The Relationship of Emotion Regulation, Schema Modes, and Three Creative Arts Therapy Methods in Schema-Focused Treatment for Personality Disorders: A Single Case Experimental Design

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Abstract

The ability to regulate one's emotions plays an important role in a variety of psychopathologies. Difficulties in emotion regulation (ER) are highly prevalent in personality disorders (PDs). Treatment, such as schema focused treatment, has shown to be effective for PDs, however literature suggests that it might benefit from additional treatment options, such as creative arts therapies (CATs). To date, previous research has mostly explored the effects of CATs by using a single method, such as only art therapy or dramatherapy. Only little research compared different CATs methods or studied their effects together. This study investigated how the relationship between a mixed CATs treatment and ER impacted PD patients, and how mixed CATs treatment for ER impacted the use of schema modes. To examine this, 11 participants underwent schema focused treatment with an additional ER-module comprising three CAT-methods (dramatherapy, art therapy, and psychomotor therapy) and filled in the SERATS and DERS questionnaires for ER and the SMI-2 for schema modes. It was expected that emotion regulation would improve after the CATs treatment and that adaptive schema modes would increase, while maladaptive schema modes would decrease. The results confirmed these hypotheses, giving first insights into the application of mixed CATs treatment. Further, the relationships were impacted by the occurrence of crises, the treatment length, and the nature of the post-treatment. Future research could develop more mixed CATs treatments with a different set of CATs, assess the therapeutic relationship in more detail, and apply the present treatment to different mental disorders.

Keywords: Emotion regulation (ER), schema modes, creative arts therapies (CATs), single case experimental design (SCED), personality disorders (PDs)

Introduction

Emotion regulation (ER) has been proposed as a transdiagnostic construct and finding effective ways to improve ER skills may have merits for a variety of psychpathologies. ER is defined as strategies, conscious or non-conscious, that modify the onset, intensity, duration, and quality of emotions (Salgó et al., 2021). Additionally, Gratz and Roemer (2004) discussed multiple approaches and conceptualisations of ER. They concluded that ER involves more than control over expression and experience of emotions, namely four aspects: (1) the understanding and awareness of emotions, (2) acceptance, (3) the capacity to control impulsivity and act according to goals in the face of negative emotions, and (4) the skill to use fitting ER strategies in accordance with the situation. Therefore, literature has suggested that ER encompasses awareness and understanding of emotional states as much as the control over them and their expression. Negative emotion regulation strategies, for instance avoidance or suppression of emotions, occur in a variety of psychological disorders and often facilitate their maintenance (Sloan et al., 2017). In their paper, the authors suggested that, due to the transdiagnostic nature of ER, methods to improve ER strategies could be applied to a variety of treatments and disorders. Finally, they remarked that future research could delve further into treatments which focus on ER.

While ER is prevalent in a multitude of mental disorders, it is especially relevant for personality disorders. In the development of people's personalities, adaptive capacities include controlling emotions and impulses and their absence is linked to personality problems (Verheul et al., 2008). With a prevalence of 7.8% (Winsper et al., 2020), personality disorders (PDs) are characterised by rigid emotional and cognitive patterns and issues in interpersonal relationships and impulse control (American Psychological Association, 2013). Additionally, PDs are associated with high social costs, such as interpersonal conflicts, a decreased quality of life, and difficulties in the regulation of emotions (Volkert et al., 2018; Marco et al., 2021).

A viable treatment approach for PDs is schema therapy (ST). According to Martin and Young (2010), in ST, personality disorders are treated in an integrative way that targets chronic aspects of the disorder in schema therapy. A key aspect they discussed are schema modes, which are a combination of schemas and coping styles. People can switch between modes because schemas that grow into overwhelming emotions or coping styles that grow rigid can activate schema modes. Furthermore, Jacob and Arntz (2013) described how schema modes can be separated into four categories. There are dysfunctional child and parent modes, dysfunctional coping modes, and healthy modes. The latter two comprise the happy child and

healthy adult and can be classified as adaptive modes, while the rest are grouped as maladaptive schema modes.

Schema modes can be connected to emotion regulation. Salgó et al. (2021) referred to schema modes as "intense dysregulated emotional states, internalised critical messages, and maladaptive copings related to basic unmet needs" (p.2). In the same study, the authors assessed the association between schema modes and emotion regulation. Their findings showed a positive association between adaptive ER strategies and adaptive schema modes, and a negative association between maladaptive schema modes and emotion regulation difficulties. Not only are schema modes and ER connected, Wolterink and Westerhof (2018) also showed that a change in schema modes lead to decreased psychological distress in PD patients. Therefore, schema modes and ER present two core concepts for PD treatment.

The effectiveness of ST has been previously studied across a variety of personality disorders and contexts. A study by Videler et al. (2018) showed that ST has positive effects on adults with personality disorders in later life, already throughout treatment. Additionally, research has explored ST for borderline personality disorder and other personality disorders, as well as a group treatment and found ST to be mostly effective (Jacob & Arntz, 2013). Furthermore, in comparison with other treatments, such as treatment as usual or transference-focused psychotherapy, studies have found ST to be more beneficial (Bamelis et al., 2014; Jacob & Arntz, 2013).

Even though ST has been proven effective for PD, literature has proposed that additional treatment options may support this effectiveness. Videler et al. (2018) mentioned how next to CBT techniques, experiential techniques play a role and their results showed no superior effect over one technique over the other. Instead, both together added to the success of the treatment. Additionally, Haeyen et al. (2020) discussed how a risk for relapse or return of symptoms remain after PD treatment and how adding art therapy could have valuable effects. They conducted a quantitative study on the added benefit of art therapy and found statistically significant improvements overall and for emotional functioning. Indeed, in the Netherlands, using Creative Arts Therapies to treat PDs is recommended, as they allow patients to explore their emotions (Akwa GGZ, n.d.).

Creative Arts Therapies (CATs) use a variety of arts in psychological treatment. Methods used are art therapy, dramatherapy, movement therapy, bibliotherapy, psychodrama, and music therapy (de Witte et al., 2021). According to Bosgraaf et al. (2020) CATs belong to the experiential techniques and are readily accessible, and aid in improving self-esteem and emotional resilience. Additionally, de Witte et al. (2021) argued that CATs are characterised

by an active engagement and indirect expression of internal states, for instance through movement, visual or musical forms. Various factors, such as self-concept, perspective taking, and self-awareness can be addressed. Moreover, the review discussed multiple joint factors of CATs, such as therapeutic alliance, experimentation and self-awareness, expression, connection with the self and others, regulating and expressing and processing emotions, creativity, self-display, non-verbal expression, pleasure, symbolism, and perspective-taking. However, there are also characteristics that are unique to each CAT, such as tactile work in AT, expressing oneself through movement in dance movement therapy, role-reversal in dramatherapy, or music making in music therapy. Finally, the authors argued that arts have a beneficial effect on health and well-being, and improvements stem from daily life, programmes to foster health, or specific therapeutic interventions. For instance, research has shown positive effects for CATs on the reduction of depressive symptoms (Dunphy et al., 2019) and improvements in psychosocial functioning in children and adolescents through engagement with the art materials and the therapist, regardless of the combination of techniques and materials used (Bosgraaf et al., 2020).

Multiple studies have shown the benefits of CATs on emotion regulation. Abbing et al. (2019) explored the use of anhroposophic art therapy (AAT) in a client with anxiety. AAT uses a holistic approach to improve well-being by attempting to gain insight into the underlying processes of the primary symptoms. The authors found that AAT resulted in improvements in ER and a decrease in anxiety symptoms. Additionally, Kapitan (2012) highlighted the efficacy of AT for a variety of factors, such as anxiety, and emotional distress and expression.

The positive effects of CATs on ER have also been replicated in populations with personality disorders. In their study, Gatta et al. (2014) administered group art therapy over 18 weekly sessions. The authors found that the group relationship and therapeutic relationships improved. They also discussed how sharing emotional experiences through art expression aided in creating a group culture which facilitated change. Another study by Doomen (2018) has explored the relationship of dramatherapy (DT) in a schema-focused context on personality disorders. The results indicated that participants exhibited more emotions with less detachment and more healthy modes present. The author concluded that DT improves emotional expression and could be a valuable and effective PD treatment. Furthermore, Haeyen et al. (2015) did a qualitative analysis of cluster B/C personality disorders and developed a model of the effects of art therapy (AT). Their categories involved perception, personal integration, emotion and impulse regulation, behaviour change, and

insight and comprehension. The participants reported better regulation skills and expression of emotions, suggesting that AT directly improves ER in PD patients. This has been replicated in a randomised controlled trial, where findings have shown that AT reduces PD pathology, strengthens adaptive schema modes and decreases the presence of maladaptive schema modes (Haeyen et al., 2018a).

Although the previously discussed research is promising, most studied CATs effects by using a single method of intervention, for instance only art therapy or dramatherapy. Literature involving multiple CAT methods rarely uses more than one method in a single intervention. For example, Im and Lee (2014) have done art and music therapy in the elderly to assess their effects on depression and cognitive functioning. Their method was to divide the elderly into two groups: an art therapy and music therapy programme respectively. Another review on CATs compared various studies on art, dance, drama, and music in light of effectiveness and quality and highlighted the need for more studies using CAT interventions (Dunphy et al., 2019). Finally, only a pilot study by van den Broek (2011) compared arts therapies and psychotherapy and involved multiple CATs methods in the arts therapy condition.

Therefore, the present paper assessed a mixed CATs treatment for emotion regulation in PD patients. As previously discussed, de Witte et al. (2021) gave a record of joint and unique factors of CATs and as a general overlap as well as unique traits are present, one could suggest that a treatment intervention could benefit from using a multitude of CATs. Moreover, it is noticeable that ER appears in those joint factors of CATs, further supporting the idea that administering a variety of CAT forms could aid in finding patient tailored treatment methods. Additionally, Haeyen et al. (2018a) emphasise the need for more research on CATs across different settings and for a wider scope of CAT research. According to de Witte et al. (2021), in CATs research it is recommended to make use of change process research, that is how and why therapy causes changes. The authors concluded that researching change can help, for instance in finding therapeutic factors that impact the change and improving the interventions used. Other research has explored such questions. De Witte et al. (2020) discussed how music therapy can either use active improvisation or receptive interventions, whereby simplicity and structure appeared as important change process factors. Moreover, Kapitan (2012) discussed different factors possibly impacting AT, such as the role of the therapist and materials used. Finally, Dunphy et al. (2019) also examined proposed change mechanisms for each CAT they studied. Thus, research should ascertain the ways change is impacted.

Therefore, the goal of this study is to assess a mixed CATs treatment across pre-treatment, treatment, and post-treatment phases in order to contribute to the current state of research and to aid future researchers and treatment specialists in finding patient tailored, transdiagnostic and transmethodological ways of administering treatment. To do so, the following research questions will be explored:

1) How do mixed CATs impact ER in PD patients?
2) How does a mixed CATs intervention as ER treatment impact adaptive or maladaptive schema modes?
3) Are ER changes related to changes in adaptive and maladaptive schema modes?

It is hypothesised that ER will increase during CATs treatment as evidenced by previous research (Haeyen et al., 2015; Haeyen et al., 2018a). Moreover, a mixed CATs treatment should lead to less maladaptive and more adaptive schema modes, similarly to how art therapy has resulted in that in a previous study (Haeyen et al., 2018a). Finally, with improved ER, the use of adaptive schema modes should increase and the use in maladaptive schema modes should decrease, in accordance with the results by Salgó et al. (2021).

Methods

Design

This multiple baseline single experimental case study was part of a larger research about working mechanisms of CATs, conducted at the clinic Mediant de Boerhaven. Patients with complex personality disorders underwent treatment for about a year, which involved a variety of therapy methods, including psychotherapy, schema therapy, and creative arts therapies. Data from the Severity Indices of Personality Problems (SIPP-118), Brief Symptom Inventory (BSI), Mental Health Continuum Short Form (MHC-sf), Schema Mode Inventory (SMI-2), three questions of the Difficulties in Emotion Regulation Scale (DERS), Self-Expression and Emotion Regulation in Art Therapy Scale (SERATS), and nine questions (three out of every scale) of the State Adult Attachment Measure (SAAM) were collected. Additionally, ER problems, such as self-destructive behaviour like drug use, self-harm, or suicidal ideation were scored by the social workers.

The SIPP-118, BSI, MHC-sf, and the SMI-2 were filled in at four time points: prior to the treatment, after the ER-phase, after the attachment phase, and at the end of treatment. The SERATS, DERS, and SAAM were collected weekly.

Only a part of the questionnaires will be relevant for this study. These include the SMI-2, DERS, and SERATS.

Setting

At the expertise centre for personality disorders, Mediant de Boerhaven, patients received schema focused treatment for complex personality disorders. The length of treatment spanned circa one year, with the option to extent.

To be admitted for treatment, participants had to have a (complex) personality disorder, an IQ above 80, and a sufficient understanding of the Dutch language.

Participants received treatment in four phases: (1) Acquaintance: within the first 8 weeks, they got acquainted with the programme, had schema focused therapy, and a case conceptualisation was made. (2) ER: the following 14 weeks revolved around emotion regulation, where participants received CATs. CATs involved were dramatherapy, art therapy, and psychomotor therapy. (3) Connection: for the duration for 14 weeks, participants explored topics such as relationships and attachment and past trauma (trauma therapy). (4) Autonomy: the final phase was about autonomy, also with a duration of 14 weeks.

Participants

Prior to recruiting participants, ethical approval was granted by the BMS Ethics Committee. The participants were 20 adults undergoing treatment for personality disorders. 9 participants dropped out of the research, of which 7 stopped treatment prematurely. The final participants of this study were 11 adults (1 male, 10 female; ages 20 to 35). The mean age of the participants was M= 26.18 (SD= 4.87). Four out of eleven participants were diagnosed with a borderline personality disorder, two with an avoidant personality disorder and five with personality disorder not otherwise specified. Examples for ER problems included dissociation, self-harm, and running away.

Participants were recruited from the treatment centre Mediant de Boerhaven in Hengelo. All patients who indeed started the treatment were included, there were no further exclusion criteria.

Procedure

Upon intake, participants received information about the research and were able to give their informed consent. They all followed the same treatment and received the same ER intervention.

Participants were their own control, in accordance with other single case experimental designs. The first phase (acquaintance phase) served as a baseline measurement. Participants were randomly assigned to start measurements 3-8 weeks prior to the intervention. They filled in the ER questionnaires (SERATS and three DERS questions) weekly. This phase will hereafter be called “pre-treatment phase.” The participants then followed the emotion

regulation module, that is the CATs-intervention. In this ER-phase, in the following text called “treatment phase,” the same questionnaires were filled in weekly. Finally, after concluding the intervention and during the third phase (attachment phase), participants continued to fill in the same questionnaires weekly, five more times, which will therefore be called the “post-treatment phase.”

Additionally, over the entire course of treatment, the SMI-2 was measured. Prior to the start (“pre-test”), after the ER-phase (at 22 weeks; “post-test”), after the connection phase (36 weeks), and at the end of treatment. The other questionnaires mentioned in the Design section were measured in the same way but are not relevant for this paper.

Materials

The data were collected over a span of a year and two months, from November 2020 until January 2022 for the ER questionnaires (SERATS, DERS) and until April 2022 for the SMI-2.

The SMI-2 (Schema Mode Inventory) assessed the presence of adaptive and maladaptive schema modes. It is a 118-item questionnaire with answer possibilities on a 6-point Likert scale, ranging from 1= never or almost never to 6= all of the time. Lobbestael et al. (2010) did a psychometric evaluation of the instrument and found acceptable test-retest reliability and adequate construct validity. It is noteworthy that for some participants, more SMI-2 measurements were done, which is due to some participants having an extension of their treatment.

Emotion regulation data were collected via the SERATS (Self-Expression and Emotion Regulation in Art Therapy Scale) and three questions of the DERS (Difficulties in Emotion Regulation Scale). The SERATS was designed as 9-item questionnaire measuring ER in art therapy, in order to focus on the results of the effects of AT (Haeyen et al., 2018b). Upon assessing the scale in terms of reliability and validity, studies have found that the SERATS has high test-retest and internal reliability (Haeyen et al., 2018b) and high convergent validity, meaning it is comparable to other, similar measurements (Haeyen & Noorthorn, 2021). As the present study used a multidisciplinary approach to AT, “art therapy” was replaced with “art therapies” in the SERATS. The items were answered on a 5-point Likert scale (1= never true, 2= seldom true, 3= sometimes true, 4= often true, 5= (almost) always true).

The DERS is a 36-item self-report questionnaire that was created to assess emotion dysregulation across six factors:

(a) Lack of awareness of emotional responses, (b) lack of clarity of emotional responses, (c) nonacceptance of emotional responses, (d) limited access to emotion regulation strategies perceived as effective, (e) difficulties controlling impulses when experiencing negative emotions, and (f) difficulties engaging in goal-directed behaviours when experiencing negative emotions. (Gratz & Roemer, 2004, p.52)

The evaluation of the questionnaire has shown that the internal consistency of the DERS is high, test-retest reliability is good, and both, predictive and construct validity are satisfactory (Gratz & Roemer, 2004). For this study, three questions of the DERS were used, chosen based on the highest correlation with the main factor of the DERS. The questions were one of the scale strategies ("When I'm upset, I believe there is nothing I can do to make myself feel better."), goals ("When I'm upset, I have difficulty focusing on other things.") and clarity ("I have difficulty making sense out of my feelings.") respectively. Participants answered the questions on a 5-point Likert scale, ranging from "almost never" to "almost always." A high DERS score was associated with low emotion regulation.

Data analysis

Data were analysed via Excel and IBM SPSS 28. The variables were studied in a single case experimental design (SCED). According to Smith (2012), in SCEDs, two or more time periods, also called phases, are compared. For comparison, data of a baseline phase are collected, therefore participants function as their own control group. The goal of SCED is to determine the relationship between the independent variable and dependent variable by measuring the latter within and across all phases of the independent variable.

In the present study, the dependent variable was emotion regulation (quantitative, measured via the SERATS and DERS) and the independent variable was the CATs module, divided into three phases: pre-treatment, treatment, and post-treatment.

Two main steps comprise the analysis. One, a visual analysis, following the steps by Lane and Gast (2014) and a statistical analysis.

To visually analyse SCED data, Lane and Gast (2014) proposed doing a within condition and between condition analysis. In the first and second step, a letter is assigned to each condition and the number of sessions are counted. These steps were skipped in the present research, as there was no fixed number of sessions per participant. In the third step, the mean, median, stability envelopes, and range were calculated for every condition. This was done for the SERATS and DERS measurements separately. In step four, relative level changes were assessed by calculating the medians for the first and second halves of each phase and subtracting the first from the second half. Absolute level changes were calculated

by subtracting the first value from each phase of the last value of their respective phase. In the final steps, the trendlines were determined with the use of the medians of the first and second halves of the phases. Based on these calculations, graphs were made for every participant in Excel, with the phase on the x-axis and the SERATS- or DERS-score on the y-axis. The data points from all conditions, means and stability envelopes were included (see Appendix A). Additionally, the same graphs without the stability envelopes but with added trendlines of each condition were created (see Appendix B).

To analyse changes between the conditions, trends from pre-treatment to treatment condition, and treatment to post-treatment condition were compared. Additionally, the relative level change was determined by subtracting the median and absolute level change were calculated by subtracting, the mean from the pre-treatment (i.e. baseline) phase was subtracted from the mean of the treatment-phase. To compare between the second and third condition, the mean from the treatment-phase was subtracted from the mean of the post-treatment phase. The fifth step, to calculate percent of overlapping and non-overlapping data was skipped as it was not relevant to the analysis. To interpret the results of the between-conditions analysis, in the visual analysis, trendlines and stability envelopes were assessed. Additionally, to compare between conditions, level changes were evaluated.

The SMI-2 results were treated slightly differently. As has been shown in previous research (Jacob & Arntz, 2013; Salgó et al., 2021), the schema modes were divided in adaptive and maladaptive schema modes. Means were calculated for each across all points of measurement. Furthermore, Excel was used to create graphs with the measurement point on the x-axis and the SMI-2 score on the y-axis (see Appendix C).

After following these steps, the graphs were analysed for patterns. Hereby, trendlines were most important for the results. A pattern from a visual analysis can be regarded as a relation between variables if at least three repetitions can be shown (Lane & Gast, 2014). Therefore, if the graphs of three or more participants exhibited the same pattern, they were put into the results.

For comparison across participants, further statistical analyses were done in IBM SPSS 28 for the first and second research questions. As the data were non-normally distributed, two Friedman's tests were done for RQ 1. One for SERATS, with pre-treatment mean SERATS, treatment-mean SERATS, and post-treatment mean SERATS as test variables. The second one was done for DERS, with pre-treatment mean DERS, treatment-mean DERS, and post-treatment mean DERS as test variables. Post-hoc analyses were done with Wilcoxon signed-rank tests. For the second research question, two Wilcoxon signed-rank

tests were done, as there were two levels (pre- and post-treatment) to be compared. The first was done for adaptive schema modes, with SMI-adaptive pre-treatment and SMI-adaptive post-treatment as test variables. The second was done for maladaptive schema modes, with SMI-maladaptive pre-treatment and SMI-maladaptive post-treatment as test variables.

Additionally, to analyse the third research question, difference scores of SMI-2 and ER were calculated. For SMI-2, pre-treatment scores were subtracted from post-treatment scores, once for adaptive and once for maladaptive schema modes. Difference scores for ER were calculated by subtracting the mean of the pre-treatment phase from the mean of the post-treatment phase. Following that, Spearman's rank-order correlations were done to determine the association between the change in ER and schema mode usage.

Results

Research Question 1: How do Mixed CATs Impact ER in PD Patients?

Visual Analysis

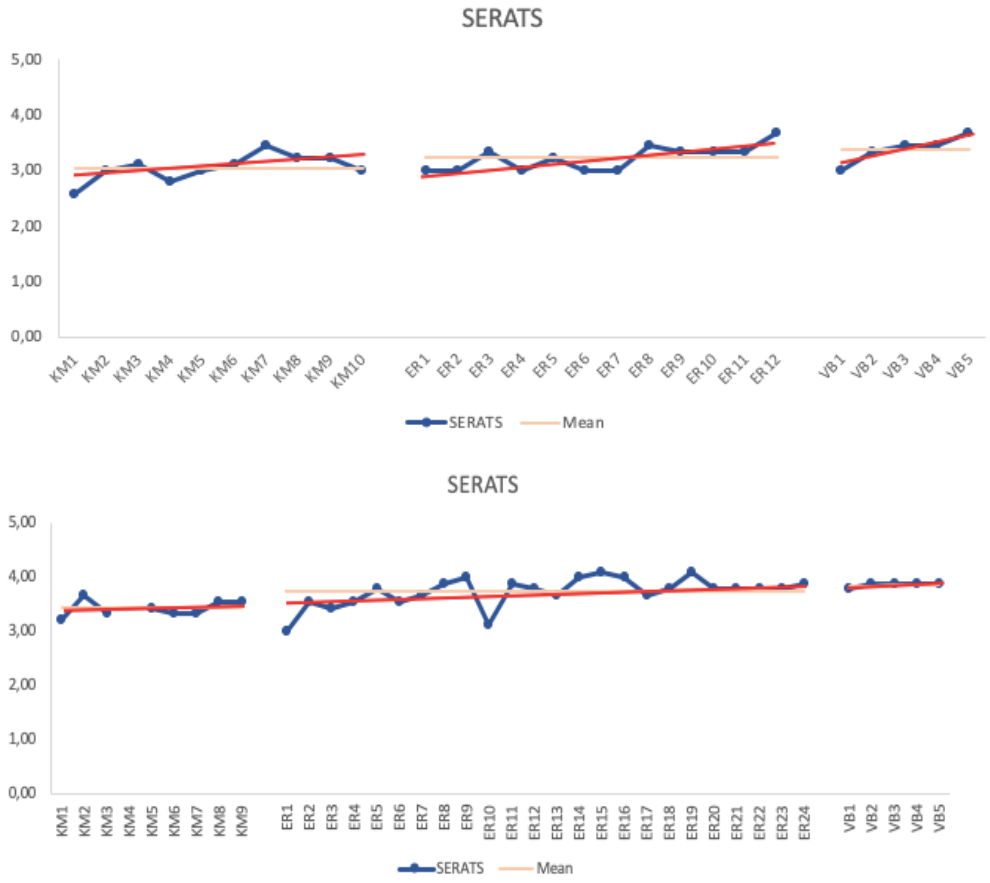
The following four patterns have emerged for SERATS: (1) high initial SERATS scores, (2) stability and fluctuations around the mean, (3) improvement across all conditions, and (4) post-treatment decrease. For DERS, the following three patterns were found: (1) higher fluctuations and reasonable stability, (2) decrease from pre-treatment to treatment phase, and (3) increase in post-treatment. Finally, two patterns were found irrespective of SERATS or DERS measurements. Three participants of the sample encountered a crisis and these patterns have emerged: (1) relative stability despite of crisis and (2) no increased fluctuations before the crisis.

SERATS. The first pattern showed high initial SERATS scores, even in the acquaintance phase for almost all acquaintance phase, for almost all participants. The second pattern found was a high stability. All participants showed only little fluctuations around the mean and almost all of the measurements fell within the stability envelopes. Only participants 002 and 006 have outliers outside of the stability envelopes (see Appendix A). Hence, data can be regarded as stable.

The third pattern that was found was the improvement across all conditions, regardless whether the change occurred within or between them. Participant 003 and participant 004 followed this pattern (see Figure 1).

Figure 1

SERATS graphs for participant 003 (top) and participant 004 (bottom)



Note. The trendlines in red increase across all conditions, highlighting improved ER over time.

Both participants had a longer duration of the treatment, suggesting that this might support improved ER development. However, participant 008 and 010, who also had longer treatment, did not show exactly the same pattern (for graphs, see Appendix B). Participant 010 deteriorated within the phases but improved from pre-treatment to treatment phase and from treatment phase to post-treatment phase. Participant 008 did not improve from pre-treatment to treatment phase but from treatment to post-treatment phase. Additionally, participant 007, who did not have longer treatment, also showed improvements within and between the conditions. The other participants were less homogenous and instead shifted between the improvements, stability, and deterioration. Therefore, as SERATS scores improved between conditions in almost all participants, one might conclude that CAT treatment improves ER in this population.

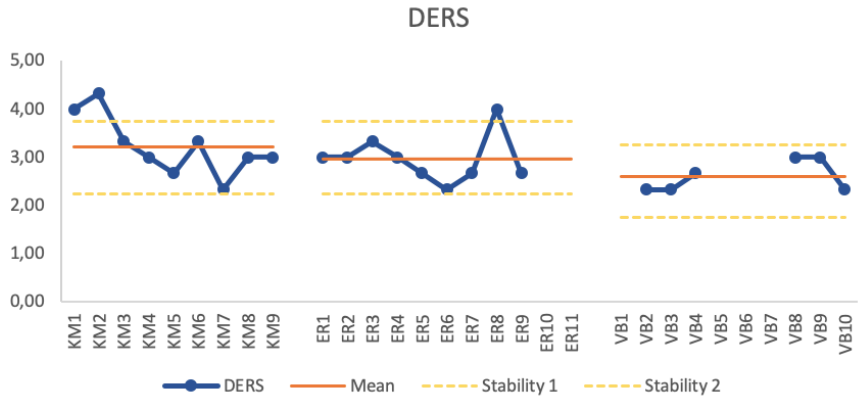
The final pattern was the post-treatment decrease. While SERATS scores increased during the treatment phase, they decreased in the post-treatment phase. This pattern could be

found for participants 001, 005, and 008. Interestingly, the means of the post-treatment phase were still higher than in the pre-treatment phase, except for participant 001. This participant only had two pre-treatment measurements which might explain this finding.

DERS. The first pattern was one of higher fluctuations around the mean than SERATS but with still high stability. The lowest percentage of data points that fell within the stability envelopes were found in participant 007, where three points crossed the threshold of the stability envelopes (see Figure 2). As this is a low number of data points, data were still regarded as stable.

Figure 2

DERS graph with stability envelopes, participant 007

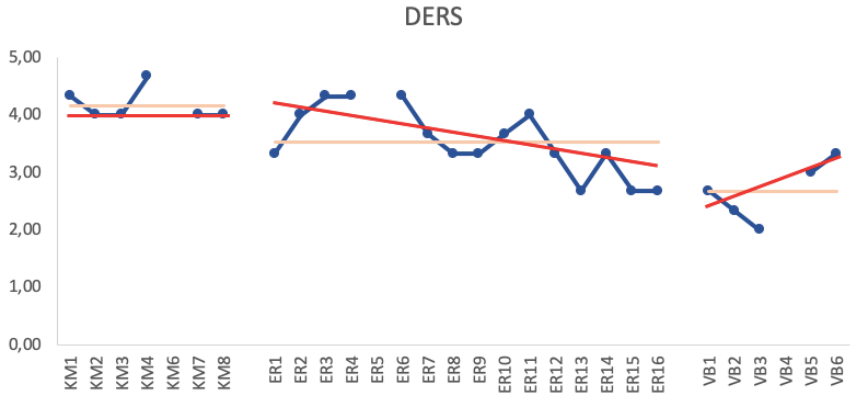


Note. Two measurements in the first (pre-treatment) phase and one in the second (treatment) phase fall outside of the stability envelopes.

Furthermore, the second pattern was the decrease of DERS scores from pre-treatment to treatment phase. This pattern occurred in 8 out of 11 participants. Only participant 006, 008, and 009 showed the opposite, that is DERS increasing or remaining stable (see Appendix B). As discussed in the methods section, a smaller DERS scores signals less difficulties in ER and therefore improved emotion regulation. This supports the found SERATS results. Even so, this change did not always continue into the post-treatment phase, where DERS scores either stayed stable or increased again, for example in participant 010 (see Figure 3).

Figure 3

Graph with trendlines DERS, participant 010



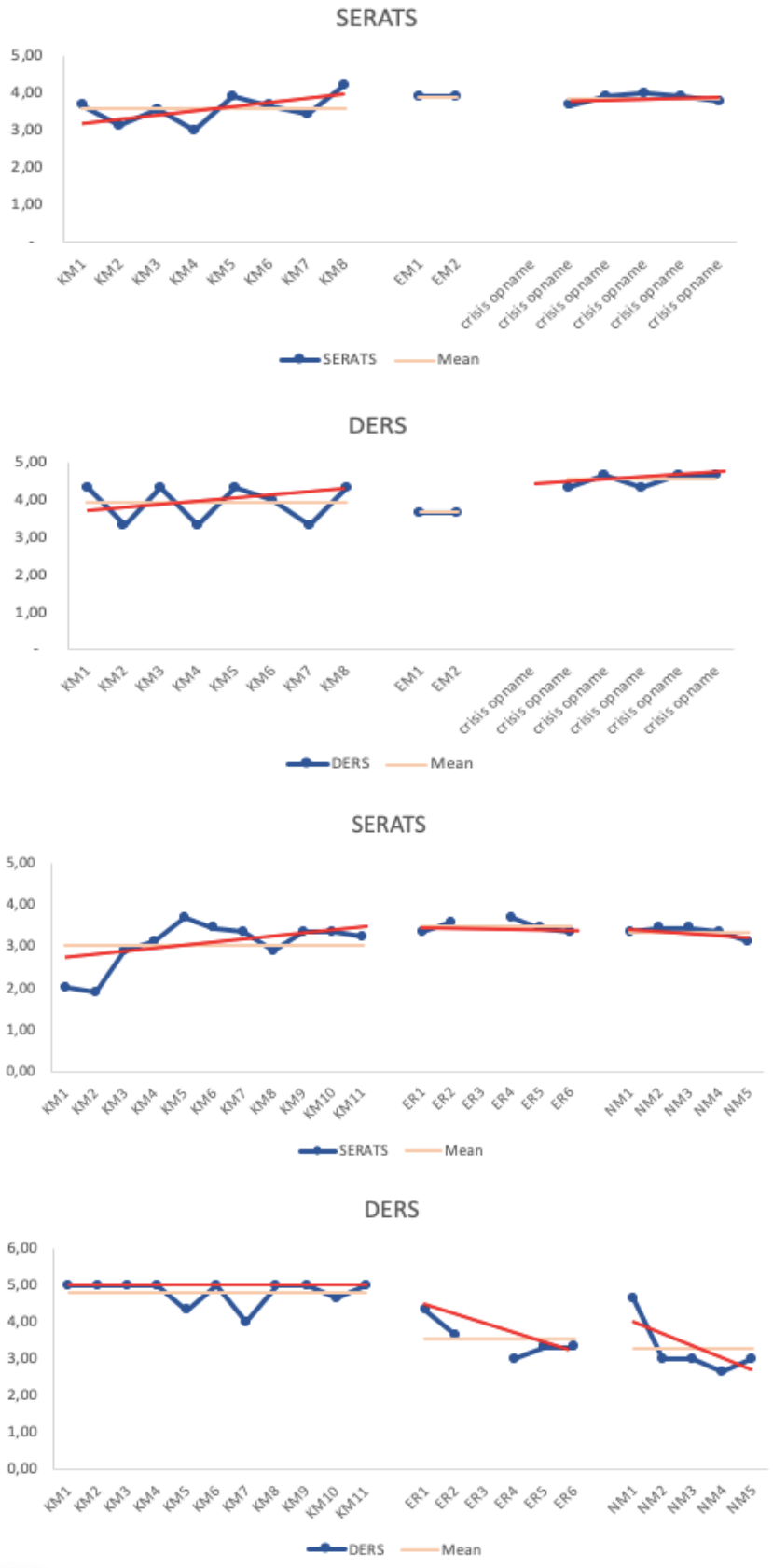
Note. This graph not only shows high fluctuations around the mean but also, the trendline (red) indicates an increase of DERS scores in the third (post-treatment) phase.

This increase in DERS scores in the post-treatment phase, which occurred after previous decrease could also be found in seven other participants and can thus be regarded as final pattern. The participants exhibiting this pattern were participants 001, 004, 005, 007, 009, 010, and 011 (for graphs, see Appendix B). Even so, the mean of the post-treatment phase remained lower than the mean of the pre-treatment phase, suggesting that despite the difficulties in ER increasing in the post-treatment phase, they did not get as bad as prior to treatment. Only participant 009, did not retain lower means in the post-treatment phase, which might be due to the crisis they encountered. This is in line with the fourth pattern of the SERATS scores (post-treatment decrease).

Crisis. The first pattern was the relative stability of ER despite of the crisis. Interestingly, participant 009 destabilised during the crisis (i.e. ER deteriorated) according to the DERS scores while their SERATS scores remained stable. And participant 002 deteriorated during the crisis only according to the SERATS scores while improving according to the DERS scores (see Figure 4).

Figure 4

SERATS and DERS graphs, participant 009 (top) and 002 (bottom)



Note. The trendlines (red) indicate changes within the phases.

The third participant (006) only had a short crisis during the treatment phase and no post-treatment measurements were available. Therefore, their development during the crisis could not be assessed.

The final pattern was the absence of increased fluctuations right before the crisis. The ER scores of all three participants showed no spikes right before the onset of the crisis (see Table 1). Only participants 002 had a high spike in their DERS scores right after the onset of the crisis (see Figure 5).

Table 1

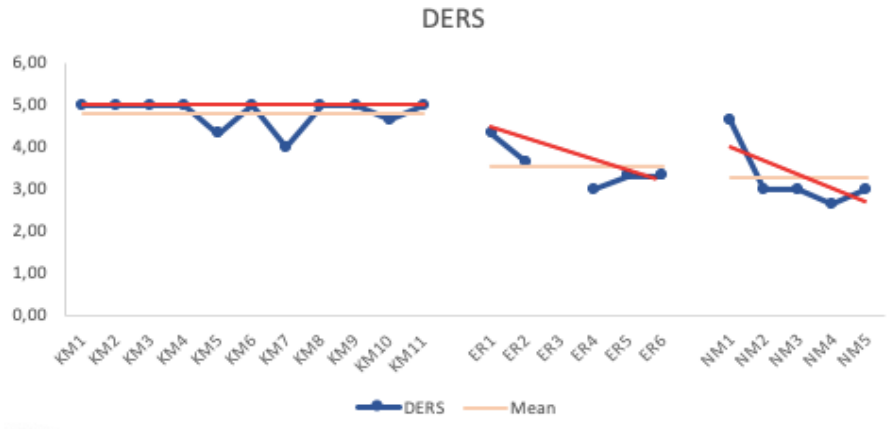
First and last scores in ER-phase

	ER-phase SERATS		ER-phase DERS	
Participant	First score	Last score	First score	Last score
002	3.33	3.33	4.33	3.33
006	2.56	2.56	4.67	4.67
009	3.89	3.89	3.67	3.67

Note. The last scores given were the scores right before the onset of a crisis.

Figure 5

DERS graph, participant 002



Note. NM1 was the first measurement after the crisis and shows a high spike in comparison to the rest of the measurements.

Therefore, a possible conclusion is that encountering a crisis have at most a minor effect on how ER improves, as all participants presented to be initially impacted by their crisis but stabilised afterwards.

Statistical Analysis

SERATS. Additionally, a Friedman's test was done with pre-treatment mean SERATS, treatment mean SERATS, and post-treatment mean SERATS as test variables. There was a statistically significant difference in ER as measured by the SERATS, $\chi^2 = 9.8$, $p = .007$. Post-hoc analysis was done with Wilcoxon signed-rank tests with a Bonferroni correction, therefore, the significance level was set at $p < .017$.

No significant differences between pre-treatment and treatment ($Z = -.978$, $p = .328$), pre-treatment and post-treatment ($Z = -1.886$, $p = .059$), or treatment and post-treatment ($Z = -1.988$, $p = .047$) were found. Median (IQR) SERATS scores for the pre-treatment, treatment, and post-treatment conditions were 3.14 (3 to 3.47), 3.34 (3.17 to 3.57), and 3.42 (3.35 to 3.85), respectively. Thus, while an overall difference was found, post-hoc analysis could not determine which levels differed significantly.

DERS. For DERS, another Friedman's test with pre-treatment mean DERS, treatment mean DERS, and post-treatment mean DERS was conducted. There was a statistically significant difference in ER as measured by DERS scores, $\chi^2 = 9.8$, $p = .007$. Wilcoxon's signed rank tests were used for a post-hoc analysis. The Bonferroni adjustment was applied and the significance level was set at $p < .017$.

Median (IQR) DERS scores for the pre-treatment, treatment, and post-treatment conditions were 4.17 (3.43 to 4.44), 3.53 (2.95 to 3.92), and 3.37 (2.65 to 3.77), respectively.

There was a statistically significant reduction in DERS scores from pre-treatment to treatment ($Z = -2.490$, $p = .013$). However, there were no significant differences between pre-treatment and post-treatment ($Z = -2.293$, $p = .022$) nor treatment and post-treatment ($Z = -1.580$, $p = .114$).

Research Question 2: How does a Mixed CAT Intervention as ER Treatment Impact Adaptive or Maladaptive Schema Modes?

The patterns that were found in the visual analysis were (1) an overall increase of adaptive schema modes and reduction of maladaptive schema modes, (2) ending the treatment with more adaptive than maladaptive schema modes, (3) starting with more maladaptive schema modes, and (4) initial increase of maladaptive schema modes.

Visual Analysis

The first pattern was an overall increase of adaptive schema modes and reduction of maladaptive schema modes could be seen across almost all participants (see Appendix C). Only participant 002, who encountered a crisis, showed an increase of both, adaptive and

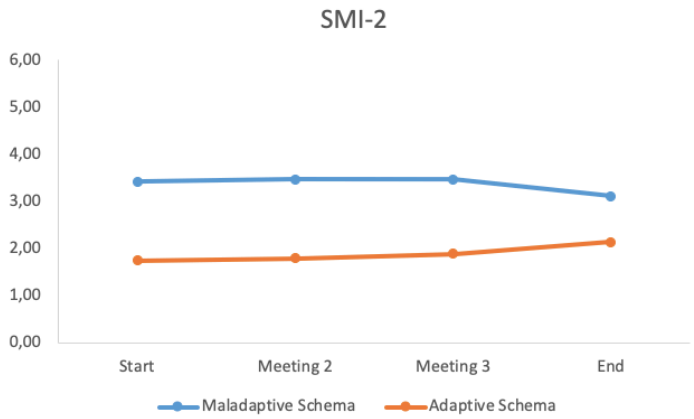
maladaptive schema modes. However, as mentioned previously, this participant dropped out of the treatment.

Moreover, the second pattern showed that, except for participant 002, 006, and 009, all participants ended the treatment with more adaptive schema modes than maladaptive ones (see Appendix C). This could potentially be explained by their respective treatment process: all three of them had a crisis during the ER-phase and in addition, participant 002 dropped out of the treatment and for participant 009 no SMI-2 data were available. While the crisis of participant 002 took multiple weeks, participant 006 had their crisis during week 27, followed by a few weeks without CAT treatment. This could suggest that an ongoing process of CATs facilitates changes in schema modes.

Interestingly, despite their crisis, participant 006 showed a trend to increasing adaptive schema modes and decreasing maladaptive schema modes regardless (see Figure 6), which could be due to their continued ER-treatment after the crisis.

Figure 6

SMI-2 graph, participant 006



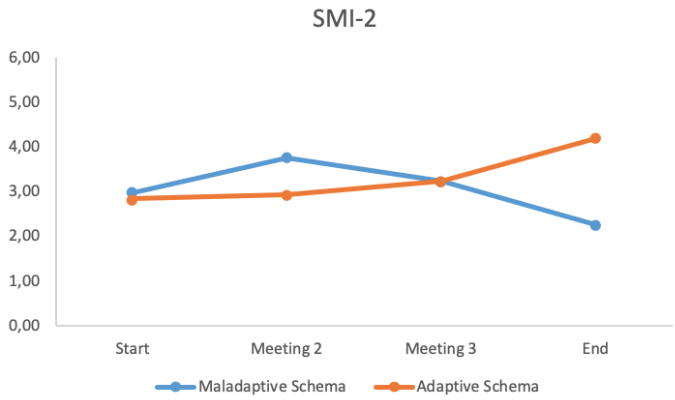
Note. Towards the end, a slight increase in adaptive and slight decrease in maladaptive schema modes can be seen.

Another characteristic pattern was that six out of 11 patients initially, i.e. in the beginning of treatment, had higher use of maladaptive schema modes, which often switched to a higher use of adaptive schema modes towards the end of treatment. The participants in questions were participants 002, 004, 005, 006, 008, and 010 (see Figure 6 for an example and Appendix C for all graphs). This means that after treatment involving a mixed CATs intervention, participants used more adaptive than maladaptive schema modes.

Additionally, during the treatment, for the participants 003, 004, 007, and 010, the usage of maladaptive schema modes briefly increased before decreasing (for an example, see Figure 7). Interestingly, the reverse pattern, meaning adaptive schema modes decreasing before increasing, rarely appeared in the adaptive schema modes.

Figure 7

SMI-2 graph, participant 010



Note. This graph is an example for the initial increase in maladaptive schema modes. For the rest of the graphs, see Appendix C.

Statistical Analysis

Adaptive Schema Modes. A Wilcoxon signed-rank test showed that a mixed CATs treatment elicited a significant change in adaptive schema mode usage (Z= -2.203, p= .028). Median SMI adaptive rating was 2.80 for the pre-treatment and 2.95 for the post-treatment.

Maladaptive Schema Modes. A Wilcoxon signed-rank test showed that a mixed CATs treatment did not result in a significant change in maladaptive schema mode usage (Z= -.700, p= .484). Median SMI maladaptive rating was 3.095 for the pre-treatment and 3.48 for the post-treatment.

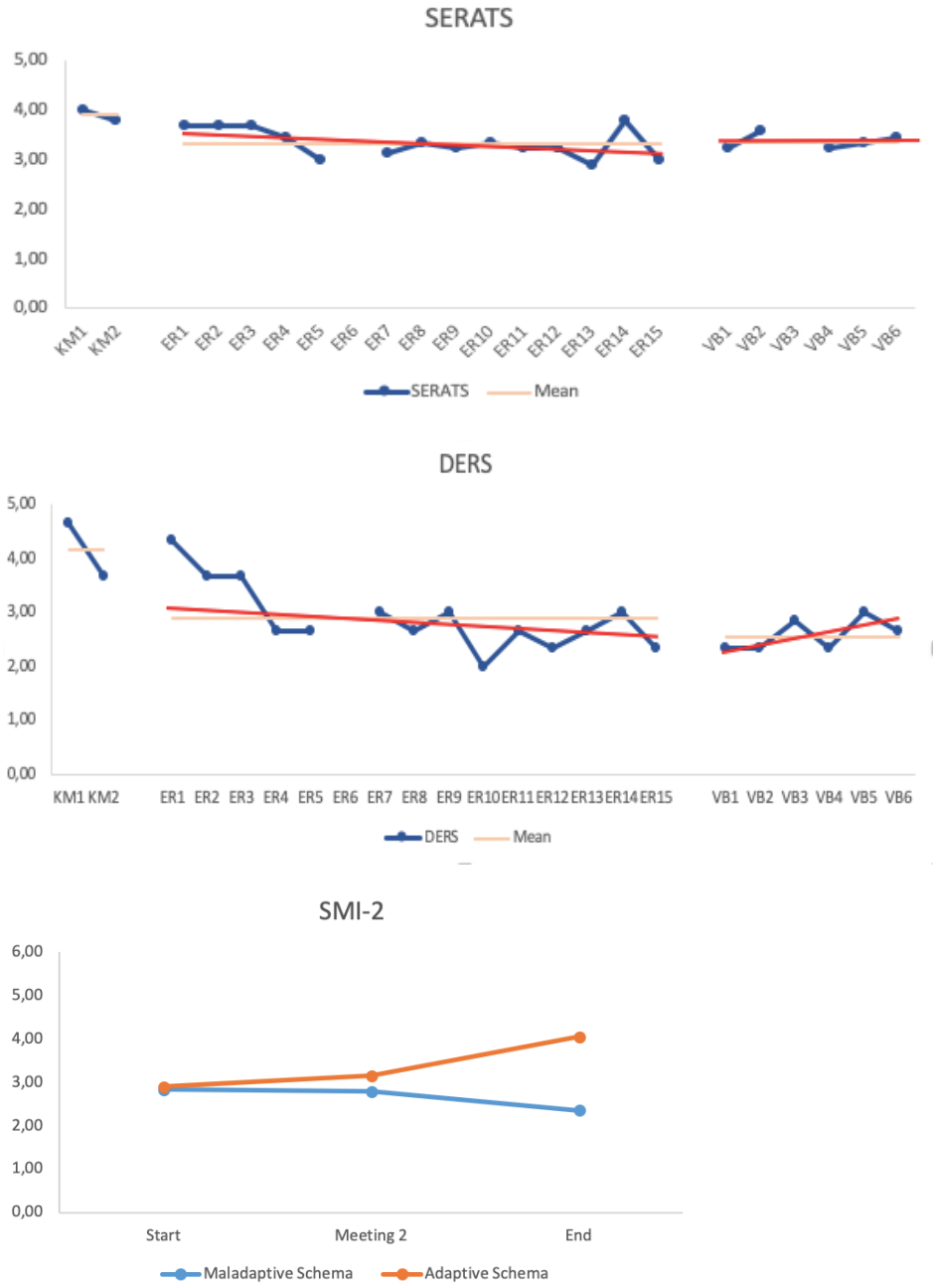
Research Question 3: Are ER Changes Related to Changes in Adaptive and Maladaptive Schema Modes?

Visual Analysis

One pattern could be found in the visual analysis, that is an increased use of adaptive schema modes and a decreased use of maladaptive schema modes while ER partially improved. Participant 001 showed this pattern. While their SERATS scores decreased during the treatment phase, the results of their DERS measurements showed improved ER (see Figure 8).

Figure 8

SERATS and DERS graphs with trendlines, and SMI-2 graph, participant 001



Note. As the pre-treatment condition only had two points of measurements, no trendline could be determined.

Participants 005, 007, and 010 also showed the same changes in schema mode usage, however, for participants 007 and 010, SERATS scores did not decrease. Additionally, participant 003 showed increased ER according to the SERATS but not the DERS

measurements. This suggests that improvements in ER is related to changes in schema mode usage, particularly in an increase in adaptive and decrease in maladaptive schema modes.

Statistical Analysis

Correlation.

Finally, Spearman's rank-order correlations were run to determine the relationship between SMI-2 and ER. The difference scores between pre- and post-treatment, once for adaptive and once for maladaptive schema modes, and once for SERATS and once for DERS, were used. As with the other analyses, SERATS and DERS were treated as separate measurements.

The relationships between adaptive schema modes and SERATS scores ($r_s(6)= -.072$, $p= .866$) and adaptive schema modes and DERS scores ($r_s(6)= -.431$, $p= .286$) were negative but not significant. Likewise, the tests for the relationships between maladaptive schema modes and SERATS scores ($r_s(6)= -.190$, $p= .651$) and maladaptive schema modes and DERS scores ($r_s(6)= -.476$, $p= .233$) were negative and not significant.

Discussion

This study investigated the relationship between mixed CATs and ER, as well as the relationship of ER and adaptive and maladaptive schema modes in PD patients.

Research Question 1: How do Mixed CATs Impact ER in PD Patients?

The results of the visual analysis showed general improvements for ER in both the SERATS and DERS scores. These findings were partially supported by the statistical analysis, where the Friedman's test for SERATS was significant but not the post-hoc analysis. The Friedman's test for DERS was significant, with the post-hoc analysis showing a significant change from pre-treatment to treatment. It is important to mention that, due to the low number of participants, statistical analyses have to be interpreted carefully. Generally, these results are mostly in line with the hypothesis and one can say that emotion regulation increased after mixed CATs treatment.

Various patterns for how this change was impacted were found. One of which was the duration of ER treatment. Some participants who showed thorough improvements on the SERATS scales had a longer duration of the ER-phase, suggesting that this could be beneficial to ER training. However, not all participants who had a longer duration of treatment also had improvements across all phases. Therefore, one could also conclude that those participants needed more time to develop the necessary ER skills and thus the longer treatment. In previous studies that conducted CATs treatment, albeit with single CAT

methods, treatment length was around 10 weeks with weekly sessions (Haeyen et al., 2018a) or 14 weeks (Abbing et al. 2019). Both studies found that the participants exhibited improved ER. However, Chiang et al. (2019) discussed how the dosage of CATs is still subject to research. They argued that there appears to be an association between the benefit of CATs and total treatment hours, as this also deepens the therapeutic relationship and aids clients in developing necessary skills. Thus, especially for a mixed CATs treatment, as present in this study, this should be carefully considered and evaluated. In conclusion, a long duration of CATs treatment could be beneficial, but developing an adaptable treatment length that is tailored to the clients' needs could also be postulated.

Another pattern was found in the post-treatment phase. For both, SERATS and DERS, emotion regulation deteriorated in the third phase. This raises the question about the durability of ER improvements through CATs. However, one has to consider the nature of the post-treatment phase. In the present study, the "connection phase" within the treatment was treated as post-treatment phase. Topics that were explored in this phase, such as trauma therapy, could be regarded as more difficult. Therefore, heightened emotions may have been elicited in the clients, thus presenting a tougher challenge for emotion regulation. That timing may have an impact on the efficacy of emotion regulation has been shown by Sheppes and Gross (2011). In their paper, they discussed how the impact of emotional intensity is dependent on the kind of regulation strategy that is used at what time. In their findings they showed how reappraisal of emotions, i.e. a new interpretation of a stimulus, is impacted by intense emotions. Even so, they also concluded that other ER strategies are not impacted, bringing about the question which strategies were relevant during the post-treatment phase. Gratz and Roemer (2004) explained how the DERS measures difficulties in ER across a variety of factors. The three scales assessed in the present paper were limited access to effective ER strategies, difficulties in goal-directed behaviour in the presence of negative emotions, and missing clarity of emotional responses. All of them are particularly important to the experience and regulation of negative emotions, which could have been highly present in the post-treatment phase. As most DERS scores increased during the post-treatment, suggesting higher emotion dysregulation, strong emotions in the post-treatment phase could indeed have impacted ER. Interestingly, while post-treatment scores indicated worse ER, they stayed below the mean level of the pre-treatment, which suggests that people without a mixed CATs treatment may have faced bigger challenges during the connection phase of the schema focused treatment (SFT) which is in line with the findings by Videler et al. (2018) who suggested using experiential treatment methods in addition to CBT techniques.

Finally, one has to consider the three participants who encountered a crisis. Interestingly, only one participant destabilised within the crisis while another even showed improvement. On top of that, no spikes right before the onset of a crisis was found. This conflicts with results of Borschmann and Moran (2011), who discussed that emotionally distress caused by a precipitating event usually precedes a crisis in Bipolar Personality Disorder (BPD) patients. Therefore, the results of the present study suggest that the crises and their onset could have been experienced as more intense without CATs treatment. However, no further supporting literature was found, thus, future studies should attempt to replicate these findings.

Research Question 2: How does a Mixed CAT Intervention as ER Treatment Impact Adaptive or Maladaptive Schema Modes?

In the visual analysis, a reduction of maladaptive and increase in adaptive schema modes was found. However, in the statistical analysis, only the results of the adaptive schema modes were significant. Therefore, the analysis suggested that a mixed CATs treatment may lead to more adaptive schema mode usage, thus the hypothesis was partially confirmed.

In a first pattern, it was shown that all participants ended the treatment with more adaptive than maladaptive schema modes overall. While a first interpretation could be that this is due to the CATs intervention, this has to be critically examined. The nature of this analysis used data from the SMI-2 across the entire treatment context for its visual analysis to assess global trends. The more specific statistical analysis only used the measurements from before and after the treatment phase. As the change between more adaptive than maladaptive schema modes often appeared towards the end rather than right after the treatment phase, one could attribute this change to the entire nature of the inpatient SFT. This is supported by Wolterink and Westerhof (2018), who found that PD patients improved more in the latter half of the treatment. Even so, previous research has shown that AT can be connected to higher use of adaptive schema modes (Haeyen et al., 2018a), thus CATs may still have had an effect.

Another pattern appeared for the crisis patients. None of them ended the treatment with more adaptive schema modes, which might suggest that a crisis impacts the development of schema modes. Even so, one has to consider that these patients dropped out of the treatment and one participant did not fill in the post-treatment questionnaires. Interestingly, while they did not fill in more ER-questionnaires, their remaining SMI-2 results showed a slight increase in adaptive schema modes and decrease in maladaptive schema modes. This could suggest that picking up ER-treatment after a crisis could be beneficial for a change in schema modes. This is relevant as little research could be found on crisis management.

Borschmann and Moran (2011) discussed recommendations for dealing with crises in BPD patients, such as risk assessment or training coping strategies, and highlighted the need for more research on the topic. Additionally, previous research has shown that added crisis support had no effect on treatment outcome in an outpatient BPD treatment (Nadort et al., (2009). Even so, these findings assessed dealing with a crisis rather than moving forward after a crisis and how it does or does not affect continued treatment. However, this study cannot make certain claims, as the crisis participants did not continue with the research.

A final result showed how in some cases, maladaptive schema modes briefly increased before decreasing. This could be explained in light of the nature of the post-treatment phase. As mentioned previously, the post-treatment phase for this study was simultaneously the connection phase of the treatment, which involved intense therapy. Not only did participants struggle with ER, but also maladaptive coping modes increased, supporting the findings by Sheppes and Gross (2011) and the previously discussed assumption that high intensity emotions not only impacted ER but also maladaptive schema modes use. In turn, this may also explain the non-significant results for the statistical analysis of maladaptive schema modes.

Research Question 3: Are ER Changes Related to Changes in Adaptive and Maladaptive Schema Modes?

In relation to SERATS and DERS scores, the results of the visual analysis only partially confirmed the hypothesis. While adaptive schema modes increased and maladaptive schema modes decreased, the two ER measurements showed conflicting results. In some occasions, DERS scores decreased while SERATS scores decreased as well. As described previously, a lower DERS score signals less difficulties in ER, while a decreased SERATS score suggests lower ER. However, a potential explanation could be given by the nature of the questionnaires. The SERATS was specifically designed to measure ER and self-expression in art therapy (Haeyen et al., 2018b) thus some participants may have assessed themselves more positively during CATs than generally or when they are overwhelmed, as is done by the DERS (Gratz & Roemer, 2004). Other participants may have done so vice versa. Hence, there may be individual differences in the assessment of own ER skills which could point towards the necessity of patient tailored treatment and research options.

Finally, while the correlation results were not significant, they give a global overview of the direction of the relationships. The hypothesised direction of the use of adaptive schema modes increasing when ER improved could only be found for DERS measurements. In contrast, the hypothesis of a decrease in maladaptive scores with improved ER could only be

found for SERATS measurements. Therefore, it could be suggested that less difficulties in ER allow for a higher use of adaptive schema modes, while maladaptive schema modes could be impacted by improved ER skills through CATs directly. This is contrary to previous literature, which has found an association between ER and schema modes, with adaptive modes increasing and maladaptive modes decreasing (Salgó et al., 2021). Additionally, Wolterink and Westerhof (2018) discussed how the decrease of psychological distress is related to the decrease of more specific modes, namely child and parent modes. Thus, a more distinctive view on what schema modes may be impacted could be interesting to analyse for ER. Finally, as CATs treatment has been proven to improve ER (Haeyen et al., 2015; Haeyen et al., 2018a), the direction of association between a decrease in maladaptive schema modes and an increase in SERATS scores suggests an impact of the CATs treatment.

Limitations and Strengths

The nature of the research design has brought about a number of limitations. For one, for the DERS measurements, only three questions were used. One could bring into question whether this could have impacted the stability: DERS scores showed a higher fluctuation around the mean than SERATS scores. However, as discussed previously, the fluctuations were not that big and almost all of them still fell within the stability envelopes. Therefore, the fluctuations might result from the nature of the questionnaires themselves: the SERATS measured ER specifically for CATs (Haeyen et al., 2018b) and DERS ask more generally about difficulties in ER, for instance when they get overwhelmed (Gratz & Roemer, 2004). Therefore, DERS scores may vary depending on the experiences of the participants.

Moreover, there is no uniform and consistent way to analyse and report visual data. Lane and Gast (2014) provided a good guideline with a thorough list of steps to follow. Even so, their article discusses an analysis across two conditions. The present paper used three conditions, therefore, the steps in the article had to be adapted and some steps were left out. As this was based upon the assessment of the researchers, the resulting analysis might show some pitfalls. Ledford et al. (2017) moreover discusses the lack of consistency when reporting the results of visual analysis in SCED. Even so, this paper documented the method clearly to allow future research to replicate its findings.

Another limitation is the way the SMI-2 data was used in analysis. For the visual analysis, more measurements were included than for the statistical analysis, which used a pre-treatment and post-treatment comparison. Thus, these results are difficult to put into context and one should consider to use the same amount of measurements for both analyses.

Additionally, all of the statistical analyses have the pitfall of a small sample number and therefore have to be interpreted with caution. They were used to give a more general direction which should be attempted to be replicated with larger sample numbers. While some significant effects were found over time, post-hoc analyses proved more challenging. A possible reason could be lower statistical power due to even smaller samples in the listwise comparison, particularly as some participants missed data in some phases.

Even so, single case experimental designs have an important strength. SCEDs provide a detailed look into data of individuals, allowing in-depth analyses of how a change occurs between treatment and baseline. This can support researchers and treatment specialists in finding patient tailored treatment interventions. However, the present study did not discuss the therapy process and context, or detailed information about the patients (e.g. specific ER problems) which might also have contributed to the findings. Another strength is the population. This intervention was given to a clinical population, hence the recommendations are applicable in praxis.

Suggestions for Future Research

As this is a novel treatment with mixed CATs, further research could apply such treatment across a variety of different populations for which CATs treatment has proven beneficial, such as children and adolescents (Bosgraaf et al., 2020) or elderly (Im & Lee, 2014), and different mental disorders, such as depression (Dunphy et al., 2019) or anxiety (Abbing et al., 2019; Kapitan, 2012).

Furthermore, the present paper suggests the importance to look at the impact of crises and treatment length, and gives insights into how these might impact ER development. However, one could also assess the mixed CATs intervention in more detail. De Witte et al. (2021) explained the importance of change process research, that is how and why therapy causes changes, in CATs research. The authors concluded that researching change can help, for instance in finding therapeutic factors that impact the change and improving the interventions used. Other research has explored such questions. De Witte et al. (2020) discussed how music therapy can either use active improvisation or receptive interventions, whereby simplicity and structure appeared as important change process factors. Moreover, Kapitan (2012) discussed different factors possibly impacting AT, such as the role of the therapist and materials used. Thus, future research could attempt to define change process factors in a mixed CATs intervention.

An example that has been previously discussed is therapist behaviour. Bosgraaf et al. (2020) established three different therapist behaviours, directive, non-directive, and eclectic.

While they found significant results for all forms, non-directive behaviour, meaning the therapist facilitates and follows the client, yielded the most significant results. Furthermore, they suggested that therapist behaviour can be fitted to the client's needs. Hence, future research could assess how different therapists positively or negatively impact the change in ER through CATs treatment. This is especially relevant, as the treatment administered was a mixed CATs treatment, thus differences in therapist behaviour according to the different CATs participants received may be an interesting area to explore.

Another recommendation would be to observe patients' experiences of CATs. Van den Broek et al. (2011) discussed how CATs facilitate the process of eliciting and reprocessing emotions, however a study by Haeyen et al. (2015) found that patients did not always find AT to be safe and were hesitant and threatened by the prospect of exploring their feelings in such a manner. The authors highlighted that practitioners should not simply assume AT to be accessible. Thus, it could be interesting to apply this to the present setting, potentially getting a more thorough look at the change in the post-treatment phase and how it was impacted, especially as emotionally challenging topics, such as trauma, were treated in that phase.

Two final recommendations could be to include the entire DERS questionnaire and to do a similar study with a larger sample to support or disprove the statistical results in the present paper.

Implications

This study provides more insight into CATs research in a multidisciplinary context, as suggested by Haeyen et al. (2018a). Patients with complex PDs may have difficulties in accessing and regulating their emotions (Akwa GGZ, n.d.; Volkert et al., 2018) and the addition of experiential techniques like CATs may be preferable, as proposed by Videler et al. (2018). Therefore, by introducing a mixed CATs treatment within an SFT for PD, which has not been done by previous studies, this paper adds to the current state of the art. The findings propose that a mixed CATs intervention could function as additional treatment method for PD, complementing the paper by Haeyen et al. (2020) which found art therapy to be a beneficial addition for emotional functioning. Moreover, using multiple CATs in an intervention may benefit patient tailored treatment, as it gives multiple approaches for different people and allows them to process their emotions in a multimodal way. Next to that, the presented patterns also give insights into how mixed CATs can be implemented, for instance by discussing length of the treatment. As results seemed to be lost over time, one might suggest including booster sessions of CATs.

Moreover, the SERATS is a relatively new measurement device that needs more research (Haeyen et al., 2018b), which has been done in this study. A novel addition was to use the SERATS for CATs research instead of only AT. The findings of the present paper suggest that the SERATS is indeed usable for CAT research.

Furthermore, as the present study used three CATs methods, further studies should explore different and more combinations of CATs, to expand the knowledge on using mixed CAT methods in treatment and find the combinations that yield the best possible treatment outcomes. For example, McCaffrey et al. (2011) found music therapy (MT) to be beneficial for patients who struggle with participation in therapy and social relation. As people with PDs are known to often encounter interpersonal conflict (Volkert et al., 2018), a mixed CAT intervention with added MT might be an interesting area for future research.

Finally, the findings for the crisis patients are relevant as they give first insights into how to deal with crises in inpatient treatment for PD, particularly as crises are common in this population. As the participants stayed mostly stable, CATs might serve as protective factors to avoid crises from being more intense.

Conclusion

In conclusion, this study explored the relationships between mixed CATs treatment and ER in PD patients and mixed CATs treatment and schema modes in PD patients. The results replicate previously found associations, such as that CATs are related to improved ER and adaptive schema modes and decreased maladaptive schema modes. This study adds to that by highlighting the same results in a mixed CAT intervention for PD patients, which is the first study to assess such an intervention, to the author's knowledge. Additional suggestions were made for how these relationships were impacted, for instance through the nature of the post-treatment phase, ER-treatment length, or occurrence of a crisis.

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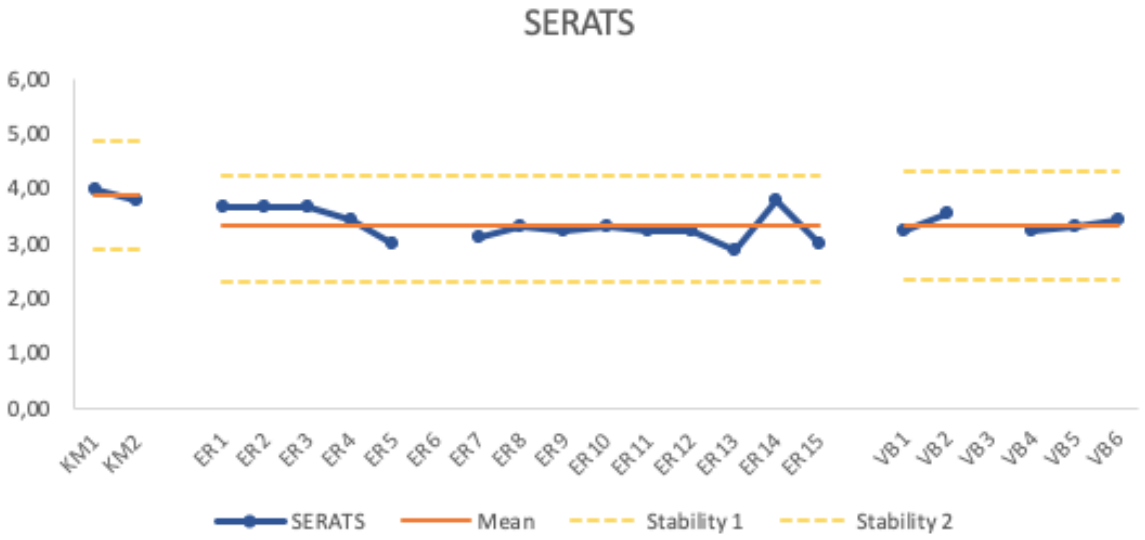
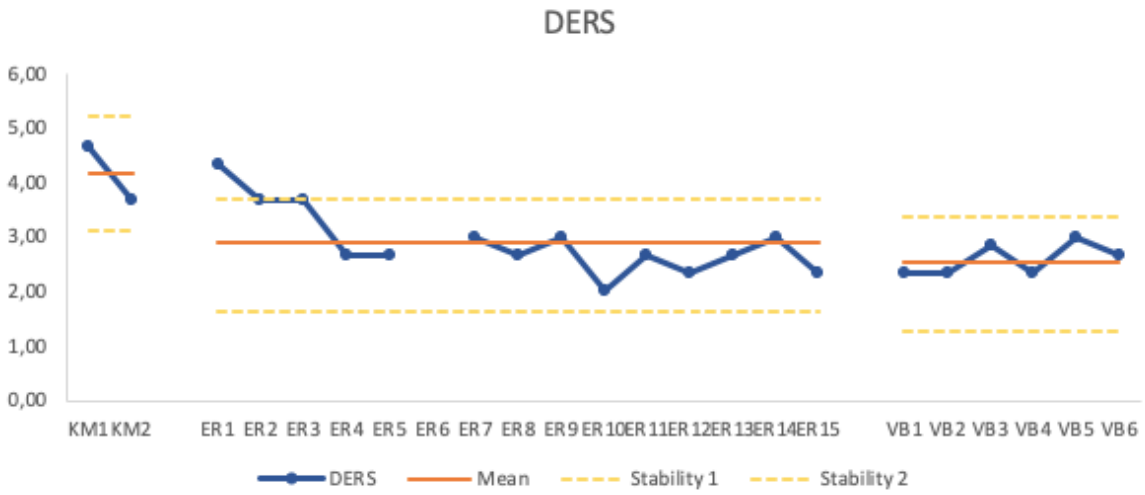
Appendix A

SERATS and DERS graphs with stability envelopes for each participant

Participant 001





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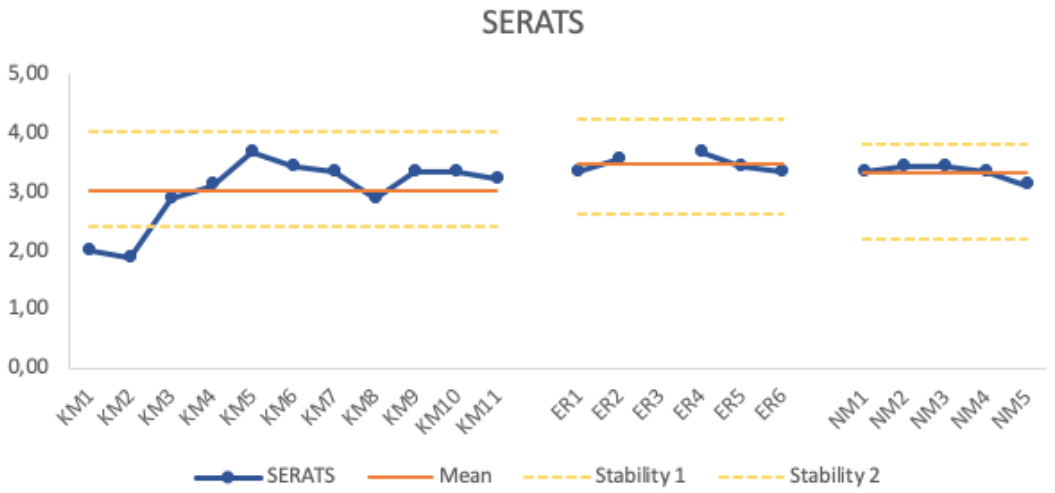

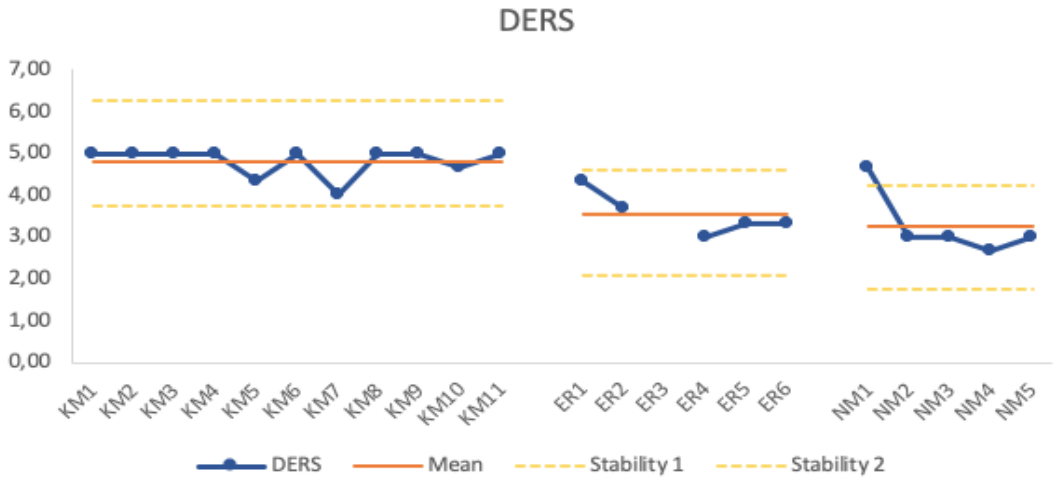

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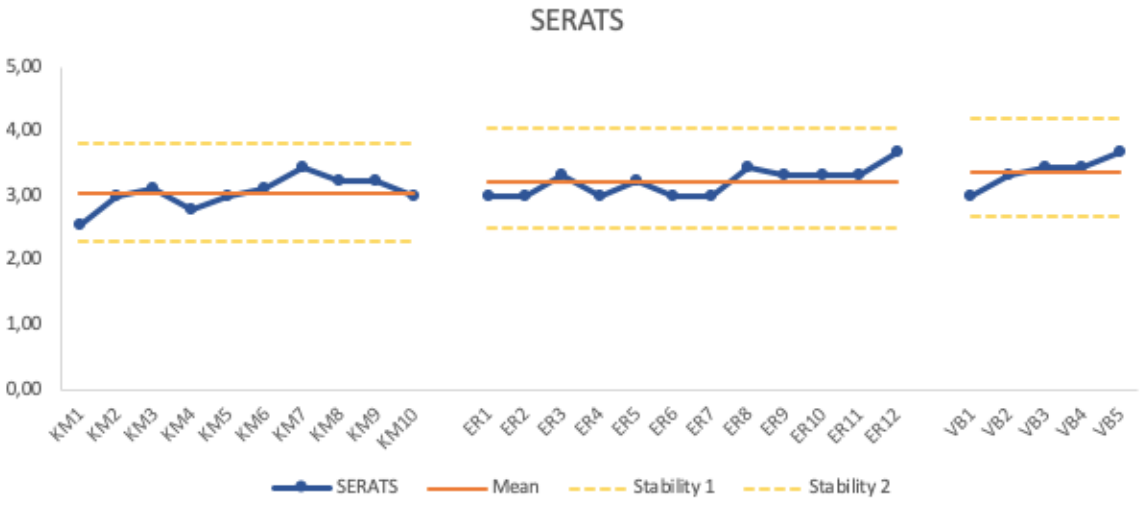

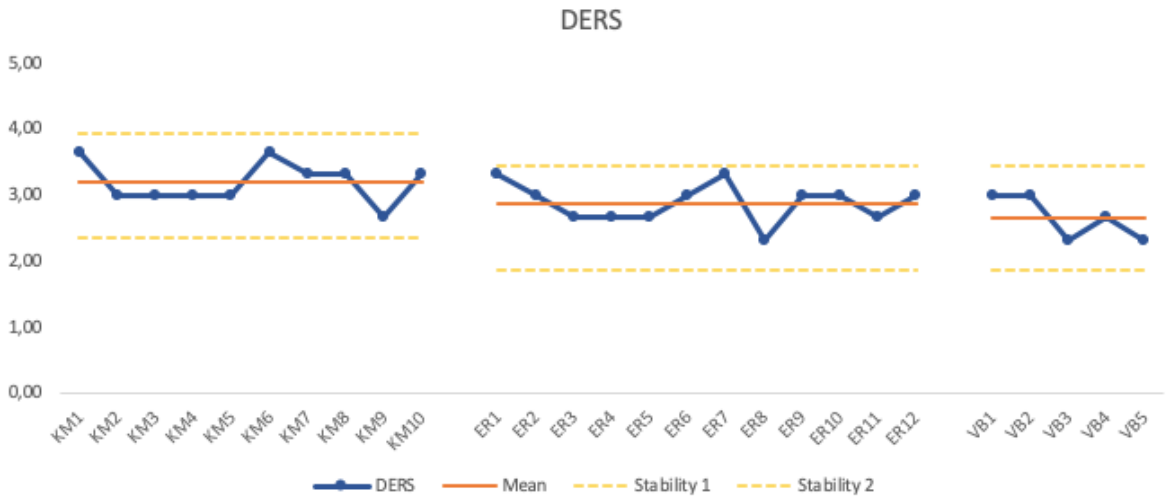

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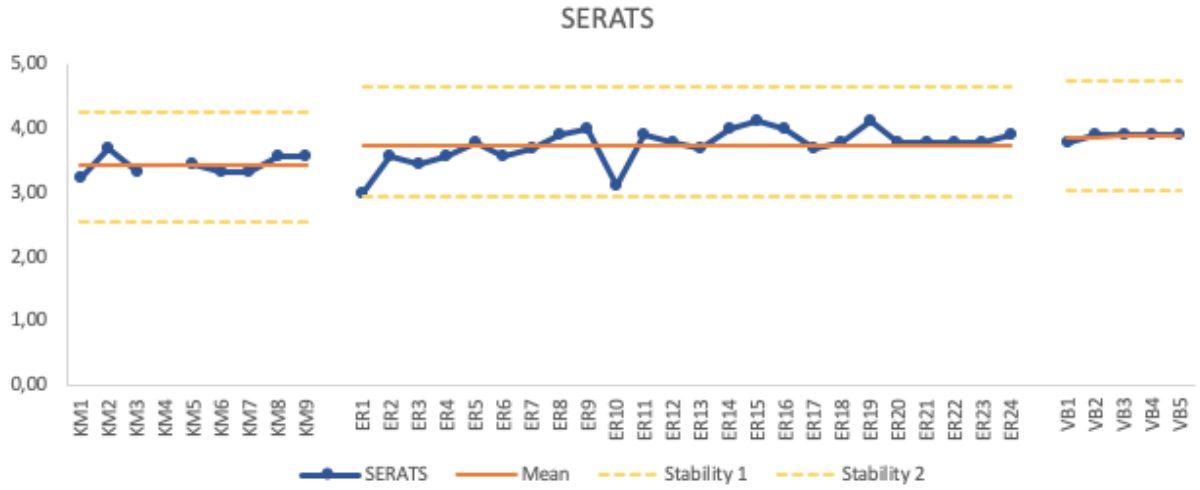

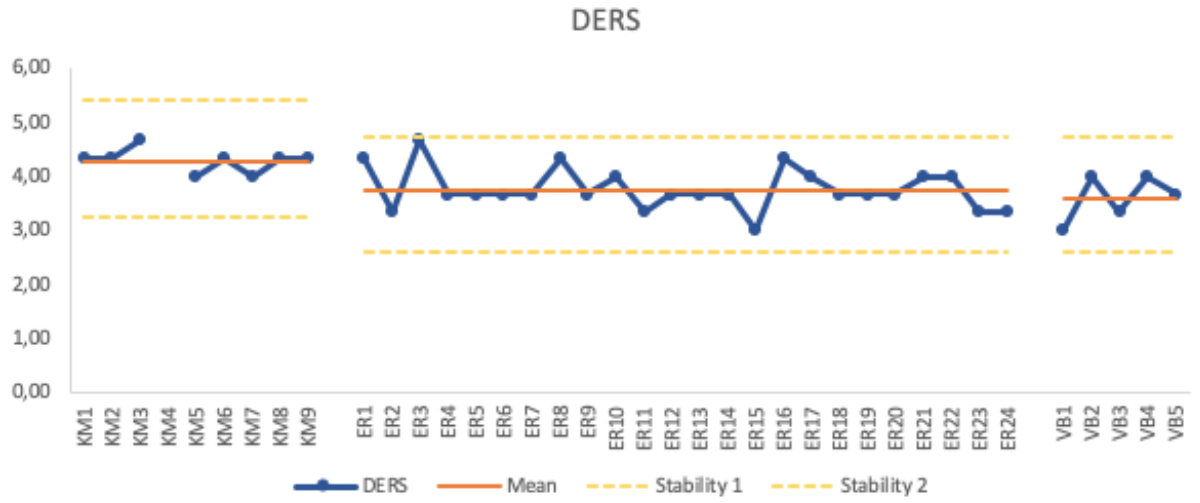

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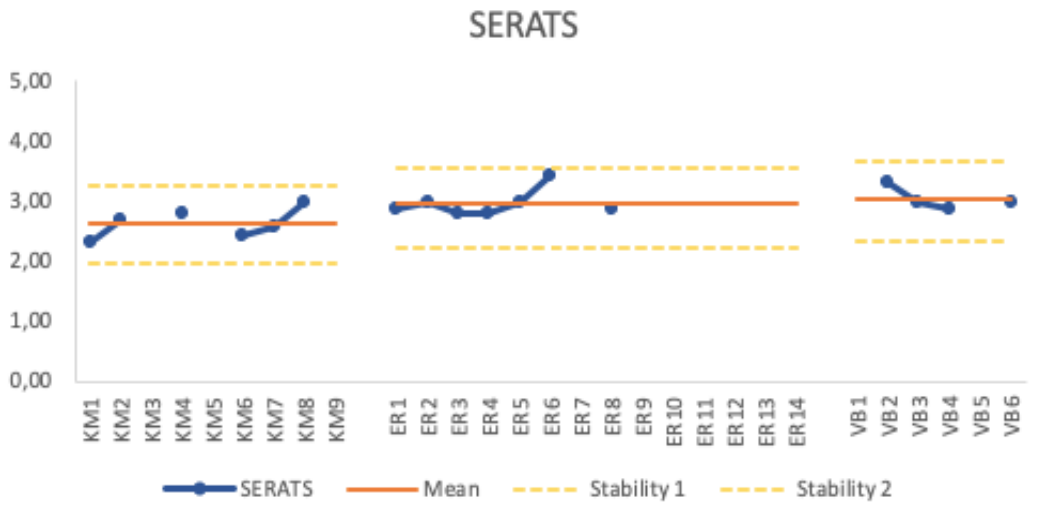

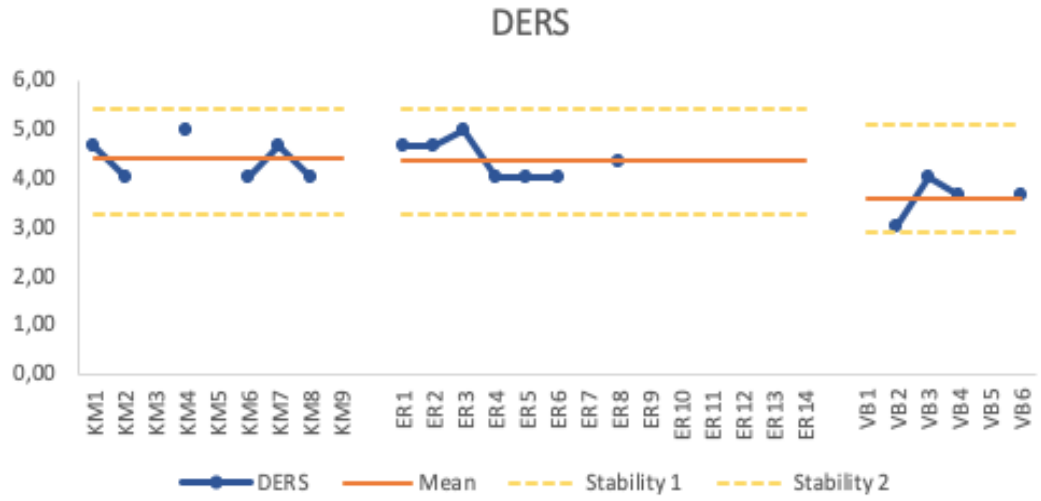

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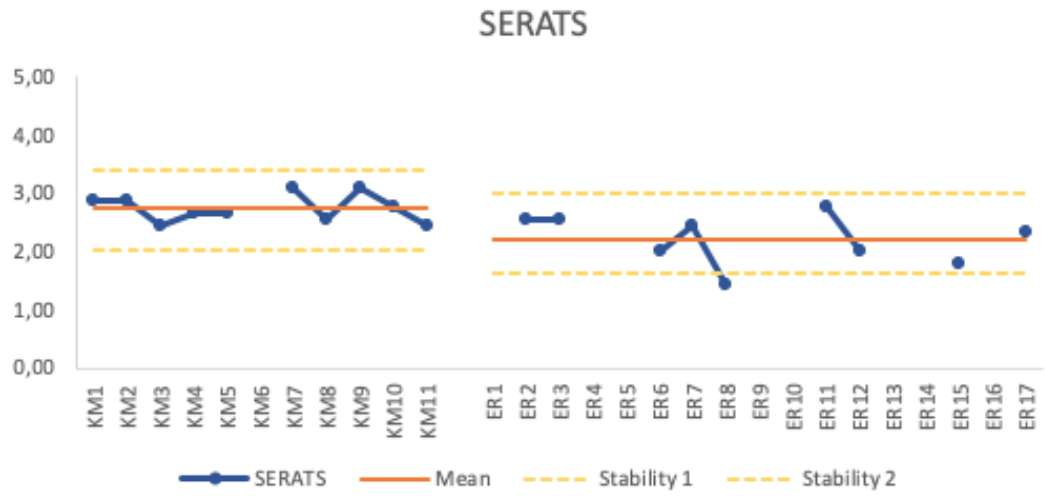

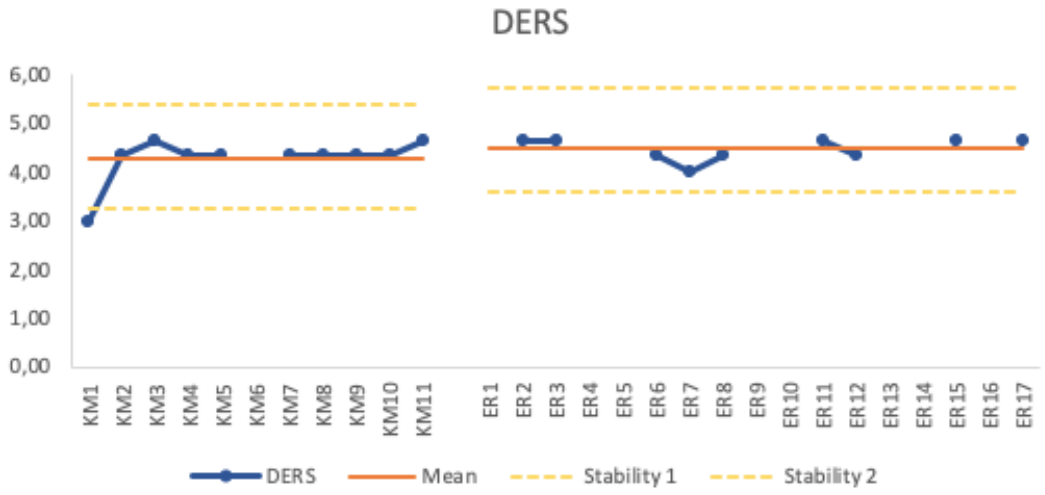

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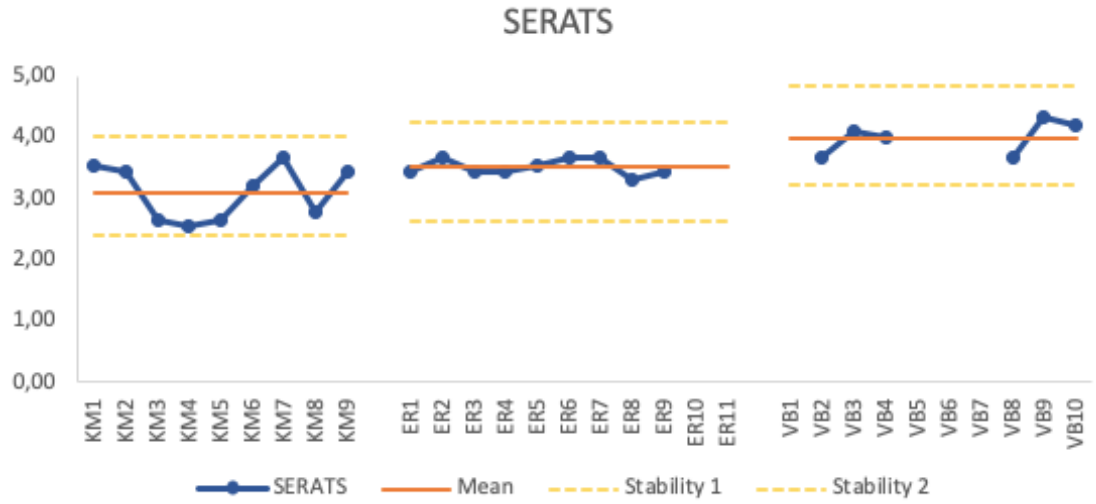

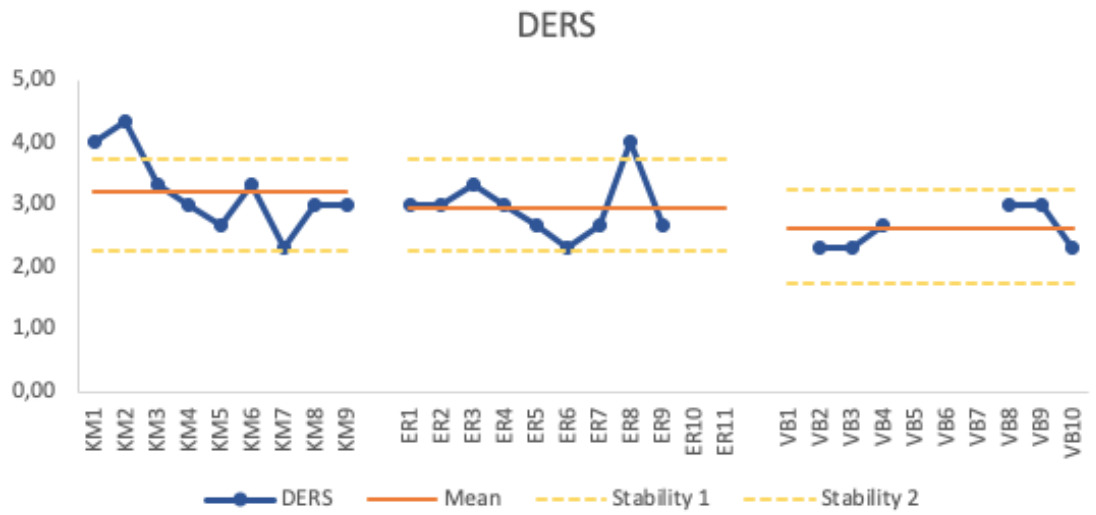

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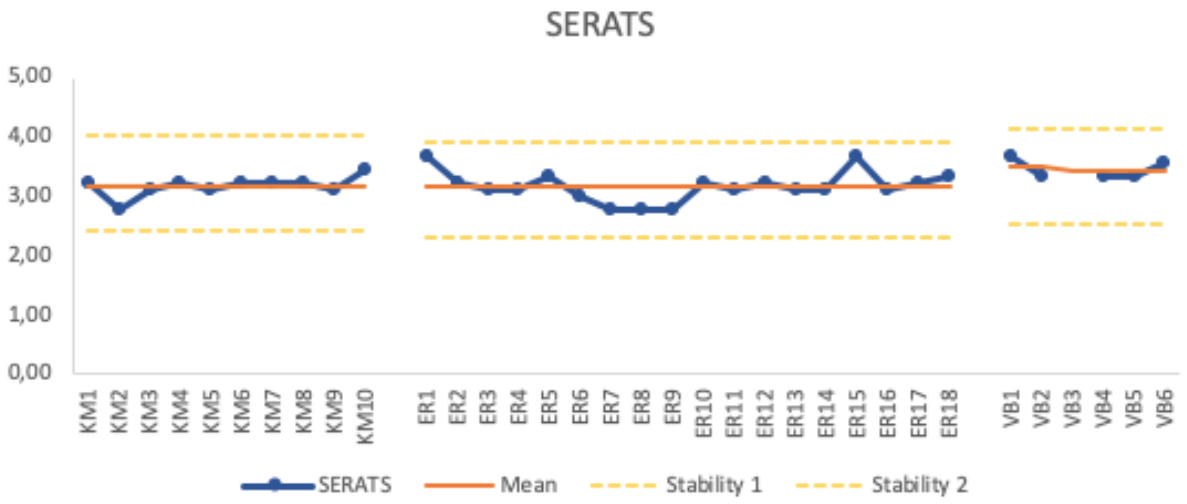

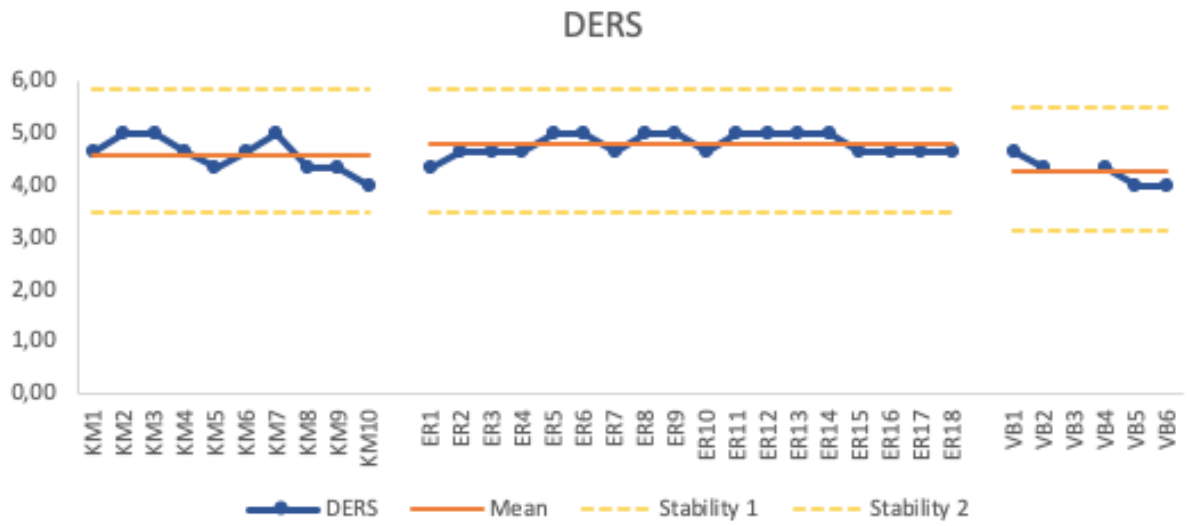

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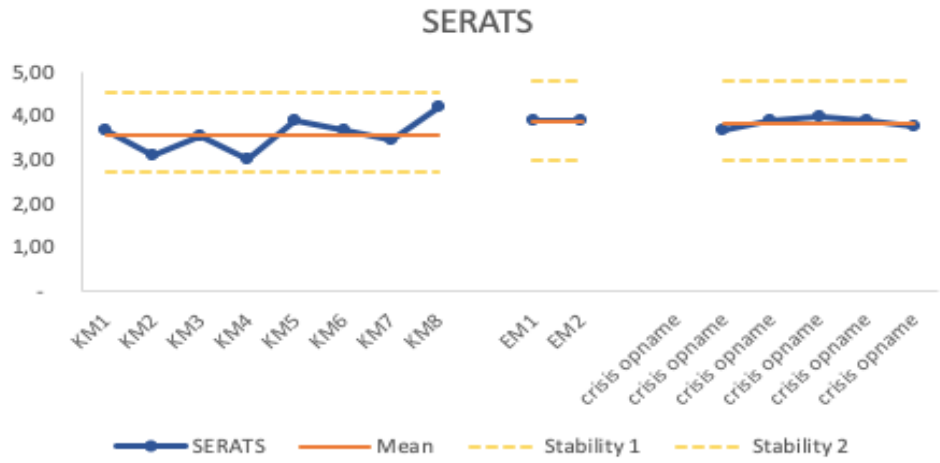

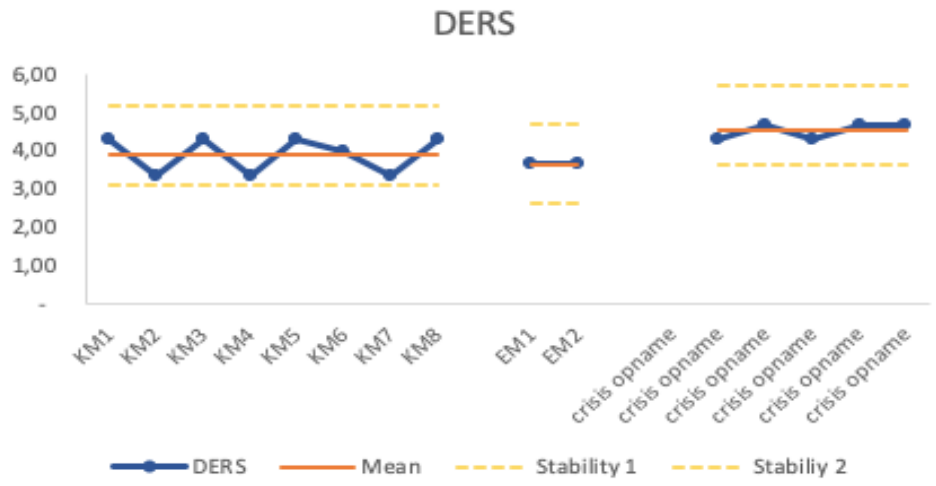

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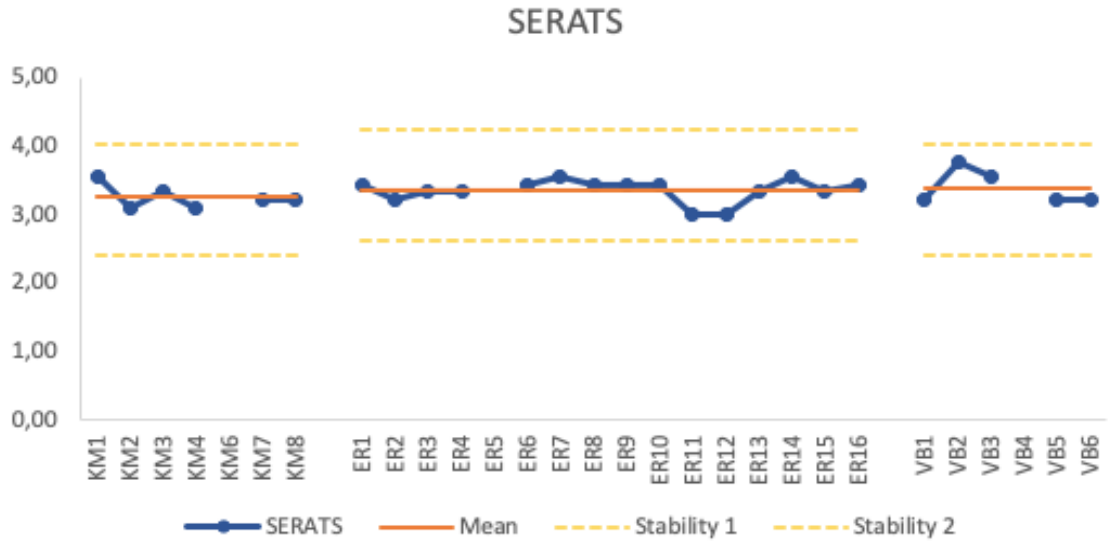

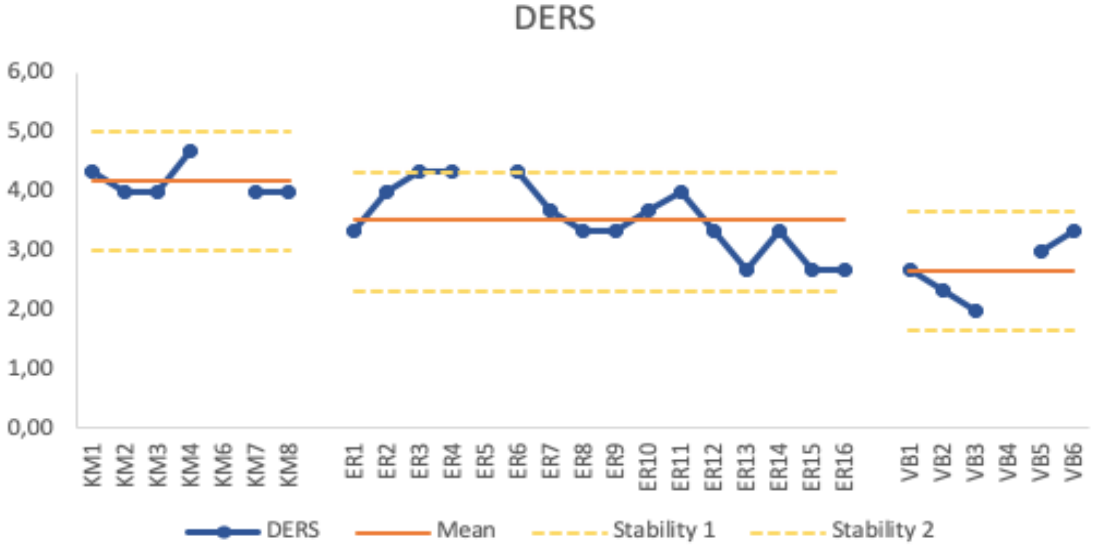

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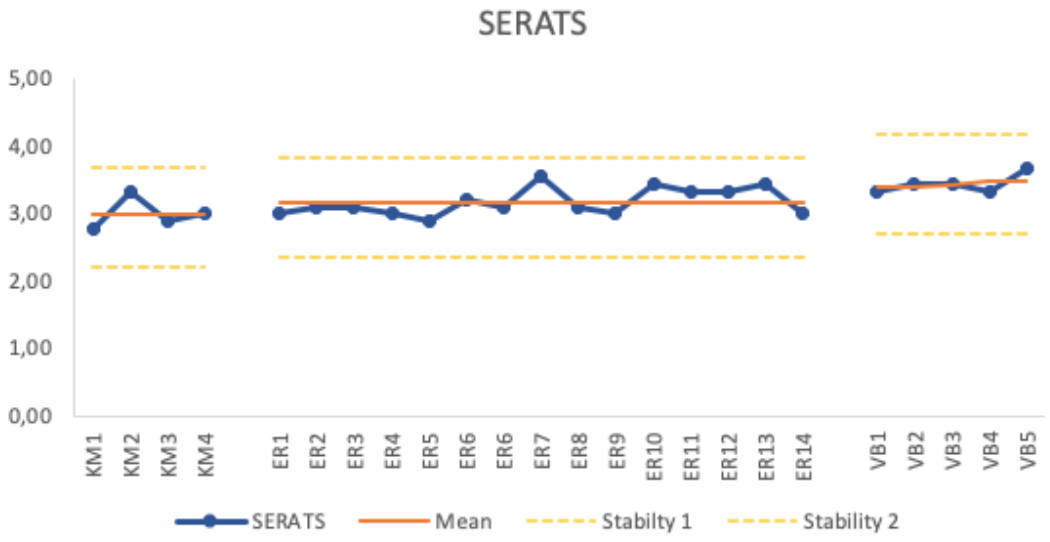
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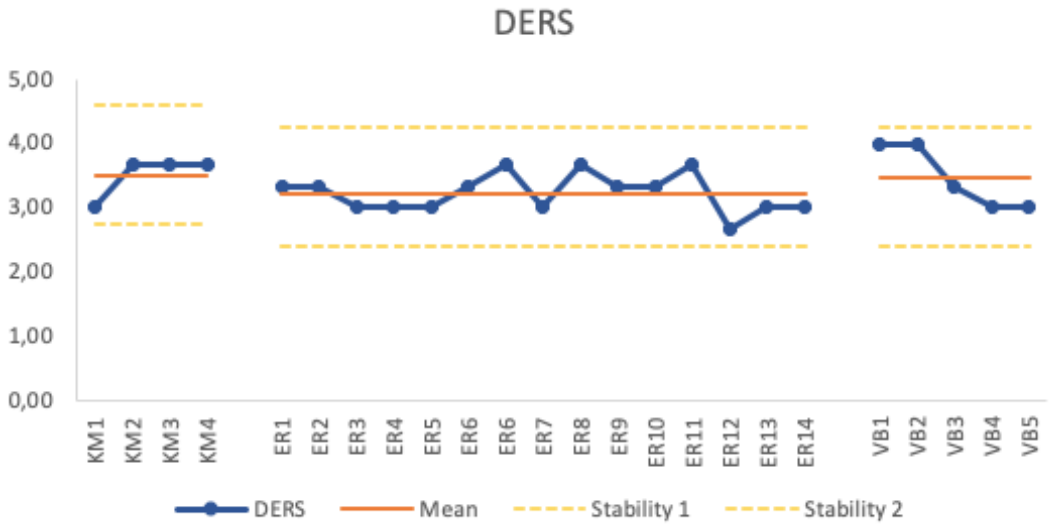
VB4
VB5
SERATS
Mean
Stabilty 1
Stability 2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ER13
ER14
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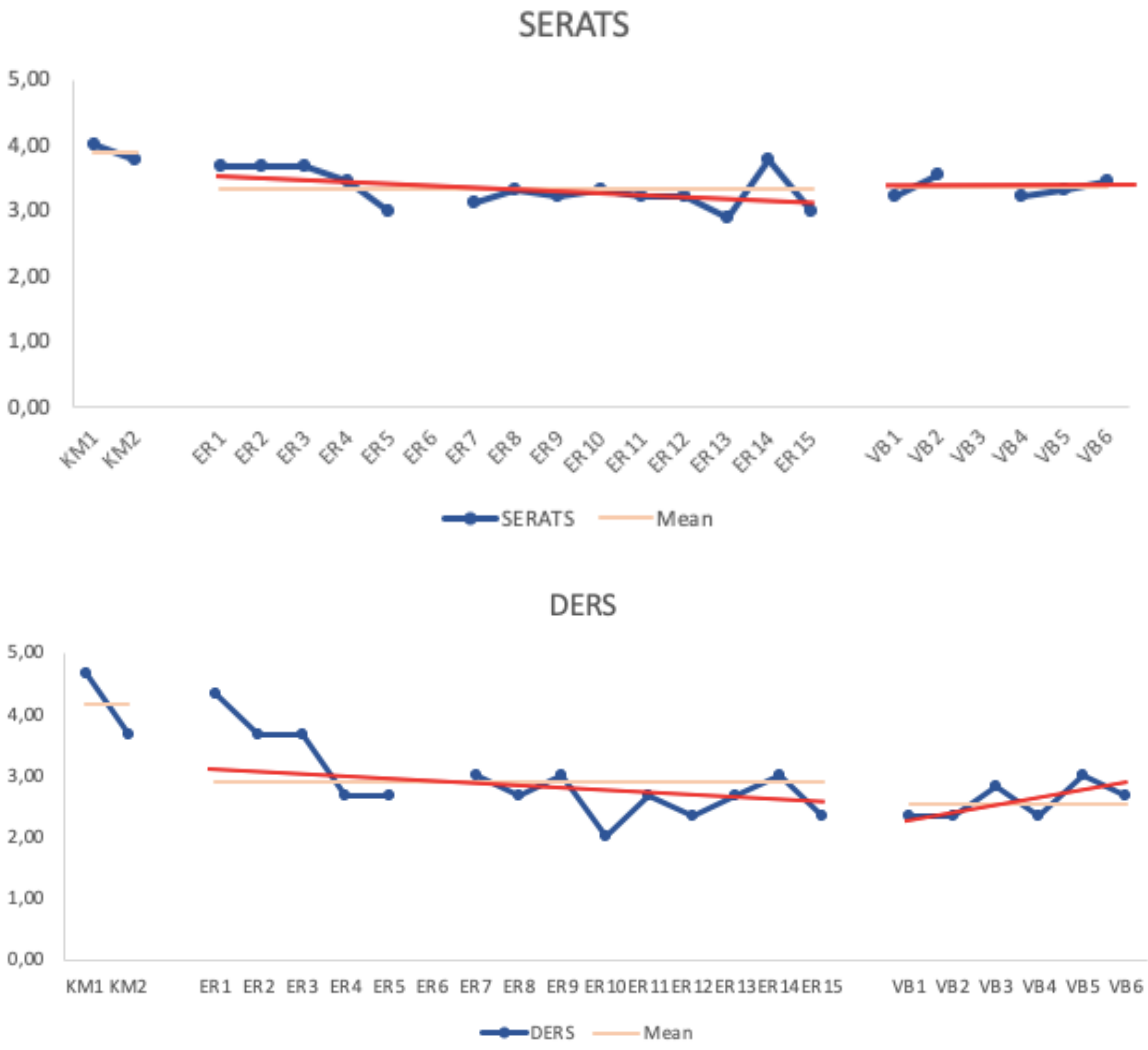
DERS
Mean
Stability 1
Stability 2

Appendix B

SERATS and DERS graphs with trendlines for each participant

Participant 001



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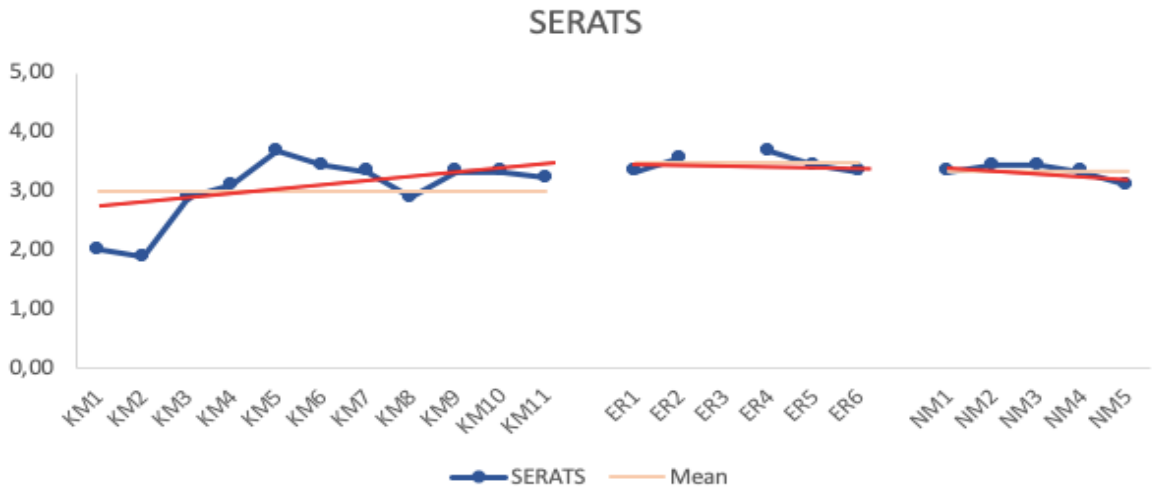

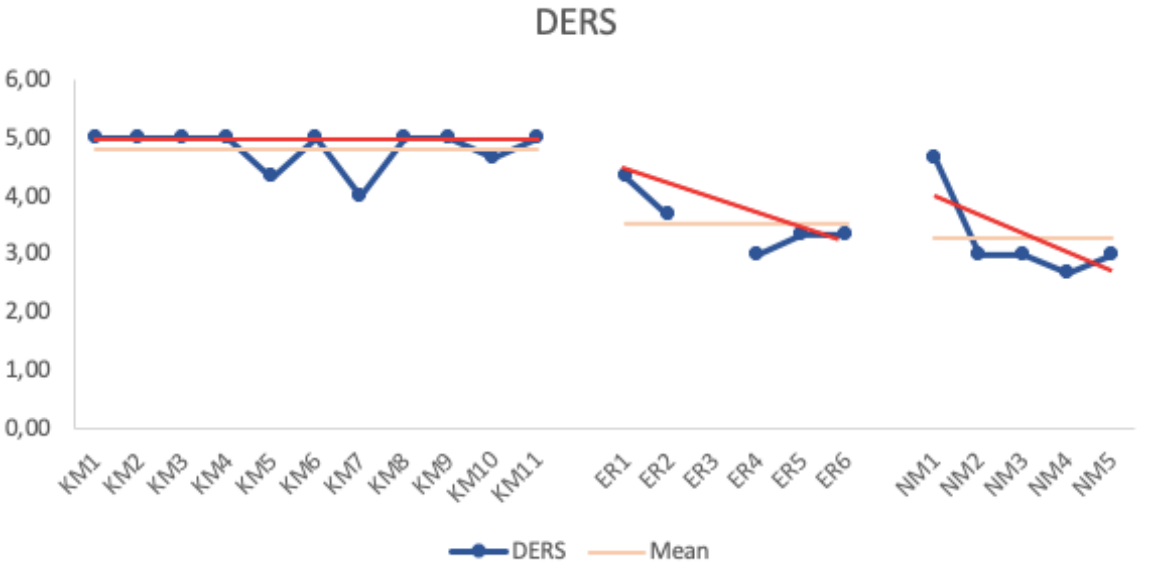

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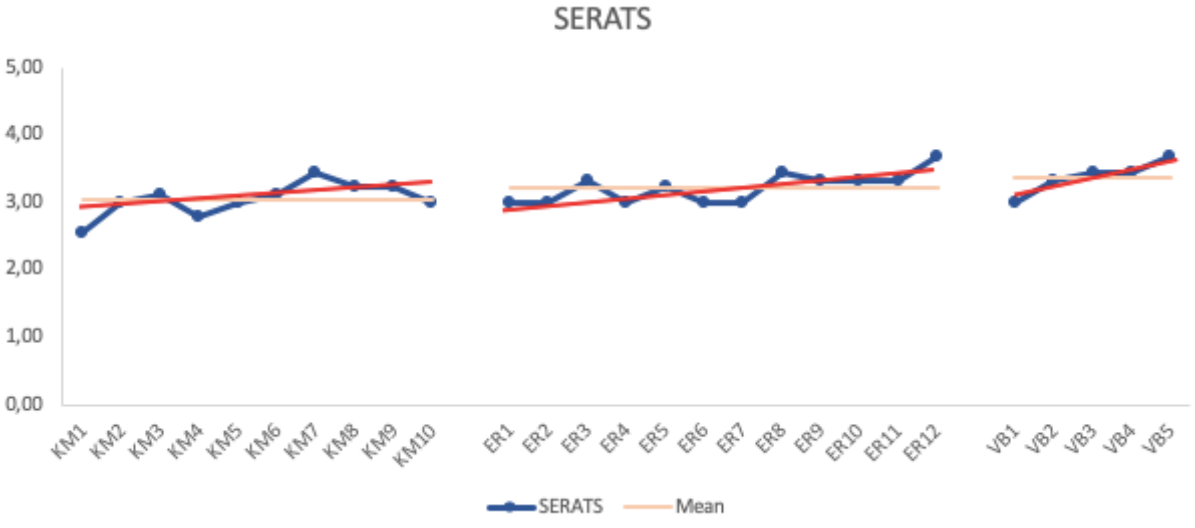

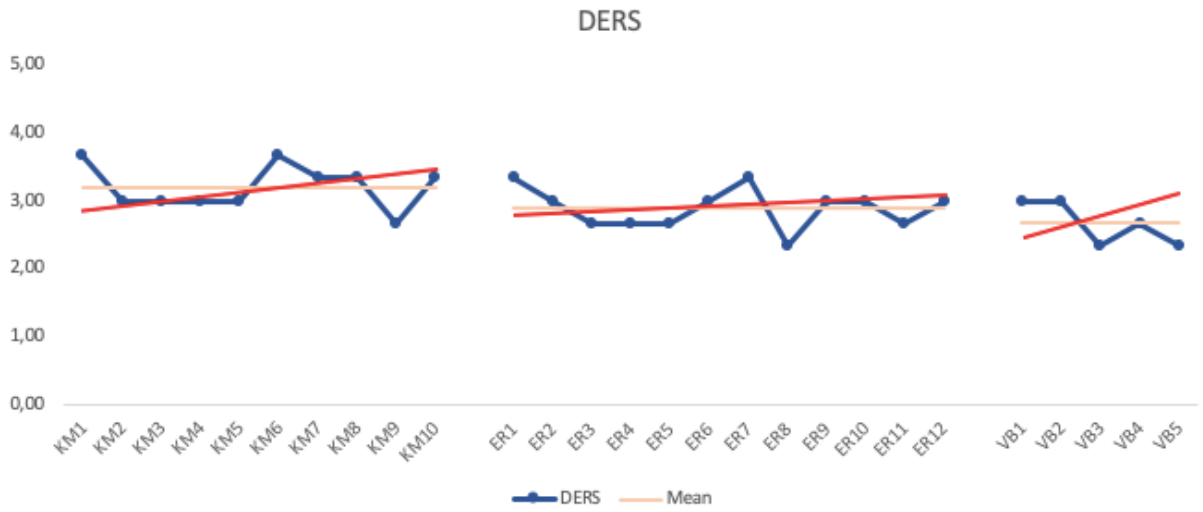

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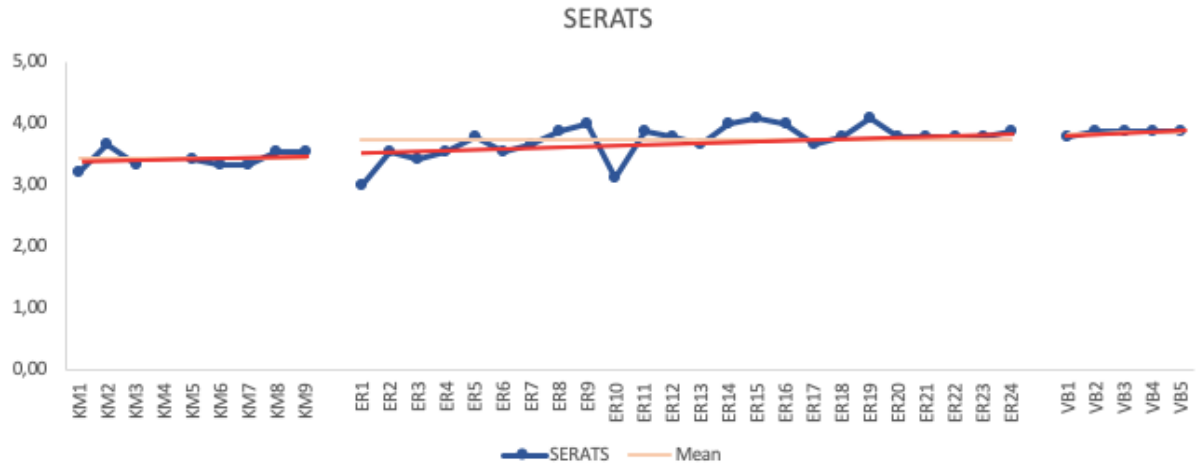

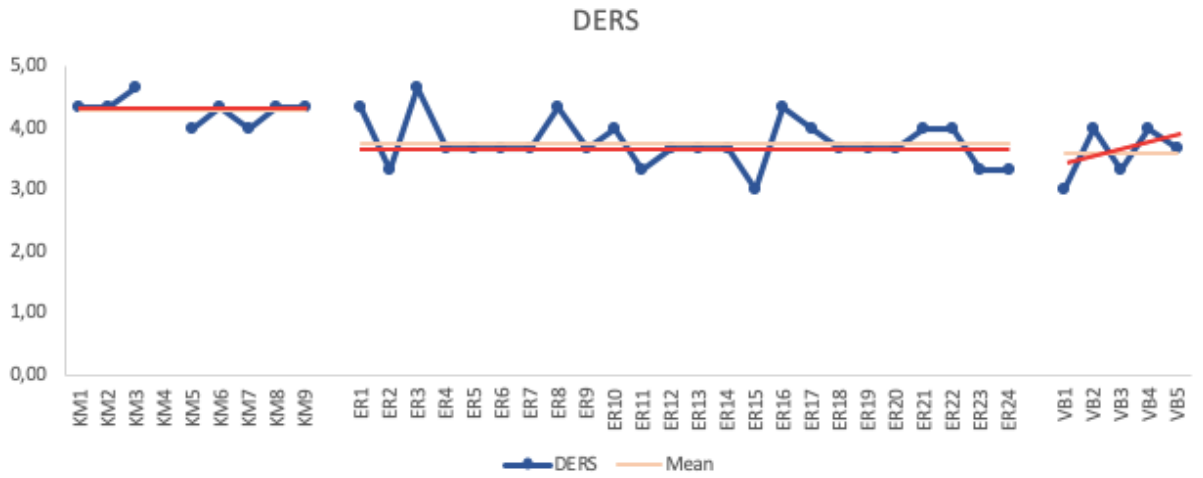

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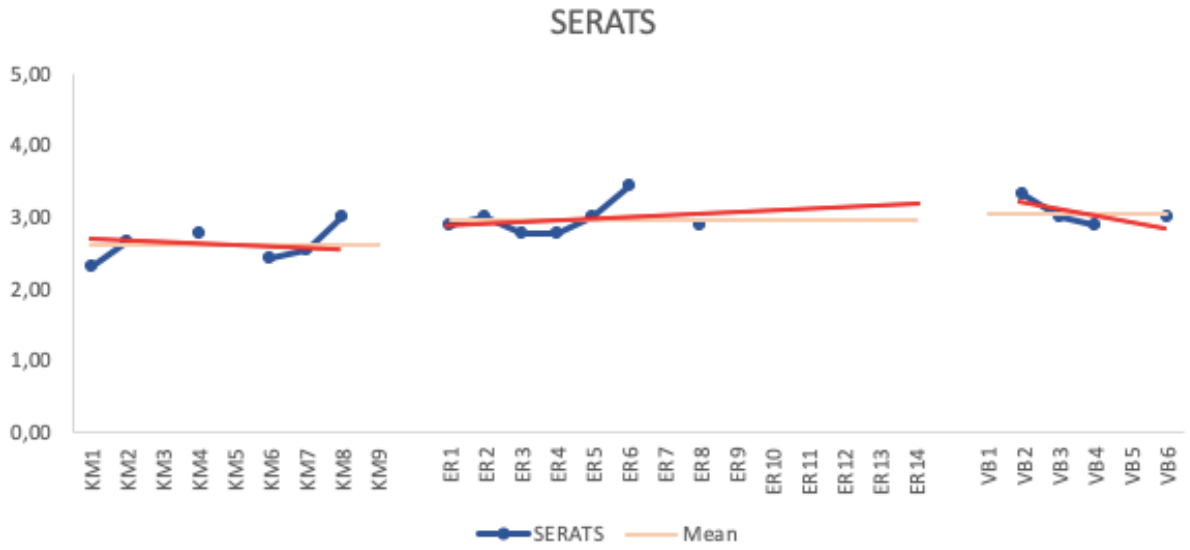

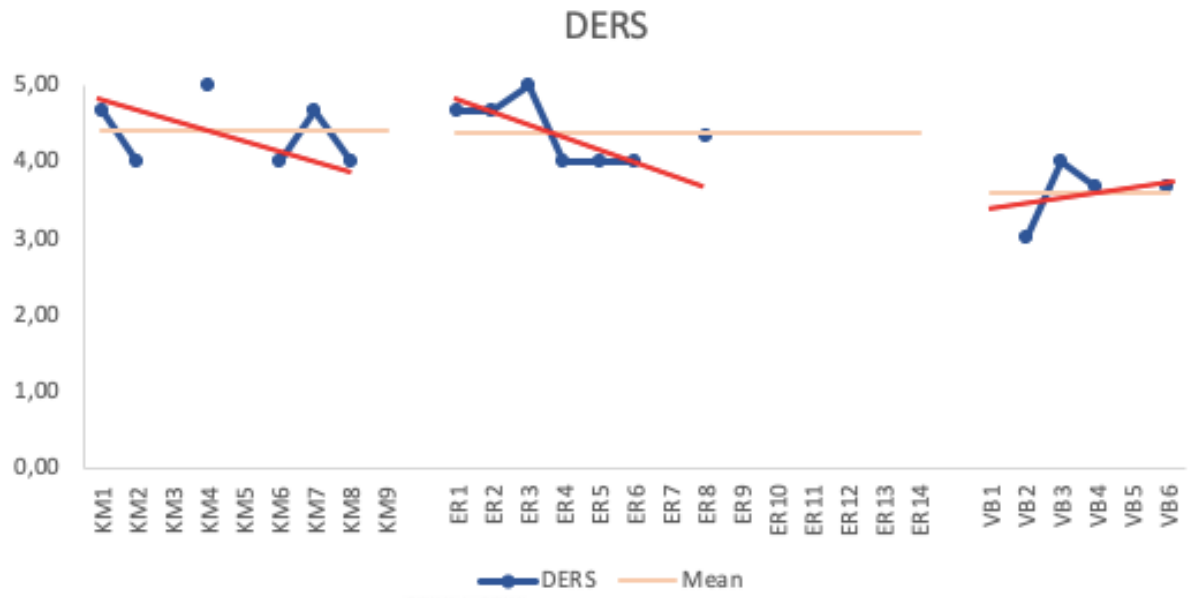

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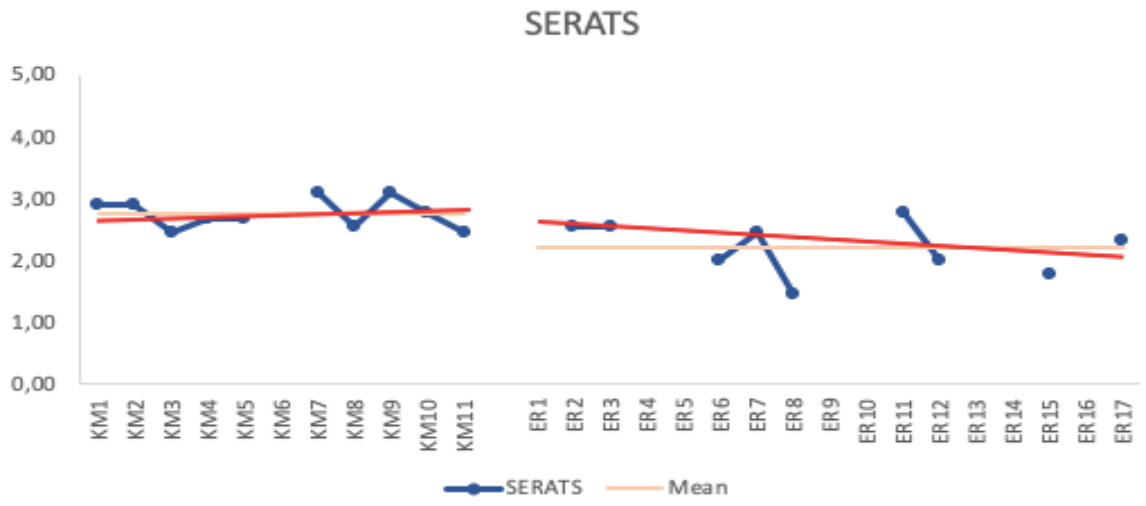

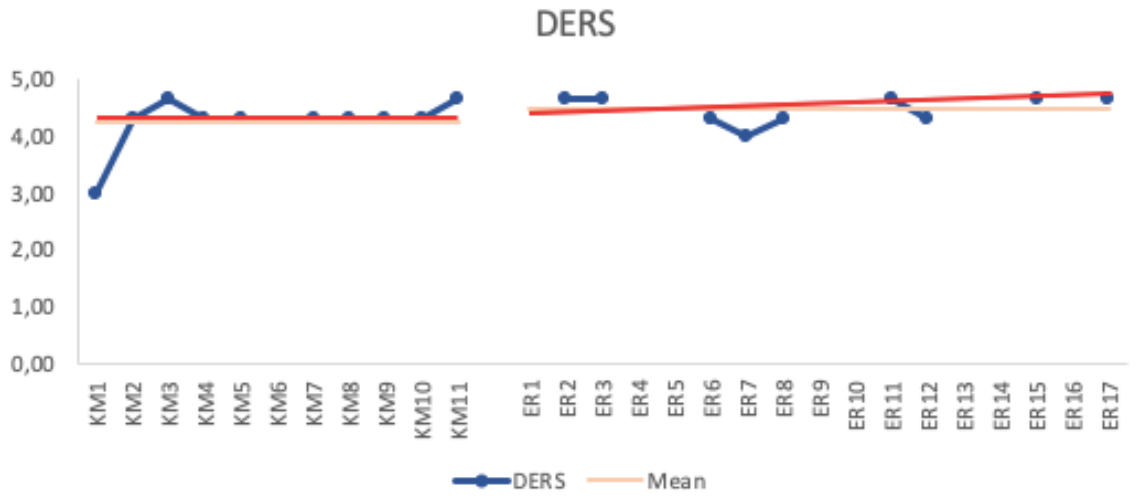

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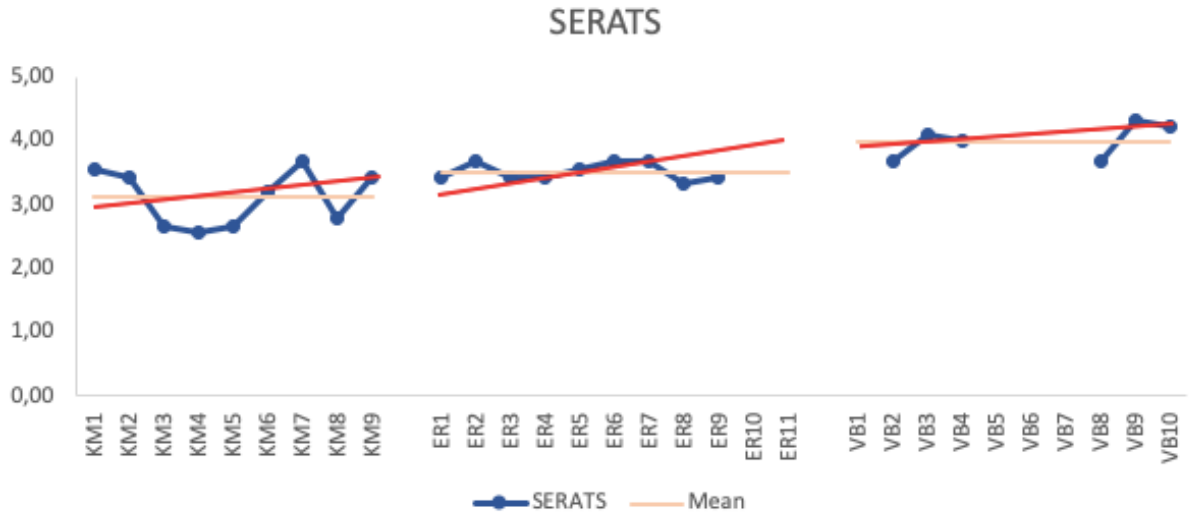

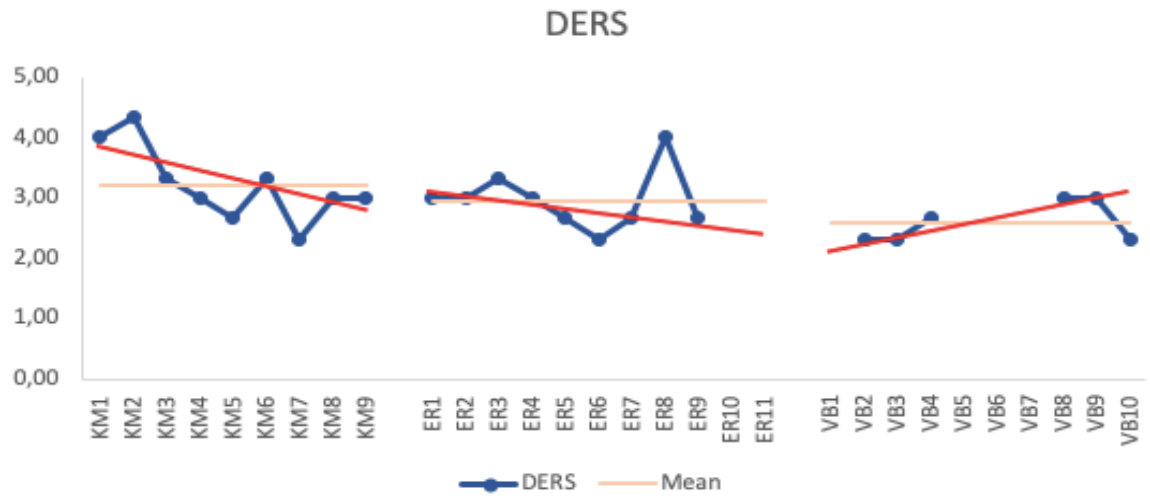

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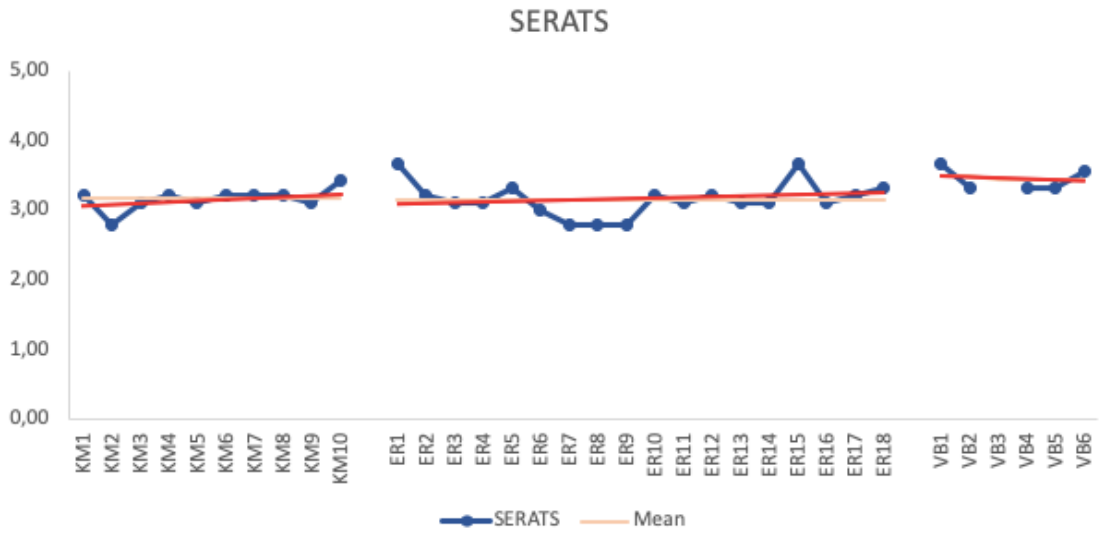

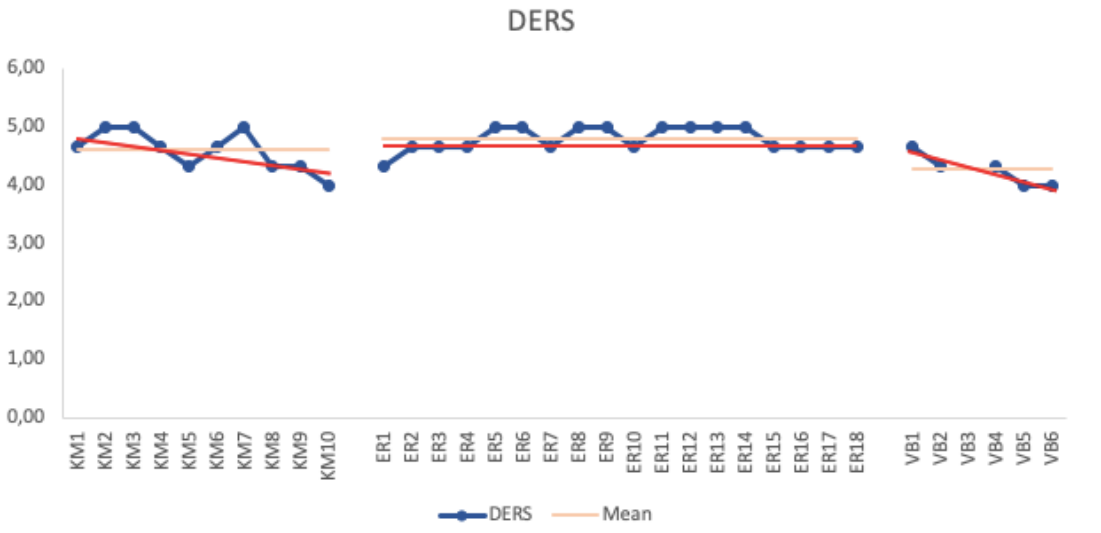

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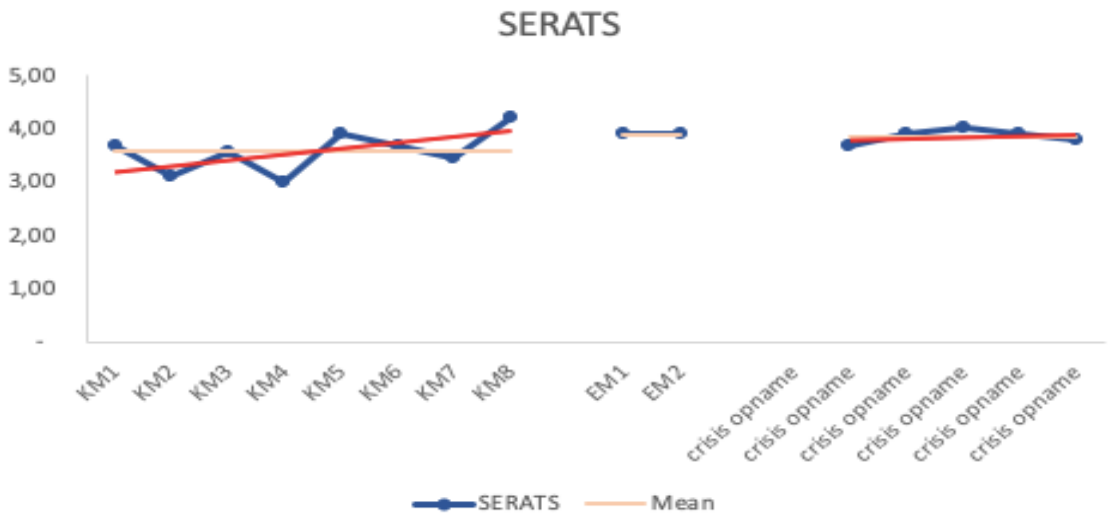

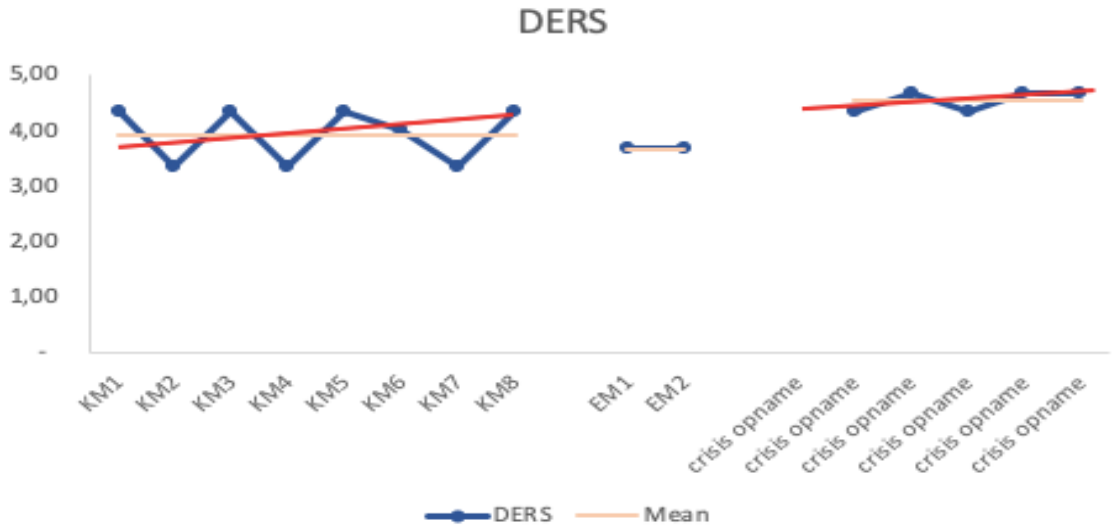

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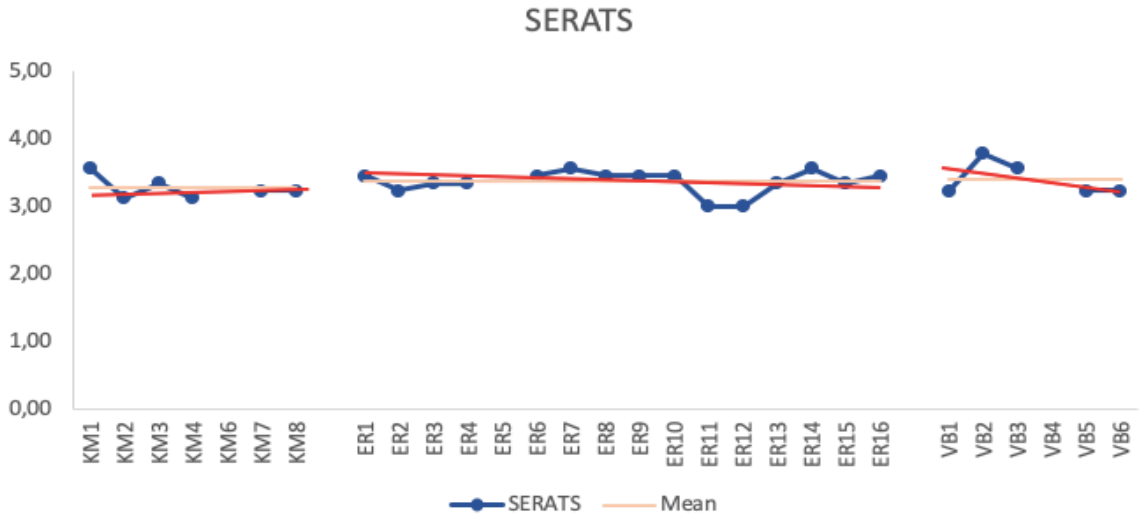

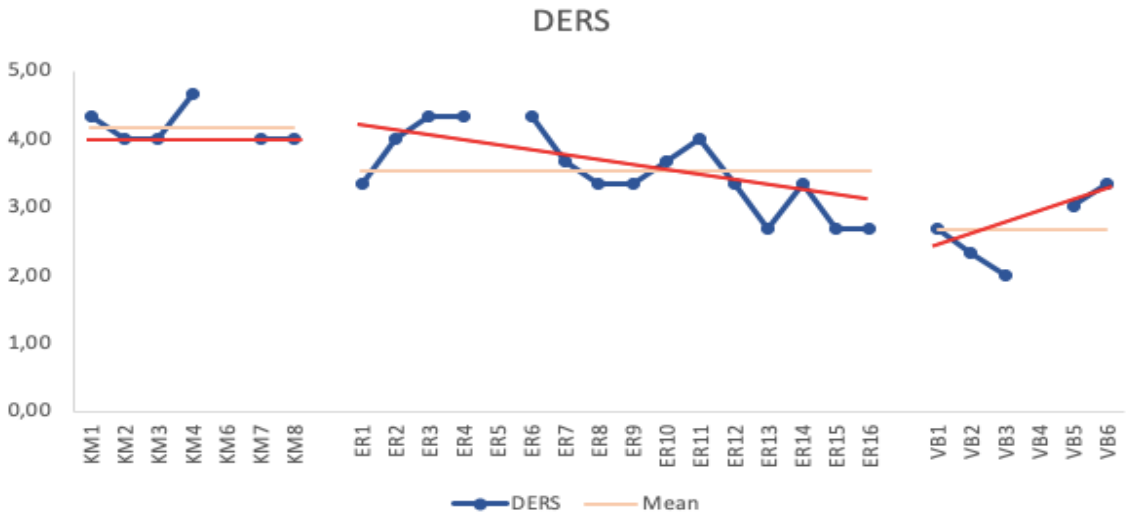

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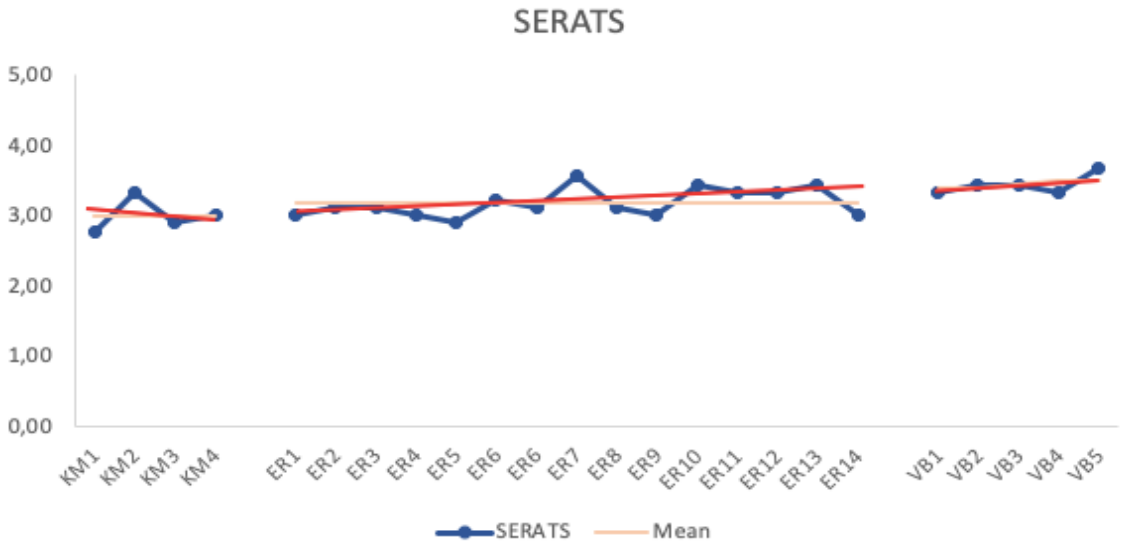
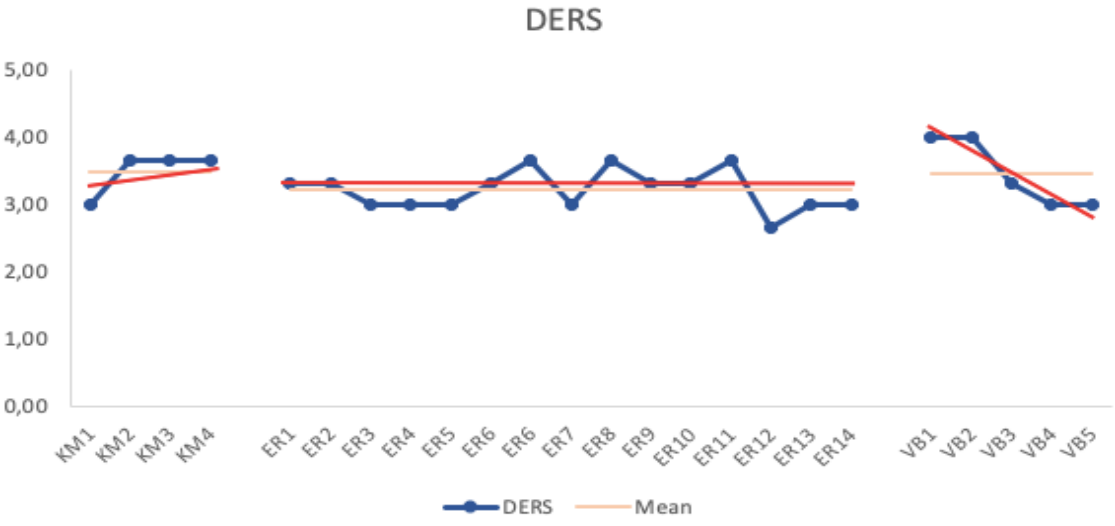
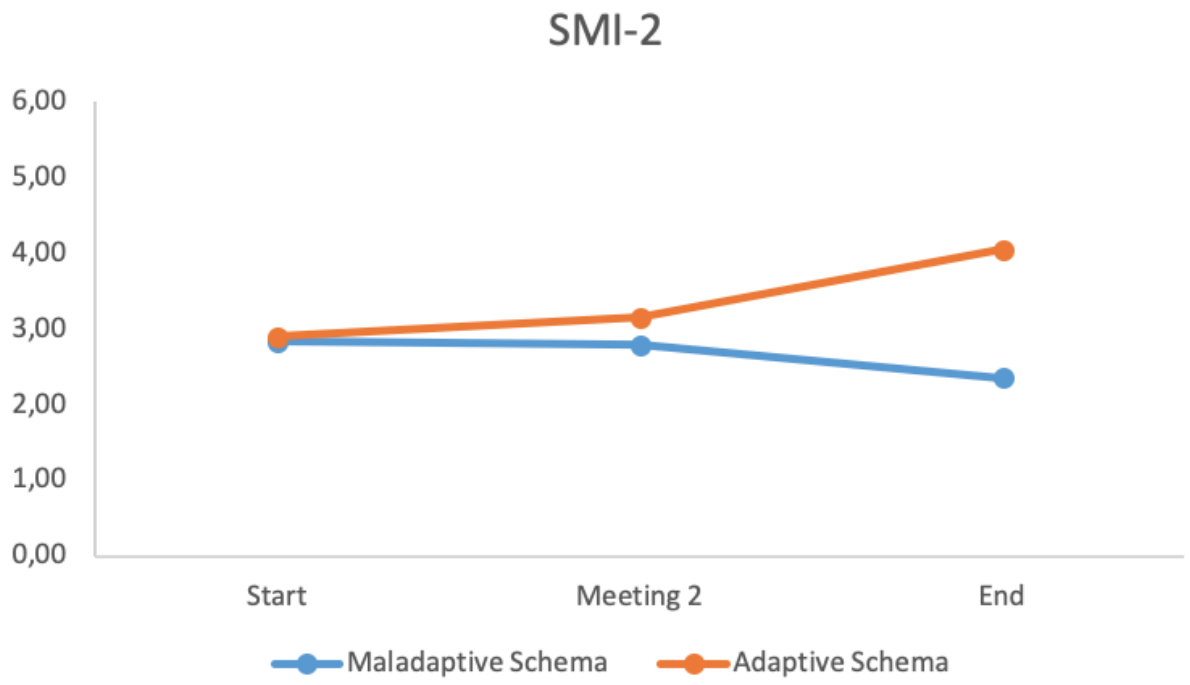




Appendix C

SMI-2 graphs for every participant

Participant 001



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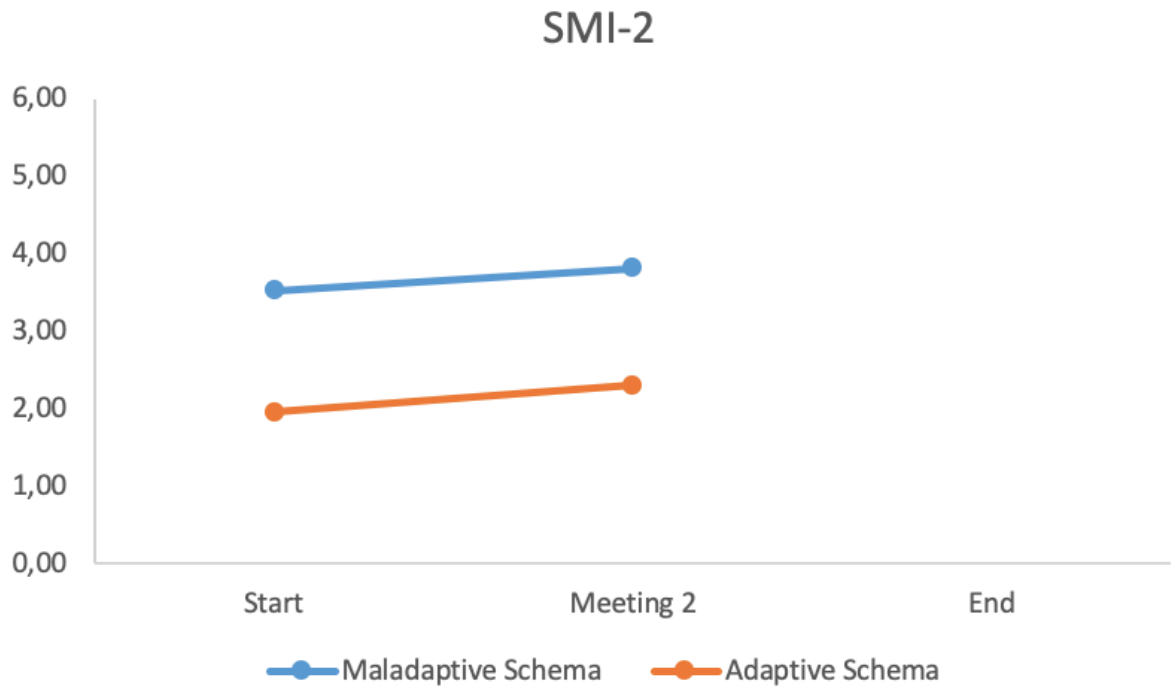

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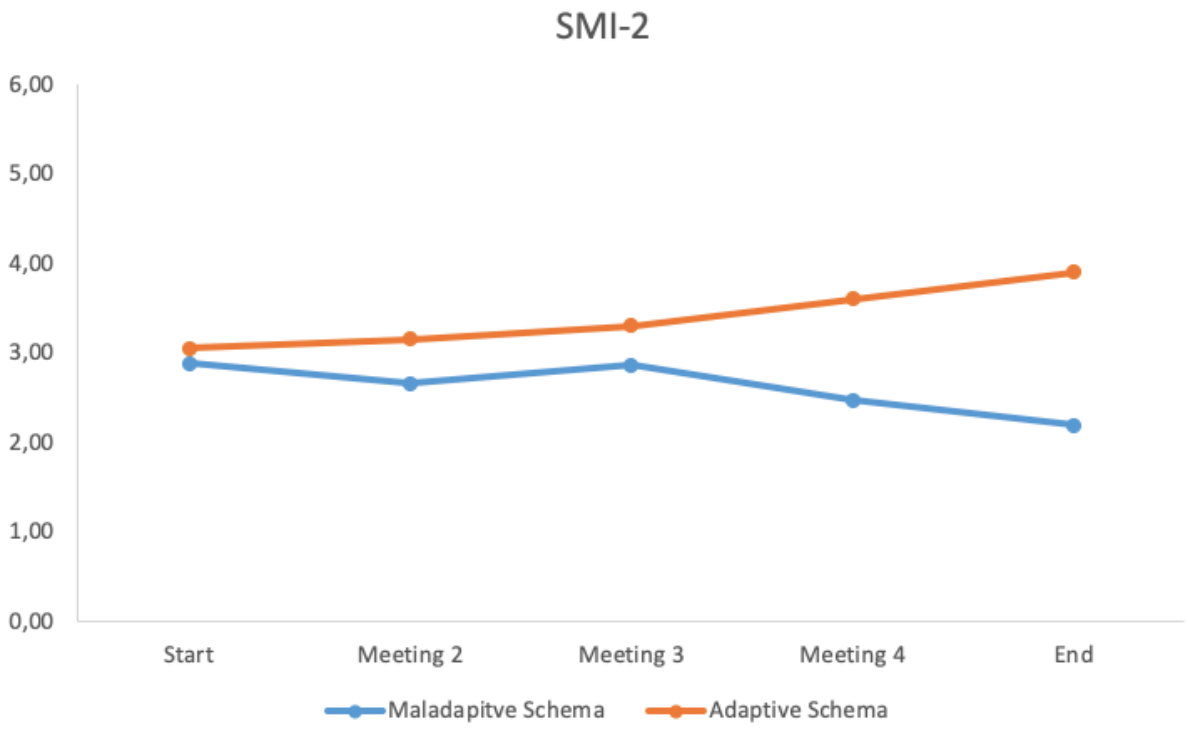

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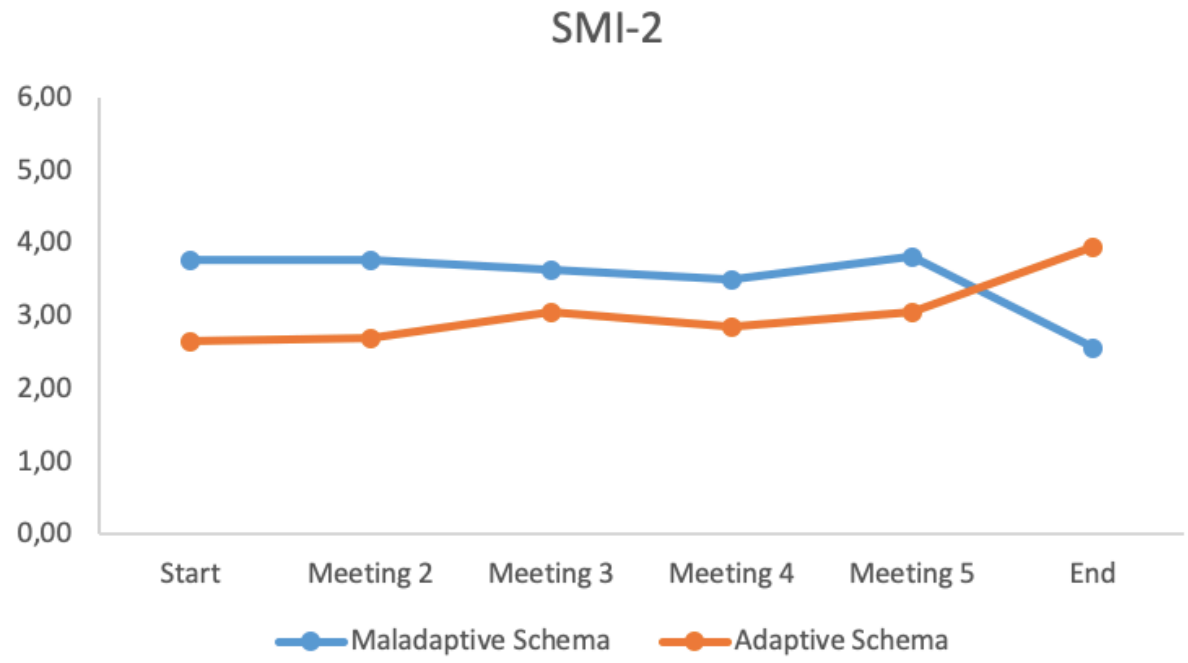

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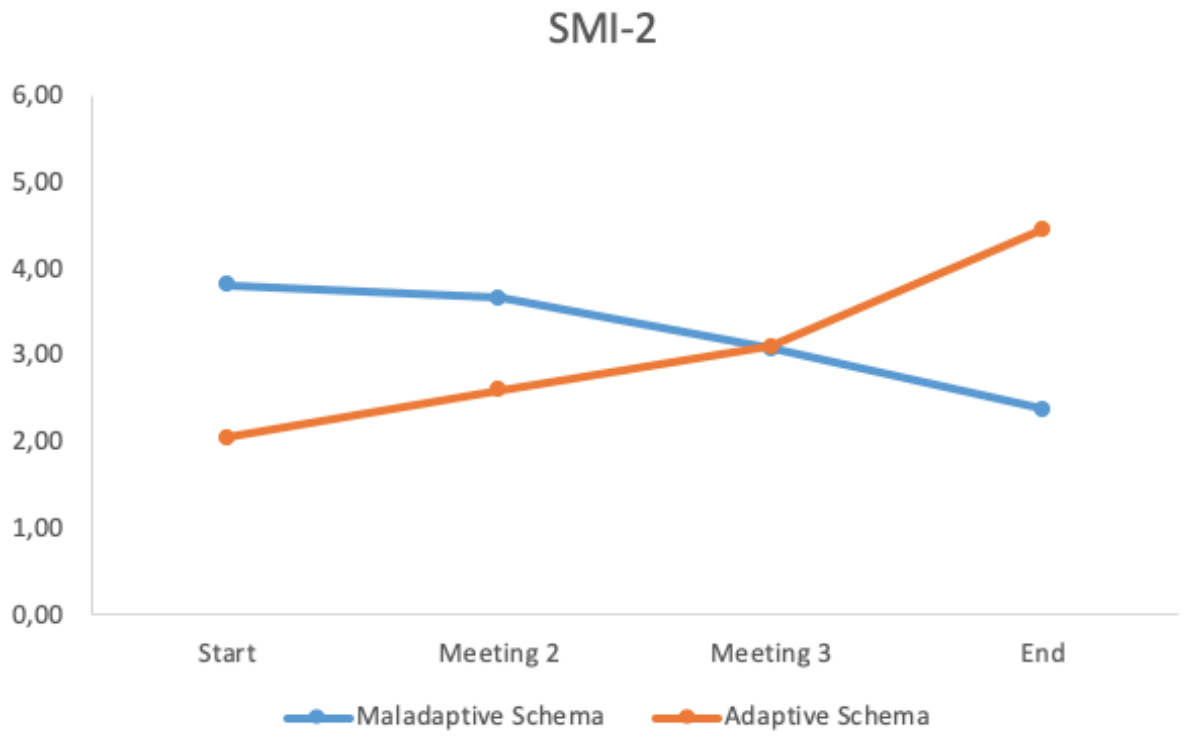

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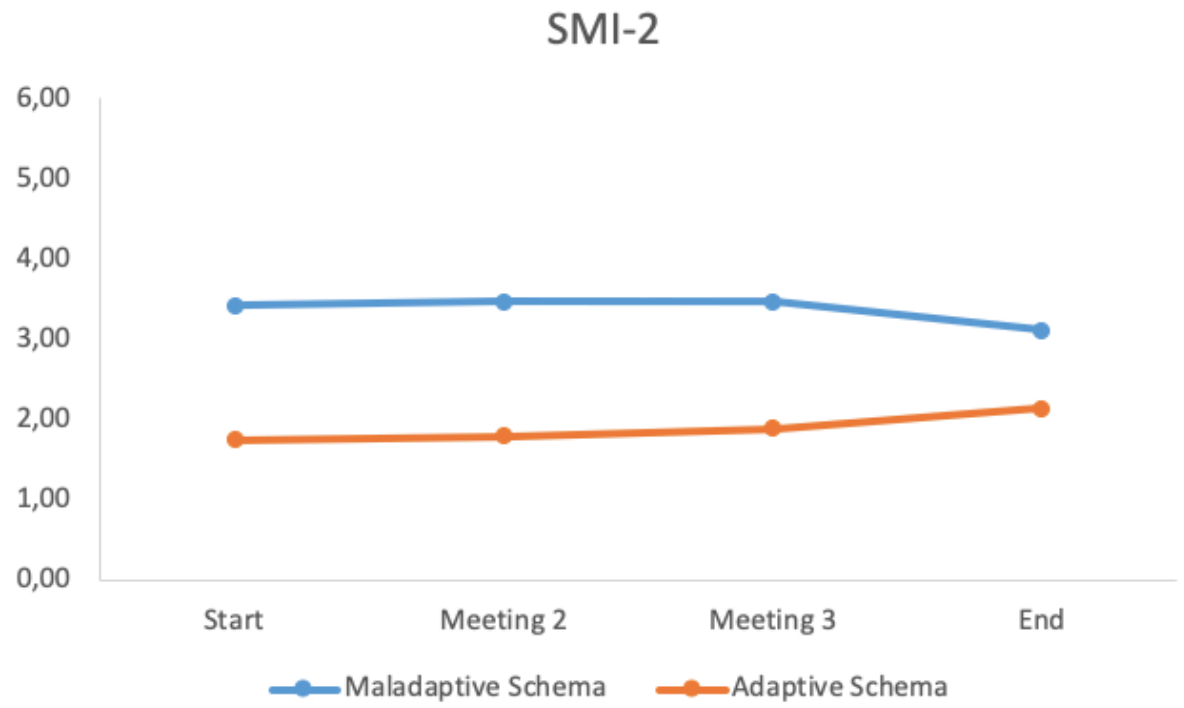
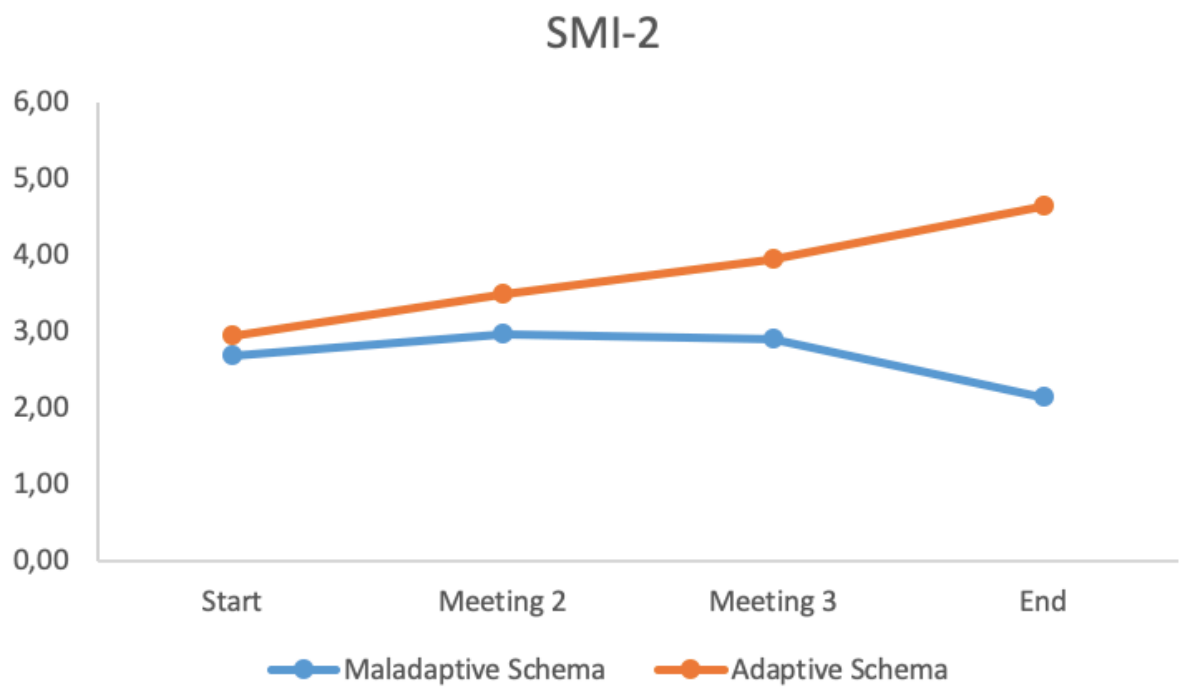
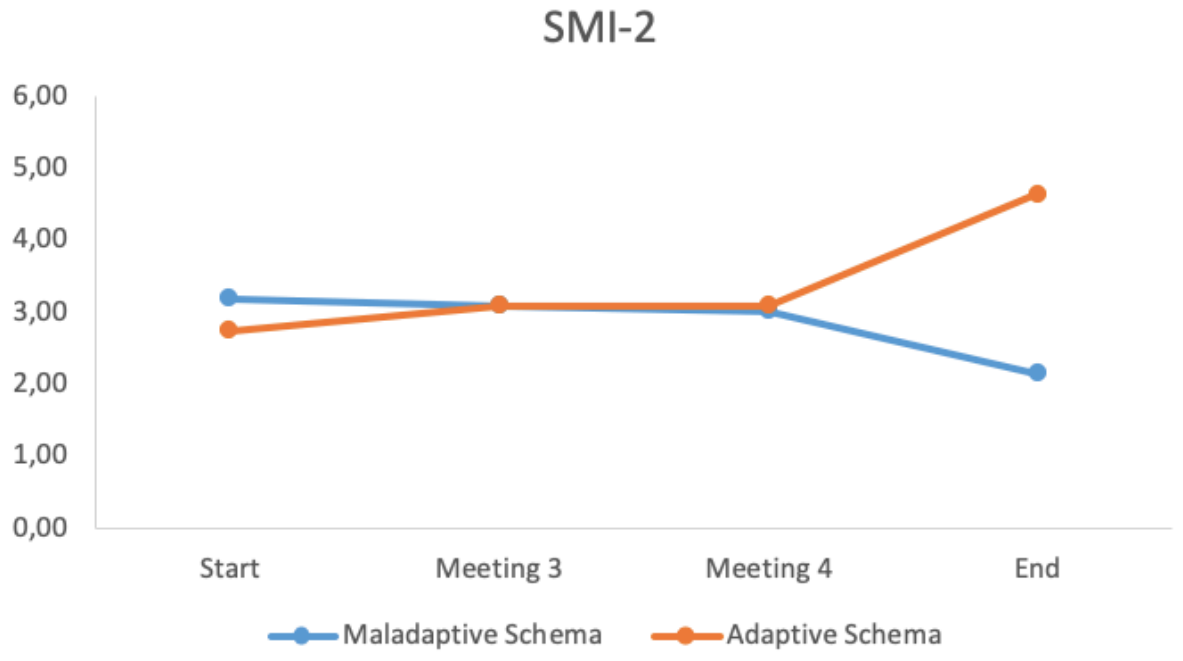


Participant 007

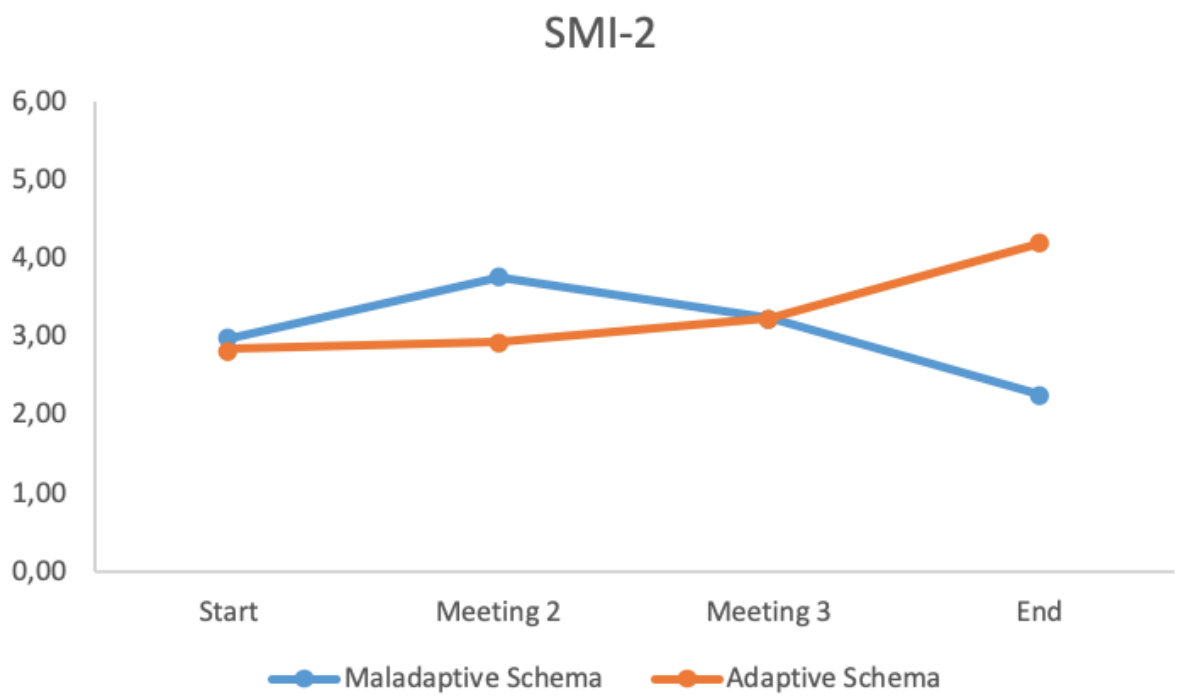


Participant 008



Participant 009 – No SMI-2 data available.

Participant 010



Participant 011