7	85.7	0.47	85.6	89.5	-3.9	4.6	6.2	-1.6	4.6	0	3
26	83.2	9.0	76.8	0.42	86.0	81.5	4.5	7.0	6.6	0.4	-3.7	4	2
27	85.4	8.5	83.5	0.43	85.3	85.2	0.1	7.2	6.9	0.3	0.2	0	8
28	90.2	9.9	88.8	-0.06	93.5	87.8	5.8	6.4	8.2	-1.8	-5.9	3	2
29	88.6	10.2	86.5	0.30	91.6	86.0	5.6	7.4	7.0	0.4	-5.6	2	5
30	95.2	10.4	94.6	0.52	95.5	94.9	0.6	9.7	8.6	1.1	-0.6	1	0
31	105.8	9.2	106.2	0.47	107.8	104.0	3.8	8.0	6.4	1.7	-4.1	1	1
32	113.2	4.4	112.3	0.65	112.6	113.7	-1.1	2.9	3.1	-0.2	1.4	1	3
33	85.9	7.2	84.9	0.55	86.7	85.3	1.4	6.0	5.6	0.4	-1.4	2	1
34	98.0	5.5	95.9	0.51	98.0	98.2	-0.2	4.3	4.2	0.2	0.7	1	2
35	106.8	5.3	105.8	0.62	107.5	106.3	1.2	4.0	4.1	-0.1	-1.1	2	2
36	85.0	5.1	81.3	0.66	86.0	84.6	1.4	4.1	3.2	0.9	-0.8	3	6
37	95.6	7.6	89.1	0.69	97.9	94.3	3.6	5.9	5.2	0.7	-2.6	4	4
38	96.0	8.9	91.9	0.43	95.8	97.0	-1.1	9.1	6.7	2.4	2.0	3	2
39	85.9	5.9	81.6	0.26	88.0	84.8	3.2	4.0	4.2	-0.2	-2.6	4	1
40	106.5	5.3	107.0	0.82	105.7	106.6	-1.0	2.6	3.3	-0.7	0.7	2	4
41	91.0	7.5	88.5	0.79	95.0	87.8	7.2	5.5	5.4	0.1	-7.5	4	0
42	89.0	6.2	89.1	0.62	88.4	89.5	-1.1	5.1	5.6	-0.5	1.1	0	2
43	99.8	6.8	101.7	0.52	99.3	99.9	-0.7	5.5	5.2	0.4	0.3	1	3
AVG	97.5	7.6	95.4	0.55	98.4	97.1	1.3	5.9	5.7	0.2	-1.0	2	3

Table 3. Effect sizes (Cohen's *d*) associated with interrupted time series analysis t-tests

	Phase											
ID	2	3	4	5	6	7	8	9	10	11	12	13
01	-0.10	-0.29	-0.30	-0.81 *	0.55 *	-0.91 *	0.38	-0.41 *	-0.60 *	-0.61 *	0.29	0.16
02	-0.20	0.11	0.07	0.06	0.27	0.26	0.44 *	1.09 *	0.65 *	0.67 *	0.45 *	0.48 *
03	0.21	0.39	0.43 *	0.37	0.47 *	0.67 *	0.42 *	0.51 *	0.83 *	0.65 *	0.63 *	0.66 *
04	0.35	0.05	-0.21	-0.02	-0.07	0.20	1.19 *	0.71 *	0.68 *	-0.17	-0.30	-0.20
05	-0.78 *	0.24	-0.07	-0.07	0.14	-0.09	0.39	-0.07	-0.45 *	-0.10	0.34	0.03
06	0.45 *	0.12	-0.19	0.42 *	0.73 *	0.40 *	0.47 *	0.00	0.41 *	0.51 *	0.19	0.31
07	-0.98 *	-0.47 *	-0.54 *	0.28	-0.51 *	-0.21	-0.28	1.03 *	0.12	0.55 *	0.94 *	-0.42 *
08	-0.21	-0.28	-0.55 *	0.24	0.25	0.18	0.48 *	0.10	0.16	0.21	-0.41 *	0.21
09	0.09	0.00	-0.22	0.29	-0.02	0.85 *	0.32	1.07 *	0.47 *	0.51 *	0.57 *	0.17
10	-0.33	-0.38	-0.26	0.30	-0.50 *	-0.39	0.08	-0.24	-0.25	0.09	-0.34	-0.76 *
11	1.64 *	1.08 *	1.03 *	0.69 *	0.70 *	0.62 *	1.01 *	0.67 *	0.81 *	0.49 *	0.72 *	0.72 *
12	0.27	0.10	0.68 *	0.16	0.47 *	0.38	-0.17	0.05	0.06	-0.55 *	0.04	-0.09
13	0.29	0.14	0.28	0.17	0.75 *	0.29	0.69 *	0.70 *	0.41 *	-0.06	0.38	-0.10
14	0.37 *	-0.42 *	-0.07	0.04	-0.08	-0.22	0.42 *	-0.18	0.21	-0.21	-0.43 *	-0.18
15	0.53 *	0.04	0.44 *	0.18	0.50 *	0.85 *	2.17 *	1.31 *	0.85 *	0.51 *	0.85 *	1.06 *
16	-0.58 *	-0.60 *	-0.34	0.02	-0.54 *	-0.43 *	0.00	0.15	-0.03	-0.52 *	-0.53 *	0.18
17	-0.33	-0.10	-0.21	-0.11	-0.40	-0.03	0.23	-0.06	-0.30	-0.30	-0.35	-0.29
18	0.78 *	-0.03	0.36	-0.02	0.23	0.12	0.43 *	0.18	0.67 *	-0.01	-0.49 *	-0.47 *
19	0.13	0.34	0.31	-0.31	-0.13	0.37	0.17	0.87 *	0.48 *	0.35	0.43 *	0.41 *
20	0.30	-0.09	-0.59 *	-0.27	1.52 *	0.96 *	0.37	0.67 *	-0.04	0.42 *	-0.18	-0.03
21	-0.44 *	-0.21	-0.12	0.01	0.56 *	0.10	1.22 *	0.73 *	1.08 *	1.29 *	0.47 *	-0.03
22	0.49 *	-0.02	-0.52 *	0.38	0.53 *	-0.29	-0.11	-0.04	-0.44 *	0.35	0.15	0.25
23	-0.20	0.55 *	0.02	-0.22	0.04	0.14	0.25	0.20	-0.32	-0.29	-0.21	-0.73 *
24	-0.27	-0.41 *	0.83 *	0.16	0.02	-0.06	1.46 *	0.70 *	0.93 *	1.09 *	0.09	0.05
25	-0.04	0.18	-0.11	0.20	0.03	0.54 *	-0.27	1.20 *	0.34	0.44 *	0.11	0.02
26	0.22	-0.18	0.08	-0.05	1.36 *	0.27	1.24 *	1.18 *	1.11 *	0.71 *	0.96 *	0.92 *
27	0.25	0.61 *	0.13	-0.44 *	0.11	0.49 *	0.38	0.53 *	0.28	-0.25	-0.28	-0.08
28	-0.38	-0.42 *	1.82 *	0.13	-0.06	-0.45 *	1.17 *	0.11	1.50 *	0.81 *	-0.43 *	-1.04 *
29	0.94 *	-0.28	0.26	-0.41 *	0.14	-0.32	1.74 *	1.09 *	0.19	-0.35	-0.45 *	-0.02
30	-0.24	-0.35	0.23	-0.12	0.09	0.28	0.56 *	0.56 *	0.00	0.05	-0.25	-0.34
31	-0.17	-0.90 *	0.84 *	0.52 *	0.02	-0.01	0.32	0.19	0.10	-0.64 *	-0.34	-0.29
32	-0.11	-0.14	-0.17	-0.36	0.08	0.44 *	-0.24	0.86 *	0.15	1.18 *	0.50 *	-0.64 *
33	0.44 *	-0.22	-0.43 *	0.03	-0.08	-0.44 *	0.97 *	0.38	0.18	-0.02	-0.11	0.45 *
34	0.16	0.27	-0.29	0.43 *	0.25	0.75 *	0.26	0.11	1.31 *	0.65 *	-0.17	-0.06
35	0.17	0.36	-0.24	-0.28	0.04	0.00	0.96 *	0.39	0.45 *	0.53 *	-0.31	-0.57 *
36	0.09	0.26	0.35	0.63 *	0.81 *	0.51 *	0.67 *	1.02 *	0.95 *	0.51 *	0.18	0.03
37	0.15	-0.10	0.25	0.27	0.69 *	0.49 *	0.92 *	0.90 *	0.75 *	1.13 *	0.77 *	0.52 *
38	0.42 *	0.07	-0.12	0.51 *	-0.11	0.33	0.33	0.95 *	0.63 *	0.71 *	0.52 *	0.22
39	0.81 *	-0.33	0.30	0.74 *	0.02	0.60 *	2.17 *	0.59 *	2.11 *	1.00 *	1.22 *	1.30 *
40	-0.12	-0.23	-0.58 *	-0.53 *	-0.42 *	-0.10	0.51 *	0.39 *	0.66 *	-0.50 *	-0.49 *	0.51 *
41	0.21	-0.09	0.39 *	-0.15	0.83 *	0.27	0.47 *	0.32	-0.01	-0.40 *	0.40 *	-0.09
42	-0.31	-0.23	-0.25	-0.14	-0.37	0.01	-0.26	0.14	0.38	0.43 *	-0.13	0.46 *
43	-0.39	-0.54 *	-0.65 *	0.09	-0.74 *	-0.43 *	0.61 *	-0.01	0.05	-0.39	-0.10	0.08

* $p < .05$

Table 4. ANOVA result summaries for level-based cluster comparisons

	Level-Based Cluster							
	Low (n = 16)	Middle (n = 21)	High (n = 6)	Total (N = 43)	ANOVA Summary			
Dependent Variable	Mean (SD)				*F*	*df*	*p* value	η^2
Series Mean	86.05 (4.5)	100.24 (4.4)	118.80 (7.6)	97.55 (11.92)	100.12	2, 40	<.001 *	0.83
Series SD	7.57 (1.7)	7.97 (2.8)	6.65 (2.0)	7.64 (2.3)	0.74	2, 40	0.48	0.04
BL Level	83.58 (5.7)	97.67 (6.8)	119.08 (7.6)	95.41 (13.3)	66.94	2, 40	<.001 *	0.77
AR1	.48 (0.2)	.57 (0.1)	.67 (0.1)	.55 (0.2)	3.56	2, 40	0.04 *	0.15
Pooled Stress Mean	86.99 (5.2)	101.05 (5.3)	119.61 (8.4)	98.41 (12.2)	75.71	2, 40	<.001 *	0.79
Pooled Rest Mean	85.53 (4.4)	99.97 (4.3)	117.97 (7.7)	97.11 (11.8)	103.15	2, 40	<.001 *	0.84
Pooled Stess vs. Pooled Rest Mean	1.46 (3.2)	1.07 (3.4)	1.63 (4.1)	1.30 (3.3)	0.09	2, 40	0.91	0.01
Pooled Stress SD	5.80 (1.4)	6.30 (2.4)	4.77 (1.43)	5.90 (2.0)	1.44	2, 40	0.25	0.07
Pooled Rest SD	5.97 (1.4)	5.74 (2.0)	4.94 (2.0)	5.71 (1.8)	0.72	2, 40	0.50	0.04
Pooled Stess vs. Pooled Rest SD	-0.17 (0.9)	0.56 (1.4)	-0.17 (1.7)	0.19 (1.3)	1.69	2, 40	0.20	0.08
AVG Stress to Rest Change in Mean	-1.14 (3.3)	-0.68 (3.1)	-1.75 (4.1)	-1.00 (3.3)	0.26	2, 40	0.77	0.01
# Stressors > than BL	2.25 (1.7)	2.29 (1.7)	1.17 (1.2)	2.12 (1.6)	1.19	2, 40	0.32	0.06
% Missing	3.13 (2.6)	3.24 (2.7)	2.83 (1.9)	3.14 (2.5)	0.06	2, 40	0.94	0.00

* $p < .05$

Table 5. ANOVA result summaries for shape-based cluster comparisons

	Shape-Based Cluster						
	Stabile (n = 28)	Labile (n = 13)	Total (N = 41)	ANOVA Summary			
Dependent Variable	Mean (SD)			*F*	*df*	*p* value	η^2
Series Mean	95.57 (12.1)	101.56 (11.9)	97.47 (12.2)	2.20	1, 39	0.15	0.05
Series SD	6.75 (1.7)	8.56 (1.6)	7.32 (1.9)	10.21	1, 39	.003 *	0.21
BL Level	93.74 (13.6)	100.1 (12.3)	95.74 (13.4)	2.02	1, 39	0.16	0.05
AR1	.57 (0.1)	.50 (0.2)	.55 (0.2)	1.22	1, 39	0.28	0.03
Pooled Stress Mean	95.60 (12.0)	103.77 (11.8)	98.19 (12.3)	4.18	1, 39	0.05 *	0.10
Pooled Rest Mean	95.76 (12.1)	100.00 (12.2)	97.10 (12.1)	1.09	1, 39	0.30	0.03
Pooled Stess vs. Pooled Rest Mean	-0.16 (2.3)	3.77 (2.5)	1.08 (3.0)	24.68	1, 39	<.001 *	0.39
Pooled Stress SD	5.27 (1.8)	6.61 (1.3)	5.69 (1.8)	5.55	1, 39	0.02 *	0.13
Pooled Rest SD	5.15 (1.6)	6.6 (1.4)	5.61 (1.7)	7.78	1, 39	0.01 *	0.17
Pooled Stess vs. Pooled Rest SD	0.12 (1.1)	0.01 (1.1)	0.09 (1.1)	0.09	1, 39	0.76	0.00
AVG Stress to Rest Change in Mean	0.53 (2.3)	-3.8 (2.6)	-0.84 (3.1)	28.53	1, 39	<.001 *	0.42
# Stressors > than BL	2.00 (1.7)	2.08 (1.3)	2.02 (1.6)	0.02	1, 39	0.89	0.00
% Missing	3.57 (2.6)	2.15 (2.2)	3.12 (2.6)	2.87	1, 39	0.10	0.07

* $p < .05$

Table 6. Number of participants in each combo cluster

		Shape-Based Cluster		
		Stabile	Labile	Total
Level-Based Cluster				
	Low	12	4	16
	Middle	13	6	19
	High	3	3	6
	Total	28	13	41

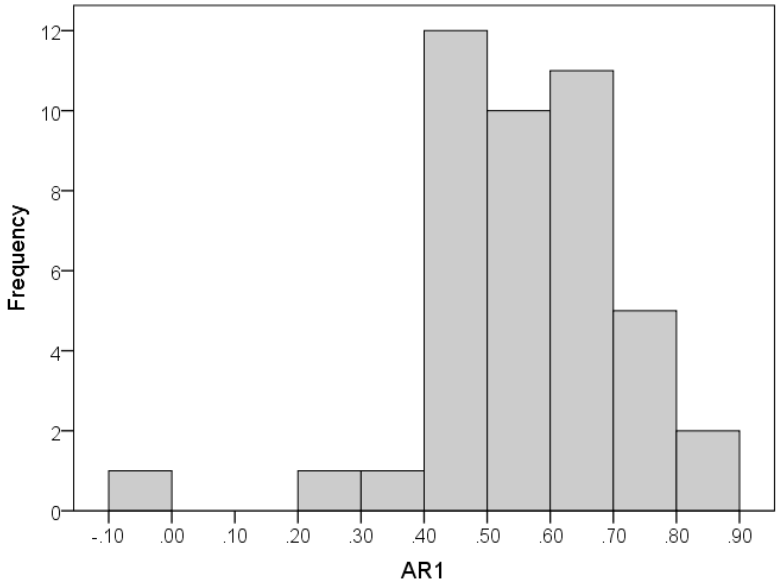


Figure 1. Distribution of AR1 for the total sample (N = 43)

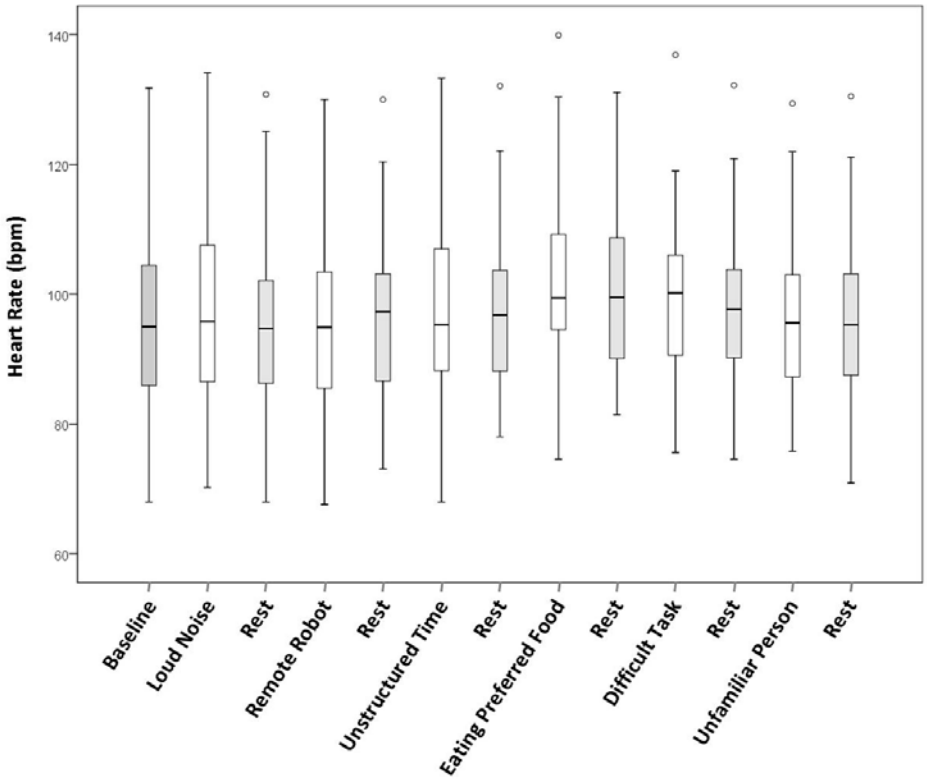


Figure 2. Box and whisker plot for the total sample mean heart rate by phase

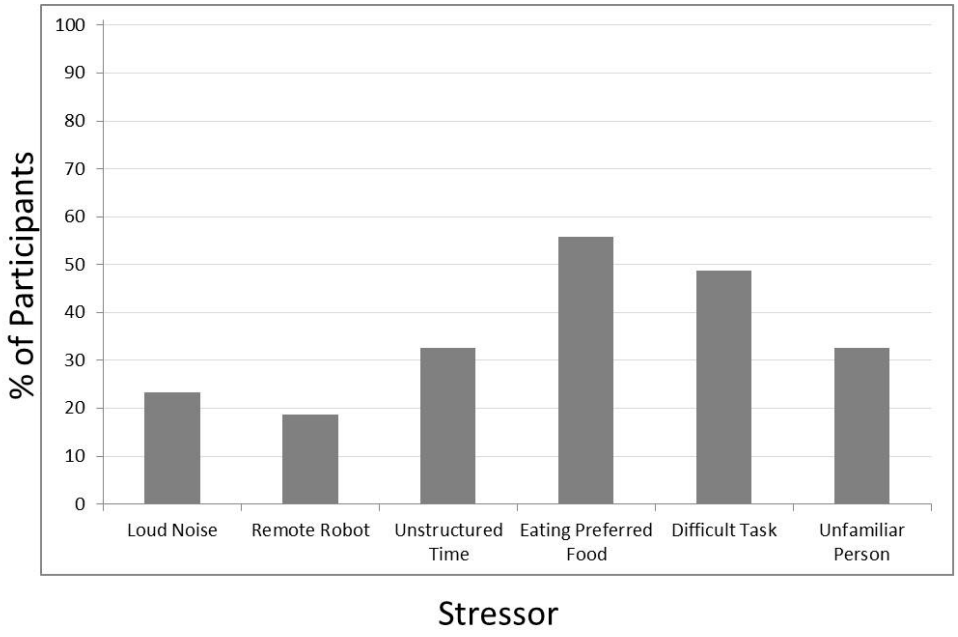


Figure 3. Percent of participants with significantly greater mean heart rate during stress vs. baseline phases

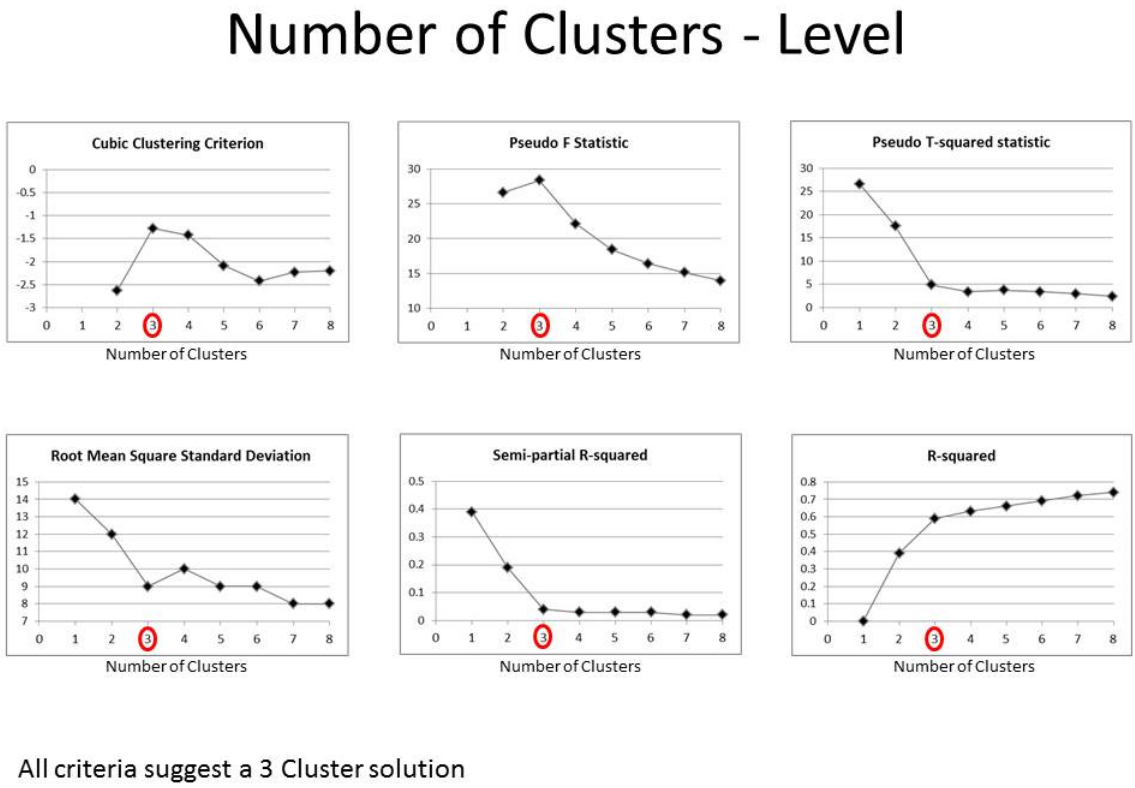


Figure 4. Quantitative criteria for determining number of clusters in the level-based cluster analysis

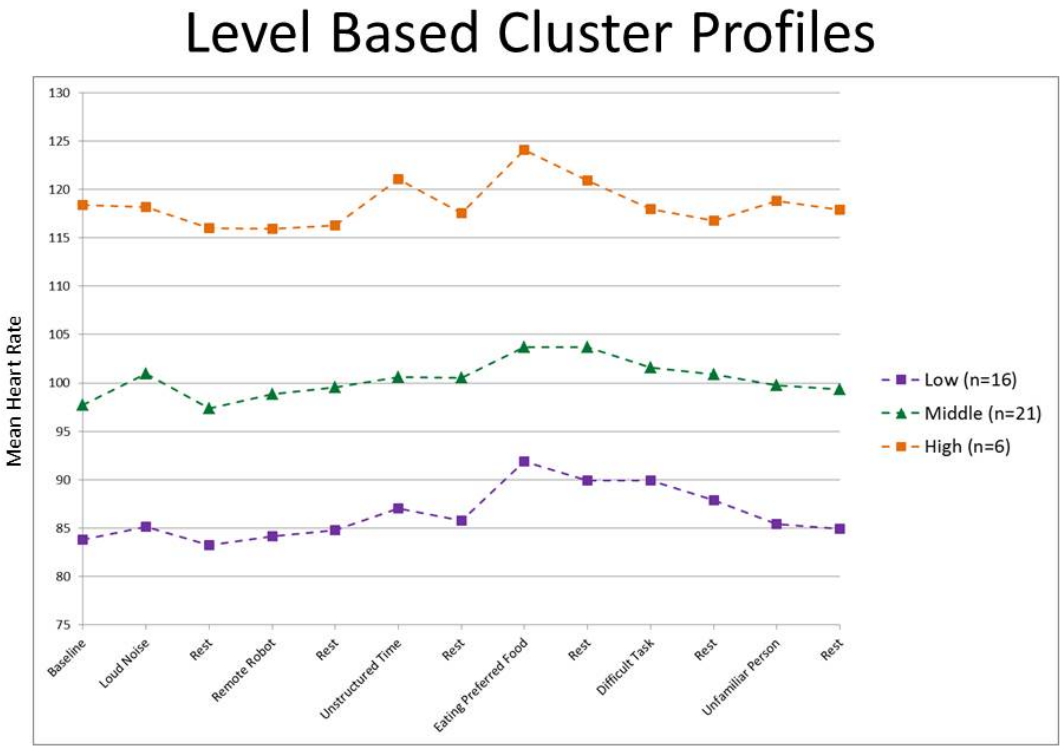


Figure 5. Level-based cluster profiles

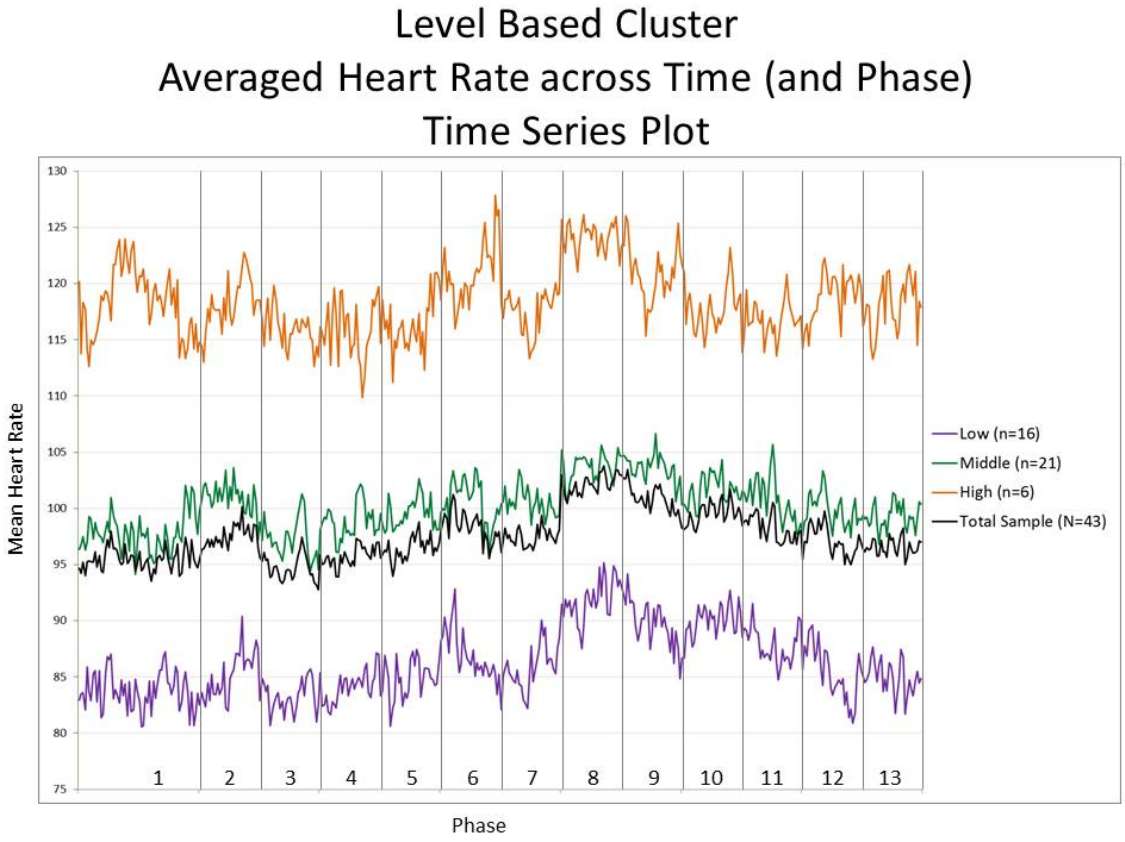


Figure 6. Level-based cluster averages across time (and phase)

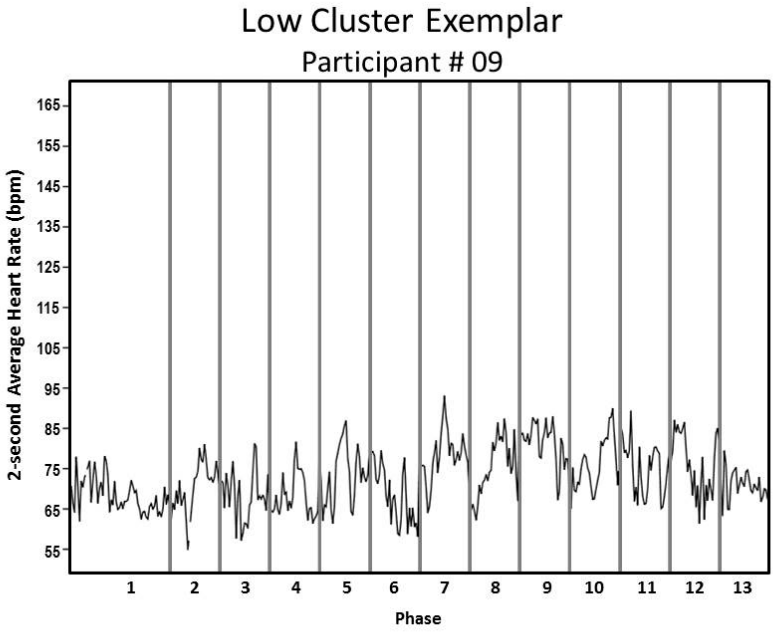


Figure 7. Low Cluster Exemplar

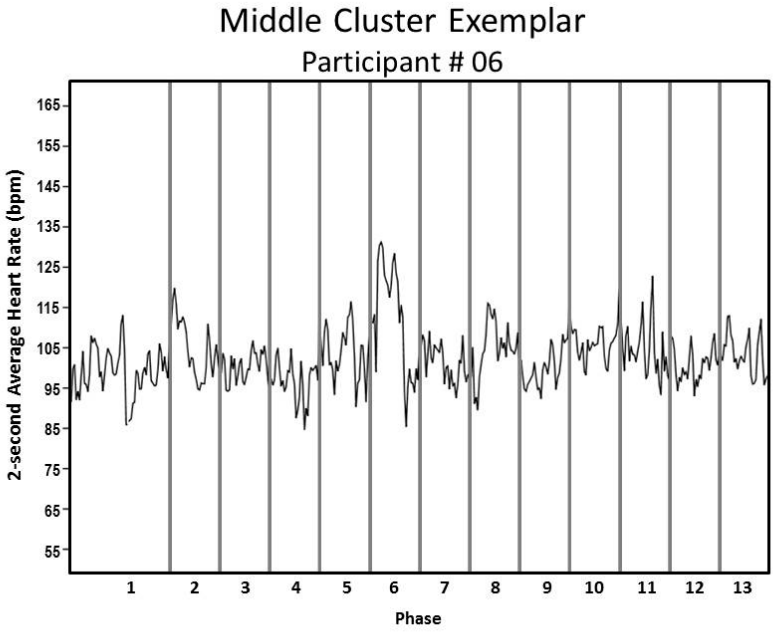


Figure 8. Middle Cluster Exemplar

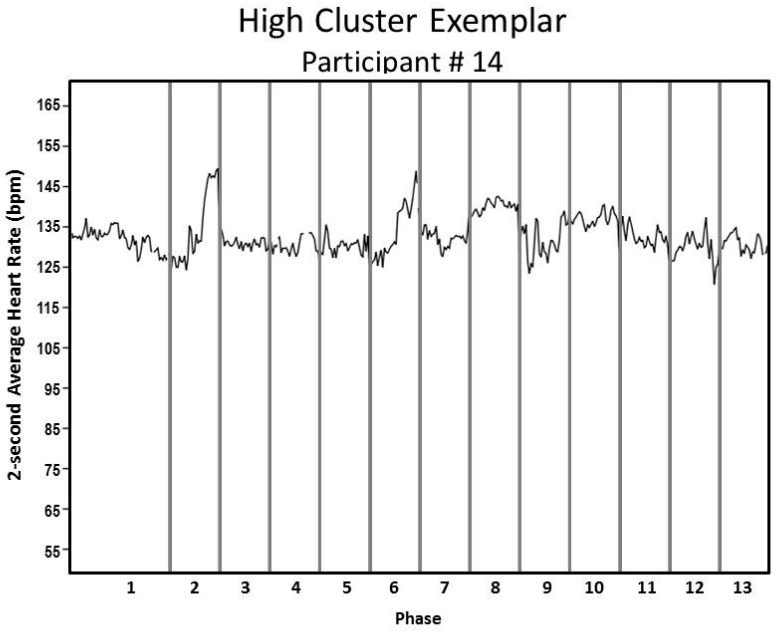


Figure 9. High Cluster Exemplar

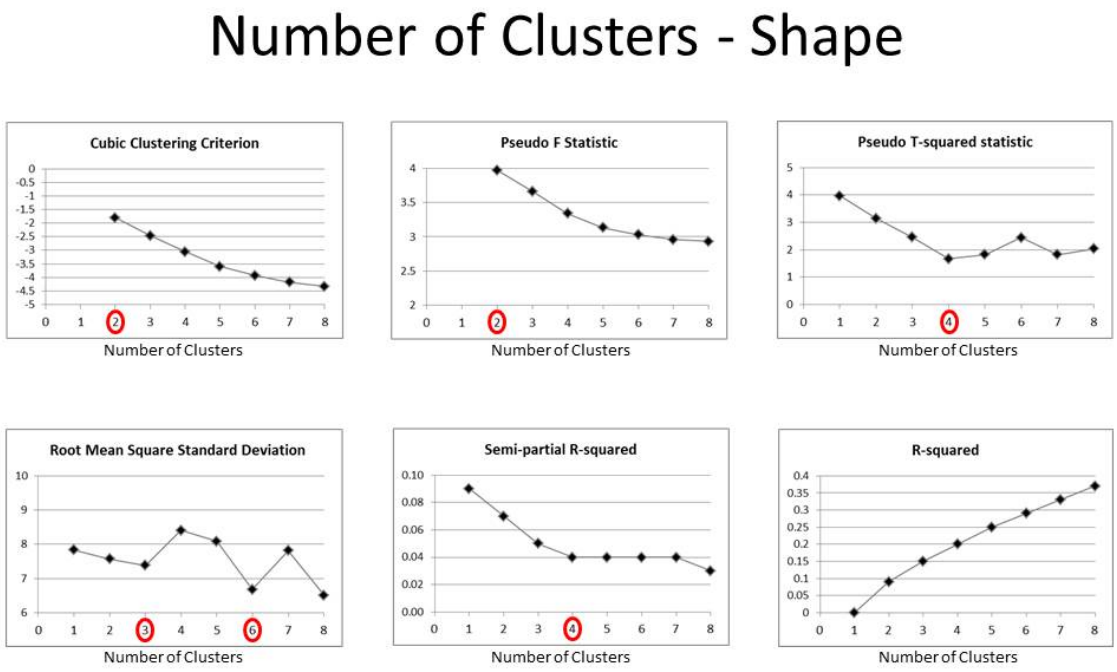


Figure 10. Quantitative criteria for determining number of clusters in the shape-based cluster analysis

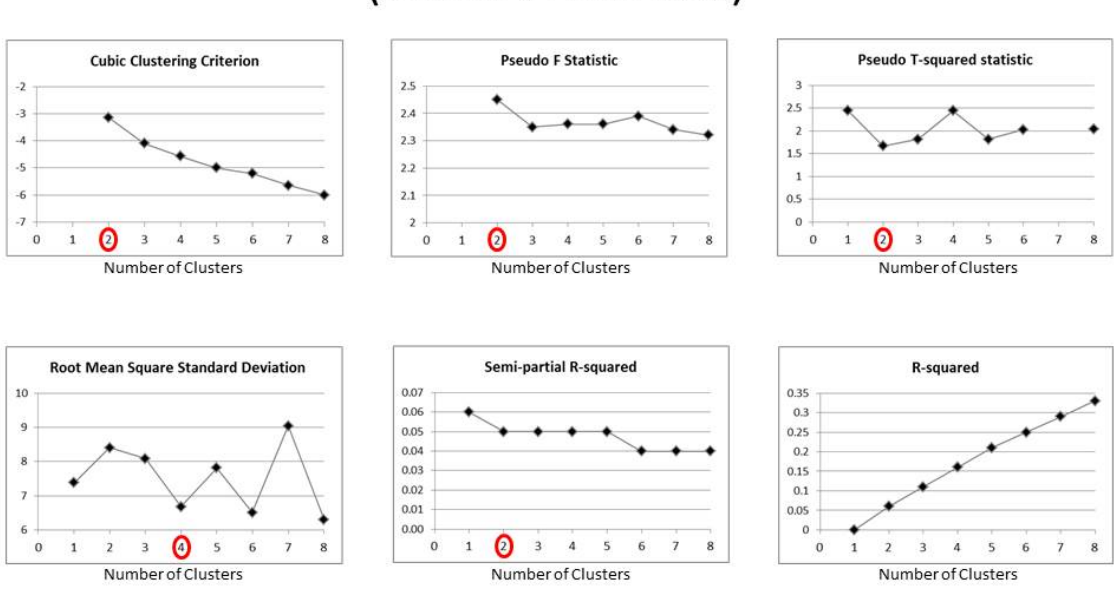


Figure 11. Quantitative criteria for determining number of clusters in the outliers removed shape-based cluster analysis

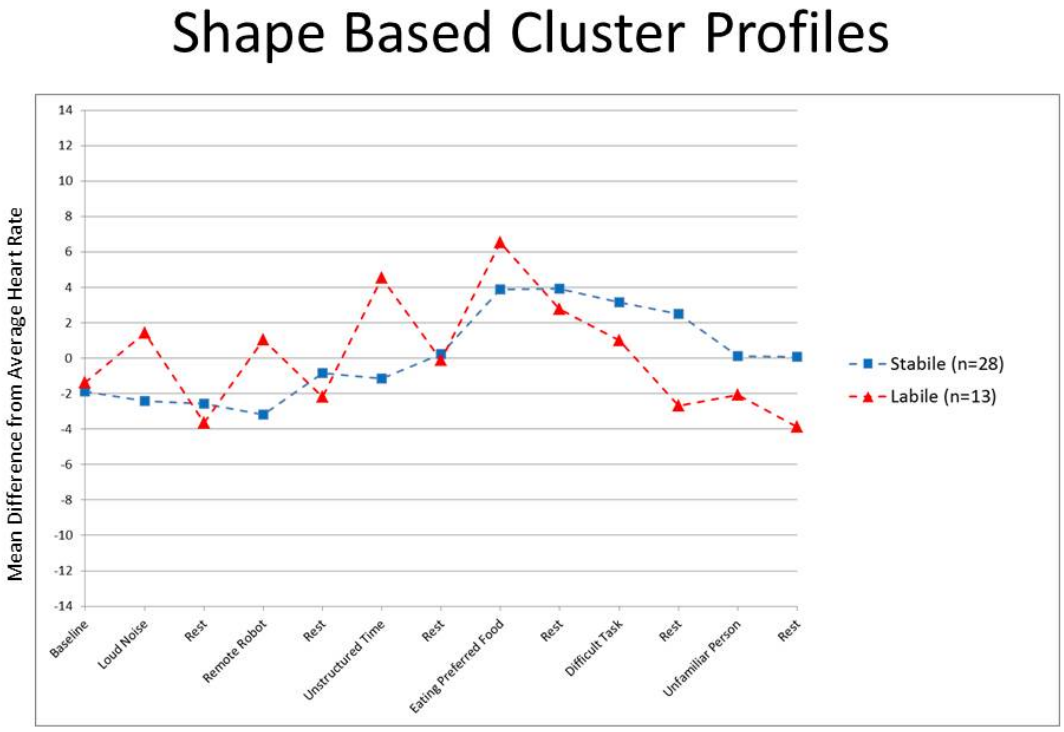


Figure 12. Shape-based cluster profiles

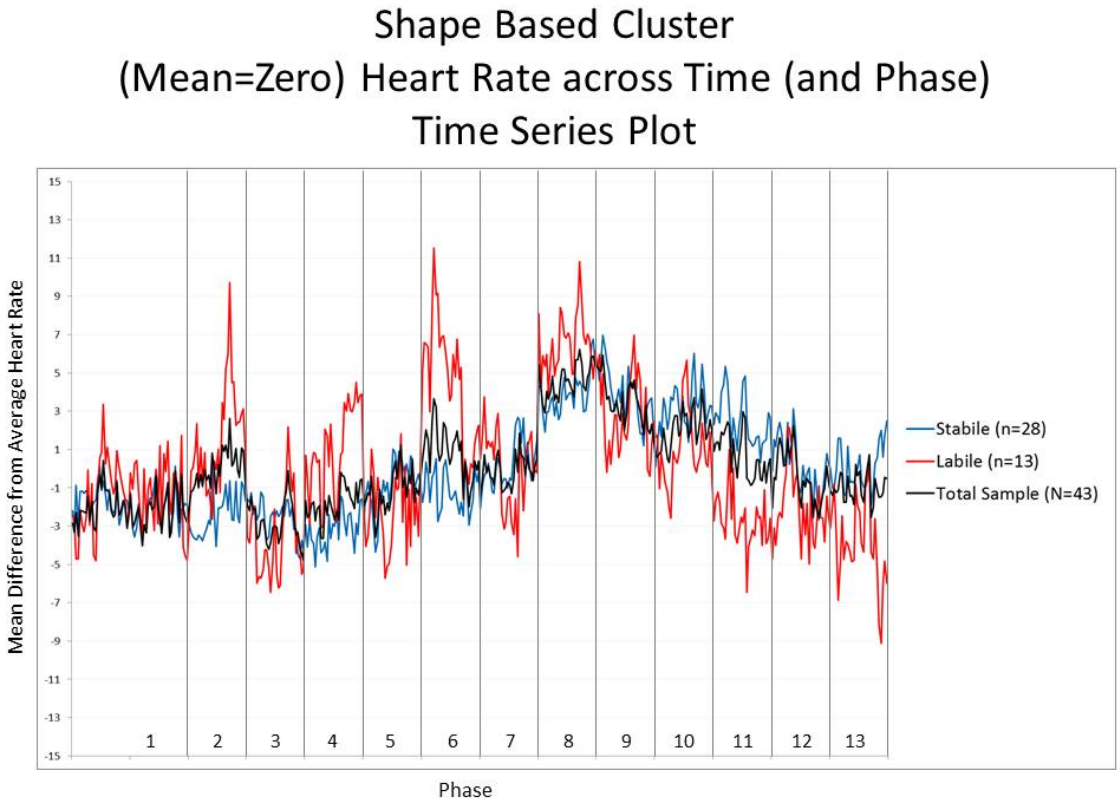


Figure 13. Shape-based cluster averages across time (and phase)

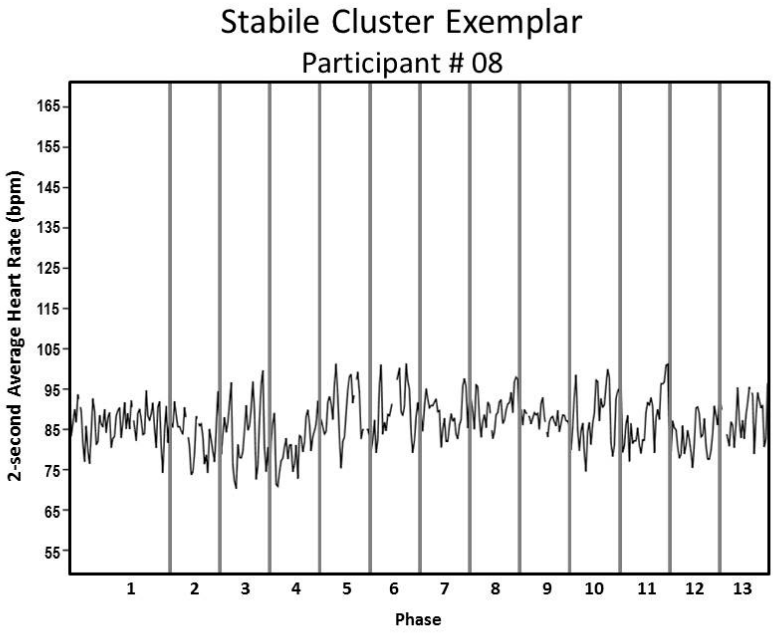


Figure 14. Stabile Cluster Exemplar

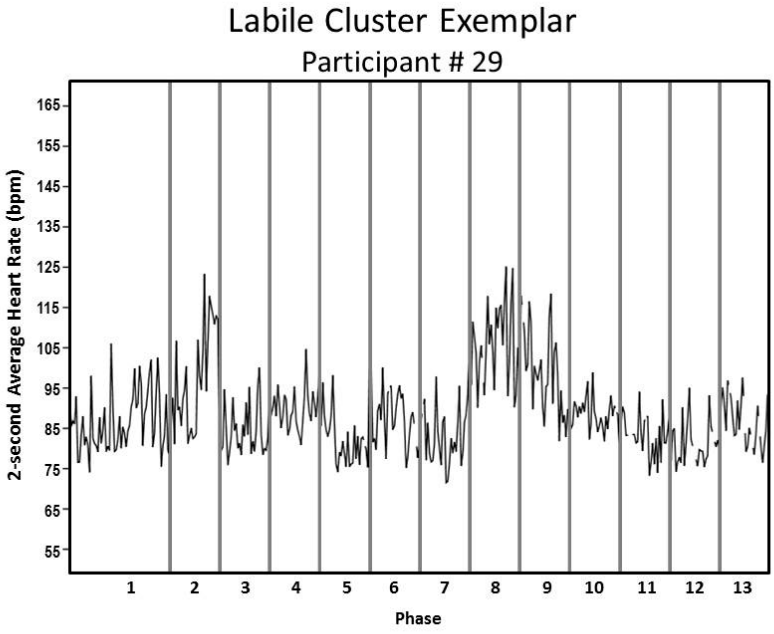


Figure 15. Labile Cluster Exemplar

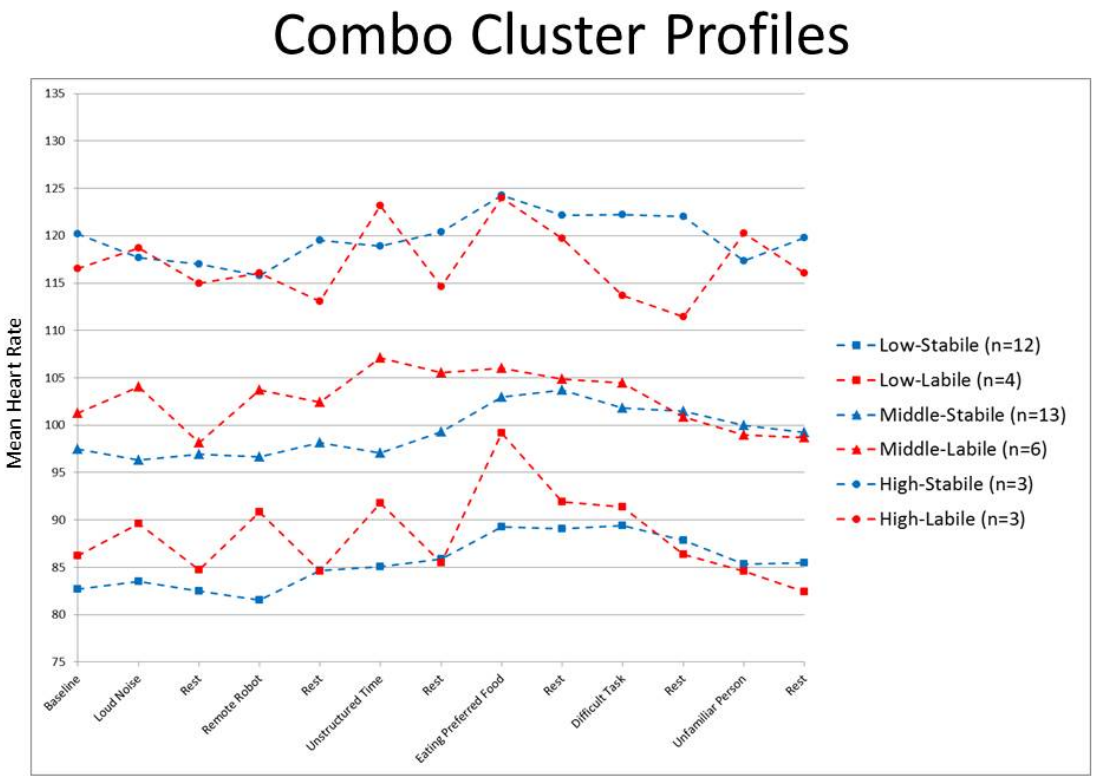


Figure 16. Combo Cluster Profiles

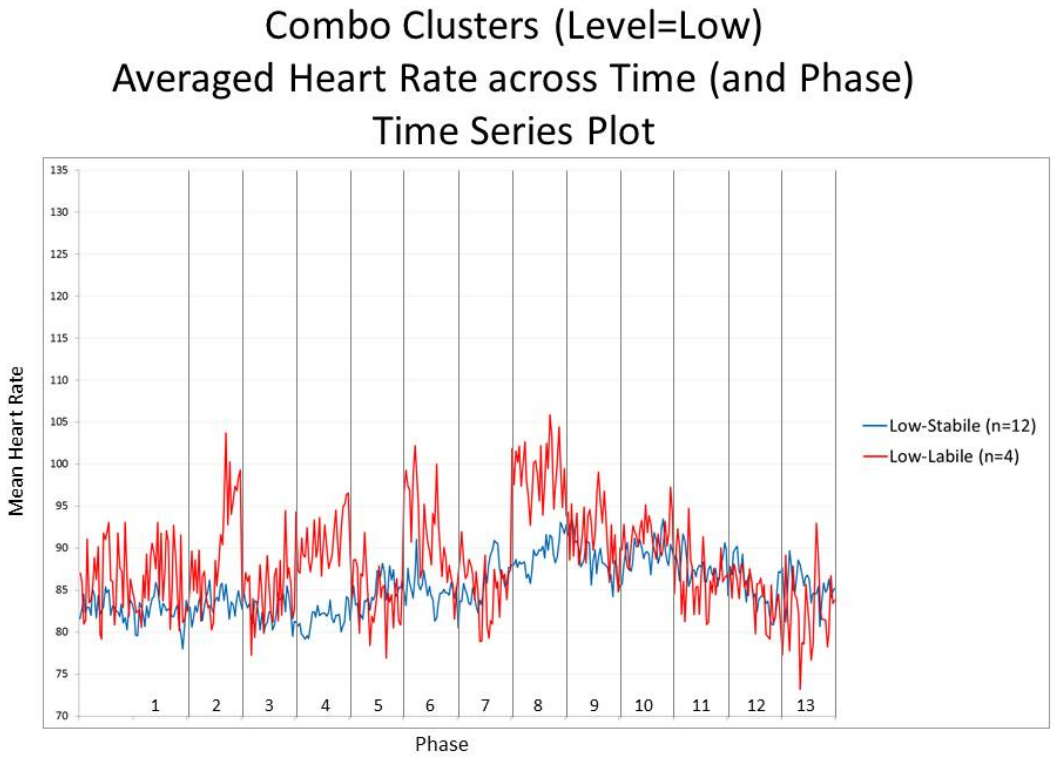


Figure 17. Low-Stabile and Low-Labile cluster averages across time (and phase)

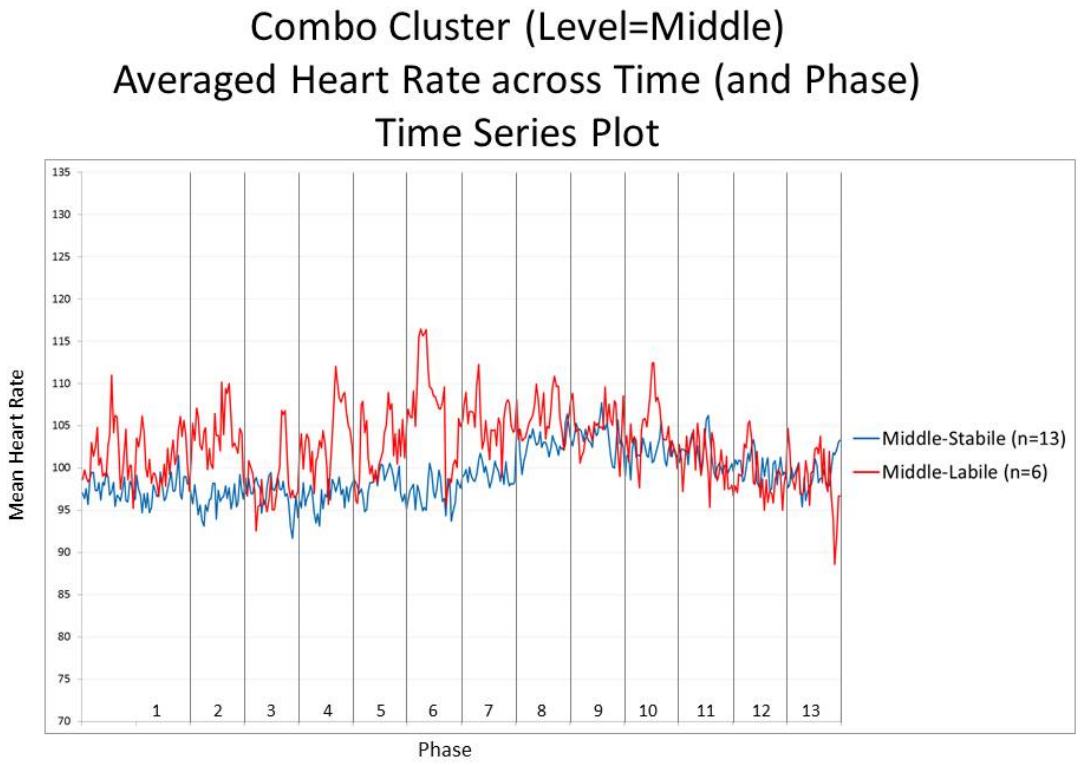


Figure 18. Middle-Stabile and Middle-Labile cluster averages across time (and phase)

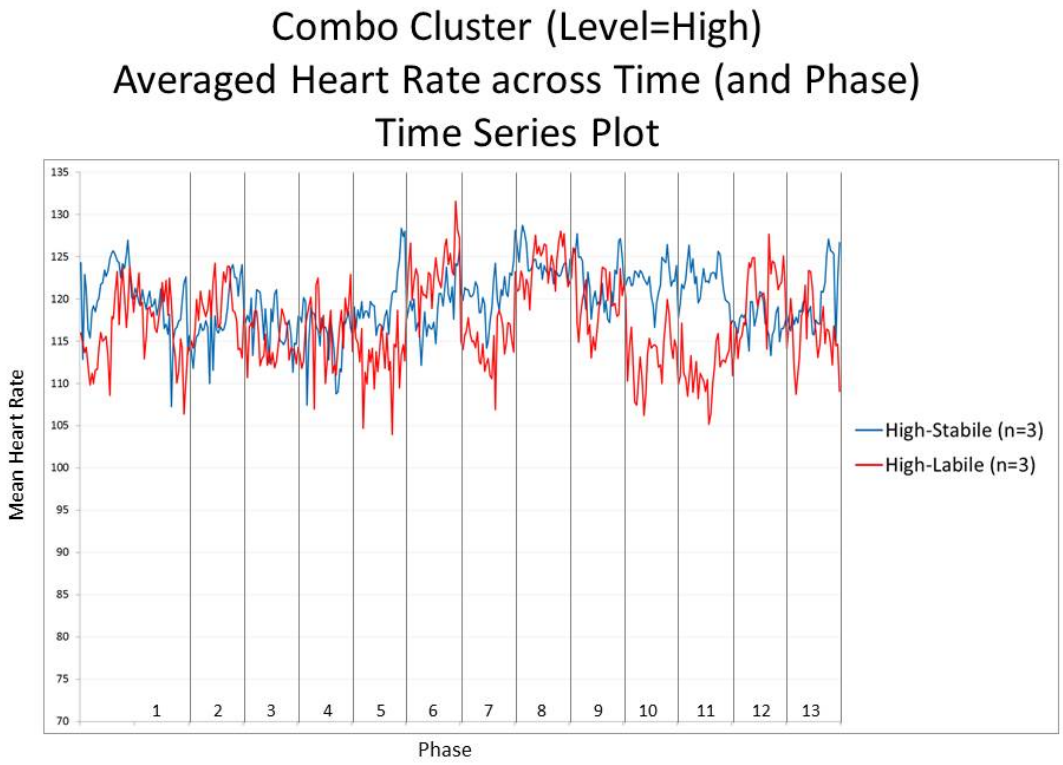


Figure 19. High-Stabile and High-Labile cluster averages across time (and phase)

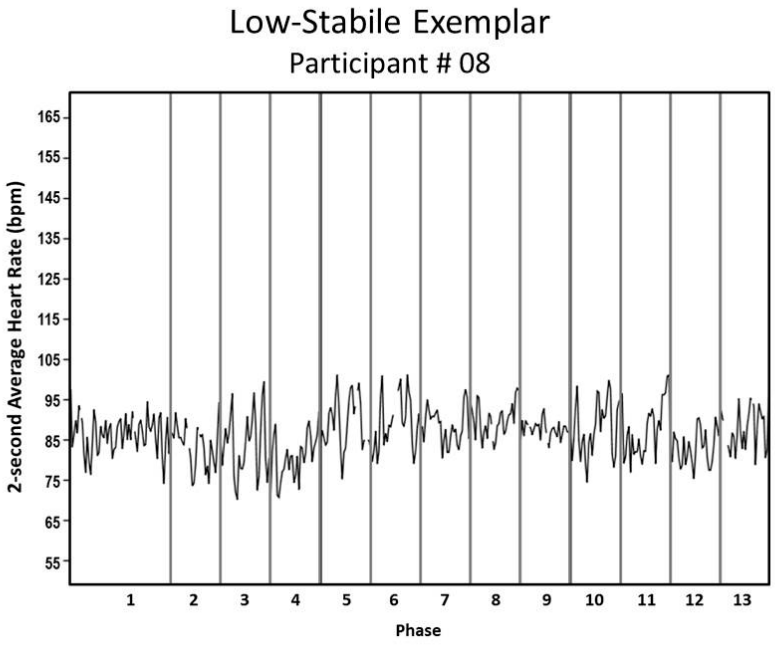


Figure 20. Low-Stabile Cluster Exemplar

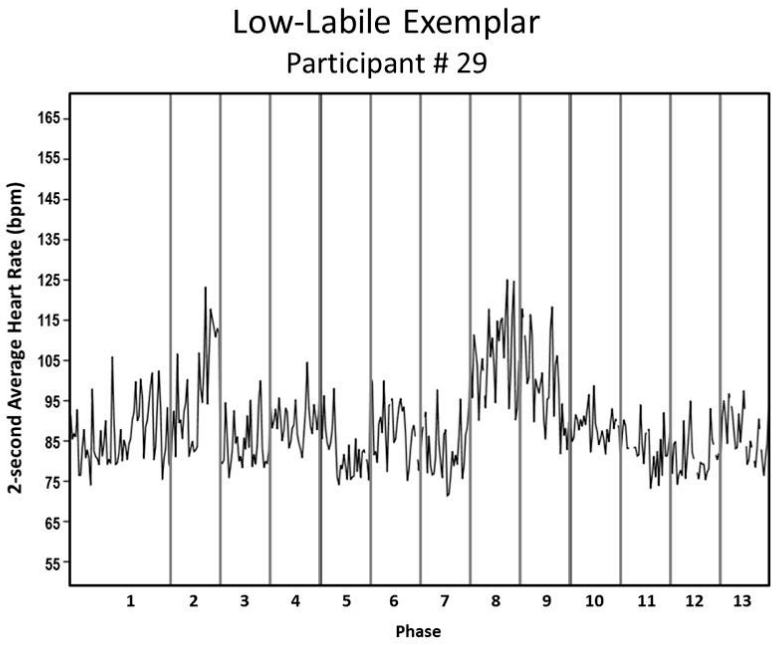


Figure 21. Low-Labile Cluster Exemplar

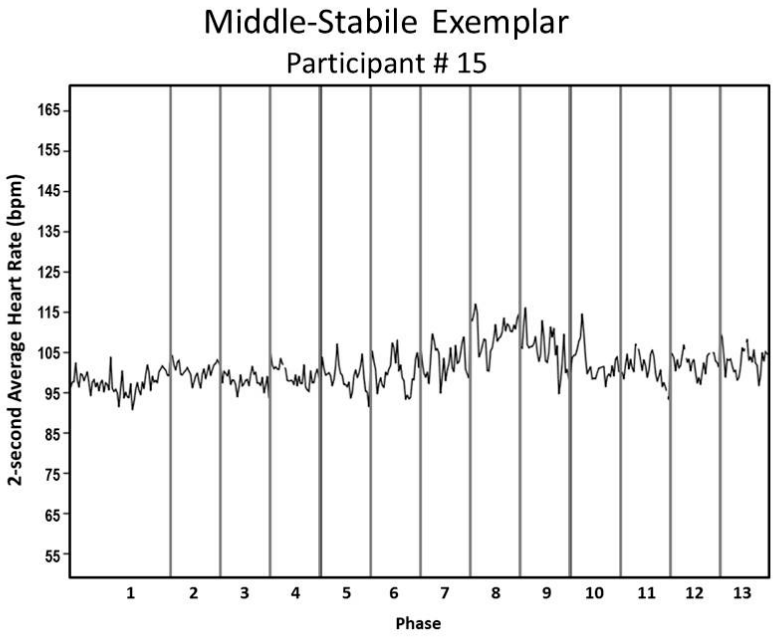


Figure 22. Middle-Stabile Cluster Exemplar

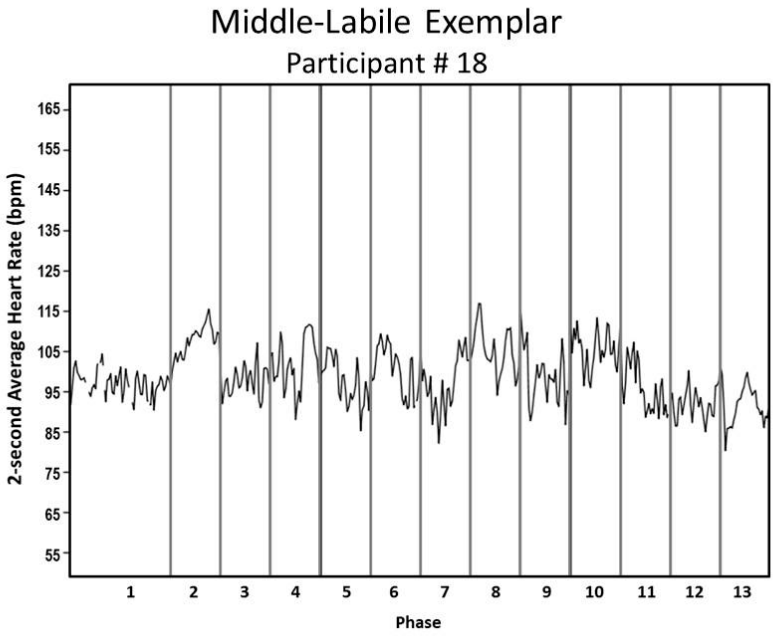


Figure 23. Middle-Labile Cluster Exemplar

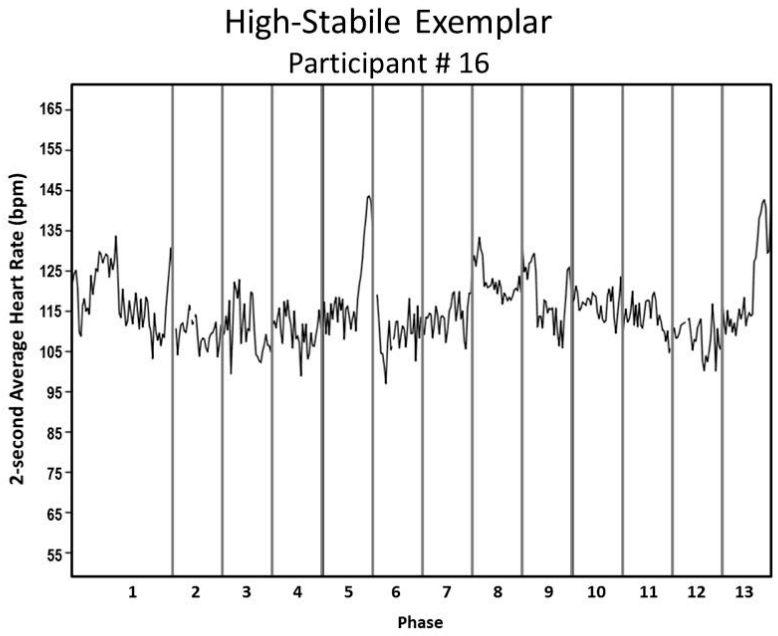


Figure 24. High-Stabile Cluster Exemplar

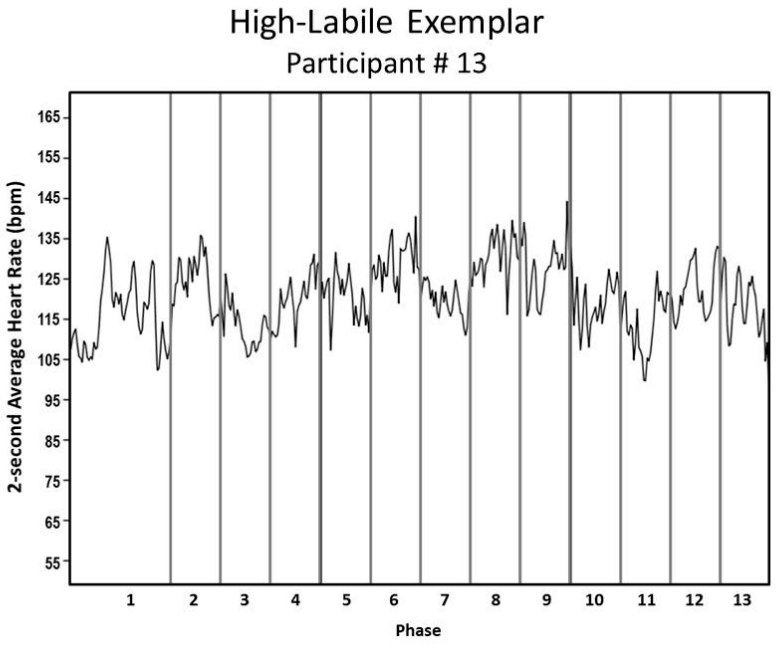
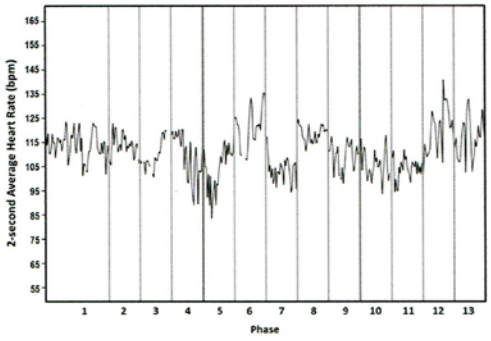


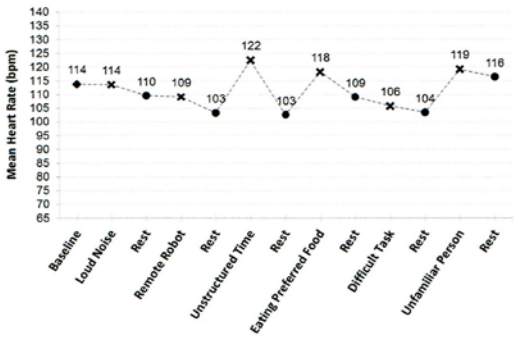
Figure 25. High-Labile Cluster Exemplar

Appendix 1. Participant 01

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	113.8	5.4
2	Loud Noise	30	113.6	4.6
3	Rest	30	109.7	5.5
4	Remote Robot	30	109.1	9.5
5	Rest	30	103.4	8.7
6	Unstructured Time	30	122.5	7.4
7	Rest	30	102.7	4.3
8	Eating Preferred Food	30	118.2	3.3
9	Rest	30	109.1	5.4
10	Difficult Task	30	105.7	5.9
11	Rest	30	103.5	4.4
12	Unfamiliar Person	30	119.1	9.8
13	Rest	30	116.4	8.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	113.9	1.60	71.33	<.0001		
AR1	1st order autoregressive term	0.6	0.04	13.11	<.0001		
DL_{phase2}	Loud Noise vs. BL	-1.3	2.60	-0.48	0.630		-0.10
DL_{phase3}	Rest vs. BL	-3.9	2.94	-1.33	0.185		-0.29
DL_{phase4}	Remote Robot vs. BL	-3.9	2.71	-1.44	0.149		-0.30
DL_{phase5}	Rest vs. BL	-10.6	2.67	-3.95	<.0001	*	-0.81
DL_{phase6}	Unstructured Time vs. BL	7.2	2.78	2.60	0.009	*	0.55
DL_{phase7}	Rest vs. BL	-12.1	2.77	-4.36	<.0001	*	-0.91
DL_{phase8}	Eating Preferred Food vs. BL	5.0	2.67	1.85	0.064		0.38
DL_{phase9}	Rest vs. BL	-5.3	2.68	-1.99	0.046	*	-0.41
$DL_{phase10}$	Difficult Task vs. BL	-7.9	2.76	-2.87	0.004	*	-0.60
$DL_{phase11}$	Rest vs. BL	-8.0	2.77	-2.90	0.004	*	-0.61
$DL_{phase12}$	Unfamiliar Person vs. BL	3.8	2.68	1.41	0.159		0.29
$DL_{phase13}$	Rest vs. BL	2.2	2.71	0.79	0.427		0.16

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 0
- All phases = 1

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 4
- All phases = 5

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 4
- All phases = 6

Stress Phases Significantly *Greater Than* baseline

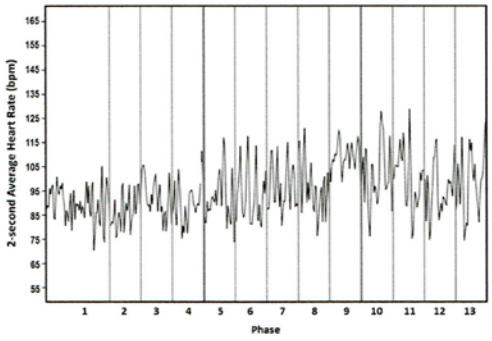
- Unstructured Time

Cluster Classification

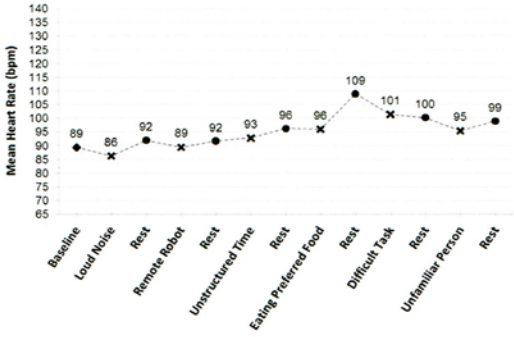
Level Cluster = High
Shape Cluster = Labile
Combo Cluster = High-Labile

Appendix 2. Participant 02

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	89.4	7.1
2	Loud Noise	30	86.2	7.0
3	Rest	30	91.9	7.6
4	Remote Robot	30	89.4	8.1
5	Rest	30	91.7	9.8
6	Unstructured Time	30	92.8	11.1
7	Rest	30	96.3	9.4
8	Eating Preferred Food	30	96.0	10.6
9	Rest	30	108.9	5.7
10	Difficult Task	30	101.4	12.5
11	Rest	30	100.2	11.7
12	Unfamiliar Person	30	95.4	10.4
13	Rest	30	99.0	13.2

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	89.5	2.13	42.03	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.33	<.0001		
DL_{phase2}	Loud Noise vs. BL	-3.5	3.53	-0.99	0.321		-0.20
DL_{phase3}	Rest vs. BL	1.8	3.60	0.51	0.608		0.11
DL_{phase4}	Remote Robot vs. BL	1.3	3.61	0.35	0.729		0.07
DL_{phase5}	Rest vs. BL	1.0	3.61	0.28	0.783		0.06
DL_{phase6}	Unstructured Time vs. BL	4.7	3.61	1.29	0.197		0.27
DL_{phase7}	Rest vs. BL	4.5	3.61	1.23	0.218		0.26
DL_{phase8}	Eating Preferred Food vs. BL	7.7	3.60	2.12	0.034	*	0.44
DL_{phase9}	Rest vs. BL	18.9	3.61	5.26	<.0001	*	1.09
$DL_{phase10}$	Difficult Task vs. BL	11.4	3.60	3.16	0.002	*	0.65
$DL_{phase11}$	Rest vs. BL	11.7	3.61	3.25	0.001	*	0.67
$DL_{phase12}$	Unfamiliar Person vs. BL	7.8	3.61	2.16	0.031	*	0.45
$DL_{phase13}$	Rest vs. BL	8.4	3.64	2.32	0.020	*	0.48

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

Stress Phases Significantly *Greater Than* baseline

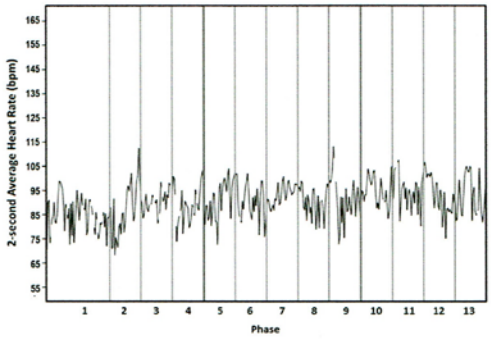
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

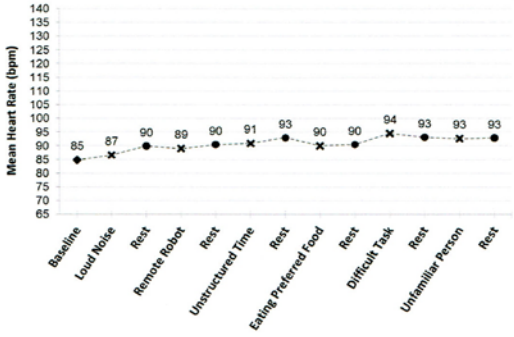
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 3. Participant 03

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	84.8	7.2
2	Loud Noise	30	86.6	11.0
3	Rest	30	89.9	4.2
4	Remote Robot	30	89.0	7.9
5	Rest	30	90.5	7.9
6	Unstructured Time	30	90.9	7.5
7	Rest	30	93.0	4.1
8	Eating Preferred Food	30	90.0	6.0
9	Rest	30	90.5	8.9
10	Difficult Task	30	94.5	5.7
11	Rest	30	93.1	6.4
12	Unfamiliar Person	30	92.6	7.8
13	Rest	30	92.9	8.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	84.4	1.59	52.96	<.0001		
AR1	1st order autoregressive term	0.5	0.05	10.39	<.0001		
DL_{phase2}	Loud Noise vs. BL	2.7	2.63	1.03	0.305		0.21
DL_{phase3}	Rest vs. BL	5.1	2.79	1.83	0.067		0.39
DL_{phase4}	Remote Robot vs. BL	5.6	2.72	2.06	0.039	*	0.43
DL_{phase5}	Rest vs. BL	4.8	2.68	1.81	0.070		0.37
DL_{phase6}	Unstructured Time vs. BL	6.1	2.69	2.26	0.024	*	0.47
DL_{phase7}	Rest vs. BL	8.7	2.68	3.25	0.001	*	0.67
DL_{phase8}	Eating Preferred Food vs. BL	5.5	2.68	2.06	0.039	*	0.42
DL_{phase9}	Rest vs. BL	6.7	2.70	2.47	0.014	*	0.51
$DL_{phase10}$	Difficult Task vs. BL	10.8	2.69	4.02	<.0001	*	0.83
$DL_{phase11}$	Rest vs. BL	8.5	2.73	3.13	0.002	*	0.65
$DL_{phase12}$	Unfamiliar Person vs. BL	8.2	2.72	3.03	0.003	*	0.63
$DL_{phase13}$	Rest vs. BL	8.6	2.70	3.19	0.001	*	0.66

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 5
- Rest phases = 4
- All phases = 9

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 5
- Rest phases = 4
- All phases = 9

Stress Phases Significantly *Greater Than* baseline

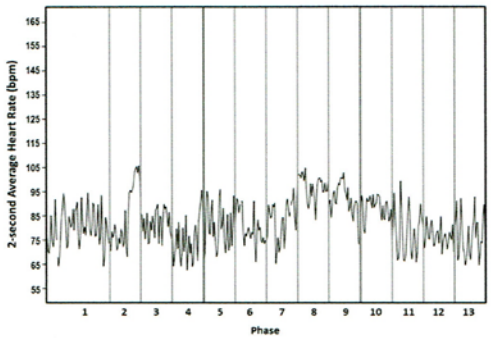
- Remote Robot
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

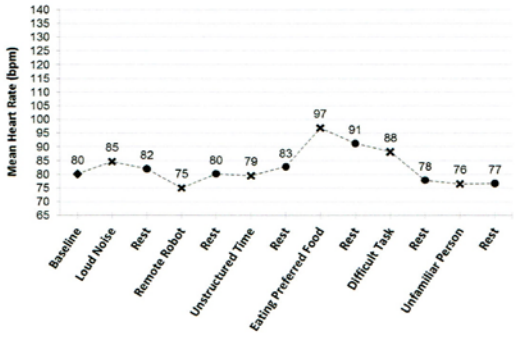
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 4. Participant 04

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	80.1	7.7
2	Loud Noise	30	84.6	12.7
3	Rest	30	81.9	5.3
4	Remote Robot	30	75.0	8.7
5	Rest	30	80.2	9.0
6	Unstructured Time	30	79.4	6.6
7	Rest	30	82.7	8.3
8	Eating Preferred Food	30	96.8	5.0
9	Rest	30	91.2	7.0
10	Difficult Task	30	88.2	4.4
11	Rest	30	77.9	9.5
12	Unfamiliar Person	30	76.5	4.0
13	Rest	30	76.6	8.5

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	80.0	1.71	46.71	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.37	<.0001		
DL_{phase2}	Loud Noise vs. BL	4.9	2.84	1.74	0.082		0.35
DL_{phase3}	Rest vs. BL	0.7	2.90	0.25	0.805		0.05
DL_{phase4}	Remote Robot vs. BL	-3.0	2.90	-1.04	0.300		-0.21
DL_{phase5}	Rest vs. BL	-0.3	2.90	-0.11	0.913		-0.02
DL_{phase6}	Unstructured Time vs. BL	-1.0	2.91	-0.36	0.723		-0.07
DL_{phase7}	Rest vs. BL	2.8	2.90	0.98	0.328		0.20
DL_{phase8}	Eating Preferred Food vs. BL	16.7	2.90	5.77	<.0001	*	1.19
DL_{phase9}	Rest vs. BL	10.0	2.90	3.45	0.001	*	0.71
$DL_{phase10}$	Difficult Task vs. BL	9.5	2.90	3.27	0.001	*	0.68
$DL_{phase11}$	Rest vs. BL	-2.3	2.90	-0.81	0.418		-0.17
$DL_{phase12}$	Unfamiliar Person vs. BL	-4.3	2.90	-1.47	0.142		-0.30
$DL_{phase13}$	Rest vs. BL	-2.9	2.92	-0.98	0.325		-0.20

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

Stress Phases Significantly *Greater Than* baseline

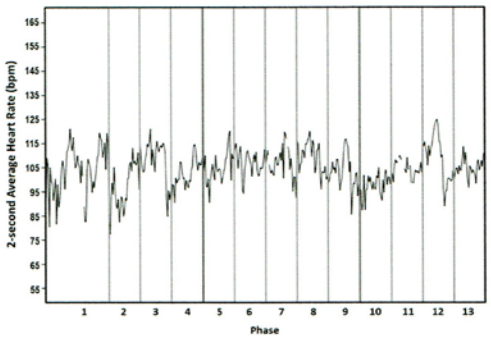
- Eating Preferred Food
- Difficult Task

Cluster Classification

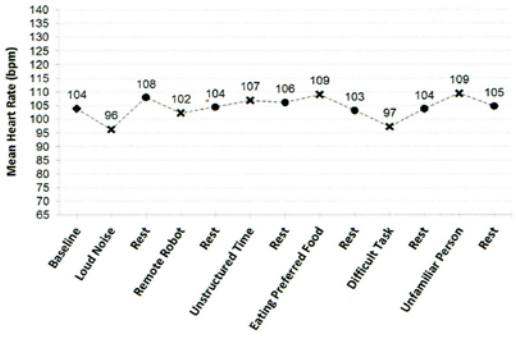
Level Cluster = Low
Shape Cluster = Labile
Combo Cluster = Low-Labile

Appendix 5. Participant 05

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	103.9	9.8
2	Loud Noise	30	96.2	9.4
3	Rest	30	108.0	8.5
4	Remote Robot	30	102.2	6.0
5	Rest	30	104.4	6.3
6	Unstructured Time	30	106.9	5.0
7	Rest	30	106.2	6.2
8	Eating Preferred Food	30	109.0	6.4
9	Rest	30	103.2	7.2
10	Difficult Task	30	97.2	4.6
11	Rest	30	103.8	3.2
12	Unfamiliar Person	30	109.4	9.8
13	Rest	30	104.7	3.9

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	104.8	1.99	52.75	<.0001		
AR1	1st order autoregressive term	0.6	0.04	16.34	<.0001		
DL_{phase2}	Loud Noise vs. BL	-12.3	3.12	-3.94	<.0001	*	-0.78
DL_{phase3}	Rest vs. BL	3.8	3.24	1.18	0.239		0.24
DL_{phase4}	Remote Robot vs. BL	-1.1	3.24	-0.35	0.724		-0.07
DL_{phase5}	Rest vs. BL	-1.2	3.25	-0.36	0.717		-0.07
DL_{phase6}	Unstructured Time vs. BL	2.2	3.25	0.69	0.492		0.14
DL_{phase7}	Rest vs. BL	-1.5	3.30	-0.44	0.661		-0.09
DL_{phase8}	Eating Preferred Food vs. BL	6.3	3.25	1.94	0.052		0.39
DL_{phase9}	Rest vs. BL	-1.1	3.30	-0.34	0.734		-0.07
$DL_{phase10}$	Difficult Task vs. BL	-7.3	3.33	-2.20	0.028	*	-0.45
$DL_{phase11}$	Rest vs. BL	-1.7	3.32	-0.51	0.610		-0.10
$DL_{phase12}$	Unfamiliar Person vs. BL	5.4	3.25	1.67	0.095		0.34
$DL_{phase13}$	Rest vs. BL	0.5	3.32	0.14	0.891		0.03

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***less than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

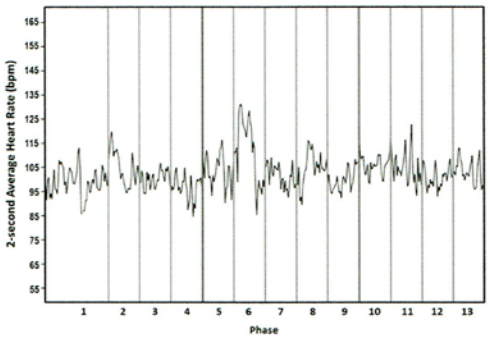
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

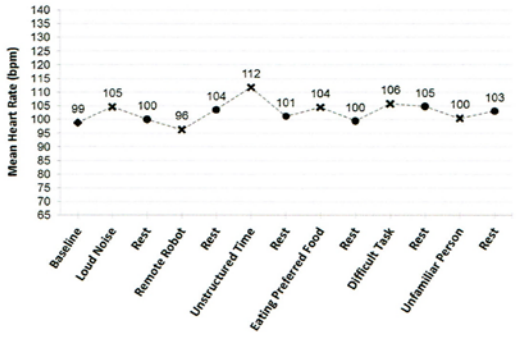
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 6. Participant 06

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	98.8	5.6
2	Loud Noise	30	104.6	7.1
3	Rest	30	100.0	3.5
4	Remote Robot	30	96.3	4.9
5	Rest	30	103.6	6.6
6	Unstructured Time	30	111.8	13.4
7	Rest	30	101.2	4.6
8	Eating Preferred Food	30	104.5	6.8
9	Rest	30	99.5	4.5
10	Difficult Task	30	105.8	3.9
11	Rest	30	104.8	7.1
12	Unfamiliar Person	30	100.4	4.2
13	Rest	30	103.1	5.0

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	98.3	1.84	53.54	<.0001		
AR1	1st order autoregressive term	0.7	0.04	18.67	<.0001		
DL_{phase2}	Loud Noise vs. BL	6.5	2.77	2.36	0.018	*	0.45
DL_{phase3}	Rest vs. BL	1.8	2.95	0.60	0.546		0.12
DL_{phase4}	Remote Robot vs. BL	-2.8	2.97	-0.95	0.343		-0.19
DL_{phase5}	Rest vs. BL	6.2	2.98	2.10	0.036	*	0.42
DL_{phase6}	Unstructured Time vs. BL	10.8	2.98	3.63	0.000	*	0.73
DL_{phase7}	Rest vs. BL	6.0	2.99	2.00	0.045	*	0.40
DL_{phase8}	Eating Preferred Food vs. BL	7.0	2.98	2.34	0.019	*	0.47
DL_{phase9}	Rest vs. BL	0.0	2.98	-0.01	0.990		0.00
$DL_{phase10}$	Difficult Task vs. BL	6.0	2.98	2.03	0.043	*	0.41
$DL_{phase11}$	Rest vs. BL	7.5	2.98	2.52	0.012	*	0.51
$DL_{phase12}$	Unfamiliar Person vs. BL	2.7	2.98	0.92	0.358		0.19
$DL_{phase13}$	Rest vs. BL	4.7	3.06	1.53	0.126		0.31

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 3
- All phases = 7

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 3
- All phases = 7

Stress Phases Significantly *Greater Than* baseline

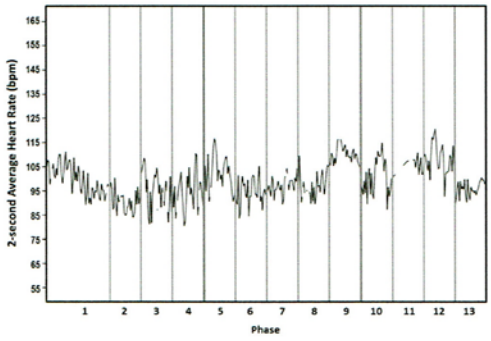
- Loud Noise
- Unstructured Time
- Eating Preferred Food
- Difficult Task

Cluster Classification

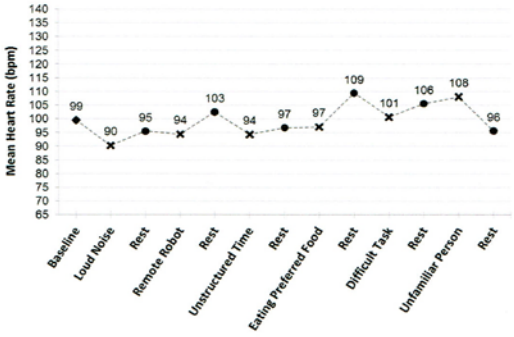
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 7. Participant 07

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	99.5	6.1
2	Loud Noise	30	90.3	4.4
3	Rest	30	95.5	7.9
4	Remote Robot	30	94.4	7.6
5	Rest	30	102.5	6.9
6	Unstructured Time	30	94.3	5.4
7	Rest	30	96.8	3.6
8	Eating Preferred Food	30	97.1	5.3
9	Rest	30	109.4	3.2
10	Difficult Task	30	100.6	7.3
11	Rest	30	105.6	3.2
12	Unfamiliar Person	30	108.0	6.1
13	Rest	30	95.6	3.3

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	99.5	1.15	86.57	<.0001		
AR1	1st order autoregressive term	0.4	0.05	8.29	<.0001		
DL_{phase2}	Loud Noise vs. BL	-9.2	1.94	-4.75	<.0001	*	-0.98
DL_{phase3}	Rest vs. BL	-4.5	1.95	-2.28	0.022	*	-0.47
DL_{phase4}	Remote Robot vs. BL	-5.1	1.95	-2.59	0.010	*	-0.54
DL_{phase5}	Rest vs. BL	2.6	1.94	1.35	0.176		0.28
DL_{phase6}	Unstructured Time vs. BL	-4.8	1.94	-2.49	0.013	*	-0.51
DL_{phase7}	Rest vs. BL	-2.0	1.99	-1.02	0.308		-0.21
DL_{phase8}	Eating Preferred Food vs. BL	-2.7	1.97	-1.35	0.176		-0.28
DL_{phase9}	Rest vs. BL	9.7	1.96	4.96	<.0001	*	1.03
$DL_{phase10}$	Difficult Task vs. BL	1.1	1.94	0.59	0.557		0.12
$DL_{phase11}$	Rest vs. BL	6.0	2.70	2.24	0.025	*	0.55
$DL_{phase12}$	Unfamiliar Person vs. BL	8.8	1.94	4.57	<.0001	*	0.94
$DL_{phase13}$	Rest vs. BL	-4.0	1.94	-2.05	0.040	*	-0.42

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 2
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 4
- All phases = 8

Stress Phases Significantly *Greater Than* baseline

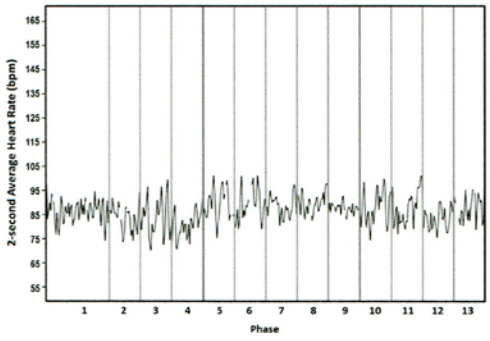
- Unfamiliar Person

Cluster Classification

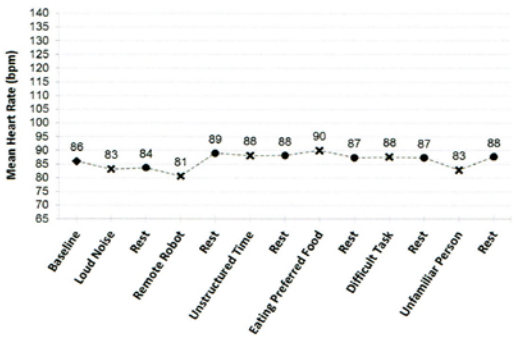
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 8. Participant 08

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	86.1	4.7
2	Loud Noise	30	83.2	5.5
3	Rest	30	83.7	7.8
4	Remote Robot	30	80.6	5.7
5	Rest	30	89.0	6.5
6	Unstructured Time	30	88.1	6.8
7	Rest	30	88.2	4.4
8	Eating Preferred Food	30	90.0	4.3
9	Rest	30	87.4	2.1
10	Difficult Task	30	87.6	6.9
11	Rest	30	87.4	6.9
12	Unfamiliar Person	30	82.9	4.3
13	Rest	30	87.7	5.4

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	86.1	1.15	74.96	<.0001		
AR1	1st order autoregressive term	0.4	0.05	9.44	<.0001		
DL_{phase2}	Loud Noise vs. BL	-2.0	1.95	-1.02	0.309		-0.21
DL_{phase3}	Rest vs. BL	-2.6	1.95	-1.33	0.183		-0.28
DL_{phase4}	Remote Robot vs. BL	-5.1	1.95	-2.63	0.009	*	-0.55
DL_{phase5}	Rest vs. BL	2.3	1.99	1.15	0.248		0.24
DL_{phase6}	Unstructured Time vs. BL	2.4	2.03	1.19	0.233		0.25
DL_{phase7}	Rest vs. BL	1.7	1.95	0.86	0.391		0.18
DL_{phase8}	Eating Preferred Food vs. BL	4.5	1.96	2.29	0.022	*	0.48
DL_{phase9}	Rest vs. BL	0.9	1.96	0.48	0.633		0.10
$DL_{phase10}$	Difficult Task vs. BL	1.5	1.96	0.75	0.455		0.16
$DL_{phase11}$	Rest vs. BL	2.0	1.98	1.02	0.310		0.21
$DL_{phase12}$	Unfamiliar Person vs. BL	-3.9	1.95	-2.00	0.046	*	-0.41
$DL_{phase13}$	Rest vs. BL	2.0	2.05	0.98	0.328		0.21

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 0
- All phases = 1

# of phases significantly ***less than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 0
- All phases = 3

Stress Phases Significantly *Greater Than* baseline

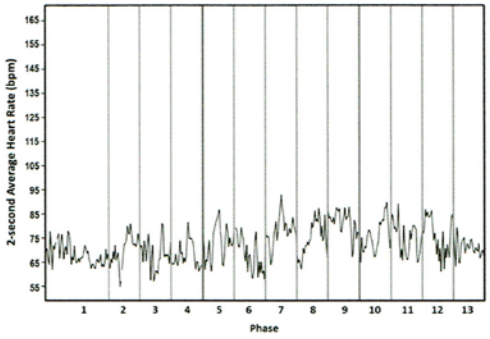
- Eating Preferred Food

Cluster Classification

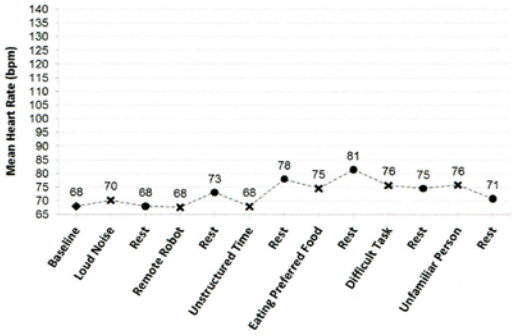
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 9. Participant 09

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	68.0	4.2
2	Loud Noise	30	70.2	5.9
3	Rest	30	68.0	6.1
4	Remote Robot	30	67.6	5.2
5	Rest	30	73.1	7.2
6	Unstructured Time	30	68.0	7.1
7	Rest	30	78.0	6.2
8	Eating Preferred Food	30	74.6	7.1
9	Rest	30	81.4	5.1
10	Difficult Task	30	75.6	6.6
11	Rest	30	74.6	6.6
12	Unfamiliar Person	30	75.8	7.6
13	Rest	30	70.9	4.0

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	68.5	1.65	41.44	<.0001		
AR1	1st order autoregressive term	0.7	0.04	17.19	<.0001		
DL_{phase2}	Loud Noise vs. BL	1.2	2.56	0.46	0.644		0.09
DL_{phase3}	Rest vs. BL	0.0	2.69	0.01	0.991		0.00
DL_{phase4}	Remote Robot vs. BL	-2.9	2.72	-1.08	0.279		-0.22
DL_{phase5}	Rest vs. BL	3.9	2.71	1.42	0.155		0.29
DL_{phase6}	Unstructured Time vs. BL	-0.2	2.71	-0.08	0.935		-0.02
DL_{phase7}	Rest vs. BL	11.3	2.71	4.17	<.0001	*	0.85
DL_{phase8}	Eating Preferred Food vs. BL	4.2	2.71	1.56	0.118		0.32
DL_{phase9}	Rest vs. BL	14.3	2.71	5.29	<.0001	*	1.07
$DL_{phase10}$	Difficult Task vs. BL	6.3	2.75	2.27	0.023	*	0.47
$DL_{phase11}$	Rest vs. BL	6.9	2.78	2.48	0.013	*	0.51
$DL_{phase12}$	Unfamiliar Person vs. BL	7.6	2.71	2.80	0.005	*	0.57
$DL_{phase13}$	Rest vs. BL	2.3	2.78	0.83	0.405		0.17

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 3
- All phases = 5

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 3
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

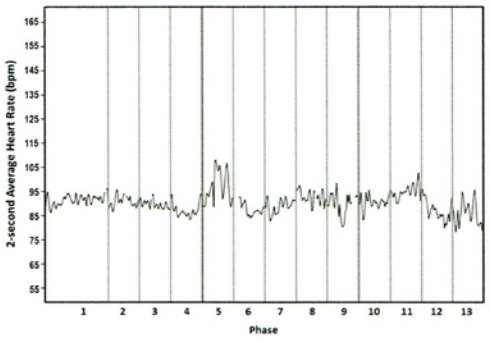
- Difficult Task
- Unfamiliar Person

Cluster Classification

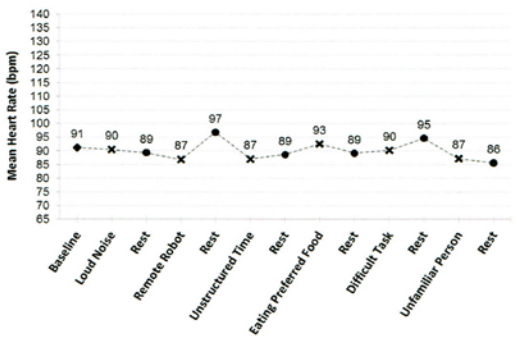
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 10. Participant 10

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	91.2	2.0
2	Loud Noise	30	90.5	2.4
3	Rest	30	89.3	1.6
4	Remote Robot	30	86.8	2.8
5	Rest	30	96.8	6.6
6	Unstructured Time	30	87.0	2.3
7	Rest	30	88.7	2.9
8	Eating Preferred Food	30	92.5	2.9
9	Rest	30	89.2	4.8
10	Difficult Task	30	90.2	2.6
11	Rest	30	94.6	2.8
12	Unfamiliar Person	30	87.1	4.3
13	Rest	30	85.6	4.8

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	91.9	1.04	88.45	<.0001		
AR1	1st order autoregressive term	0.7	0.04	16.98	<.0001		
DL_{phase2}	Loud Noise vs. BL	-2.7	1.60	-1.69	0.092		-0.33
DL_{phase3}	Rest vs. BL	-3.2	1.71	-1.87	0.062		-0.38
DL_{phase4}	Remote Robot vs. BL	-2.2	1.74	-1.29	0.197		-0.26
DL_{phase5}	Rest vs. BL	2.6	1.76	1.46	0.145		0.30
DL_{phase6}	Unstructured Time vs. BL	-4.4	1.85	-2.36	0.018	*	-0.50
DL_{phase7}	Rest vs. BL	-3.2	1.69	-1.91	0.056		-0.39
DL_{phase8}	Eating Preferred Food vs. BL	0.7	1.69	0.39	0.695		0.08
DL_{phase9}	Rest vs. BL	-2.1	1.75	-1.17	0.243		-0.24
$DL_{phase10}$	Difficult Task vs. BL	-2.1	1.72	-1.20	0.230		-0.25
$DL_{phase11}$	Rest vs. BL	0.7	1.71	0.43	0.670		0.09
$DL_{phase12}$	Unfamiliar Person vs. BL	-2.9	1.69	-1.70	0.089		-0.34
$DL_{phase13}$	Rest vs. BL	-6.5	1.73	-3.73	0.000	*	-0.76

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

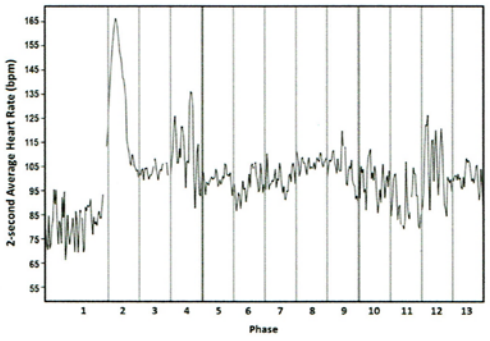
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

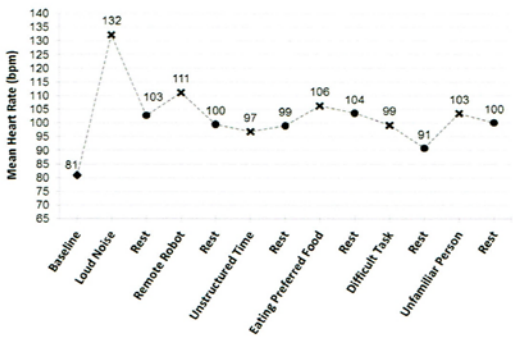
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 11. Participant 11

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	80.9	7.3
2	Loud Noise	30	132.2	23.1
3	Rest	30	102.7	2.2
4	Remote Robot	30	111.1	12.6
5	Rest	30	99.5	3.0
6	Unstructured Time	30	96.9	5.5
7	Rest	30	99.0	4.5
8	Eating Preferred Food	30	106.3	2.6
9	Rest	30	103.7	6.8
10	Difficult Task	30	99.2	6.8
11	Rest	30	90.8	8.8
12	Unfamiliar Person	30	103.5	12.4
13	Rest	30	100.1	4.7

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	81.0	3.39	23.92	<.0001		
AR1	1st order autoregressive term	0.7	0.04	21.29	<.0001		
DL_{phase2}	Loud Noise vs. BL	44.1	5.31	8.31	<.0001	*	1.64
DL_{phase3}	Rest vs. BL	29.1	5.36	5.42	<.0001	*	1.08
DL_{phase4}	Remote Robot vs. BL	27.7	5.38	5.16	<.0001	*	1.03
DL_{phase5}	Rest vs. BL	18.4	5.23	3.52	0.000	*	0.69
DL_{phase6}	Unstructured Time vs. BL	18.5	5.09	3.62	0.000	*	0.70
DL_{phase7}	Rest vs. BL	16.3	5.08	3.22	0.001	*	0.62
DL_{phase8}	Eating Preferred Food vs. BL	26.7	5.08	5.25	<.0001	*	1.01
DL_{phase9}	Rest vs. BL	17.8	5.10	3.50	0.001	*	0.67
$DL_{phase10}$	Difficult Task vs. BL	21.5	5.09	4.23	<.0001	*	0.81
$DL_{phase11}$	Rest vs. BL	13.0	5.09	2.56	0.010	*	0.49
$DL_{phase12}$	Unfamiliar Person vs. BL	19.2	5.10	3.77	0.000	*	0.72
$DL_{phase13}$	Rest vs. BL	19.3	5.28	3.65	0.000	*	0.72

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 6
- Rest phases = 6
- All phases = 12

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 6
- Rest phases = 6
- All phases = 12

Stress Phases Significantly *Greater Than* baseline

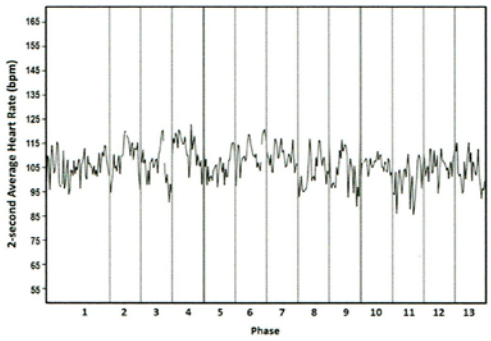
- Loud Noise
- Remote Robot
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

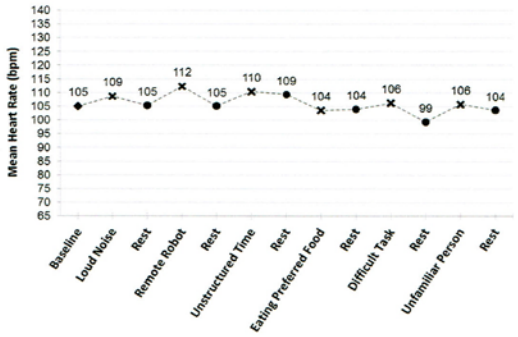
Level Cluster = Middle
Shape Cluster = outlier (removed)
Combo Cluster = NA

Appendix 12. Participant 12

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	105.0	5.2
2	Loud Noise	30	108.7	6.7
3	Rest	30	105.4	7.1
4	Remote Robot	30	112.3	6.0
5	Rest	30	105.1	5.2
6	Unstructured Time	30	110.4	5.8
7	Rest	30	109.4	4.1
8	Eating Preferred Food	30	103.5	6.7
9	Rest	30	104.0	7.8
10	Difficult Task	30	106.2	2.8
11	Rest	30	99.4	7.1
12	Unfamiliar Person	30	105.8	4.5
13	Rest	30	103.7	6.6

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	104.9	1.28	81.72	<.0001		
AR1	1st order autoregressive term	0.5	0.04	10.85	<.0001		
DL_{phase2}	Loud Noise vs. BL	2.8	2.14	1.31	0.190		0.27
DL_{phase3}	Rest vs. BL	1.1	2.18	0.50	0.618		0.10
DL_{phase4}	Remote Robot vs. BL	7.2	2.17	3.30	0.001	*	0.68
DL_{phase5}	Rest vs. BL	1.7	2.18	0.77	0.442		0.16
DL_{phase6}	Unstructured Time vs. BL	5.0	2.19	2.26	0.024	*	0.47
DL_{phase7}	Rest vs. BL	4.1	2.21	1.84	0.066		0.38
DL_{phase8}	Eating Preferred Food vs. BL	-1.8	2.17	-0.83	0.407		-0.17
DL_{phase9}	Rest vs. BL	0.5	2.18	0.25	0.803		0.05
$DL_{phase10}$	Difficult Task vs. BL	0.6	2.19	0.28	0.780		0.06
$DL_{phase11}$	Rest vs. BL	-5.8	2.17	-2.65	0.008	*	-0.55
$DL_{phase12}$	Unfamiliar Person vs. BL	0.4	2.17	0.18	0.857		0.04
$DL_{phase13}$	Rest vs. BL	-1.0	2.19	-0.45	0.654		-0.09

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

Stress Phases Significantly *Greater Than* baseline

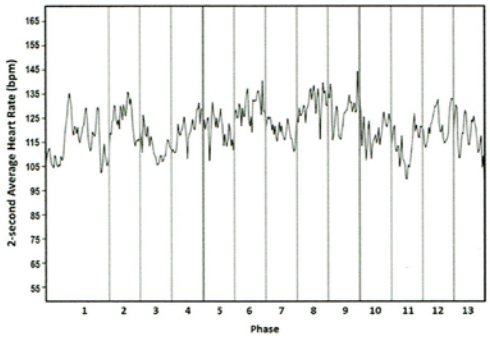
- Remote Robot
- Unstructured Time

Cluster Classification

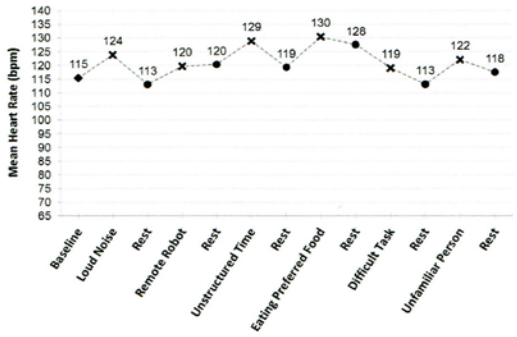
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 13. Participant 13

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	115.4	8.6
2	Loud Noise	30	123.8	6.8
3	Rest	30	113.1	5.4
4	Remote Robot	30	119.7	6.3
5	Rest	30	120.4	5.6
6	Unstructured Time	30	128.9	5.3
7	Rest	30	119.4	3.9
8	Eating Preferred Food	30	130.4	5.3
9	Rest	30	127.5	7.1
10	Difficult Task	30	119.0	6.1
11	Rest	30	113.2	7.2
12	Unfamiliar Person	30	122.0	6.4
13	Rest	30	117.5	7.6

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	115.4	2.17	53.10	<.0001		
AR1	1st order autoregressive term	0.7	0.04	21.15	<.0001		
DL_{phase2}	Loud Noise vs. BL	4.9	3.10	1.57	0.116		0.29
DL_{phase3}	Rest vs. BL	2.3	3.39	0.69	0.492		0.14
DL_{phase4}	Remote Robot vs. BL	4.9	3.43	1.43	0.153		0.28
DL_{phase5}	Rest vs. BL	3.0	3.44	0.86	0.388		0.17
DL_{phase6}	Unstructured Time vs. BL	12.9	3.44	3.76	0.000	*	0.75
DL_{phase7}	Rest vs. BL	5.1	3.44	1.48	0.138		0.29
DL_{phase8}	Eating Preferred Food vs. BL	11.9	3.44	3.46	0.001	*	0.69
DL_{phase9}	Rest vs. BL	12.2	3.44	3.54	0.000	*	0.70
$DL_{phase10}$	Difficult Task vs. BL	7.1	3.46	2.06	0.039	*	0.41
$DL_{phase11}$	Rest vs. BL	-1.0	3.45	-0.29	0.770		-0.06
$DL_{phase12}$	Unfamiliar Person vs. BL	6.5	3.45	1.89	0.059		0.38
$DL_{phase13}$	Rest vs. BL	-1.7	3.62	-0.47	0.639		-0.10

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 1
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 1
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

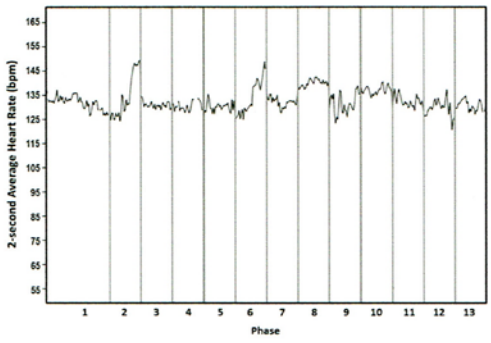
- Unstructured Time
- Eating Preferred Food
- Difficult Task

Cluster Classification

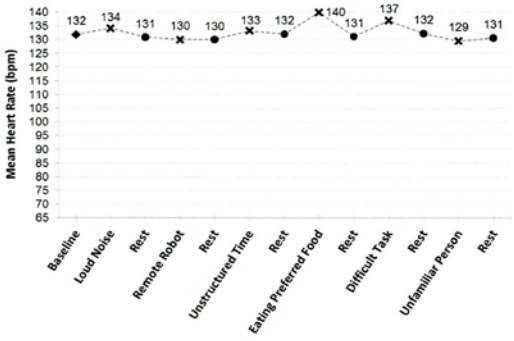
Level Cluster = High
Shape Cluster = Labile
Combo Cluster = High-Labile

Appendix 14. Participant 14

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	131.8	2.7
2	Loud Noise	30	134.1	9.0
3	Rest	30	130.8	1.4
4	Remote Robot	30	130.0	1.8
5	Rest	30	130.0	2.0
6	Unstructured Time	30	133.3	6.9
7	Rest	30	132.1	2.1
8	Eating Preferred Food	30	139.9	1.5
9	Rest	30	131.1	4.2
10	Difficult Task	30	136.9	1.7
11	Rest	30	132.2	2.4
12	Unfamiliar Person	30	129.4	3.3
13	Rest	30	130.5	2.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	133.2	1.77	75.25	<.0001		
AR1	1st order autoregressive term	0.9	0.03	30.45	<.0001		
DL_{phase2}	Loud Noise vs. BL	4.8	2.25	2.15	0.031	*	0.37
DL_{phase3}	Rest vs. BL	-5.6	2.37	-2.36	0.018	*	-0.42
DL_{phase4}	Remote Robot vs. BL	-0.9	2.45	-0.36	0.719		-0.07
DL_{phase5}	Rest vs. BL	0.5	2.51	0.21	0.837		0.04
DL_{phase6}	Unstructured Time vs. BL	-1.1	2.58	-0.42	0.675		-0.08
DL_{phase7}	Rest vs. BL	-3.0	2.64	-1.14	0.253		-0.22
DL_{phase8}	Eating Preferred Food vs. BL	5.8	2.57	2.26	0.024	*	0.42
DL_{phase9}	Rest vs. BL	-2.5	2.54	-0.97	0.331		-0.18
$DL_{phase10}$	Difficult Task vs. BL	2.9	2.56	1.13	0.260		0.21
$DL_{phase11}$	Rest vs. BL	-2.8	2.57	-1.10	0.272		-0.21
$DL_{phase12}$	Unfamiliar Person vs. BL	-5.9	2.59	-2.28	0.023	*	-0.43
$DL_{phase13}$	Rest vs. BL	-2.5	2.71	-0.93	0.350		-0.18

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 1
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

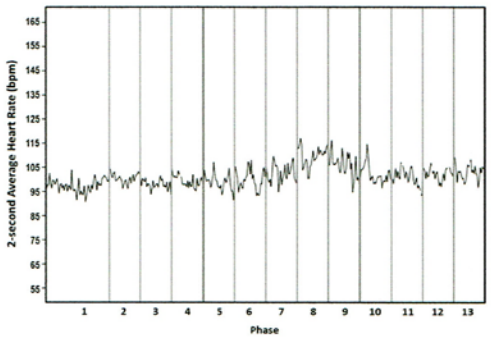
- Loud Noise
- Eating Preferred Food

Cluster Classification

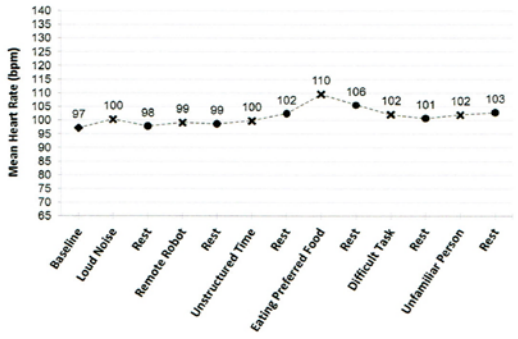
Level Cluster = High
Shape Cluster = Stabile
Combo Cluster = High-Stabile

Appendix 15. Participant 15

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	97.2	2.6
2	Loud Noise	30	100.3	2.1
3	Rest	30	97.8	2.0
4	Remote Robot	30	99.1	2.4
5	Rest	30	98.7	3.2
6	Unstructured Time	30	99.8	4.1
7	Rest	30	102.5	3.8
8	Eating Preferred Food	30	109.5	4.1
9	Rest	30	105.6	4.8
10	Difficult Task	30	102.1	4.0
11	Rest	30	100.7	3.2
12	Unfamiliar Person	30	101.9	2.4
13	Rest	30	102.9	3.2

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	97.1	0.74	130.82	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.84	<.0001		
DL_{phase2}	Loud Noise vs. BL	3.2	1.22	2.60	0.009	*	0.53
DL_{phase3}	Rest vs. BL	0.3	1.25	0.20	0.840		0.04
DL_{phase4}	Remote Robot vs. BL	2.7	1.26	2.14	0.032	*	0.44
DL_{phase5}	Rest vs. BL	1.1	1.25	0.89	0.371		0.18
DL_{phase6}	Unstructured Time vs. BL	3.0	1.25	2.40	0.017	*	0.50
DL_{phase7}	Rest vs. BL	5.1	1.25	4.10	<.0001	*	0.85
DL_{phase8}	Eating Preferred Food vs. BL	13.2	1.26	10.47	<.0001	*	2.17
DL_{phase9}	Rest vs. BL	7.9	1.26	6.32	<.0001	*	1.31
$DL_{phase10}$	Difficult Task vs. BL	5.2	1.25	4.12	<.0001	*	0.85
$DL_{phase11}$	Rest vs. BL	3.1	1.26	2.45	0.014	*	0.51
$DL_{phase12}$	Unfamiliar Person vs. BL	5.2	1.26	4.09	<.0001	*	0.85
$DL_{phase13}$	Rest vs. BL	6.4	1.27	5.08	<.0001	*	1.06

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 6
- Rest phases = 4
- All phases = 10

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 6
- Rest phases = 4
- All phases = 10

Stress Phases Significantly *Greater Than* baseline

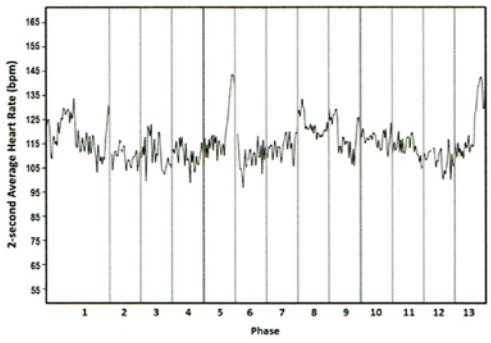
- Loud Noise
- Remote Robot
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

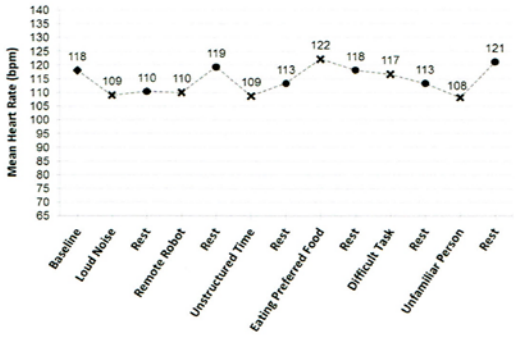
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 16. Participant 16

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	118.1	7.3
2	Loud Noise	30	109.0	3.3
3	Rest	30	110.4	6.4
4	Remote Robot	30	110.0	4.3
5	Rest	30	119.4	10.5
6	Unstructured Time	30	108.7	4.9
7	Rest	30	113.4	3.9
8	Eating Preferred Food	30	122.2	4.2
9	Rest	30	118.2	7.3
10	Difficult Task	30	116.7	3.1
11	Rest	30	113.3	3.8
12	Unfamiliar Person	30	108.2	4.1
13	Rest	30	121.1	11.7

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	119.1	2.23	53.43	<.0001		
AR1	1st order autoregressive term	0.7	0.04	20.85	<.0001		
DL_{phase2}	Loud Noise vs. BL	-10.4	3.57	-2.90	0.004	*	-0.58
DL_{phase3}	Rest vs. BL	-10.6	3.44	-3.07	0.002	*	-0.60
DL_{phase4}	Remote Robot vs. BL	-5.9	3.44	-1.73	0.084		-0.34
DL_{phase5}	Rest vs. BL	0.4	3.57	0.10	0.920		0.02
DL_{phase6}	Unstructured Time vs. BL	-9.7	3.69	-2.62	0.009	*	-0.54
DL_{phase7}	Rest vs. BL	-7.5	3.47	-2.17	0.030	*	-0.43
DL_{phase8}	Eating Preferred Food vs. BL	0.0	3.47	0.00	0.996		0.00
DL_{phase9}	Rest vs. BL	2.7	3.44	0.78	0.436		0.15
$DL_{phase10}$	Difficult Task vs. BL	-0.5	3.44	-0.16	0.876		-0.03
$DL_{phase11}$	Rest vs. BL	-9.3	3.58	-2.60	0.009	*	-0.52
$DL_{phase12}$	Unfamiliar Person vs. BL	-9.4	3.53	-2.65	0.008	*	-0.53
$DL_{phase13}$	Rest vs. BL	3.2	3.58	0.91	0.365		0.18

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***less than*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

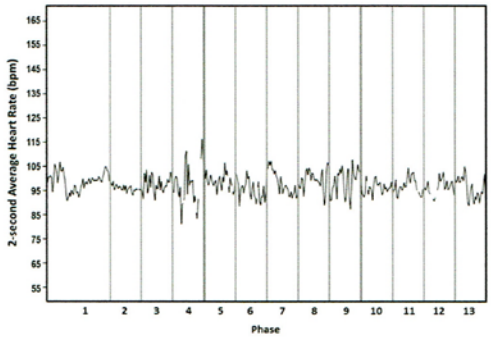
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

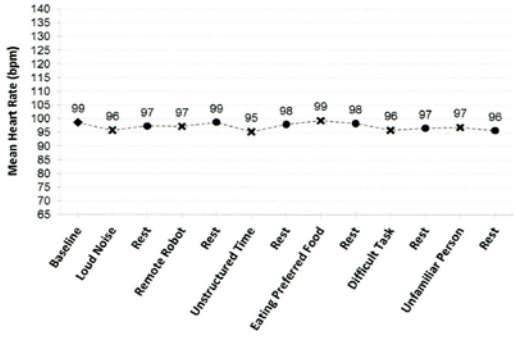
Level Cluster = High
Shape Cluster = Stabile
Combo Cluster = High-Stabile

Appendix 17. Participant 17

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	98.6	3.7
2	Loud Noise	30	95.8	1.4
3	Rest	30	97.3	3.3
4	Remote Robot	30	97.2	8.3
5	Rest	30	98.7	3.2
6	Unstructured Time	30	95.3	4.1
7	Rest	30	98.0	4.9
8	Eating Preferred Food	30	99.4	4.1
9	Rest	30	98.4	5.4
10	Difficult Task	30	95.9	2.5
11	Rest	30	96.6	3.4
12	Unfamiliar Person	30	96.9	2.8
13	Rest	30	95.8	4.5

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value	*Cohen's d*
L	Baseline (BL) level	98.5	0.97	101.56	<.0001	
AR1	1st order autoregressive term	0.5	0.04	11.92	<.0001	
DL_{phase2}	Loud Noise vs. BL	-2.6	1.59	-1.61	0.108	-0.33
DL_{phase3}	Rest vs. BL	-0.8	1.63	-0.48	0.633	-0.10
DL_{phase4}	Remote Robot vs. BL	-1.7	1.67	-1.03	0.304	-0.21
DL_{phase5}	Rest vs. BL	-0.8	1.65	-0.51	0.608	-0.11
DL_{phase6}	Unstructured Time vs. BL	-3.1	1.64	-1.91	0.056	-0.40
DL_{phase7}	Rest vs. BL	-0.2	1.63	-0.13	0.895	-0.03
DL_{phase8}	Eating Preferred Food vs. BL	1.8	1.64	1.10	0.270	0.23
DL_{phase9}	Rest vs. BL	-0.5	1.63	-0.31	0.759	-0.06
$DL_{phase10}$	Difficult Task vs. BL	-2.3	1.64	-1.43	0.151	-0.30
$DL_{phase11}$	Rest vs. BL	-2.4	1.64	-1.47	0.141	-0.30
$DL_{phase12}$	Unfamiliar Person vs. BL	-2.8	1.69	-1.67	0.096	-0.35
$DL_{phase13}$	Rest vs. BL	-2.3	1.65	-1.41	0.158	-0.29

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

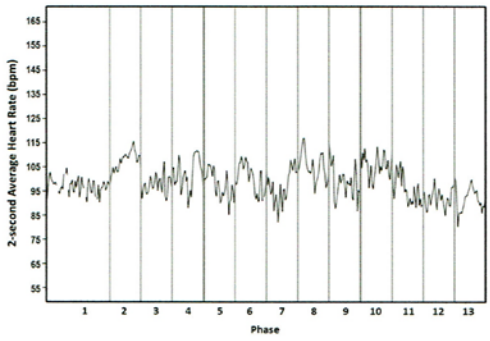
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

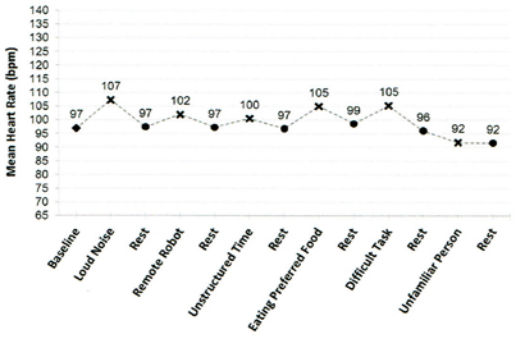
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 18. Participant 18

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	96.9	3.2
2	Loud Noise	30	107.3	4.2
3	Rest	30	97.4	3.7
4	Remote Robot	30	101.9	6.6
5	Rest	30	97.3	5.6
6	Unstructured Time	30	100.5	5.9
7	Rest	30	96.9	6.9
8	Eating Preferred Food	30	105.0	5.7
9	Rest	30	98.6	6.9
10	Difficult Task	30	105.2	4.7
11	Rest	30	96.1	6.5
12	Unfamiliar Person	30	91.8	3.7
13	Rest	30	91.6	4.9

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	97.4	1.39	70.07	<.0001		
AR1	1st order autoregressive term	0.6	0.04	15.17	<.0001		
DL_{phase2}	Loud Noise vs. BL	8.6	2.19	3.94	<.0001	*	0.78
DL_{phase3}	Rest vs. BL	-0.3	2.27	-0.15	0.884		-0.03
DL_{phase4}	Remote Robot vs. BL	4.1	2.28	1.78	0.074		0.36
DL_{phase5}	Rest vs. BL	-0.3	2.28	-0.12	0.908		-0.02
DL_{phase6}	Unstructured Time vs. BL	2.5	2.28	1.11	0.266		0.23
DL_{phase7}	Rest vs. BL	1.4	2.28	0.60	0.548		0.12
DL_{phase8}	Eating Preferred Food vs. BL	4.9	2.30	2.12	0.034	*	0.43
DL_{phase9}	Rest vs. BL	2.1	2.28	0.90	0.366		0.18
$DL_{phase10}$	Difficult Task vs. BL	7.5	2.28	3.31	0.001	*	0.67
$DL_{phase11}$	Rest vs. BL	-0.1	2.33	-0.05	0.958		-0.01
$DL_{phase12}$	Unfamiliar Person vs. BL	-5.5	2.31	-2.37	0.018	*	-0.49
$DL_{phase13}$	Rest vs. BL	-5.4	2.32	-2.31	0.021	*	-0.47

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 0
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 1
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

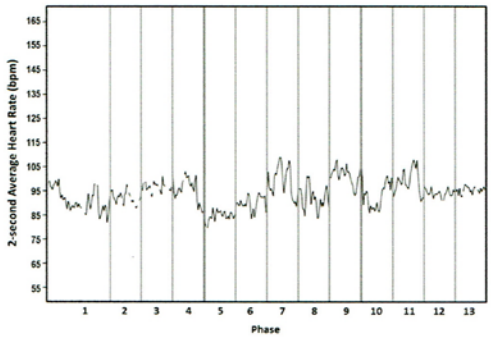
- Loud Noise
- Eating Preferred Food
- Difficult Task

Cluster Classification

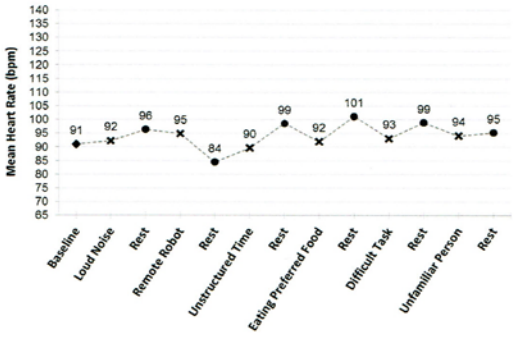
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 19. Participant 19

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	91.0	4.6
2	Loud Noise	30	92.2	2.3
3	Rest	30	96.4	2.1
4	Remote Robot	30	94.9	5.0
5	Rest	30	84.5	1.9
6	Unstructured Time	30	89.6	2.9
7	Rest	30	98.6	6.3
8	Eating Preferred Food	30	91.9	4.7
9	Rest	30	101.2	3.6
10	Difficult Task	30	93.1	5.5
11	Rest	30	98.9	4.9
12	Unfamiliar Person	30	94.1	1.6
13	Rest	30	95.3	1.3

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	90.9	1.50	60.49	<.0001		
AR1	1st order autoregressive term	0.8	0.03	24.16	<.0001		
DL_{phase2}	Loud Noise vs. BL	1.4	2.00	0.71	0.476		0.13
DL_{phase3}	Rest vs. BL	4.0	2.32	1.75	0.081		0.34
DL_{phase4}	Remote Robot vs. BL	3.7	2.36	1.59	0.113		0.31
DL_{phase5}	Rest vs. BL	-3.7	2.33	-1.59	0.111		-0.31
DL_{phase6}	Unstructured Time vs. BL	-1.5	2.31	-0.66	0.507		-0.13
DL_{phase7}	Rest vs. BL	4.4	2.32	1.91	0.056		0.37
DL_{phase8}	Eating Preferred Food vs. BL	2.0	2.31	0.85	0.396		0.17
DL_{phase9}	Rest vs. BL	10.3	2.32	4.44	<.0001	*	0.87
$DL_{phase10}$	Difficult Task vs. BL	5.7	2.33	2.43	0.015	*	0.48
$DL_{phase11}$	Rest vs. BL	4.1	2.32	1.77	0.077		0.35
$DL_{phase12}$	Unfamiliar Person vs. BL	5.2	2.33	2.21	0.027	*	0.43
$DL_{phase13}$	Rest vs. BL	5.0	2.45	2.05	0.041	*	0.41

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 2
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 2
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

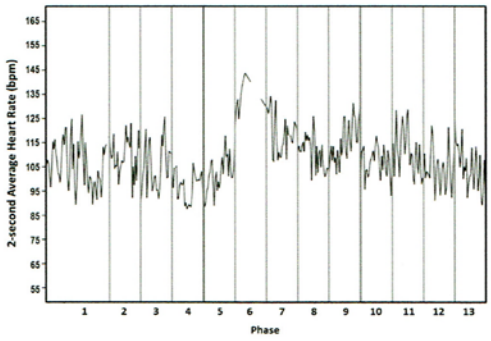
- Difficult Task
- Unfamiliar Person

Cluster Classification

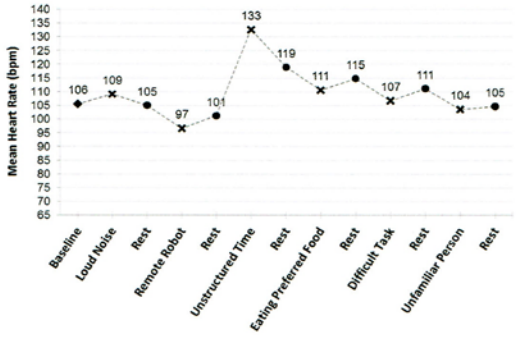
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 20. Participant 20

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	105.6	9.2
2	Loud Noise	30	109.1	7.6
3	Rest	30	105.0	9.9
4	Remote Robot	30	96.6	5.8
5	Rest	30	101.3	7.1
6	Unstructured Time	30	132.6	8.0
7	Rest	30	119.0	8.3
8	Eating Preferred Food	30	110.6	6.5
9	Rest	30	114.8	8.3
10	Difficult Task	30	106.7	6.0
11	Rest	30	111.2	8.9
12	Unfamiliar Person	30	103.6	7.8
13	Rest	30	104.7	9.0

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	105.7	1.76	60.06	<.0001		
AR1	1st order autoregressive term	0.5	0.05	10.25	<.0001		
DL_{phase2}	Loud Noise vs. BL	4.4	2.99	1.46	0.145		0.30
DL_{phase3}	Rest vs. BL	-1.3	2.95	-0.43	0.668		-0.09
DL_{phase4}	Remote Robot vs. BL	-8.5	2.94	-2.89	0.004	*	-0.59
DL_{phase5}	Rest vs. BL	-3.9	2.93	-1.33	0.182		-0.27
DL_{phase6}	Unstructured Time vs. BL	25.5	4.07	6.25	<.0001	*	1.52
DL_{phase7}	Rest vs. BL	13.8	2.96	4.65	<.0001	*	0.96
DL_{phase8}	Eating Preferred Food vs. BL	5.3	2.93	1.79	0.073		0.37
DL_{phase9}	Rest vs. BL	9.6	2.93	3.28	0.001	*	0.67
$DL_{phase10}$	Difficult Task vs. BL	-0.5	2.94	-0.18	0.860		-0.04
$DL_{phase11}$	Rest vs. BL	6.0	2.93	2.04	0.042	*	0.42
$DL_{phase12}$	Unfamiliar Person vs. BL	-2.6	2.93	-0.88	0.377		-0.18
$DL_{phase13}$	Rest vs. BL	-0.5	2.95	-0.16	0.870		-0.03

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 0
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 3
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

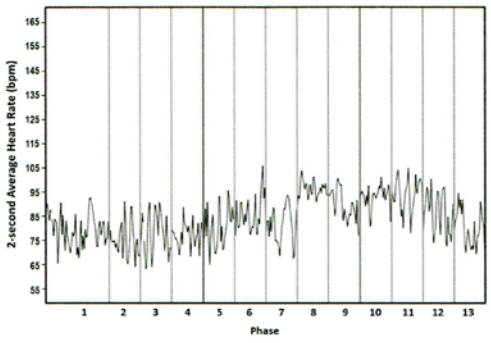
- Unstructured Time

Cluster Classification

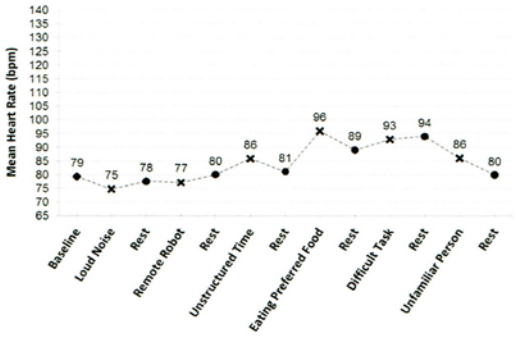
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 21. Participant 21

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	79.3	6.5
2	Loud Noise	30	74.7	6.8
3	Rest	30	77.6	8.7
4	Remote Robot	30	77.1	4.7
5	Rest	30	80.0	8.1
6	Unstructured Time	30	85.9	7.2
7	Rest	30	81.2	7.5
8	Eating Preferred Food	30	95.9	3.5
9	Rest	30	89.1	6.5
10	Difficult Task	30	92.9	4.6
11	Rest	30	94.0	6.7
12	Unfamiliar Person	30	86.0	8.6
13	Rest	30	80.0	7.4

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	79.7	1.50	53.13	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.41	<.0001		
DL_{phase2}	Loud Noise vs. BL	-5.4	2.48	-2.16	0.031	*	-0.44
DL_{phase3}	Rest vs. BL	-2.6	2.54	-1.02	0.309		-0.21
DL_{phase4}	Remote Robot vs. BL	-1.5	2.54	-0.60	0.551		-0.12
DL_{phase5}	Rest vs. BL	0.1	2.54	0.04	0.970		0.01
DL_{phase6}	Unstructured Time vs. BL	6.9	2.54	2.70	0.007	*	0.56
DL_{phase7}	Rest vs. BL	1.3	2.54	0.51	0.613		0.10
DL_{phase8}	Eating Preferred Food vs. BL	15.0	2.54	5.92	<.0001	*	1.22
DL_{phase9}	Rest vs. BL	8.9	2.54	3.52	0.000	*	0.73
$DL_{phase10}$	Difficult Task vs. BL	13.3	2.54	5.24	<.0001	*	1.08
$DL_{phase11}$	Rest vs. BL	15.9	2.54	6.26	<.0001	*	1.29
$DL_{phase12}$	Unfamiliar Person vs. BL	5.8	2.54	2.30	0.022	*	0.47
$DL_{phase13}$	Rest vs. BL	-0.4	2.56	-0.16	0.873		-0.03

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 2
- All phases = 6

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 0
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 5
- Rest phases = 2
- All phases = 7

Stress Phases Significantly *Greater Than* baseline

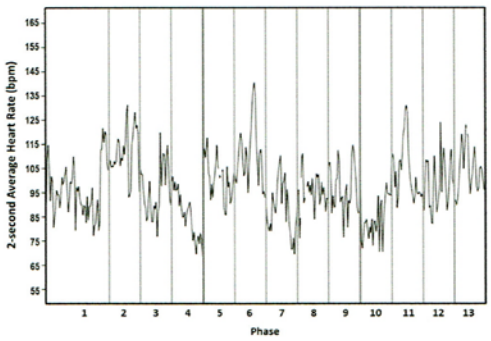
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

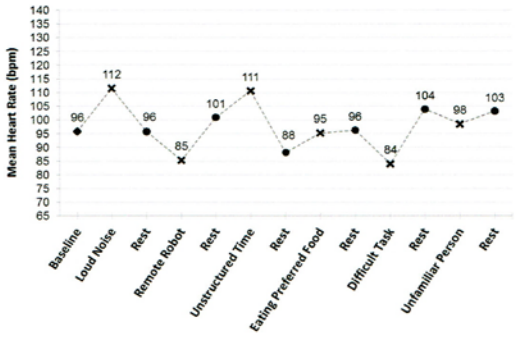
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 22. Participant 22

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	95.8	10.9
2	Loud Noise	30	111.5	10.1
3	Rest	30	95.7	10.8
4	Remote Robot	30	85.3	9.5
5	Rest	30	100.9	8.9
6	Unstructured Time	30	110.6	12.8
7	Rest	30	88.1	11.0
8	Eating Preferred Food	30	95.2	7.3
9	Rest	30	96.3	9.9
10	Difficult Task	30	83.9	8.4
11	Rest	30	103.9	12.0
12	Unfamiliar Person	30	98.5	10.4
13	Rest	30	103.2	9.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	96.4	2.68	35.89	<.0001		
AR1	1st order autoregressive term	0.6	0.04	15.58	<.0001		
DL_{phase2}	Loud Noise vs. BL	10.6	4.28	2.48	0.013	*	0.49
DL_{phase3}	Rest vs. BL	-0.5	4.42	-0.12	0.906		-0.02
DL_{phase4}	Remote Robot vs. BL	-11.4	4.44	-2.56	0.010	*	-0.52
DL_{phase5}	Rest vs. BL	8.2	4.46	1.85	0.065		0.38
DL_{phase6}	Unstructured Time vs. BL	11.5	4.45	2.59	0.010	*	0.53
DL_{phase7}	Rest vs. BL	-6.3	4.44	-1.42	0.156		-0.29
DL_{phase8}	Eating Preferred Food vs. BL	-2.4	4.47	-0.53	0.593		-0.11
DL_{phase9}	Rest vs. BL	-0.9	4.44	-0.21	0.833		-0.04
$DL_{phase10}$	Difficult Task vs. BL	-9.5	4.44	-2.14	0.033	*	-0.44
$DL_{phase11}$	Rest vs. BL	7.5	4.44	1.70	0.090		0.35
$DL_{phase12}$	Unfamiliar Person vs. BL	3.3	4.44	0.75	0.453		0.15
$DL_{phase13}$	Rest vs. BL	5.5	4.53	1.22	0.221		0.25

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 2
- Rest phases = 0
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 0
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

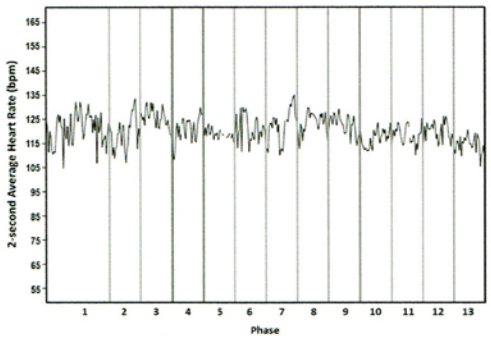
- Loud Noise
- Unstructured Time

Cluster Classification

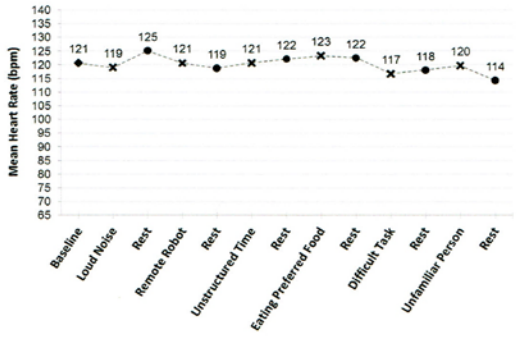
Level Cluster = Middle
Shape Cluster = outlier (removed)
Combo Cluster = NA

Appendix 23. Participant 23

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	120.7	6.4
2	Loud Noise	30	119.0	6.8
3	Rest	30	125.1	4.1
4	Remote Robot	30	120.6	5.5
5	Rest	30	118.8	1.9
6	Unstructured Time	30	120.7	5.5
7	Rest	30	122.1	7.2
8	Eating Preferred Food	30	123.3	4.3
9	Rest	30	122.5	3.9
10	Difficult Task	30	116.7	3.6
11	Rest	30	118.0	3.9
12	Unfamiliar Person	30	119.7	3.9
13	Rest	30	114.3	3.4

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	120.6	1.07	112.27	<.0001		
AR1	1st order autoregressive term	0.5	0.04	10.96	<.0001		
DL_{phase2}	Loud Noise vs. BL	-1.7	1.79	-0.96	0.335		-0.20
DL_{phase3}	Rest vs. BL	4.8	1.80	2.66	0.008	*	0.55
DL_{phase4}	Remote Robot vs. BL	0.1	1.85	0.08	0.937		0.02
DL_{phase5}	Rest vs. BL	-2.0	1.87	-1.07	0.285		-0.22
DL_{phase6}	Unstructured Time vs. BL	0.3	1.82	0.17	0.863		0.04
DL_{phase7}	Rest vs. BL	1.3	1.83	0.70	0.487		0.14
DL_{phase8}	Eating Preferred Food vs. BL	2.2	1.82	1.22	0.223		0.25
DL_{phase9}	Rest vs. BL	1.8	1.82	0.98	0.328		0.20
$DL_{phase10}$	Difficult Task vs. BL	-2.8	1.83	-1.53	0.125		-0.32
$DL_{phase11}$	Rest vs. BL	-2.5	1.83	-1.38	0.166		-0.29
$DL_{phase12}$	Unfamiliar Person vs. BL	-1.8	1.82	-1.00	0.317		-0.21
$DL_{phase13}$	Rest vs. BL	-6.4	1.84	-3.50	0.001	*	-0.73

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 0
- Rest phases = 2
- All phases = 2

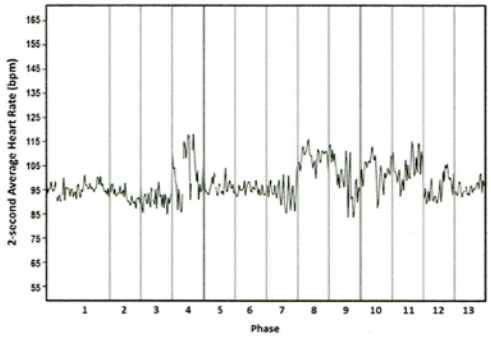
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

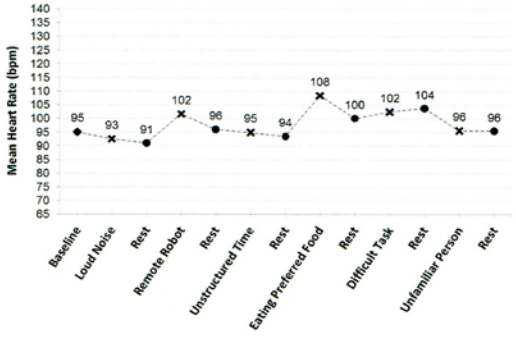
Level Cluster = High
Shape Cluster = Labile
Combo Cluster = High-Labile

Appendix 24. Participant 24

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	95.1	2.5
2	Loud Noise	30	92.5	3.0
3	Rest	30	91.1	3.5
4	Remote Robot	30	101.7	10.3
5	Rest	30	96.1	3.1
6	Unstructured Time	30	94.9	2.0
7	Rest	30	93.6	4.8
8	Eating Preferred Food	30	108.5	3.6
9	Rest	30	100.1	8.5
10	Difficult Task	30	102.4	5.8
11	Rest	30	103.8	5.9
12	Unfamiliar Person	30	95.6	5.1
13	Rest	30	95.5	2.5

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	94.8	1.03	91.74	<.0001		
AR1	1st order autoregressive term	0.4	0.05	9.51	<.0001		
DL_{phase2}	Loud Noise vs. BL	-2.3	1.73	-1.33	0.184		-0.27
DL_{phase3}	Rest vs. BL	-3.5	1.76	-1.99	0.046	*	-0.41
DL_{phase4}	Remote Robot vs. BL	7.1	1.77	3.99	<.0001	*	0.83
DL_{phase5}	Rest vs. BL	1.4	1.76	0.78	0.436		0.16
DL_{phase6}	Unstructured Time vs. BL	0.1	1.75	0.07	0.941		0.02
DL_{phase7}	Rest vs. BL	-0.5	1.76	-0.30	0.761		-0.06
DL_{phase8}	Eating Preferred Food vs. BL	12.4	1.76	7.04	<.0001	*	1.46
DL_{phase9}	Rest vs. BL	5.9	1.76	3.38	0.001	*	0.70
$DL_{phase10}$	Difficult Task vs. BL	7.9	1.76	4.49	<.0001	*	0.93
$DL_{phase11}$	Rest vs. BL	9.2	1.75	5.27	<.0001	*	1.09
$DL_{phase12}$	Unfamiliar Person vs. BL	0.8	1.75	0.45	0.656		0.09
$DL_{phase13}$	Rest vs. BL	0.4	1.77	0.24	0.813		0.05

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

Stress Phases Significantly *Greater Than* baseline

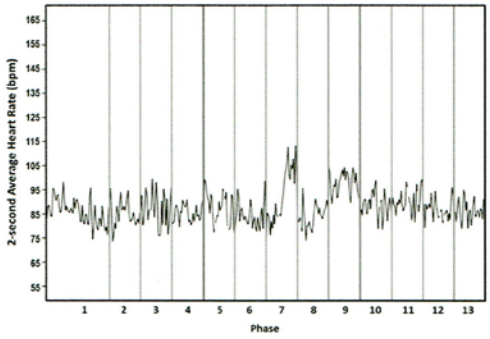
- Remote Robot
- Eating Preferred Food
- Difficult Task

Cluster Classification

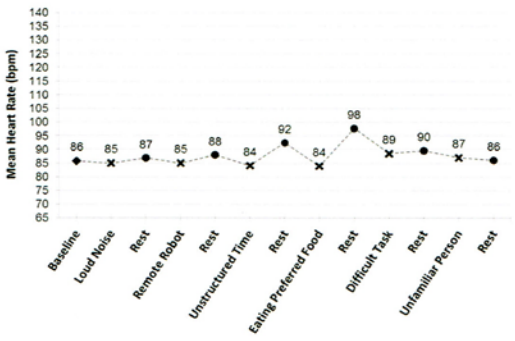
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 25. Participant 25

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	85.8	5.1
2	Loud Noise	30	85.0	5.1
3	Rest	30	86.9	7.0
4	Remote Robot	30	85.0	3.4
5	Rest	30	88.1	6.1
6	Unstructured Time	30	84.1	5.3
7	Rest	30	92.5	11.6
8	Eating Preferred Food	30	83.9	4.8
9	Rest	30	97.7	4.7
10	Difficult Task	30	88.5	5.0
11	Rest	30	89.6	4.7
12	Unfamiliar Person	30	87.0	4.0
13	Rest	30	86.1	4.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	85.7	1.22	70.05	<.0001		
AR1	1st order autoregressive term	0.5	0.05	10.43	<.0001		
DL_{phase2}	Loud Noise vs. BL	-0.4	2.04	-0.18	0.856		-0.04
DL_{phase3}	Rest vs. BL	1.8	2.08	0.85	0.396		0.18
DL_{phase4}	Remote Robot vs. BL	-1.1	2.08	-0.55	0.585		-0.11
DL_{phase5}	Rest vs. BL	2.0	2.09	0.94	0.348		0.20
DL_{phase6}	Unstructured Time vs. BL	0.3	2.09	0.13	0.896		0.03
DL_{phase7}	Rest vs. BL	5.5	2.08	2.62	0.009	*	0.54
DL_{phase8}	Eating Preferred Food vs. BL	-2.7	2.08	-1.29	0.196		-0.27
DL_{phase9}	Rest vs. BL	12.0	2.08	5.78	<.0001	*	1.20
$DL_{phase10}$	Difficult Task vs. BL	3.4	2.08	1.62	0.106		0.34
$DL_{phase11}$	Rest vs. BL	4.4	2.10	2.10	0.036	*	0.44
$DL_{phase12}$	Unfamiliar Person vs. BL	1.1	2.09	0.52	0.602		0.11
$DL_{phase13}$	Rest vs. BL	0.2	2.09	0.10	0.920		0.02

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 3
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 0
- Rest phases = 3
- All phases = 3

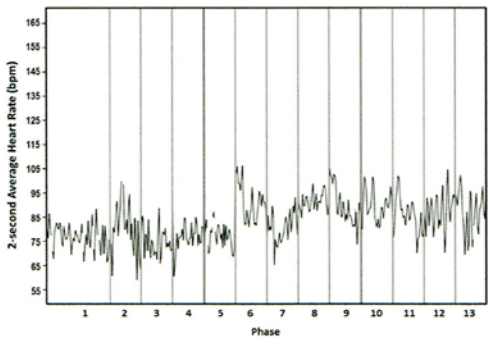
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

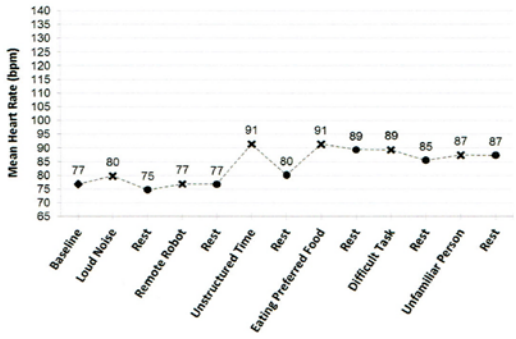
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 26. Participant 26

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	76.8	5.1
2	Loud Noise	30	79.7	10.2
3	Rest	30	74.7	5.8
4	Remote Robot	30	76.8	6.1
5	Rest	30	76.7	4.7
6	Unstructured Time	30	91.4	7.9
7	Rest	30	80.2	6.3
8	Eating Preferred Food	30	91.4	3.6
9	Rest	30	89.3	8.0
10	Difficult Task	30	89.2	6.5
11	Rest	30	85.5	7.3
12	Unfamiliar Person	30	87.4	7.5
13	Rest	30	87.3	8.7

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	76.8	1.39	55.37	<.0001		
AR1	1st order autoregressive term	0.4	0.05	9.00	<.0001		
DL_{phase2}	Loud Noise vs. BL	2.5	2.32	1.09	0.278		0.22
DL_{phase3}	Rest vs. BL	-2.1	2.34	-0.88	0.378		-0.18
DL_{phase4}	Remote Robot vs. BL	0.9	2.35	0.36	0.716		0.08
DL_{phase5}	Rest vs. BL	-0.6	2.37	-0.26	0.792		-0.05
DL_{phase6}	Unstructured Time vs. BL	15.4	2.34	6.59	<.0001	*	1.36
DL_{phase7}	Rest vs. BL	3.1	2.34	1.32	0.187		0.27
DL_{phase8}	Eating Preferred Food vs. BL	14.1	2.34	6.01	<.0001	*	1.24
DL_{phase9}	Rest vs. BL	13.4	2.34	5.73	<.0001	*	1.18
$DL_{phase10}$	Difficult Task vs. BL	12.5	2.34	5.35	<.0001	*	1.11
$DL_{phase11}$	Rest vs. BL	8.0	2.35	3.42	0.001	*	0.71
$DL_{phase12}$	Unfamiliar Person vs. BL	10.9	2.34	4.63	<.0001	*	0.96
$DL_{phase13}$	Rest vs. BL	10.5	2.36	4.45	<.0001	*	0.92

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 3
- All phases = 7

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 3
- All phases = 7

Stress Phases Significantly *Greater Than* baseline

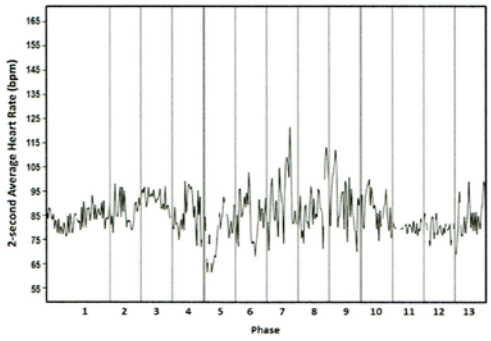
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

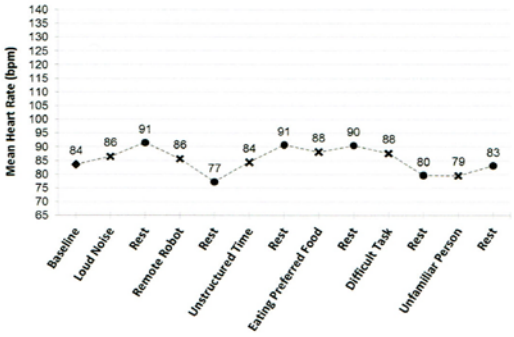
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 27. Participant 27

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	83.5	4.0
2	Loud Noise	30	86.5	5.6
3	Rest	30	91.5	3.3
4	Remote Robot	30	85.6	8.0
5	Rest	30	77.2	8.9
6	Unstructured Time	30	84.4	8.8
7	Rest	30	90.7	12.4
8	Eating Preferred Food	30	88.2	10.2
9	Rest	30	90.5	10.2
10	Difficult Task	30	87.6	6.9
11	Rest	30	79.6	1.9
12	Unfamiliar Person	30	79.5	3.7
13	Rest	30	83.1	7.8

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	83.5	1.52	55.05	<.0001		
AR1	1st order autoregressive term	0.4	0.05	8.92	<.0001		
DL_{phase2}	Loud Noise vs. BL	3.1	2.55	1.23	0.218		0.25
DL_{phase3}	Rest vs. BL	7.7	2.65	2.90	0.004	*	0.61
DL_{phase4}	Remote Robot vs. BL	1.6	2.67	0.59	0.553		0.13
DL_{phase5}	Rest vs. BL	-5.5	2.68	-2.05	0.040	*	-0.44
DL_{phase6}	Unstructured Time vs. BL	1.4	2.58	0.53	0.594		0.11
DL_{phase7}	Rest vs. BL	6.2	2.63	2.35	0.019	*	0.49
DL_{phase8}	Eating Preferred Food vs. BL	4.8	2.60	1.85	0.065		0.38
DL_{phase9}	Rest vs. BL	6.6	2.58	2.55	0.011	*	0.53
$DL_{phase10}$	Difficult Task vs. BL	3.5	2.59	1.36	0.172		0.28
$DL_{phase11}$	Rest vs. BL	-3.2	2.84	-1.14	0.255		-0.25
$DL_{phase12}$	Unfamiliar Person vs. BL	-3.6	2.67	-1.34	0.180		-0.28
$DL_{phase13}$	Rest vs. BL	-1.0	2.60	-0.38	0.701		-0.08

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 3
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 0
- Rest phases = 4
- All phases = 4

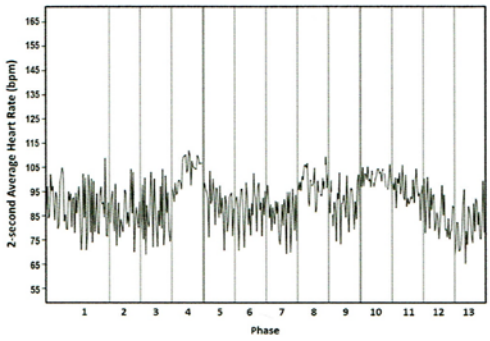
Stress Phases Significantly G*reater Than* baseline

Cluster Classification

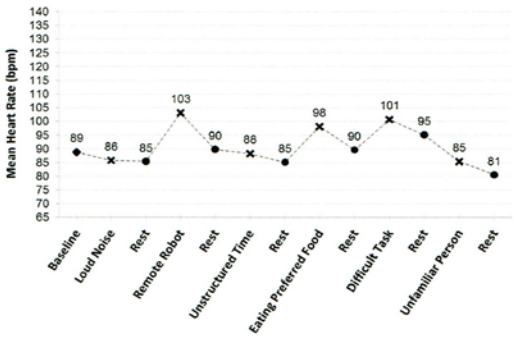
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 28. Participant 28

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	88.8	9.5
2	Loud Noise	30	85.8	8.2
3	Rest	30	85.4	10.6
4	Remote Robot	30	103.0	5.9
5	Rest	30	89.8	7.8
6	Unstructured Time	30	88.3	7.9
7	Rest	30	85.2	7.8
8	Eating Preferred Food	30	98.1	5.9
9	Rest	30	89.6	7.9
10	Difficult Task	30	100.7	3.0
11	Rest	30	95.1	5.2
12	Unfamiliar Person	30	85.4	7.7
13	Rest	30	80.6	8.6

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	88.8	0.95	93.43	<.0001		
AR1	1st order autoregressive term	-0.1	0.05	-1.20	0.230		
DL_{phase2}	Loud Noise vs. BL	-3.0	1.65	-1.83	0.067		-0.38
DL_{phase3}	Rest vs. BL	-3.3	1.65	-2.00	0.045	*	-0.42
DL_{phase4}	Remote Robot vs. BL	14.3	1.65	8.68	<.0001	*	1.82
DL_{phase5}	Rest vs. BL	1.0	1.65	0.63	0.530		0.13
DL_{phase6}	Unstructured Time vs. BL	-0.5	1.65	-0.30	0.765		-0.06
DL_{phase7}	Rest vs. BL	-3.6	1.65	-2.17	0.030	*	-0.45
DL_{phase8}	Eating Preferred Food vs. BL	9.3	1.71	5.45	<.0001	*	1.17
DL_{phase9}	Rest vs. BL	0.9	1.67	0.52	0.603		0.11
$DL_{phase10}$	Difficult Task vs. BL	12.0	1.71	6.98	<.0001	*	1.50
$DL_{phase11}$	Rest vs. BL	6.3	1.65	3.86	0.000	*	0.81
$DL_{phase12}$	Unfamiliar Person vs. BL	-3.4	1.65	-2.06	0.039	*	-0.43
$DL_{phase13}$	Rest vs. BL	-8.2	1.65	-4.96	<.0001	*	-1.04

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 1
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 4
- All phases = 8

Stress Phases Significantly *Greater Than* baseline

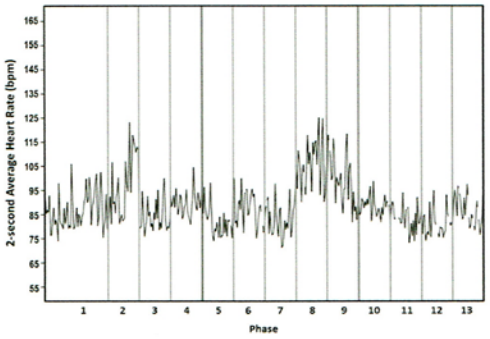
- Remote Robot
- Eating Preferred Food
- Difficult Task

Cluster Classification

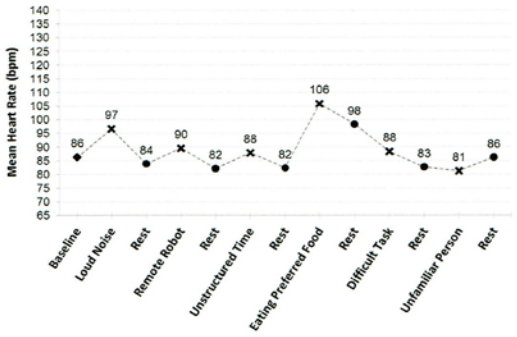
Level Cluster = Low
Shape Cluster = Labile
Combo Cluster = Low-Labile

Appendix 29. Participant 29

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	86.3	7.5
2	Loud Noise	30	96.6	13.0
3	Rest	30	83.8	6.2
4	Remote Robot	30	89.5	4.8
5	Rest	30	82.1	6.7
6	Unstructured Time	30	87.8	7.3
7	Rest	30	82.4	6.8
8	Eating Preferred Food	30	105.8	9.8
9	Rest	30	98.4	10.3
10	Difficult Task	30	88.3	3.8
11	Rest	30	82.7	5.4
12	Unfamiliar Person	30	81.2	5.8
13	Rest	30	86.2	6.1

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	86.5	1.33	65.06	<.0001		
AR1	1st order autoregressive term	0.3	0.05	6.05	<.0001		
DL_{phase2}	Loud Noise vs. BL	10.3	2.27	4.52	<.0001	*	0.94
DL_{phase3}	Rest vs. BL	-3.1	2.29	-1.36	0.174		-0.28
DL_{phase4}	Remote Robot vs. BL	2.9	2.29	1.27	0.205		0.26
DL_{phase5}	Rest vs. BL	-4.5	2.30	-1.97	0.049	*	-0.41
DL_{phase6}	Unstructured Time vs. BL	1.6	2.33	0.68	0.495		0.14
DL_{phase7}	Rest vs. BL	-3.5	2.30	-1.54	0.123		-0.32
DL_{phase8}	Eating Preferred Food vs. BL	19.1	2.30	8.30	<.0001	*	1.74
DL_{phase9}	Rest vs. BL	11.9	2.30	5.20	<.0001	*	1.09
$DL_{phase10}$	Difficult Task vs. BL	2.1	2.30	0.90	0.367		0.19
$DL_{phase11}$	Rest vs. BL	-3.9	2.38	-1.62	0.105		-0.35
$DL_{phase12}$	Unfamiliar Person vs. BL	-5.0	2.38	-2.11	0.035	*	-0.45
$DL_{phase13}$	Rest vs. BL	-0.2	2.36	-0.10	0.921		-0.02

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

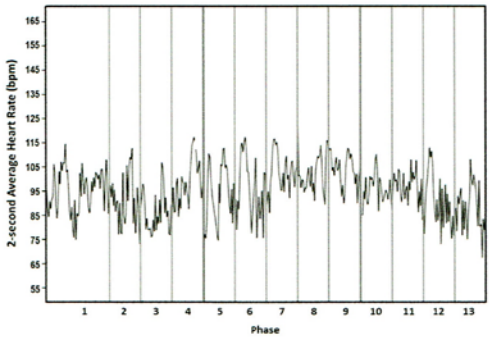
- Loud Noise
- Eating Preferred Food

Cluster Classification

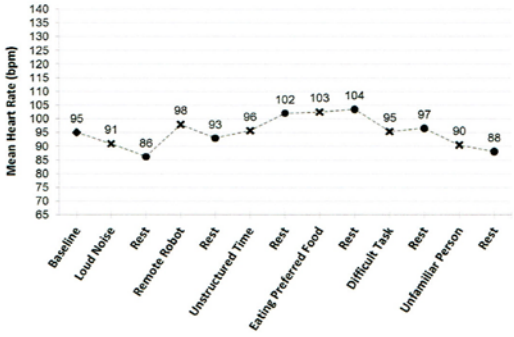
Level Cluster = Low
Shape Cluster = Labile
Combo Cluster = Low-Labile

Appendix 30. Participant 30

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	95.0	8.7
2	Loud Noise	30	90.9	10.4
3	Rest	30	86.2	8.5
4	Remote Robot	30	97.9	9.3
5	Rest	30	93.0	12.4
6	Unstructured Time	30	95.7	12.5
7	Rest	30	102.1	8.3
8	Eating Preferred Food	30	102.5	8.6
9	Rest	30	103.5	6.6
10	Difficult Task	30	95.4	6.2
11	Rest	30	96.5	6.2
12	Unfamiliar Person	30	90.4	11.0
13	Rest	30	88.1	9.2

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	94.6	2.08	45.44	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.96	<.0001		
DL_{phase2}	Loud Noise vs. BL	-4.1	3.43	-1.18	0.237		-0.24
DL_{phase3}	Rest vs. BL	-5.9	3.53	-1.68	0.093		-0.35
DL_{phase4}	Remote Robot vs. BL	3.9	3.52	1.12	0.263		0.23
DL_{phase5}	Rest vs. BL	-2.1	3.51	-0.60	0.547		-0.12
DL_{phase6}	Unstructured Time vs. BL	1.5	3.51	0.41	0.680		0.09
DL_{phase7}	Rest vs. BL	4.8	3.52	1.38	0.169		0.28
DL_{phase8}	Eating Preferred Food vs. BL	9.6	3.52	2.71	0.007	*	0.56
DL_{phase9}	Rest vs. BL	9.5	3.51	2.69	0.007	*	0.56
$DL_{phase10}$	Difficult Task vs. BL	0.0	3.52	0.00	0.998		0.00
$DL_{phase11}$	Rest vs. BL	0.8	3.51	0.23	0.817		0.05
$DL_{phase12}$	Unfamiliar Person vs. BL	-4.2	3.51	-1.20	0.231		-0.25
$DL_{phase13}$	Rest vs. BL	-5.8	3.55	-1.64	0.102		-0.34

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

Stress Phases Significantly *Greater Than* baseline

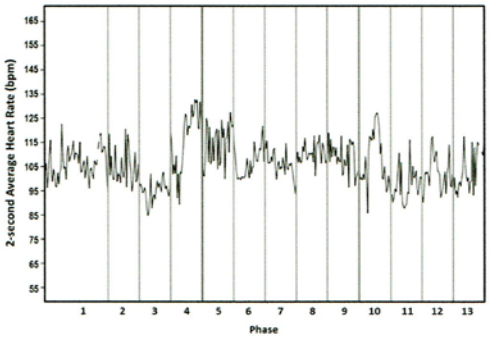
- Eating Preferred Food

Cluster Classification

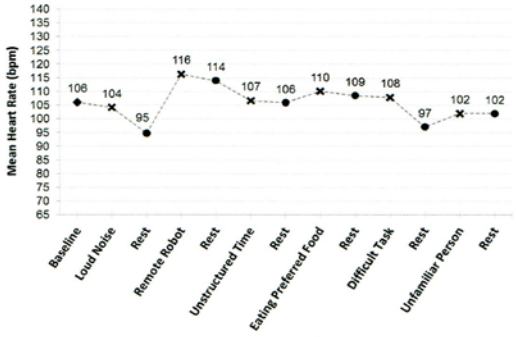
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 31. Participant 31

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	106.0	6.0
2	Loud Noise	30	104.2	7.2
3	Rest	30	94.7	4.3
4	Remote Robot	30	116.3	12.4
5	Rest	30	114.0	8.4
6	Unstructured Time	30	106.7	6.5
7	Rest	30	106.0	5.2
8	Eating Preferred Food	30	110.1	4.0
9	Rest	30	108.5	6.1
10	Difficult Task	30	107.8	11.1
11	Rest	30	97.1	6.9
12	Unfamiliar Person	30	102.0	7.0
13	Rest	30	102.0	7.8

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	106.2	1.57	67.65	<.0001		
AR1	1st order autoregressive term	0.5	0.04	10.51	<.0001		
DL_{phase2}	Loud Noise vs. BL	-2.2	2.61	-0.83	0.406		-0.17
DL_{phase3}	Rest vs. BL	-11.6	2.66	-4.36	<.0001	*	-0.90
DL_{phase4}	Remote Robot vs. BL	10.8	2.66	4.05	<.0001	*	0.84
DL_{phase5}	Rest vs. BL	6.7	2.66	2.53	0.012	*	0.52
DL_{phase6}	Unstructured Time vs. BL	0.3	2.66	0.12	0.907		0.02
DL_{phase7}	Rest vs. BL	-0.1	2.66	-0.03	0.980		-0.01
DL_{phase8}	Eating Preferred Food vs. BL	4.2	2.66	1.57	0.116		0.32
DL_{phase9}	Rest vs. BL	2.4	2.66	0.91	0.365		0.19
$DL_{phase10}$	Difficult Task vs. BL	1.3	2.66	0.50	0.616		0.10
$DL_{phase11}$	Rest vs. BL	-8.2	2.66	-3.09	0.002	*	-0.64
$DL_{phase12}$	Unfamiliar Person vs. BL	-4.4	2.66	-1.64	0.101		-0.34
$DL_{phase13}$	Rest vs. BL	-3.8	2.75	-1.38	0.168		-0.29

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 2
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

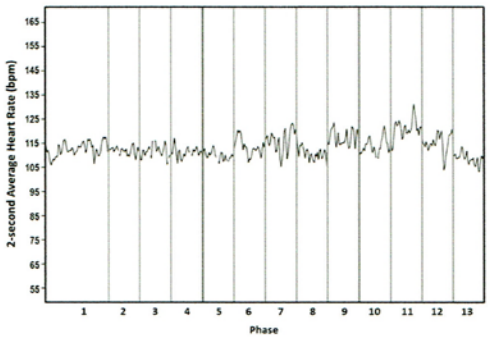
- Remote Robot

Cluster Classification

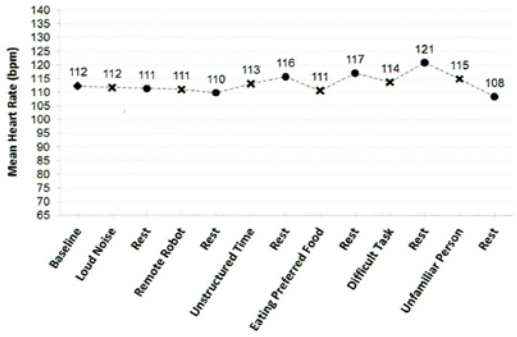
Level Cluster = Middle
Shape Cluster = Labile
Combo Cluster = Middle-Labile

Appendix 32. Participant 32

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

	Phase	N	*M*	*SD*
1	Baseline	60	112.3	2.9
2	Loud Noise	30	111.7	1.6
3	Rest	30	111.4	2.4
4	Remote Robot	30	111.1	2.2
5	Rest	30	109.9	1.8
6	Unstructured Time	30	113.2	3.5
7	Rest	30	115.8	4.7
8	Eating Preferred Food	30	110.7	2.8
9	Rest	30	117.1	3.1
10	Difficult Task	30	113.8	3.4
11	Rest	30	120.9	4.1
12	Unfamiliar Person	30	114.9	4.0
13	Rest	30	108.5	2.3

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	112.3	0.84	133.66	<.0001		
AR1	1st order autoregressive term	0.7	0.04	17.04	<.0001		
DL_{phase2}	Loud Noise vs. BL	-0.7	1.30	-0.55	0.585		-0.11
DL_{phase3}	Rest vs. BL	-0.9	1.37	-0.68	0.500		-0.14
DL_{phase4}	Remote Robot vs. BL	-1.1	1.38	-0.83	0.407		-0.17
DL_{phase5}	Rest vs. BL	-2.4	1.39	-1.75	0.080		-0.36
DL_{phase6}	Unstructured Time vs. BL	0.6	1.38	0.40	0.686		0.08
DL_{phase7}	Rest vs. BL	3.0	1.38	2.17	0.030	*	0.44
DL_{phase8}	Eating Preferred Food vs. BL	-1.6	1.38	-1.17	0.240		-0.24
DL_{phase9}	Rest vs. BL	5.8	1.38	4.23	<.0001	*	0.86
$DL_{phase10}$	Difficult Task vs. BL	1.0	1.38	0.75	0.451		0.15
$DL_{phase11}$	Rest vs. BL	8.0	1.38	5.81	<.0001	*	1.18
$DL_{phase12}$	Unfamiliar Person vs. BL	3.4	1.38	2.45	0.014	*	0.50
$DL_{phase13}$	Rest vs. BL	-4.4	1.41	-3.12	0.002	*	-0.64

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 1
- Rest phases = 4
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

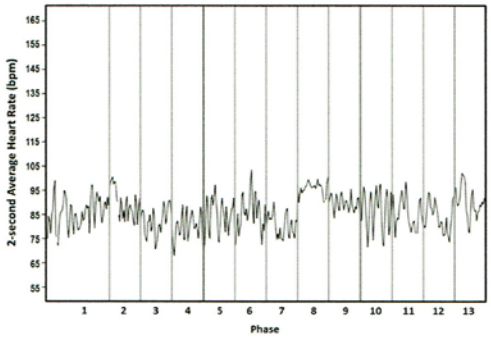
- Unfamiliar Person

Cluster Classification

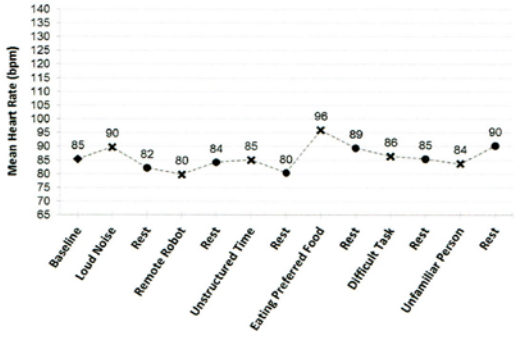
Level Cluster = High
Shape Cluster = Stabile
Combo Cluster = High-Stabile

Appendix 33. Participant 33

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	85.4	6.3
2	Loud Noise	30	89.7	6.2
3	Rest	30	82.1	5.6
4	Remote Robot	30	79.7	5.4
5	Rest	30	84.2	7.2
6	Unstructured Time	30	85.0	7.8
7	Rest	30	80.4	4.6
8	Eating Preferred Food	30	95.9	2.6
9	Rest	30	89.4	3.0
10	Difficult Task	30	86.4	8.1
11	Rest	30	85.5	6.0
12	Unfamiliar Person	30	83.7	5.9
13	Rest	30	90.3	6.2

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	84.9	1.40	60.53	<.0001		
AR1	1st order autoregressive term	0.5	0.04	13.07	<.0001		
DL_{phase2}	Loud Noise vs. BL	5.0	2.30	2.16	0.031	*	0.44
DL_{phase3}	Rest vs. BL	-2.6	2.35	-1.09	0.278		-0.22
DL_{phase4}	Remote Robot vs. BL	-4.9	2.35	-2.08	0.038	*	-0.43
DL_{phase5}	Rest vs. BL	0.3	2.36	0.13	0.898		0.03
DL_{phase6}	Unstructured Time vs. BL	-1.0	2.36	-0.41	0.682		-0.08
DL_{phase7}	Rest vs. BL	-5.0	2.36	-2.13	0.033	*	-0.44
DL_{phase8}	Eating Preferred Food vs. BL	11.1	2.36	4.71	<.0001	*	0.97
DL_{phase9}	Rest vs. BL	4.3	2.36	1.83	0.068		0.38
$DL_{phase10}$	Difficult Task vs. BL	2.1	2.36	0.88	0.376		0.18
$DL_{phase11}$	Rest vs. BL	-0.3	2.36	-0.12	0.907		-0.02
$DL_{phase12}$	Unfamiliar Person vs. BL	-1.3	2.36	-0.53	0.594		-0.11
$DL_{phase13}$	Rest vs. BL	5.2	2.38	2.18	0.029	*	0.45

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 1
- Rest phases = 1
- All phases = 2

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

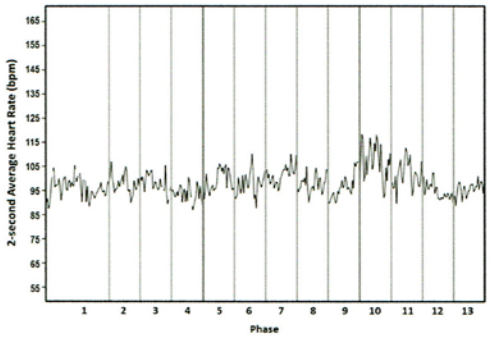
- Loud Noise
- Eating Preferred Food

Cluster Classification

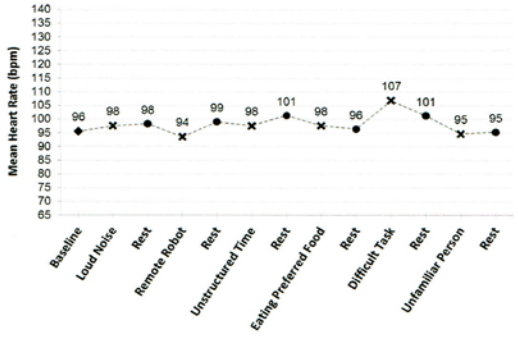
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 34. Participant 34

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	95.6	3.9
2	Loud Noise	30	97.6	3.8
3	Rest	30	98.3	3.7
4	Remote Robot	30	93.6	3.3
5	Rest	30	99.1	4.4
6	Unstructured Time	30	97.6	4.7
7	Rest	30	101.4	3.6
8	Eating Preferred Food	30	97.7	3.6
9	Rest	30	96.5	5.3
10	Difficult Task	30	106.9	7.2
11	Rest	30	101.4	5.5
12	Unfamiliar Person	30	94.7	3.4
13	Rest	30	95.3	2.8

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	95.9	0.97	98.46	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.63	<.0001		
DL_{phase2}	Loud Noise vs. BL	1.3	1.60	0.81	0.419		0.16
DL_{phase3}	Rest vs. BL	2.2	1.66	1.31	0.189		0.27
DL_{phase4}	Remote Robot vs. BL	-2.3	1.64	-1.41	0.158		-0.29
DL_{phase5}	Rest vs. BL	3.4	1.64	2.09	0.037	*	0.43
DL_{phase6}	Unstructured Time vs. BL	2.0	1.64	1.23	0.218		0.25
DL_{phase7}	Rest vs. BL	6.0	1.64	3.64	0.000	*	0.75
DL_{phase8}	Eating Preferred Food vs. BL	2.0	1.64	1.25	0.211		0.26
DL_{phase9}	Rest vs. BL	0.9	1.64	0.55	0.580		0.11
$DL_{phase10}$	Difficult Task vs. BL	10.4	1.64	6.33	<.0001	*	1.31
$DL_{phase11}$	Rest vs. BL	5.2	1.64	3.15	0.002	*	0.65
$DL_{phase12}$	Unfamiliar Person vs. BL	-1.4	1.64	-0.84	0.403		-0.17
$DL_{phase13}$	Rest vs. BL	-0.5	1.65	-0.28	0.780		-0.06

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 1
- Rest phases = 3
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

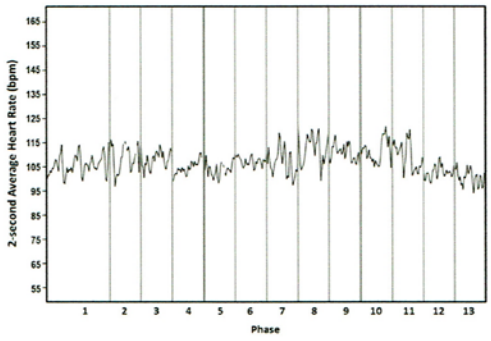
- Difficult Task

Cluster Classification

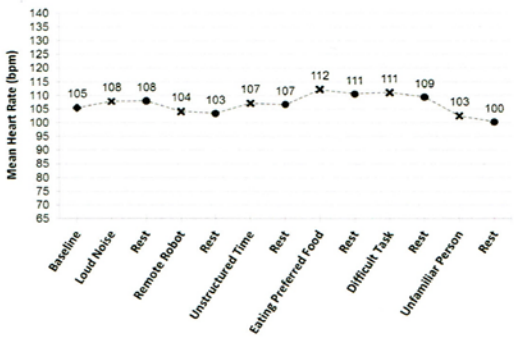
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 35. Participant 35

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	105.5	4.1
2	Loud Noise	30	107.8	5.6
3	Rest	30	107.9	3.6
4	Remote Robot	30	104.1	2.9
5	Rest	30	103.4	2.9
6	Unstructured Time	30	107.1	2.0
7	Rest	30	106.7	5.6
8	Eating Preferred Food	30	112.2	6.1
9	Rest	30	110.6	3.4
10	Difficult Task	30	111.1	4.8
11	Rest	30	109.4	5.8
12	Unfamiliar Person	30	102.5	2.7
13	Rest	30	100.3	3.3

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	105.8	1.13	93.85	<.0001		
AR1	1st order autoregressive term	0.6	0.04	15.41	<.0001		
DL_{phase2}	Loud Noise vs. BL	1.5	1.79	0.86	0.387		0.17
DL_{phase3}	Rest vs. BL	3.3	1.85	1.76	0.079		0.36
DL_{phase4}	Remote Robot vs. BL	-2.2	1.93	-1.16	0.246		-0.24
DL_{phase5}	Rest vs. BL	-2.6	1.90	-1.35	0.178		-0.28
DL_{phase6}	Unstructured Time vs. BL	0.4	1.87	0.21	0.833		0.04
DL_{phase7}	Rest vs. BL	0.0	1.87	0.00	0.998		0.00
DL_{phase8}	Eating Preferred Food vs. BL	8.8	1.86	4.72	<.0001	*	0.96
DL_{phase9}	Rest vs. BL	3.6	1.87	1.90	0.058		0.39
$DL_{phase10}$	Difficult Task vs. BL	4.1	1.87	2.21	0.027	*	0.45
$DL_{phase11}$	Rest vs. BL	4.8	1.86	2.58	0.010	*	0.53
$DL_{phase12}$	Unfamiliar Person vs. BL	-2.8	1.86	-1.50	0.133		-0.31
$DL_{phase13}$	Rest vs. BL	-5.3	1.91	-2.74	0.006	*	-0.57

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 1
- All phases = 3

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 2
- Rest phases = 2
- All phases = 4

Stress Phases Significantly *Greater Than* baseline

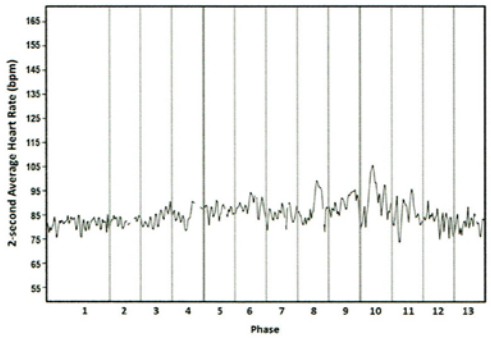
- Eating Preferred Food
- Difficult Task

Cluster Classification

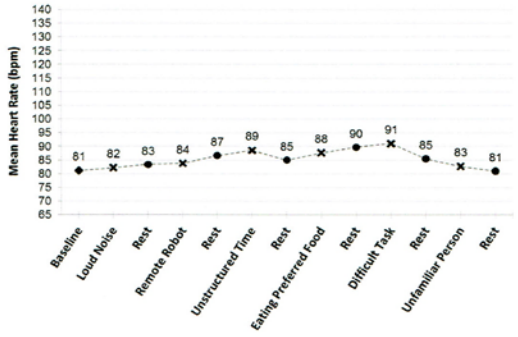
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 36. Participant 36

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	81.2	2.3
2	Loud Noise	30	82.2	1.8
3	Rest	30	83.4	3.1
4	Remote Robot	30	83.8	2.9
5	Rest	30	86.6	2.4
6	Unstructured Time	30	88.6	3.0
7	Rest	30	85.0	2.9
8	Eating Preferred Food	30	87.7	6.0
9	Rest	30	89.7	3.5
10	Difficult Task	30	91.0	7.5
11	Rest	30	85.5	5.5
12	Unfamiliar Person	30	82.7	3.6
13	Rest	30	81.0	3.0

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	81.3	1.07	76.01	<.0001		
AR1	1st order autoregressive term	0.7	0.04	17.17	<.0001		
DL_{phase2}	Loud Noise vs. BL	0.7	1.69	0.44	0.658		0.09
DL_{phase3}	Rest vs. BL	2.2	1.74	1.28	0.202		0.26
DL_{phase4}	Remote Robot vs. BL	3.1	1.83	1.68	0.092		0.35
DL_{phase5}	Rest vs. BL	5.5	1.76	3.11	0.002	*	0.63
DL_{phase6}	Unstructured Time vs. BL	7.0	1.75	3.97	<.0001	*	0.81
DL_{phase7}	Rest vs. BL	4.4	1.76	2.51	0.012	*	0.51
DL_{phase8}	Eating Preferred Food vs. BL	5.8	1.75	3.32	0.001	*	0.67
DL_{phase9}	Rest vs. BL	8.8	1.75	5.02	<.0001	*	1.02
$DL_{phase10}$	Difficult Task vs. BL	8.2	1.75	4.67	<.0001	*	0.95
$DL_{phase11}$	Rest vs. BL	4.4	1.75	2.52	0.012	*	0.51
$DL_{phase12}$	Unfamiliar Person vs. BL	1.6	1.75	0.90	0.370		0.18
$DL_{phase13}$	Rest vs. BL	0.3	1.80	0.15	0.881		0.03

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 4
- All phases = 7

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 4
- All phases = 7

Stress Phases Significantly *Greater Than* baseline

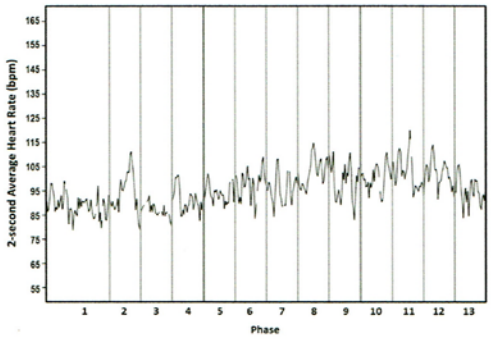
- Unstructured Time
- Eating Preferred Food
- Difficult Task

Cluster Classification

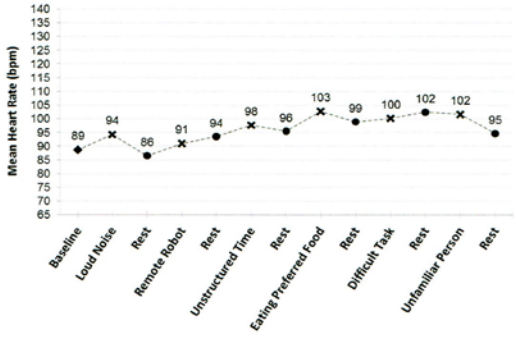
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 37. Participant 37

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	88.6	4.4
2	Loud Noise	30	94.2	8.0
3	Rest	30	86.5	2.7
4	Remote Robot	30	91.0	5.0
5	Rest	30	93.5	3.7
6	Unstructured Time	30	97.7	5.9
7	Rest	30	95.5	5.8
8	Eating Preferred Food	30	102.7	5.8
9	Rest	30	98.9	7.5
10	Difficult Task	30	100.2	5.2
11	Rest	30	102.4	6.8
12	Unfamiliar Person	30	101.6	5.7
13	Rest	30	94.6	5.4

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	89.1	1.65	54.19	<.0001		
AR1	1st order autoregressive term	0.7	0.04	18.23	<.0001		
DL_{phase2}	Loud Noise vs. BL	2.0	2.52	0.77	0.438		0.15
DL_{phase3}	Rest vs. BL	-1.3	2.67	-0.49	0.626		-0.10
DL_{phase4}	Remote Robot vs. BL	3.4	2.67	1.26	0.206		0.25
DL_{phase5}	Rest vs. BL	3.5	2.67	1.32	0.188		0.27
DL_{phase6}	Unstructured Time vs. BL	9.1	2.67	3.40	0.001	*	0.69
DL_{phase7}	Rest vs. BL	6.5	2.67	2.44	0.015	*	0.49
DL_{phase8}	Eating Preferred Food vs. BL	12.1	2.67	4.55	<.0001	*	0.92
DL_{phase9}	Rest vs. BL	11.9	2.67	4.44	<.0001	*	0.90
$DL_{phase10}$	Difficult Task vs. BL	10.0	2.67	3.74	0.000	*	0.75
$DL_{phase11}$	Rest vs. BL	14.9	2.67	5.60	<.0001	*	1.13
$DL_{phase12}$	Unfamiliar Person vs. BL	10.2	2.67	3.82	0.000	*	0.77
$DL_{phase13}$	Rest vs. BL	6.9	2.75	2.51	0.012	*	0.52

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 4
- All phases = 8

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 4
- All phases = 8

Stress Phases Significantly *Greater Than* baseline

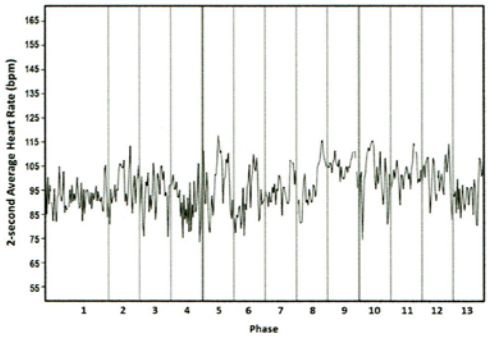
- Unstructured Time
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

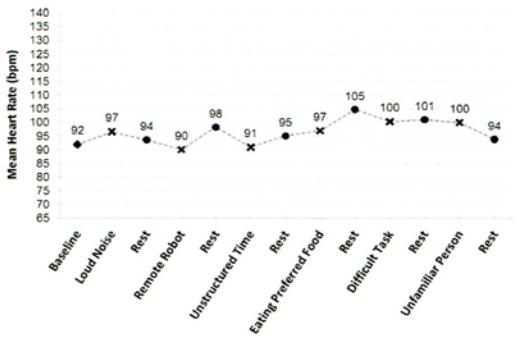
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 38. Participant 38

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	91.9	5.5
2	Loud Noise	30	96.6	7.5
3	Rest	30	93.6	8.4
4	Remote Robot	30	90.1	8.5
5	Rest	30	98.3	11.2
6	Unstructured Time	30	91.0	10.1
7	Rest	30	95.1	5.7
8	Eating Preferred Food	30	97.0	9.9
9	Rest	30	104.8	3.5
10	Difficult Task	30	100.4	10.8
11	Rest	30	101.1	5.1
12	Unfamiliar Person	30	100.0	7.8
13	Rest	30	93.9	7.4

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	91.9	1.63	56.30	<.0001		
AR1	1st order autoregressive term	0.4	0.05	9.45	<.0001		
DL_{phase2}	Loud Noise vs. BL	5.6	2.74	2.04	0.041	*	0.42
DL_{phase3}	Rest vs. BL	0.9	2.77	0.33	0.744		0.07
DL_{phase4}	Remote Robot vs. BL	-1.7	2.77	-0.60	0.549		-0.12
DL_{phase5}	Rest vs. BL	6.9	2.77	2.47	0.013	*	0.51
DL_{phase6}	Unstructured Time vs. BL	-1.4	2.77	-0.51	0.610		-0.11
DL_{phase7}	Rest vs. BL	4.4	2.78	1.57	0.115		0.33
DL_{phase8}	Eating Preferred Food vs. BL	4.4	2.78	1.58	0.115		0.33
DL_{phase9}	Rest vs. BL	12.9	2.83	4.54	<.0001	*	0.95
$DL_{phase10}$	Difficult Task vs. BL	8.4	2.79	3.02	0.003	*	0.63
$DL_{phase11}$	Rest vs. BL	9.6	2.80	3.43	0.001	*	0.71
$DL_{phase12}$	Unfamiliar Person vs. BL	7.0	2.78	2.51	0.012	*	0.52
$DL_{phase13}$	Rest vs. BL	3.0	2.79	1.07	0.286		0.22

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 3
- All phases = 6

Stress Phases Significantly *Greater Than* baseline

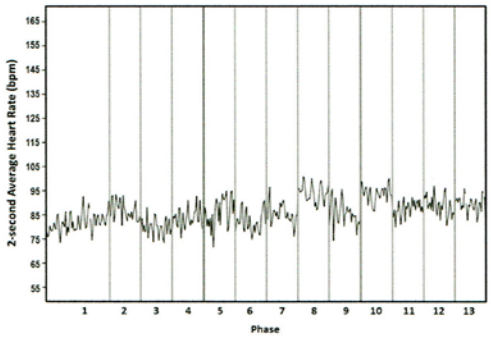
- Loud Noise
- Difficult Task
- Unfamiliar Person

Cluster Classification

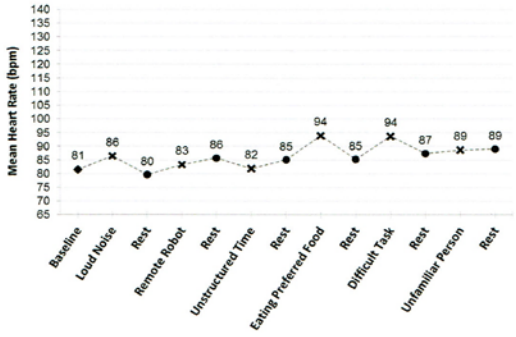
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 39. Participant 39

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	81.5	3.9
2	Loud Noise	30	86.4	3.9
3	Rest	30	79.6	3.6
4	Remote Robot	30	83.3	4.1
5	Rest	30	85.7	6.3
6	Unstructured Time	30	81.8	4.6
7	Rest	30	85.1	4.0
8	Eating Preferred Food	30	93.9	3.7
9	Rest	30	85.2	5.1
10	Difficult Task	30	93.6	3.4
11	Rest	30	87.3	3.2
12	Unfamiliar Person	30	88.7	4.2
13	Rest	30	89.0	3.3

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	81.6	0.70	116.35	<.0001		
AR1	1st order autoregressive term	0.3	0.05	5.29	<.0001		
DL_{phase2}	Loud Noise vs. BL	4.7	1.20	3.88	0.000	*	0.81
DL_{phase3}	Rest vs. BL	-1.9	1.20	-1.57	0.118		-0.33
DL_{phase4}	Remote Robot vs. BL	1.7	1.20	1.43	0.154		0.30
DL_{phase5}	Rest vs. BL	4.3	1.20	3.54	0.000	*	0.74
DL_{phase6}	Unstructured Time vs. BL	0.1	1.20	0.10	0.923		0.02
DL_{phase7}	Rest vs. BL	3.5	1.20	2.87	0.004	*	0.60
DL_{phase8}	Eating Preferred Food vs. BL	12.5	1.20	10.39	<.0001	*	2.17
DL_{phase9}	Rest vs. BL	3.4	1.20	2.84	0.005	*	0.59
$DL_{phase10}$	Difficult Task vs. BL	12.2	1.20	10.13	<.0001	*	2.11
$DL_{phase11}$	Rest vs. BL	5.8	1.20	4.79	<.0001	*	1.00
$DL_{phase12}$	Unfamiliar Person vs. BL	7.1	1.20	5.86	<.0001	*	1.22
$DL_{phase13}$	Rest vs. BL	7.6	1.22	6.20	<.0001	*	1.30

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 5
- All phases = 9

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 5
- All phases = 9

Stress Phases Significantly *Greater Than* baseline

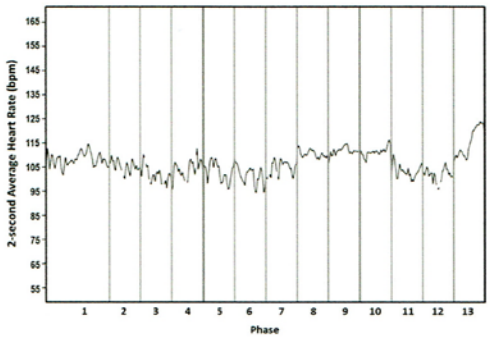
- Loud Noise
- Eating Preferred Food
- Difficult Task
- Unfamiliar Person

Cluster Classification

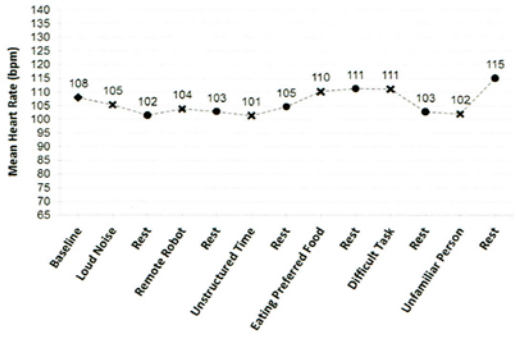
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 40. Participant 40

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	108.0	2.7
2	Loud Noise	30	105.4	2.3
3	Rest	30	101.5	3.0
4	Remote Robot	30	103.9	3.8
5	Rest	30	102.9	3.9
6	Unstructured Time	30	101.4	3.8
7	Rest	30	104.7	2.8
8	Eating Preferred Food	30	110.3	1.5
9	Rest	30	111.3	1.8
10	Difficult Task	30	111.1	1.9
11	Rest	30	102.9	2.9
12	Unfamiliar Person	30	102.0	2.4
13	Rest	30	115.1	6.0

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	107.0	1.32	81.04	<.0001		
AR1	1st order autoregressive term	0.8	0.03	26.96	<.0001		
DL_{phase2}	Loud Noise vs. BL	-1.2	1.64	-0.71	0.478		-0.12
DL_{phase3}	Rest vs. BL	-2.3	1.90	-1.21	0.226		-0.23
DL_{phase4}	Remote Robot vs. BL	-6.0	1.95	-3.08	0.002	*	-0.58
DL_{phase5}	Rest vs. BL	-5.5	1.97	-2.79	0.005	*	-0.53
DL_{phase6}	Unstructured Time vs. BL	-4.4	1.99	-2.19	0.028	*	-0.42
DL_{phase7}	Rest vs. BL	-1.0	2.02	-0.51	0.609		-0.10
DL_{phase8}	Eating Preferred Food vs. BL	5.3	2.02	2.64	0.008	*	0.51
DL_{phase9}	Rest vs. BL	4.1	2.01	2.03	0.043	*	0.39
$DL_{phase10}$	Difficult Task vs. BL	6.9	2.02	3.40	0.001	*	0.66
$DL_{phase11}$	Rest vs. BL	-5.1	1.99	-2.58	0.010	*	-0.50
$DL_{phase12}$	Unfamiliar Person vs. BL	-5.1	2.00	-2.55	0.011	*	-0.49
$DL_{phase13}$	Rest vs. BL	5.4	2.12	2.56	0.010	*	0.51

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 2
- Rest phases = 2
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

# of phases significantly ***different from*** baseline:
- Stress phases = 5
- Rest phases = 4
- All phases = 9

Stress Phases Significantly *Greater Than* baseline

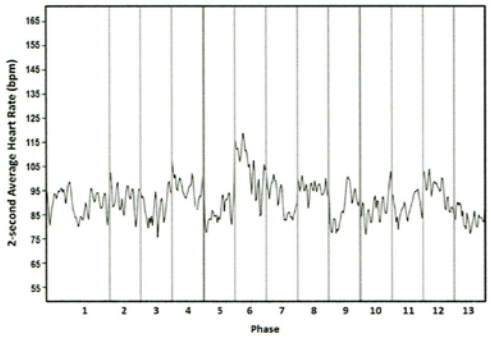
- Eating Preferred Food
- Difficult Task

Cluster Classification

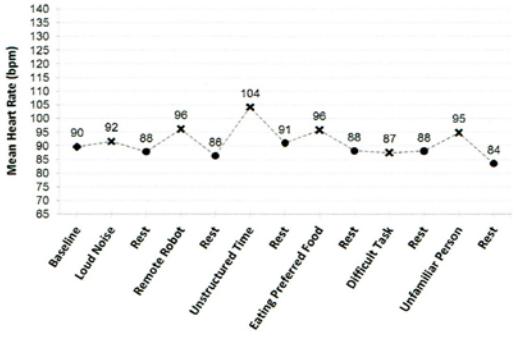
Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

Appendix 41. Participant 41

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

	Phase	N	*M*	*SD*
1	Baseline	60	89.6	5.0
2	Loud Noise	30	91.6	5.1
3	Rest	30	87.8	5.9
4	Remote Robot	30	96.1	4.6
5	Rest	30	86.4	5.2
6	Unstructured Time	30	104.2	9.3
7	Rest	30	91.1	6.6
8	Eating Preferred Food	30	95.8	2.9
9	Rest	30	88.2	7.3
10	Difficult Task	30	87.5	5.7
11	Rest	30	88.1	4.5
12	Unfamiliar Person	30	94.8	5.4
13	Rest	30	83.5	3.5

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	88.5	2.09	42.28	<.0001		
AR1	1st order autoregressive term	0.8	0.03	24.25	<.0001		
DL_{phase2}	Loud Noise vs. BL	3.3	2.76	1.21	0.228		0.21
DL_{phase3}	Rest vs. BL	-1.4	3.09	-0.45	0.649		-0.09
DL_{phase4}	Remote Robot vs. BL	6.5	3.18	2.03	0.042	*	0.39
DL_{phase5}	Rest vs. BL	-2.5	3.21	-0.79	0.429		-0.15
DL_{phase6}	Unstructured Time vs. BL	13.7	3.21	4.26	<.0001	*	0.83
DL_{phase7}	Rest vs. BL	4.4	3.22	1.37	0.170		0.27
DL_{phase8}	Eating Preferred Food vs. BL	7.8	3.24	2.42	0.016	*	0.47
DL_{phase9}	Rest vs. BL	5.3	3.30	1.61	0.107		0.32
$DL_{phase10}$	Difficult Task vs. BL	-0.1	3.24	-0.03	0.976		-0.01
$DL_{phase11}$	Rest vs. BL	-6.5	3.24	-2.02	0.043	*	-0.40
$DL_{phase12}$	Unfamiliar Person vs. BL	6.6	3.23	2.05	0.040	*	0.40
$DL_{phase13}$	Rest vs. BL	-1.5	3.44	-0.43	0.666		-0.09

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 4
- Rest phases = 0
- All phases = 4

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 1
- All phases = 1

# of phases significantly ***different from*** baseline:
- Stress phases = 4
- Rest phases = 1
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

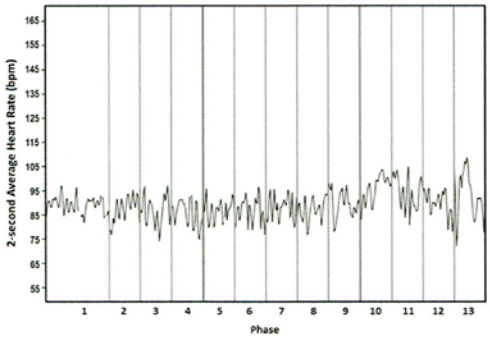
- Remote Robot
- Unstructured Time
- Eating Preferred Food
- Unfamiliar Person

Cluster Classification

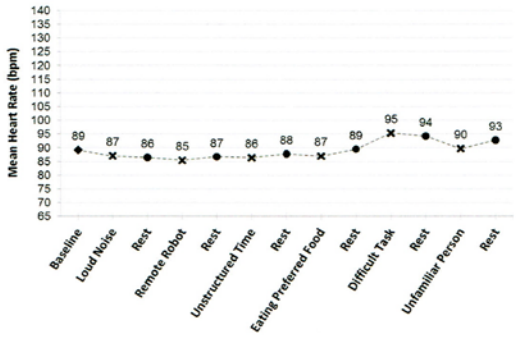
Level Cluster = Low
Shape Cluster = Labile
Combo Cluster = Low-Labile

Appendix 42. Participant 42

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	89.2	3.2
2	Loud Noise	30	87.0	5.2
3	Rest	30	86.4	5.7
4	Remote Robot	30	85.4	5.3
5	Rest	30	86.7	4.1
6	Unstructured Time	30	86.4	5.1
7	Rest	30	87.8	4.7
8	Eating Preferred Food	30	86.9	4.6
9	Rest	30	89.4	5.5
10	Difficult Task	30	95.3	5.9
11	Rest	30	94.3	6.7
12	Unfamiliar Person	30	89.6	4.9
13	Rest	30	92.7	9.7

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	89.1	1.46	61.06	<.0001		
AR1	1st order autoregressive term	0.6	0.04	15.50	<.0001		
DL_{phase2}	Loud Noise vs. BL	-3.6	2.29	-1.56	0.120		-0.31
DL_{phase3}	Rest vs. BL	-2.7	2.39	-1.12	0.264		-0.23
DL_{phase4}	Remote Robot vs. BL	-3.0	2.40	-1.24	0.215		-0.25
DL_{phase5}	Rest vs. BL	-1.7	2.40	-0.69	0.489		-0.14
DL_{phase6}	Unstructured Time vs. BL	-4.3	2.41	-1.80	0.072		-0.37
DL_{phase7}	Rest vs. BL	0.1	2.41	0.05	0.961		0.01
DL_{phase8}	Eating Preferred Food vs. BL	-3.1	2.40	-1.29	0.196		-0.26
DL_{phase9}	Rest vs. BL	1.7	2.40	0.71	0.481		0.14
$DL_{phase10}$	Difficult Task vs. BL	4.4	2.40	1.85	0.065		0.38
$DL_{phase11}$	Rest vs. BL	5.1	2.40	2.13	0.033	*	0.43
$DL_{phase12}$	Unfamiliar Person vs. BL	-1.5	2.41	-0.62	0.535		-0.13
$DL_{phase13}$	Rest vs. BL	5.5	2.45	2.23	0.026	*	0.46

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 0
- Rest phases = 2
- All phases = 2

# of phases significantly ***less than*** baseline:
- Stress phases = 0
- Rest phases = 0
- All phases = 0

# of phases significantly ***different from*** baseline:
- Stress phases = 0
- Rest phases = 2
- All phases = 2

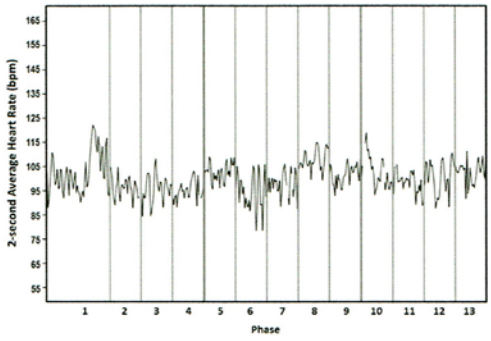
Stress Phases Significantly *Greater Than* baseline

Cluster Classification

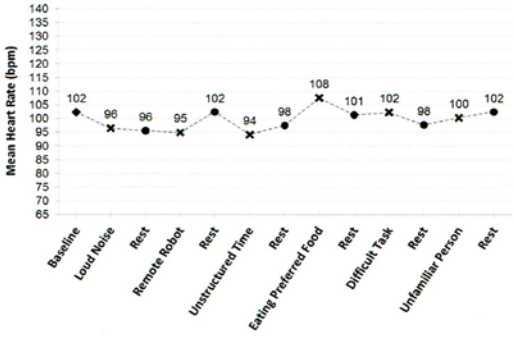
Level Cluster = Low
Shape Cluster = Stabile
Combo Cluster = Low-Stabile

Appendix 43. Participant 43

Heart Rate across Time (and Phase)



Mean Heart Rate by Phase



Heart Rate Descriptives by Phase

Phase		N	*M*	*SD*
1	Baseline	60	102.3	8.7
2	Loud Noise	30	96.4	4.4
3	Rest	30	95.6	5.7
4	Remote Robot	30	94.9	3.9
5	Rest	30	102.4	3.8
6	Unstructured Time	30	94.2	7.6
7	Rest	30	97.6	5.0
8	Eating Preferred Food	30	107.5	4.3
9	Rest	30	101.4	4.0
10	Difficult Task	30	102.2	6.4
11	Rest	30	97.7	4.4
12	Unfamiliar Person	30	100.3	6.7
13	Rest	30	102.4	4.6

Time Series Analysis Results

Parameter		Estimate	*SE*	*t* value	*p* value		*Cohen's d*
L	Baseline (BL) level	101.7	1.31	77.77	<.0001		
AR1	1st order autoregressive term	0.5	0.04	11.83	<.0001		
DL_{phase2}	Loud Noise vs. BL	-4.2	2.22	-1.87	0.061		-0.39
DL_{phase3}	Rest vs. BL	-5.8	2.23	-2.63	0.009	*	-0.54
DL_{phase4}	Remote Robot vs. BL	-6.9	2.21	-3.12	0.002	*	-0.65
DL_{phase5}	Rest vs. BL	0.9	2.21	0.42	0.672		0.09
DL_{phase6}	Unstructured Time vs. BL	-8.0	2.20	-3.61	0.000	*	-0.74
DL_{phase7}	Rest vs. BL	-4.6	2.22	-2.06	0.039	*	-0.43
DL_{phase8}	Eating Preferred Food vs. BL	6.5	2.21	2.95	0.003	*	0.61
DL_{phase9}	Rest vs. BL	-0.1	2.21	-0.06	0.953		-0.01
$DL_{phase10}$	Difficult Task vs. BL	0.5	2.25	0.23	0.820		0.05
$DL_{phase11}$	Rest vs. BL	-4.2	2.21	-1.88	0.060		-0.39
$DL_{phase12}$	Unfamiliar Person vs. BL	-1.1	2.21	-0.48	0.629		-0.10
$DL_{phase13}$	Rest vs. BL	0.9	2.23	0.40	0.693		0.08

Summary of Significant Time Series Results

# of phases significantly ***greater than*** baseline:
- Stress phases = 1
- Rest phases = 0
- All phases = 1

# of phases significantly ***less than*** baseline:
- Stress phases = 2
- Rest phases = 2
- All phases = 4

# of phases significantly ***different from*** baseline:
- Stress phases = 3
- Rest phases = 2
- All phases = 5

Stress Phases Significantly *Greater Than* baseline

- Eating Preferred Food

Cluster Classification

Level Cluster = Middle
Shape Cluster = Stabile
Combo Cluster = Middle-Stabile

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