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„Clinimetric Properties of the German Version of the Euthymia Scale (ES): Validity and Sensitivity Analysis“

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ES	Euthymia Scale
ES-G	German Version of the Euthymia Scale
CIE	Clinical Interview for Euthymia
BDI-II	Beck Depression Inventory-II
WHOQOL-BREF	World Health Organization Quality of Life 26-item version
CDRISC	Connor-Davidson Resilience Scale 10-item version
BSI	Brief Symptom Inventory 53-item version
GSI	Global Severity Index of the BSI
WHO-5	World Health Organization – 5 Well-Being Index
PWB	Psychological Well-Being Scale 18-item version
MINI	The Mini-International Neuropsychiatric Interview
PROM	Patient-reported outcome measure
CLIPROM	Clinimetric Patient-Reported Outcome Measures
WBT	Well-being Therapy
InfitMSQ	Information-weighted mean square statistic
PCAR	Principal Component Analysis of Item Residuals
BAC	Balanced Accuracy
AUC	Area under the (ROC) curve
ROC	Receiver operating characteristics
TPR	True positive rate (sensitivity)
TNR	True negative rate (specificity)
MDE	Major depressive episode

Abstract

Background

Euthymia, a transdiagnostic and integrative operationalization of well-being, is defined by the absence of mood disturbances, the presence of positive affect, balanced well-being dimensions, and integration defined as flexibility, consistency, and resilience. The Euthymia Scale (ES), a 10-item clinimetric self-report measure, has been validated in Italian, Chinese, and Japanese populations.

Objectives

This study aimed to create a German translation of the scale (ES-G) and to evaluate its clinimetric properties in accordance with recommendations for the analysis of clinimetric patient-reported outcome measures (CLIPROM criteria).

Methods

Concurrent validity (correlations with psychological distress, depression, resilience, psychological well-being, and quality of life), dimensionality (Rasch analysis), predictive validity (cross-validated predictive modeling), clinical validity (group comparisons), cutoff determination (ROC analyses), incremental validity (hierarchical regression analyses), and sensitivity to change were assessed. Additionally, a self-adapted 6-point Likert version of the ES-G was compared to the original dichotomous response format. Data came from a cross-sectional non-clinical sample and a longitudinal clinical trial at the Ludwig-Maximilians-University Hospital.

Results

The final sample consisted of 181 non-clinical participants (81% female; *M* = 25.36 years, *SD* = 8.88) and 32 patients (50% female; *M* = 39.09 years, *SD* = 13.25). The ES-G demonstrated good capability of differentiating between clinical and non-clinical populations (BAC = .82) and symptom severity groups, ω^2 = .50. The scale showed strong associations with related constructs, good item fit in the Rasch model and provided incremental value beyond existing well-being measures. It demonstrated good sensitivity to symptom change. The original version of the scale outperformed the 6-point Likert adaptation in all performance metrics.

Conclusions

These findings suggest that the ES-G is a valid, sensitive, and easy-to-administer clinimetric index for assessing positive mental health in clinical and non-clinical populations. The ES-G may be a promising screening tool for depression and could be used for monitoring treatment outcomes. Future studies with larger and population-representative samples are needed to replicate these results.

Kurzzusammenfassung

Hintergrund

Euthymie ist eine transdiagnostische und integrative Operationalisierung von psychologischem Wohlbefinden. Es wird definiert als die Abwesenheit von Stimmungsstörungen, das Vorhandenseins eines positiven Affekts sowie ausbalancierte Wohlbefindensdimensionen und Integration, definiert als Flexibilität, Konsistenz und Resilienz . Die Euthymie Skala (ES), ein 10 Items umfassender klinimetrischer Fragebogen wurde bereits in italienischen, chinesischen und japanischen Bevölkerungsgruppen validiert.

Zielsetzung

Ziel dieser Studie war es, eine deutsche Version der Euthymie Skala (ES-G) zu erstellen und diese einer klinimetrischen Validierung nach CLIPROM Standards zu unterziehen.

Methoden

Beurteilt wurden die Kriteriumsvalidität (durch Korrelationen zu psychischer Belastung, Depressivität, Resilienz, psychologischem Wohlbefinden und Lebensqualität), Dimensionalität (Rasch Analyse), prädiktive Validität (auf maschinellem Lernen basierte prädiktive Modellierung), klinische Validität (ANOVA Gruppenvergleiche), Cutoff-Wert Bestimmung (ROC Analysen), inkrementelle Validität (hierarchische Regressionsmodelle) und Sensitivität gegenüber Symptomveränderungen. Zusätzlich wurde eine 6-Punkte-Likert-Version der ES-G mit dem ursprünglichen dichotomen Format verglichen. Die Daten stammen aus einer

nicht-klinischen Querschnittsstichprobe und einer klinischen Längsschnittstudie am Klinikum der Ludwigs-Maximilians-Universität.

Ergebnisse

Die endgültige Stichprobe bestand aus 181 nicht-klinischen Teilnehmern (81% weiblich; M = 25.36 Jahre, SD = 8.88) und 32 Patienten (50% weiblich; M = 39.09 Jahre, SD = 13.25). Die ES-G zeigte eine gute Fähigkeit, zwischen klinischen und nicht-klinischen (BAC = .82) sowie zwischen Symptomschweregruppen zu differenzieren, ω^2 = .50. Die Skala zeigte starke Assoziationen mit verwandten Konstrukten, eine gute Passung im Rasch Modell und inkrementelle Validität, über bestehende Well-being Skalen hinaus. Sie zeigte sich als sensitiv für Symptomveränderungen. Die ursprüngliche Version der Skala übertraf die 6-Punkte-Likert-Adaption in allen Leistungsmetriken.

Schlussfolgerungen

Die Ergebnisse deuten darauf hin, dass die ES-G ein valider, sensitiver und einfach zu handhabender klinimetrischer Index zur Bewertung der positiven psychischen Gesundheit in klinischen und nicht-klinischen Populationen ist. Die ES-G könnte ein vielversprechendes Screening-Instrument für Depression sein und zur Überwachung von Behandlungsergebnissen im psychiatrischen und psychotherapeutischen Kontexten eingesetzt werden. Es benötigt weitere Studien um diese Ergebnisse in größeren und bevölkerungsrepräsentativen Stichproben zu replizieren.

Introduction

Over the past two decades, the importance of well-being has been increasingly acknowledged (Blanchflower & Oswald, 2011; Fava & Bech, 2016; Hicks et al., 2013; Naci & Ioannidis, 2015). Well-being is a key component of the World Health Organization's definition of mental health and, therefore, a crucial aspect of health in general (World Health Organization, 2021). While there is much agreement on the importance of well-being, there are fundamental differences in definition (Dodge et al., 2012) and theoretical basis (Deci & Ryan, 2008). Across disciplines (i.e., public health, clinical needs, politics, health economics), there are different priorities as to what well-being should measure (Diener et al., 2010).

In the research of well-being, there are two main perspectives: the hedonistic tradition defines well-being as feeling happy or showing high levels of positive affect and low negative affect. It focuses on maximizing pleasure and minimizing pain. The term subjective well-being (SWB) (Diener, 1984), a widely used operationalization of well-being, originates from the hedonic tradition.

Eudaimonia, on the other hand, has a deeper and more complex understanding of well-being. Dating back to Aristotle's "Nicomachean Ethics" (Irwin, 2019), the eudaimonic tradition views well-being as fulfilling one's true potential, fulfilling meaningful goals, and self-actualization (Deci & Ryan, 2008). Psychological well-being with measurement scales like the Psychological Well-Being Scale (PWB; Ryff & Keyes, 1995; Ryff, 1989) is rooted in this tradition.

While traditional well-being measures focus on hedonic or eudaimonic perspectives, they are often disconnected from clinical needs (e.g. symptomatic burden, functioning), which differ from those in positive, general, social, or developmental psychology, lacking relevance for individuals with mental health challenges (Wood & Tarrier, 2010). They often present a fragmented and reductionist view that doesn't reflect the complex nature of well-being. This gap highlights the necessity for a new framework for well-being that also addresses the complexities of clinical settings (Guidi & Fava, 2022).

Euthymia

Taking on these challenges, Fava and Bech (2016) provided a novel definition of euthymia, which was discussed in detail in subsequent publications (Fava & Guidi, 2020a; Guidi & Fava, 2022). With their definition of euthymia, they presented a more integrated and comprehensive multidimensional construct of well-being that aligns with the complexities of mental health and better supports clinical interventions.

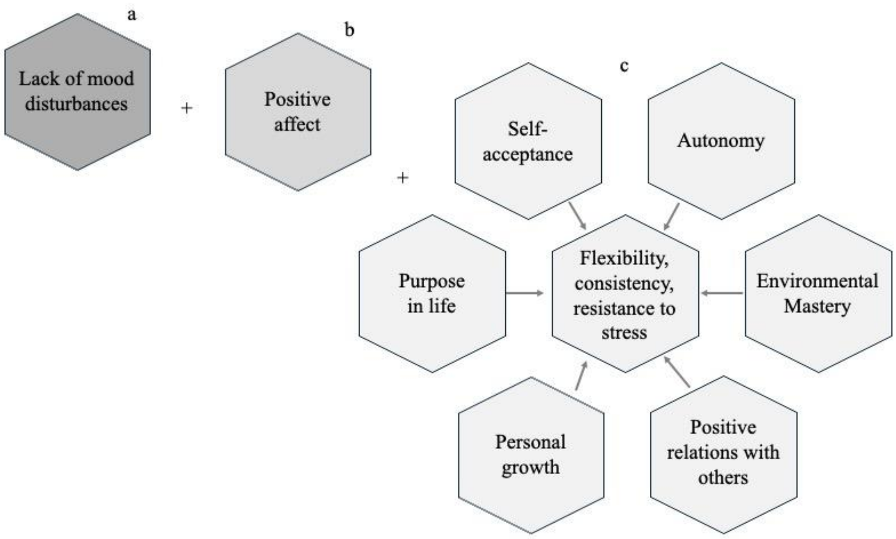
They characterize euthymia by the following features (Guidi & Fava, 2022) (Figure 1):

a) A lack of mood disturbances (i.e., diagnostic criteria): One should be in complete remission (if prior mood disorder existed), not experiencing symptoms of clinical significance. Negative affect, like sadness or anxiety, may still be experienced but should be short-lived and not negatively impact everyday life.
b) The presence of positive affect (i.e., feeling cheerful, calm, active, interested in things, and experiencing restorative sleep). This dimension overlaps with the concept of subjective well-being (Diener, 1984).
c) The third component encompasses balanced levels of well-being dimensions and integration derived from work by Marie Jahoda (1959): Jahoda identified six dimensions of positive mental health – (1) autonomy, (2) environmental

mastery, (3) positive interactions with others, (4) personal growth, (5) development or self-actualization, and (6) attitude towards oneself. Ryff (1989) later translated these dimensions into a self-rated questionnaire (The Psychological Well-Being Scale; PWB), slightly rewording the dimensions. Further, integration was defined by Jahoda as (1) a balance of psychic forces (flexibility), (2) a unifying outlook on life (consistency), and (3) resistance to stress (resilience).

Figure 1

The Unifying Concept of Euthymia as defined by Guidi and Fava (2022)



Existing measures of euthymia include the Euthymia Scale (ES; Fava & Bech, 2016) - a 10-item self-report questionnaire, and the Clinical Interview for Euthymia (CIE; Fava & Guidi, 2020a) – a 22-item structured interview. These Instruments were developed using clinimetric principles (Fava et al., 2012; Feinstein, 1987), which will be explained in detail in the next section. Apart from the mode of administration (questionnaire vs. structured interview) the two instruments differ in the number of items: the Euthymia Scale (ES) consists of five questions adopted from the WHO-5 well-being index (Topp et al., 2015) reflecting feature b from Guidi and Fava's definition (presence of positive affect) of the displayed euthymia model (Figure 1) and five questions addressing the individual's balance among psychic forces leading to high levels of resilience and frustration tolerance (feature c).

The Clinical Interview for Euthymia (CIE) expands on these 10 questions by adding 12 questions derived from the Psychological Well Being Scale (PWB; Ryff, 1989) – each well-being dimension being represented by two questions – providing a more nuanced perspective on feature c.

Clinimetrics

The term clinimetrics was first introduced by Feinstein (1987), referring to the development and use of rating scales, indices, and instruments measuring clinical phenomena that cannot be measured by using traditional laboratory methods. Feinstein shed light on the lack of standards for rating scales within clinical use and highlighted the conflict with the scientific goals reliability and validity and the clinical goal of sensibility (face validity, content validity, and ease of use). Criteria for the development of clinimetric rating scales were described (Feinstein, 1983; Feinstein, 1987; Jones & Feinstein, 1982) and further refined in a subsequent publication (Wright & Feinstein, 1992).

The clinimetric approach, also referred to as the science of clinical measurements (Fava et al., 2012), therefore provides a set of guidelines for the development and validation of existing patient-reported outcome measures (PROMs) aligning with clinical goals and patients' needs, which the more common psychometric approach often misses to address (Wright & Feinstein, 1992).

There are several differences between the clinimetric and psychometric approaches: historically, the development of psychometrics took place in research fields outside of clinical psychology, mainly in educational or social sciences (Fava et al., 2004; Wright & Feinstein, 1992), while clinimetrics was developed specifically for measuring clinical phenomena (Feinstein, 1987).

Regarding the selection of items, the focus of the psychometric framework is often laid on homogeneity – referring to a high degree of inter-item correlations – leading to a set of items that essentially all measure the same thing (Bech, 2004; Fava et al., 2012; Tomba & Bech, 2012; Wright & Feinstein, 1992). However, maximizing homogeneous measurement of constructs may contradict with desired clinimetric properties, in particular, sensitivity to change (Fava & Belaise, 2005). It may also lead to the inclusion of redundant items, thereby reducing clinical applicability (Carrozzino, 2019). Thus, following the clinimetric approach, homogeneity and unidimensionality are not of primary interest, and items should instead provide non-redundant, clinically distinct and useful information (Wright & Feinstein, 1992).

While psychometrics focuses on construct, convergent, divergent, and criterion validity, clinimetrics emphasizes clinical, predictive, incremental, and biological validity (Carrozzino et al., 2021c).

Initiatives like the Patient-Reported Outcomes Measurement Information System (PROMIS; Cella et al., 2007; Cella et al., 2010; Rothrock et al., 2011) or Consensus-based Standards for the selection of health Measurement Instruments (COSMIN; Mokkink et al., 2018, Mokkink et al., 2006; Mokkink et al., 2016, Mokkink et al., 2010) often build the foundational framework in the development and validation of PROMs and are strongly rooted in the psychometric tradition. It is questionable if these frameworks are suited for complex clinical realities.

Carrozzino et al. (2021c) present a comprehensive overview of the methodological differences between psychometrics and clinimetrics in the context of reliability and validity testing of PROMs and provide recommendations for the analysis of clinimetric patient-reported outcome measures (CLIPROM criteria). Important CLIPROM criteria are:

Sensitivity

The concept of sensitivity refers to the capacity of a rating scale (or single items of a rating scale) to differentiate between different groups (e.g., patients and healthy controls, depressed inpatients or outpatients) and to reflect outcome changes in clinical trials (Kellner, 1972). In this context, a clinimetric rating scale should be able to differentiate between groups receiving therapeutic interventions and placebo or attention control groups (Fava et al., 2018). If clinical trials fail to differentiate between these groups, the reason may be poor performance of the treatment, but in some cases, it might be due to a lack of sensitivity of the outcome measures used (Fava et al., 2004). The sensitivity of a rating scale is a crucial criterion for its use in clinical routines.

Validity

Clinical validity. Refers to the ability of a measure to accurately identify or discriminate subjects with or without a specific condition (i.e., depression vs. no depression) (Carrozzino, 2019; Carrozzino et al., 2021a; Fava et al., 2004; Feinstein, 1987). In comparison to the criterium of sensitivity, which is about detecting meaningful differences in treatment effects, clinical validity is specifically about accurate diagnostic discrimination (i.e., correctly identifying the presence or absence of a condition).

Construct validity. The concept of construct validity was first introduced by Cronbach and Meehl (1955) and refers to how well a rating scale measures the underlying theoretical concept it is intended to measure (Strauss & Smith, 2009). Following psychometric guidelines, it is often assessed via factor or principal component analysis. But the utility of these methods for clinical use has been questioned (Bech, 2012; Fava et al., 2018; Feinstein, 1987): psychometric models reveal structure, but do not guarantee that the total score reflects the severity of a clinical condition (Bech, 2012). In the clinimetric approach, unidimensionality of an instrument is not of primary interest (Wright & Feinstein, 1992). In clinimetric analyses, construct validity can be assessed through methods like Rasch and Mokken analyses (Bech, 2012; Carrozzino et al., 2021a; Mokken, 1970; Rasch, 1993), evaluating the extent to which items provide distinctive clinical information and symptoms represented by a clinimetric scale belong to an underlying clinical syndrome (Bech, 2012; Carrozzino et al., 2021a).

Predictive validity. Refers to the ability of a rating scale to predict future outcomes like treatment response (i.e., responder vs. non-responder) or psychological distress scores after a certain time (Carrozzino et al., 2021c).

Incremental validity. Indicating that a rating scale - or each item of a scale - should add meaningful information beyond what is already available through other accessible information (Sechrest, 1963).

Concurrent validity. Concurrent validity refers to the degree to which a measure correlates with existing, previously validated instruments (Bagby et al., 1994). However, a high correlation between two instruments alone does not necessarily indicate good validity of the instrument. The scales may measure a common construct but still differ in clinical validity or sensitivity. Thus, concurrent validity in clinimetric analyses is not considered as important as other criteria (Fava et al., 2004).

Although the Euthymia Scale (ES) was originally developed based on clinimetric principles, it has yet to be systematically evaluated within a German-speaking population.

The present study

This study aimed to validate a German version of the Euthymia Scale (ES-G) through a comprehensive clinimetric analysis. The analysis plan was designed in adherence with the recommendations for clinimetric patient-reported outcome measures (CLIPROM) as outlined by Carrozzino et al. (2021c). Additionally, the performance of a self-created 6-point Likert version of the ES-G was tested against the original dichotomous version.

Research Objectives

The following research objectives were addressed. Each objective is followed by the corresponding CLIPROM criterion in brackets.

1. Rationale for the German translation of the ES
2. Correlation Analysis (*concurrent validity*)
3. Rasch analysis (*construct validity/dimensionality*)
4. Ability of the ES-G to predict whether a patient will be a responder or non-responder to psychotherapy (*predictive validity*)

5. Ability of the ES-G to predict whether a subject is clinical or non-clinical (*sensitivity*)
6. Ability of the ES-G to reflect symptom changes in psychotherapy (*sensitivity*)
7. Ability of the ES-G to discriminate between healthy subjects and subjects with a past or current depression (*clinical validity*)
8. Ability of the ES-G to discriminate between symptom severity groups (*clinical validity*)
9. Determining cutoff scores for differentiating subjects with or without depression
10. Incremental validity of the ES-G (*incremental validity*)
11. Comparison of the self-adapted 6-point Likert version of the ES-G with the original version

Hypotheses for concurrent validity

The following a priori hypotheses for concurrent validity were postulated: The correlation between the ES-G and …

H1: psychological distress was expected to be negative.

H2: quality of life was expected to be positive.

H3: trait resilience was expected to be positive.

H4: psychological well-being was expected to be positive.

H5: depressive symptoms was expected to be negative.

Methods

Study Design

This study utilized data from two sources: (1) a clinical feasibility trial, evaluating the transdiagnostic Well-Being Therapy (Fava, 2016) in a multimodal therapy approach at the day clinic of the LMU Hospital in Munich, and (2) a cross-sectional online survey targeting non-clinical participants. This design allowed for cross-sectional and longitudinal analyses.

Participants

Non-clinical participants were eligible for inclusion if they (1) were between 18 and 75 years old, (2) were fluent in speaking and reading German, and (3) provided informed consent. Exclusion criteria were: (1) the presence of inadequately treated concomitant somatic disease (e.g., current hypothyroidism and hypertension), including acute and chronic infections or autoimmune diseases, and (2) pregnancy or breastfeeding. After clearing for exclusion criteria (n = 16 somatic disease, n = 2 pregnant, and n = 2 age over 75), a total of N = 181 non-clinical participants (146 females [81%]; M = 25.36 years, SD = 8.88) were included in the study.

Day clinic patients were eligible if they met the same general criteria (age, language, consent, pregnancy, untreated somatic disease), and additionally: (1) were not acutely suicidal, and (2) did not have a primary diagnosis of organic mental disorder (F00-F09), mental and behavioral disorder due to psychoactive substance use (F10-F19; F63), or eating disorder (F50). Eligible patients were diagnosed with at least one of the following psychiatric conditions: affective disorder (F30 – F39), schizophrenia, schizotypal, delusional, and other psychotic disorder (F20 – F29), anxiety disorder (F40 – F41), obsessive-compulsive disorder (F42), dissociative, stress-related, somatoform and other nonpsychotic mental disorder (F43 – F48), or personality disorder (F60 – F62).

As of the current data cutoff, 32 patients (19 females [59%]; *M* = 39.09 years, *SD* = 13.25) had completed baseline assessment (t0), and a total of 25 patients completed both pre- (t0) and post (t1)-assessment.

Based on literature recommendations (Charter, 1999; Frost et al., 2007; Schönbrodt & Perugini, 2013), a minimum sample size of *N* = 238 (119 patients and 119 non-clinical) was targeted and preregistered to ensure stable estimates of reliability and validity. Detailed descriptions of the final sample characteristics are displayed in Tables 1 and 2.

Procedure

The two samples were recruited through separate procedures and assessed using different formats.

Non-clinical participants were recruited between October 2024 and May 2025 through study flyers and presentations in university lectures. They were invited to participate in a cross-sectional online survey through the platform Unipark (Tivian XI GmbH).

Day clinic patients were recruited at the LMU Hospital between August 2024 and May 2025 as part of an ongoing feasibility trial. This sample underwent an eight-week multimodal therapy program that included Well-being Therapy (WBT) in both group and individual formats. Data from this sample were collected at two time points:

t0 (upon admission) and t1 (at discharge after eight weeks). In the clinical sample, questionnaires were administered in a paper-and-pencil format.

This study was preregistered on the Open Science Framework (OSF; https://osf.io/yr8e5/?view_only=c9ddd629046148068bfbfdaab219e27a) and received approval from the Ethics Committee of the LMU (Faculty of Medicine, LMU Munich, Munich, Germany, project-no.: 24-0359). All deviations from the preregistration are transparently reported in the discussion section. Informed consent was obtained from all participants prior to their inclusion in the study.

Measures

Euthymia Scale (ES)

The Euthymia Scale (ES; Fava & Bech, 2016) is a 10–item self-report clinimetric measure. All Items are scored dichotomously as 1 (true) or 0 (false). Items 6 – 10, measuring psychological well-being, were adopted from the WHO-5 Well-Being Index (Topp et al., 2015). Items 1 – 5 measure levels of psychological flexibility. While Fava & Bech (2016) recommend calculating a global euthymia score, ranging from 0 – 10, with higher scores indicating higher levels of euthymia, Carrozzino et al. (2019) suggest a two-dimensional structure and recommend using separate scores for the two subscales. Clinimetric analyses of the Japanese (Sasaki et al., 2021; Sasaki & Nishi, 2023), Chinese (Zhang et al., 2022), and Italian (Carrozzino et al., 2021b; Carrozzino et al., 2019) versions have shown that the Euthymia Scale (ES) is a valid and highly sensitive clinimetric index. For the present study, an adapted 6-point Likert version (from 0 “at no time” to 5 “all of the time”) was used in addition to the original format. The scale format was adopted from the WHO-5. Both scales were administered in a German version (ES-G) (Fava & Guidi, 2020b), and total sum scores were calculated.

Beck Depression Inventory II (BDI-II)

The Beck Depression Inventory II (BDI-II; Beck et al., 1996) is a widely used self-report instrument for assessing the severity of depressive symptoms in clinical and non-clinical populations. It is based on the diagnostic criteria for major depressive disorder as outlined in the DSM-IV (American Psychiatric Association et al., 1994). The BDI-II consists of 21 items, each representing a symptom related to depression. Items are rated on a 4-point Likert scale ranging from 0 (no symptom) to 3 (severe symptom), resulting in a total score between 0 and 63. For the German version (Hautzinger et al., 2006), internal consistency (Cronbach's α) was reported as good ($\alpha \geq .84$) (Kühner et al., 2007). The BDI-II differentiates well between different severity levels of depression and is sensitive to change. In this study, cutoff scores were interpreted as recommended by Beck et al. (1996): minimal depression (0-13), mild depression (14-19), moderate depression (20-28), and severe depression (29-63).

World Health Organization Quality of Life (WHOQOL-BREF)

The WHOQOL-BREF (World Health Organization, 1998a) is a self-report questionnaire developed by the World Health Organization (WHO) to assess individuals' subjective quality of life. It is derived from the original WHOQOL-100 and consists of 26 items. It measures four domains: (1) Physical health, (2) psychological, (3) social relationships, and (4) environment. In addition to the domain scores, two items assess overall quality of life and general health. Items are rated on a 5-point Likert scale, with higher scores indicating better quality of life. The internal consistency (Cronbach's α) of the four domains was reported between .57 and .88 for the German version of the WHOQOL-BREF (Angermeyer et al., 2000). In this study, domain scores were converted to a 0-100 scale, as recommended by the authors. A mean total score was then calculated by averaging the four domain scores, providing an overall index of subjective quality of life.

Psychological Well-Being Scale (PWB-18)

The 18-item version of the Psychological Well-Being Scale (PWB; Ryff & Keyes, 1995) is a shortened form of the original 84-item instrument developed by Ryff (1989). The PWB measures six theoretically grounded dimensions of psychological well-being based on Jahoda (1959): (1) autonomy, (2) environmental mastery, (3) personal growth, (4) positive relations with others, (5) purpose in life, and (6) self-acceptance. Each dimension is assessed by three questions, rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Eight items need to be reverse-coded. Previous studies have reported low internal consistencies for the 18-item version, with Cronbach's α ranging from .33 to .56 (Ryff & Keyes, 1995). In the present study, the PWB was only assessed in the non-clinical sample, and a total psychological well-being score (range: 18 – 108) was used.

Connor Davidson Resilience Scale (CD-RISC-10)

The Connor-Davidson Resilience Scale (CD-RISC) is a widely used self-report measure for assessing trait resilience, defined as the ability to cope well with stress and adversity. The original scale consists of 25 items (Connor & Davidson, 2003), but a 10-item short version (Campbell-Sills & Stein, 2007) has been validated and is commonly used. The CD-RISC-10 includes 10 items rated on a 5-point Likert scale ranging from 0 (not true at all) to 4 (true nearly all the time), with total scores ranging from 0 to 40. The German version has shown good internal consistency (Cronbach's α = .84) and test-retest reliability (r_{tt} = .81) (Sarubin et al., 2015).

Brief Symptom Inventory (BSI-53)

The Brief Symptom Inventory (BSI; Derogatis, 1993; Franke & Derogatis, 2000) is a self-report measure to assess psychological symptom burden across a wide range of psychiatric dimensions: (1) Somatization, (2) obsessive-compulsive, (3) interpersonal sensitivity, (4) depression, (5) anxiety, (6) hostility, (7) phobic anxiety, (8) paranoid ideation, and (9) psychoticism. The BSI-53 consists of 53 Items, each rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely), reflecting symptom distress over the past 7 days. In addition to the domain scores, three global indices can be calculated: The Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST). The BSI-53 has shown good psychometric properties, including high internal consistency with Cronbach's α for the GSI typically exceeding .90 (Endermann, 2005). In the present study, the Global Severity Index (GSI), calculated as the mean score of all endorsed items, was used as a general measure for psychological distress.

WHO-5 Well-Being Index

The WHO-5 Well-Being Index (World Health Organization, 1998b) is one of the most commonly used self-report rating scales for assessing subjective well-being (SWB) in research and clinical settings. The five questions are rated on a 6-point Likert scale ranging from 0 (at no time) to 5 (all of the time), resulting in a raw score range of 0 to 25. For better comparability with other well-being measures, the raw score is typically multiplied by four, resulting in a total score from 0 to 100. The WHO-5 has demonstrated high clinimetric validity, can be used as an outcome measure, and serves as a screening tool for depression. It has shown high internal consistency across various studies with Cronbach's α typically exceeding .80 (Topp et al., 2015).

Mini-International Neuropsychiatric Interview for Depression (MINI)

The Mini-International Neuropsychiatric Interview (MINI) is a brief, structured diagnostic interview developed to assess the presence of DSM-IV or ICD-10 psychiatric disorders (Sheehan et al., 1998). In the present study, only the Major Depressive Episode (MDE) module was used, adapted as a self-reported format, to assess the presence of current and past depressive episodes. The MDE module consists of nine dichotomous items (yes/no), each representing a symptom based on DSM-IV criteria for diagnosing depression. Participants were classified as having current MDE, past MDE, or no lifetime MDE. For past MDE, participants were categorized as "YES" (endorsed 5-9 symptoms) or "NO" (0-4 symptoms). For current MDE, three categories were used: MDE (5-9 symptoms), subthreshold depression (1-4 symptoms), or none (0 symptoms). This grouping approach was adopted from Sasaki et al. (2021). Grouping criteria are also displayed in Appendix B, Table 1 B.

Translation of the Euthymia Scale

To create a German version of the Euthymia Scale (ES-G), items 6 to 10 were adopted from the official German translation of the WHO-5 (World Health Organization, 1998b). The remaining five items were derived from a published German translation of the Clinical Interview for Euthymia (Fava & Guidi, 2020b).

Unlike the Euthymia Scale (ES), the Clinical Interview for Euthymia (CIE) uses negatively worded items. Therefore, item 2 of the ES ("I do not keep thinking about negative experiences.") required a slight rewording compared to its counterpart in the CIE ("Do you keep thinking of negative experiences?"). The final version of the Euthymia Scale (ES-G) is presented in Appendix A, Table A1.

Statistical analyses

All statistical analyses were carried out using R 4.5.0 (R Core Team, 2023). The level for statistical significance was set at $\alpha = .05$. Descriptive statistics were calculated to summarize participant characteristics and key study variables. For continuous variables, means and standard deviations were reported; for categorical variables, frequencies and percentages were calculated. Between-group comparisons were performed using Mann-Whitney U tests, Fisher's exact tests, and independent *t*-tests, depending on data type and distribution.

Model assumptions for all parametric tests (e.g., normality of residuals, homoscedasticity) were examined prior to conducting analyses and are provided in Appendix C.

Missing data were handled as follows: if missing items exceeded 10% for a questionnaire, the participant was excluded. With $\leq$ 10%, mean imputation on the item level was applied.

Concurrent validity

To assess the concurrent validity (Objective 2) of the ES-G, Spearman rank correlation analyses were conducted between the ES-G total score and related constructs, including psychological distress (GSI), quality of life (WHOQOL-BREF), resilience (CD-RISC), psychological well-being (PWB), and depressive symptoms (BDI-II). *P*-values were corrected for multiple testing using the False Discovery Rate (FDR) procedure (Benjamini & Hochberg, 1995).

Dimensionality

To evaluate the dimensionality (Objective 3) of the ES-G, Rasch analysis was performed using the easyRasch package (Johansson, 2025a). This analysis was guided by recommendations from Johannson et al. (2023), with a focus on the following indicators of dimensionality:

Item Fit. Was assessed using conditional infit statistics, which are robust to sample size and preferred over traditional unweighted mean square (outfit) or z-standardized fit statistics (ZSTD values) (Johansson, 2025b; Müller, 2020). Infit is an information-weighted mean square residual, which reflects the degree to which observed item responses align with expected responses under the Rasch model. Information weighted mean square (InfitMSQ) was calculated by multiplying the squared standardized residuals by the observed response variance and then dividing by the sum of the item response variances. Values substantially above or below 1.0 may indicate item misfit. To determine item-specific cutoff values, a parametric bootstrap procedure with 200 iterations was conducted, in line with the recommendations by Johansson (Johansson, 2025b).

Principal Component Analysis of Item Residuals (PCAR). While earlier rules of thumb suggested a cutoff of 1.5 for the first eigenvalue (Smith, 2002) to support unidimensionality, later research has shown that the expected PCAR eigenvalue also depends on sample size and test length (Chou & Wang, 2010). Therefore, a simulation-based approach was used to estimate a more appropriate cutoff for the first eigenvalue in this sample. As recommended by Johansson (2025a), the distribution of eigenvalues was simulated with a parametric bootstrapping procedure, using 500 iterations to determine a cutoff value for the largest acceptable PCAR eigenvalue.

Local independence. According to the Rasch model, items should be locally independent, meaning they should only correlate through the latent trait. Violations of this assumption may indicate redundancy, item clustering, or multidimensionality. Local independence was therefore assessed by examining residual correlations between item pairs (Kim et al., 2011). To get a useful cutoff threshold for residual correlations, a bootstrapping procedure with 400 iterations was conducted as recommended by Christensen et al. (2017). Items with residual correlations above the calculated threshold were considered locally dependent.

To further validate the results of the Rasch analyses, a parallel analysis based on factor analysis with 1000 iterations to generate simulated and resampled datasets was conducted. The quantile criterion was set at .95.

Predictive validity

Predictive validity refers to the ability of a rating scale to predict future (treatment) outcomes. It was tested whether baseline ES-G total scores could predict whether a patient would respond to psychotherapy (Objective 4). Response was evaluated using two outcomes: (1) a positive well-being criterion (WHO-5), where patients with an increase of ≥ 10 points from t0 to t1 were considered responders (Topp et al., 2015); and (2) a symptom reduction criterion (BDI-II), where a ≥ 50% change was used to define response.

To robustly assess the predictive power of the ES-G while accounting for potential overfitting and class imbalance, a cross-validated predictive modeling approach was employed using logistic regression classifiers implemented with the mlr package (Bischl et al., 2016). Model performance was evaluated using nested cross-validation with 5 folds and 10 repetitions to enable fair prediction on previously unseen data. Balanced accuracy (BAC), area under the curve (AUC), true positive rate (sensitivity), and true negative rate (specificity) were reported. Due to imbalanced group sizes, random undersampling was applied within the inner CV loop. This strategy improves the robustness of predictive models with imbalanced classification tasks (He & Garcia, 2009).

Sensitivity

To evaluate the sensitivity of the ES-G, two analyses were conducted:

(1) It was tested whether baseline ES-G total scores could predict group membership (non-clinical participants vs. day clinic patients; Objective 5). A logistic regression model was fitted using the same approach described under predictive validity. Model performance was assessed in a nested 5-fold cross-validation framework (10 repetitions). To address class imbalance, random undersampling was applied within the inner CV loop. The same model evaluation metrics were reported (BAC, AUC, TPR, TNR).

(2) To examine the ES-G's sensitivity to symptom change (Objective 6), it was tested whether changes from baseline (t0) to post-treatment (t1) on the BDI-II were associated with changes on the ES-G and the ES-G Likert version, respectively, within the clinical sample. A sandwich linear regression model, with ΔBDI-II as the criterion and centered ΔES-G as the predictor, controlled for centered BDI-II baseline scores was employed:

$$\Delta\text{BDI-II} \sim \Delta\text{ES-G}_{\text{centered}} + \text{BDI-II}_{\text{t0,centered}}$$

Proof of sensitivity to change was defined as a significant Wald test of the ΔES-G (centered) slope, with an expected negative *b* coefficient. To quantify the uniquely explained variance of both ES-G versions, partial R^2 was reported.

Clinical validity

Due to violations of homogeneity of variances (Appendix C, Table C2), one-way Welch's ANOVAs were conducted to assess the clinical validity of the ES-G. It was tested whether ES-G mean scores differed between groups based on (1) depression history (Objective 7) and (2) symptom severity (Objective 8).

(1) Participants from both samples were classified into five groups based on current and past MDE status, assessed by a self-report version of the Mini-International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998). This grouping strategy was adopted from Sasaki et al. (2021) and is presented in Appendix B, Table B1.

(2) Symptom severity groups were created according to established BDI-II cutoff scores (Beck et al., 1996): *minimal* (0–13), *mild* (14–19), *moderate* (20–28), and *severe* (≥ 29) depressive symptoms. These groups included participants from both the clinical and non-clinical samples.

Jonckheere-Terpstra trend tests with 10,000 permutations were performed to assess whether a decreasing trend in ES-G total scores was observed across ordered groups with increasing symptom burden. Games–Howell post-hoc comparisons were used to account for unequal group variances. Omega squared (ω^2) was used as the effect size measure and estimated using a bootstrapping procedure with 1,000 resamples.

Cutoff determination

To determine a clinically meaningful cutoff score for the ES-G when screening for subjects with or without depression (Objective 9), receiver operating characteristics (ROC) curve analysis (Metz, 1978; Zweig & Campbell, 1993) were conducted. As a reference criterion, BDI-II scores were used. In their meta-analyses, von Glischinski et al. (2019) recommend using different cut points to screen for depression in primary care and healthy populations vs. psychiatric settings. For the non-clinical sample, a BDI-II score of ≥ 13 was used to define depression, while for the clinical sample, a score of ≥ 19 served as the cut point, as suggested by von Glischinski et al. (2019). ROC curve analyses were performed for both the original version of the Euthymia Scale and the adapted 6-point Likert version. Analyses were carried out using the R package pROC (Robin et al., 2011). The following indicators were reported: area under the curve (AUC) and balanced accuracy (BAC). The optimal cutoff scores were determined using Youden's J statistic, which maximizes the sum of true positive rate (sensitivity) and true negative rate (specificity).

Incremental validity

Hierarchical linear regression analyses were conducted to assess the incremental validity (Objective 10) of the ES-G over the WHO-5. The criterion variable was the Psychological Well-Being Scale (PWB) total score. Predictors were entered in the following order: WHO-5 total score at step 1, the ES-G total score at step 2. An increase in the explained variance (ΔR^2) from step 1 to step 2 was interpreted as an indicator of incremental validity. In addition, F-tests comparing nested models (i.e., with and without ES-G) were conducted to examine whether the inclusion of the ES-G led to a statistically significant improvement in model fit. All models were controlled for sex, age, and education as these demographic variables have been shown to be associated with well-being outcomes (Buecker et al., 2023; Carrozzino et al., 2019; Oishi & Tay, 2019; Wood et al., 1989).

Comparison of the Self-Adapted 6-Point Likert Version of the ES-G with the Original Version

The performance of the self-adapted 6-point Likert version of the ES-G was compared to the original version. This comparison was based on balanced accuracy (BAC) scores from the predictive modeling objectives (Objectives 4 and 5), explained variance (R^2) from the sensitivity to change analysis (Objective 6) and hierarchical regression models (Objective 10), and effect sizes (ω^2) from the group comparison analyses (Objectives 7 and 8).

Results

Participants

Descriptive statistics of the final sample (N = 213) are presented separately for participant characteristics (Table 1) and study variables (Table 2).

The full sample consisted of 165 females (77.5%), 46 males (21.6%), and 2 participants who identified as diverse (0.9%). The mean age of participants was 27.43 years (SD = 10.81).

Statistical analyses revealed significant differences in the distributions of categorical variables and continuous variables between the clinical and non-clinical samples. Levene's test indicated homogeneity of variances for all comparisons (all *p*s

> .05). Shapiro-Wilk tests revealed significant deviations from normality in all variables within the non-clinical sample. In the clinical sample, only the WHO-5 deviated from normality. However, the significant test results in the non-clinical sample are likely due to the larger sample size (N = 181), as the Shapiro-Wilk test becomes increasingly sensitive with greater statistical power. Since Mann-Whitney U tests yielded analogous results to the parametric independent t-tests, only the results of the t-tests are reported.

In the clinical sample, primary diagnoses were distributed as follows: major depressive disorder (n = 21; 65.6%), borderline personality disorder (n = 3; 9.4%), anxiety disorder (n = 2; 6.3%), obsessive-compulsive disorder (n = 2; 6.3%), autism spectrum disorder (n = 1; 3.1%), and schizophrenia (n = 1; 3.1%).

Table 1

Participant Characteristics at Baseline

Baseline characteristics	Full sample (N = 213)	Non-clinical (N = 181)	Clinical (N = 32)	Group comparison
	n (%)	*n* (%)	*n* (%)	*p*-value
Age, mean (*SD*)	27.43 (10.81)	25.36 (8.88)	39.09 (13.25)	< .001***
Gender				.015*
Female	165 (77.5)	146 (80.7)	19 (59.4)	
Male	46 (21.6)	34 (18.8)	12 (37.5)	
Diverse	2 (0.9)	1 (0.6)	1 (3.1)	
Marital status				.027*
Single	93 (43.7)	75 (41.4)	18 (56.2)	
Married/partnered	119 (55.9)	106 (58.6)	13 (40.6)	

Divorced/widowed	1 (0.5)	0 (0)	1 (3.1)	
Highest level of education				< .001***
Lower secondary school certificate	1 (0.5)	0 (0)	1 (3.1)	
Intermediate secondary school certificate	4 (1.9)	2 (1.1)	2 (6.2)	
University of applied sciences entrance diploma	20 (9.4)	20 (11.1)	0 (0)	
General higher education entrance qualification	106 (50.0)	104 (57.8)	2 (6.2)	
Apprenticeship	25 (11.8)	11 (6.1)	14 (43.8)	
University or postgraduate degree	56 (26.4)	43 (23.9)	13 (40.6)	
Employment status				< .001***
Unemployed	13 (6.1)	0 (0)	13 (40.6)	
Student	154 (72.3)	151 (83.4)	3 (9.4)	
Employed	39 (18.3)	24 (13.3)	15 (46.9)	
Self-employed	4 (1.9)	4 (2.2)	0 (0)	
Retired	1 (0.5)	0 (0)	1 (3.1)	
Other	2 (0.9)	2 (1.1)	0 (0)	

Note. SD = standard deviation. Age was compared using Welch *t*-test. All categorial variables were compared using Fisher's exact test due to low expected cell counts.

*** $p < .001$, * $p < .05$

Table 2

Participants' Mean Scores of Study Variables at Baseline

Baseline characteristics	Non-clinical (*N* = 181)	Clinical (*N* = 32)	Group comparison	
	Mean (SD)	*Mean (SD)*	*t*-value (df)	*p*-value
ES-G	7.38 (2.03)	3.53 (2.36)	-8.68 (39.59)	< .001***
ES-G Likert	31.83 (7.02)	20.64 (8.16)	-7.30 (39.53)	< .001***
BDI-II	10.45 (10.70)	29.84 (11.04)	9.21 (41.96)	< .001***
WHOQOL-BREF	72.44 (13.10)	52.71 (11.76)	-8.60 (45.71)	< .001***
PWB	83.05 (10.17)	n.a.		
Autonomy	12.50 (2.69)	n.a.		
Environmental mastery	13.57 (2.57)	n.a.		
Personal growth	15.43 (2.30)	n.a.		
Positive relations with others	13.80 (2.94)	n.a.		
Purpose in life	14.01 (2.52)	n.a.		
Self-acceptance	13.75 (2.96)	n.a.		
CD-RISC	25.78 (7.34)	15.56 (7.34)	-7.26 (42.69)	< .001***
GSI	0.64 (0.61)	1.39 (0.69)	5.69 (40.04)	< .001***
WHO-5	59.91 (19.22)	33.62 (17.30)	-7.79 (45.64)	< .001***

Note. SD = standard deviation. ES-G = Euthymia Scale; ES-G Likert = 6-point version of the Euthymia Scale; BDI-II = Beck Depression Inventory – II; WHOQOL-BREF = World Health Organization Quality of Life 21-item version; PWB = Psychological Well-Being Scale was only assessed in the non-clinical sample; CD-RISC = Connor-Davidson Resilience Scale 10-item version; GSI = Global Severity Index of the Brief Symptom Inventory 53-item version. WHO-5 = World Health Organization – 5. All variables were compared using Welch *t*-tests for unequal variances.

*** p < .001

Correlation analyses

Table 3 presents means, standard deviations, and Spearman rank correlations between the study variables. Spearman correlations were used due to significant deviations from normality in several variables, as indicated by Shapiro-Wilk tests (see Appendix C, Table C1).

Table 3

Descriptive Statistics and Spearman Correlations among Study Variables in the full Sample

Variable	*M*	*SD*	α	1	2	3	4	5
1. ES-G	6.80	2.49	.83	—				
2. GSI	0.75	0.68	.97	-.70***	—			
3. WHOQOL	69.48	14.69	.92	.71***	-.80***	—		
4. CD-RISC	24.25	8.18	.90	.64***	-.62***	.64***	—	
5. PWB[a]	83.05	10.17	.78	.51***	-.56***	.67***	.62***	—
6. BDI-II	13.36	12.78	.96	-.76***	.85***	-.82***	-.61***	-.57***

Note. n = number of participants, *M* = mean, *SD* = standard deviation, α = Cronbach's alpha

[a] Psychological Well-Being (PWB) was only assessed in the non-clinical sample.

ES-G = Euthymia Scale, GSI = Global Severity Index of the Brief Symptom Inventory, WHOQOL = World Health Organization Quality of Life (WHOQOL-BREF), CD-RISC = Connor Davidson Resilience Scale, BDI-II = Beck Depression Inventory-II. Benjamini-Hochberg correction was applied.

*** $p < .001$.

Rasch analysis

Rasch analysis revealed some misfit in the conditional item infit statistics (Table 4), with Item 4 showing a high item fit (InfitMSQ .10 above the threshold) and Item 5 showing a low item fit (InfitMSQ .10 below the threshold).

Table 4

Conditional Item Fit of Euthymia Scale Items

ES Item	InfitMSQ	Infit thresholds	Infit diff
Item 1	0.95	[0.79, 1.18]	no misfit
Item 2	1.00	[0.85, 1.15]	no misfit
Item 3	1.01	[0.79, 1.20]	no misfit
Item 4	**1.42**	[0.77, 1.32]	0.10
Item 5	0.89	[0.74, 1.26]	no misfit
Item 6	**0.66**	[0.77, 1.23]	-0.10
Item 7	0.98	[0.78, 1.22]	no misfit
Item 8	1.04	[0.84, 1.21]	no misfit
Item 9	1.01	[0.80, 1.20]	no misfit
Item 10	1.06	[0.81, 1.33]	no misfit

Note. InfitMSQ = information weighted mean square which is calculated by multiplying the squared standardized residuals by the observed response variance and then divided by the sum of the item response variances. MSQ values are based on conditional calculations (n = 211 complete cases). Thresholds were simulated from a parametric bootstrapping procedure with 200 iterations. Misfit items are highlighted in bold.

Principal Component Analysis of Rasch model residuals (PCAR) revealed a first eigenvalue of 1.50, accounting for 17.9% of the variance. A parametric bootstrapping procedure with 500 iterations calculated a maximum appropriate cutoff for the first eigenvalue of 1.68 to support unidimensionality.

Residual correlations between item pairs are displayed in Table 5. No correlations above the relative cutoff value of 0.21 were found.

Table 5

Residual Correlations of Euthymia Scale Item Pairs

Item	1	2	3	4	5	6	7	8	9
2	-.03								
3	.16	-.16							
4	-.22	-.03	-.19						
5	-.11	.01	.06	-.18					
6	.01	-.11	.04	-.18	-.12				
7	-.14	-.04	-.17	0	.03	.08			
8	-.24	-.24	-.03	-.09	.01	.03	-.34		
9	-.18	-.18	-.15	-.10	-.15	.01	-.13	.09	
10	-.05	-.10	-.22	-.05	-.27	-.06	-.10	-.06	-.06

Note. Relative cutoff value is 0.205, which is 0.293 above the average correlation (-0.088). The relative cutoff value was calculated with a 400-iteration bootstrapping procedure.

To validate the dimensionality assessment of the ES-G, parallel analysis was conducted with 1000 iterations. The analysis suggested that only one factor should be retained. The factor analysis scree plot is shown in Appendix D, Figure D1.

Predictive validity

A predictive modeling approach using nested cross-validation (5 folds, 10 repetitions) was applied to test whether baseline (t0) ES-G total scores or ES-G Likert total scores could predict treatment response. This analysis was conducted on a subsample of n = 25 patients who completed both pre- and post-assessment in the clinical trial at the LMU day clinic. A total of 14 patients (56.0%) were classified as responders according to the symptom reduction criterion (≥ 50% decrease in BDI-II total score from t0 to t1), and 15 patients (60.0%) met the well-being criterion (improvement of ≥ 10 points on the WHO-5 from t0 to t1).

The model performance metrics for both criteria and both scale formats are summarized in Table 6.

Sensitivity

The same predictive modeling approach was used to assess whether baseline ES-G or ES-G Likert total scores could predict group membership (non-clinical participants vs. clinical patients). The full dataset included 32 clinical patients (15.0%) and 181 non-clinical participants (85.0%). Model performance is also presented in Table 6.

Table 6

Performance of Logistic Regression Classifier (5-Fold Cross-Validation, 10 Repetitions) in Predicting Treatment Response and Group membership (clinical vs. non-clinical)

Criterion	n	Predictor	BAC	AUC	TPR	TNR
Response (BDI-II)	25					
		ES-G	0.61	0.63	0.71	0.48
		ES-G Likert	0.53	0.60	0.61	0.46
Response (WHO-5)	25					
		ES-G	0.63	0.69	0.72	0.54
		ES-G Likert	0.54	0.67	0.58	0.51

Group membership	213					
		ES-G	0.82	0.88	0.82	0.83
		ES-G Likert	0.79	0.85	0.78	0.81

Note. Response criteria were defined as: BDI-II: ≥ 50% symptom reduction from t0 to t1; WHO-5: ≥ 10 points increase from t0 to t1. Group membership was defined as clinical (day clinic patients) or non-clinical participants. The positive class was defined as "yes" for treatment response and "clinical" for group membership. BAC = balanced accuracy; AUC = area under the ROC curve; TPR = True positive rate (sensitivity); TNR = true negative rate (specificity). ES-G = baseline Euthymia Scale total score; ES-G Likert = baseline Euthymia Scale Likert version total score.

To evaluate the sensitivity to change of the ES-G and its Likert version, two linear regression models were estimated using ΔBDI-II as the outcome variable. Both models were controlled for centered BDI-II baseline scores.

The model using ΔES-G (centered) as the predictor yielded a significant negative association with symptom change, $b = -2.54$, $t(22) = -6.29$, $p < .001$. The ES-G change scores explained 64.3% of unique variance in the BDI-II change scores, after accounting for baseline depression, partial $R^2 = .64$

Similarly, the ES-G Likert version also significantly predicted symptom change, $b = -0.64$, $t(22) = -3.34$, $p = .003$. Partial R^2 of the ES-G Likert was .34.

Assumptions of linear regression were tested for both models. Shapiro-Wilk tests indicated that residuals were normally distributed ($p = .812$ and $p = .716$, respectively). Residuals vs. fitted plots showed no clear patterns, supporting the assumption of homoscedasticity (see Appendix C, Figures C3 and C4)

Clinical Validity

Mean total scores and standard deviations of the ES-G and ES-G Likert version stratified according to the past or current history of MDE are reported in Table 7. Due to violations of the homogeneity of variance assumption (Appendix C, Table C2), Welch's ANOVA was used. The test revealed a significant effect of group membership on ES-G total scores, $F(4,74.42) = 44.61$, $p < .001$. A bootstrapped estimate of omega squared confirmed a large effect size, $\omega^2 = 0.50$. A Jonckheere–Terpstra trend test with 10,000 permutations revealed a significant decreasing trend in ES-G total scores across the ordered MINI groups, $JT = 3289.5$, $p < .001$.

ES-G Likert total scores also significantly differentiated between the different groups of current or past depression history, Welch's $F(4,81.14) = 28.41$, $p < .001$. Bootstrapped omega squared again indicated a large effect, $\omega^2 = 0.40$. Likewise, a decreasing trend in ES-G Likert total scores was found, $JT = 3662.5$, $p < .001$.

Table 7

Means, Standard Deviations, and Welch's ANOVA of ES-G and ES-G Likert Total Scores stratified by Categories of History of MDE and Current MDE

Scale	Mean (SD)						Welch-ANOVA results	
	Group Total	0 Past (-) Current (-)	1 Past (+) Current (-)	2 Past (-) Current (±)	3 Past (+) Current (±)	4 Past (+) Current (+)		
	N = 206	n = 52	n = 17	n = 52	n = 44	n = 41	*F*-value	ω^2
ES-G	6.88 (2.47)	8.83 (1.31)	7.47 (1.74)	7.60 (1.71)	6.36 (1.66)	3.83 (2.25)	44.61***	.51

ES-G Likert	30.46 (8.07)	36.20 (7.53)	32.70 (4.09)	32.40 (5.97)	28.80 (4.93)	21.50 (6.87)	28.41***	.41

Note. Past (+): total score ≥ 5; Past (-): total score ≤ 4, measured by the Mini International Neuropsychiatric Interview questionnaire for lifetime episode; Current (+): total score ≥ 5; Current (±): 1 ≤ total score ≤ 4; Current (-): score = 0, measured by the Mini International Neuropsychiatric Interview questionnaire for the current two-week episode. ES-G = baseline Euthymia Scale total score; ES-G Likert = baseline Euthymia Scale Likert version total score. Omega squared (ω^2) was estimated using a nonparametric bootstrapping procedure with 1,000 resamples.
*** < .001

Games–Howell post-hoc comparisons revealed that ES-G total scores were significantly lower in all groups with a current or past depressive episode compared to the healthy group (all *p*s < .05), except for the comparison between healthy participants (Group 0) and those in full remission (Group 1), which was not significant (p = .051).

No significant differences were found between Group 1 (full remission) and Group 2 (first subthreshold depressive episode; p = .999) or between Group 1 and Group 4 (past MDE + current subthreshold symptoms; p = .188).

The ES-G Likert total scores showed a similar pattern to the original version. Scores were significantly lower in all clinical groups compared to the healthy group (all *p*s < .05), except for participants in full remission (Group 1), where the difference was not statistically significant (p = .119).

No significant difference was found between Group 1 (full remission) and Group 2 (first subthreshold depressive episode; p = 1.00).

Mean total scores of the ES-G and the ES-G Likert version stratified by BDI-II symptom severity groups are reported in Table 8. Welch's ANOVA revealed a significant effect of symptom severity on ES-G total scores, $F(3, 49.60) = 78.37$, $p < .001$. A Jonckheere–Terpstra trend test with 10,000 permutations confirmed a significant decreasing trend in ES-G scores with increasing levels of symptom severity, $JT = 1592$, $p < .001$. A bootstrapped estimate of omega squared confirmed a large effect size, $\omega^2 = .50$.

A similar pattern was observed for the ES-G Likert version. Welch's ANOVA indicated significant mean differences in ES-G Likert total scores between symptom severity groups, $F(3, 54.61) = 57.81$, $p < .001$. A decreasing trend across severity levels was likewise confirmed, $JT = 1714$, $p < .001$. A bootstrapped estimate of omega squared indicated a large effect, $\omega^2 = .45$.

Table 8

Means, Standard Deviations, and Welch's ANOVA of ES-G and ES-G Likert Total Scores stratified by Symptom Severity Groups

Scale	Mean (SD)					Welch-ANOVA results	
	Group Total N = 213	0 minimal n = 132	1 mild n = 28	2 moderate n = 20	3 severe n = 33	*F*-value	ω^2
ES-G	6.80 (2.49)	8.14 (1.46)	5.89 (1.40)	5.20 (2.50)	3.15 (1.91)	78.37***	.50
ES-G Likert	30.15 (8.22)	34.20 (6.18)	28.3 (4.26)	23.8 (6.86)	19.5 (6.11)	57.81***	.45

Note. Symptom severity groups: minimal = total score ≤ 13; mild = 14 ≤ total score ≤ 19; moderate = 20 ≤ total score ≤ 28; severe = 29 ≤ total score, measured by the Beck Depression Inventory-II. ES-G = baseline Euthymia Scale total score; ES-G Likert =

baseline Euthymia Scale Likert version total score. Omega squared (ω^2) was estimated using a nonparametric bootstrapping procedure with 1,000 resamples.
*** < .001

Games–Howell post-hoc tests revealed significant group differences in ES-G scores between all depression severity groups (all *p*s < .05), except for the difference between group 1 (mild depression) and group 2 (moderate depression) ($p = .829$).

For the ES-G Likert scores, no significant differences were found between the mild and moderate ($p = .151$) or between the moderate and severe ($p = .055$) symptom groups. All other group comparisons showed significant differences (all *p*s < .001).

A full display of pairwise comparisons is presented in Appendix E, Tables E1–E4.

Cutoff Determination

In the non-clinical sample, 53 participants were classified as depressed and 128 as non-depressed based on a BDI-II cutoff of ≥ 13. ROC analysis yielded an AUC of .88. The optimal cutoff score determined by Youden's J was 7.5. For practical purposes, a cutoff of ≥ 7 to indicate depression is recommended, which resulted in a sensitivity of 88.7% and a specificity of 71.9% (BAC = 80.3%). The ROC curve is shown in Appendix F, Figure F1.

Among day-clinic patients, 27 individuals met the criterion for depression, while 5 did not, based on a BDI-II cutoff of ≥ 19. The ROC analysis produced an AUC of .94. Youden's J indicated an optimal cutoff of 4.5. For clinical use, a cutoff of ≥ 5 seems to be appropriate. At this value, sensitivity was 92.6% and specificity was

80.0%, resulting in a balanced accuracy (BAC) of 86.3%. The ROC curve is provided in Appendix F, Figure F2.

Incremental Validity

To assess the incremental validity of the ES-G, two hierarchical regression models were fitted for each ES-G version (dichotomous vs. Likert) to predict psychological well-being (PWB total score). Both models were controlled for sex, age, and education. In the first model, adding the ES-G at step 2 led to a significant increase in explained variance, $\Delta R^2 = .08$, $F(1,167) = 21.32$, $p < .001$. In the second model, the ES-G Likert version also accounted for a significant increase, $\Delta R^2 = .06$, $F(1,167) = 16.82$, $p < .001$.

Residual diagnostics showed no substantial deviations from homoscedasticity (Appendix C, Figures C5 and C6). Although Shapiro-Wilk tests of the standardized residuals indicated deviations from normality (p's $< .001$), linear regression and model comparison tests are generally robust to such violations in large samples (e.g., (Lumley et al., 2002). Given that the primary interest was in changes in explained variance (ΔR^2), and no serious violations of other assumptions were observed, the results are considered reliable.

Comparison of the Self-Adapted 6-Point Likert Version of the ES-G with the Original Version

The ES-G in its original dichotomous scale format outperformed the ES-G Likert adaptation across all performance metrics. A comparison of the original and Likert versions of the ES-G for all validation objectives is presented in Table 9.

Table 9

Comparison of the Original and Likert Versions of the ES-G Across Validation Objectives

Analysis	Metric	ES-G Original	ES-G Likert
Predictive modeling	BAC		
- Treatment response (BDI-II)		.61	.53
- Treatment response (WHO-5)		.63	.54
- Predicting group membership (clinical vs. non-clinical)		.82	.79
Linear regression	partial R^2 / ΔR^2		
- Sensitivity to change		.64	.34
- Incremental validity		.08	.06
Welch's ANOVA	ω^2		
- Depression history (MINI)		.51	.41
- Symptom severity (BDI-II)		.50	.45

Note. BDI-II = Beck Depression Inventory-II; WHO-5 = World Health Organization – 5; MINI = Mini International Neuropsychiatric Interview questionnaire; ES-G = Euthymia Scale; ES-G Likert = 6-point version of the Euthymia Scale; BAC = balanced accuracy; partial R^2 = proportion of variance uniquely explained by ES-G change scores; ΔR^2 = increase in explained variance; ω^2 = estimated proportion of explained variance. Thresholds for interpreting ω^2, as suggested by Cohen (1988): small = .01, medium = .06, large = .14.

Discussion

Summary of Main Findings

The aim of this study was to validate the German version of the Euthymia Scale (ES-G) through a comprehensive clinimetric analysis. Following the CLIPROM criteria for patient-reported outcome measures (Carrozzino et al., 2021c), this study assessed the concurrent validity, dimensionality, predictive validity, sensitivity, clinical validity, and incremental validity of the ES-G. Additionally, statistically valid cutoff scores for the ES-G as a screener for depression were determined, and a self-adapted 6-point Likert version of the ES-G was compared with the original version.

The Euthymia Scale (ES-G) demonstrated good concurrent validity, correlating positively with measures of positive mental health (quality of life, resilience, psychological well-being) and negatively with measures of psychological distress. All correlations were highly significant and in the hypothesized directions. Effect sizes were all high according to benchmarks proposed by Cohen (1988), with the strongest association observed between the ES-G and depressive symptoms (ρ = -.76) and quality of life (ρ = .71). These findings support the convergent validity of the ES-G and are in line with the theoretical framework (Guidi & Fava, 2022). However, high correlations alone do not guarantee similar validity, as scales may share common content but differ in their specific validity profiles (Carrozzino et al., 2021c).

Several indicators of the dimensionality of the ES-G were assessed using Rasch measurement analysis for dichotomous data. Conditional item fit statistics revealed some misfit. Item 4 displayed a high infit value (underfit), and item 6 showed a low infit value (overfit). Overfit indicates that responses may be too predictable and provide little information, but it is generally not considered an indicator of multidimensionality. Underfit, on the other hand, may be an indicator of multidimensionality (Johansson, 2025b). Therefore, Item 4 underfitting the Rasch model was of potential concern regarding the dimensionality. However, follow-up dimensionality tests did not support this concern. Principal component analysis of Rasch model residuals (PCAR) and analysis of residual correlations of item pairs showed no signs of multidimensionality. The first eigenvalue was below the estimated highest first eigenvalue, and all residual correlations were below the bootstrapped relative cutoff. Furthermore, a parallel analysis suggested a unidimensional structure. While these findings suggest a unidimensional structure in this sample, previous research has identified two underlying dimensions (Carrozzino et al., 2021b; Carrozzino et al., 2019). From a clinimetric standpoint, however, strict homogeneity of components or unidimensionality are not primary requirements. Instead, the practical clinical utility of the rating scale in assessing a broad spectrum of clinical issues should be emphasized (Fava et al., 2004; Feinstein, 1987; Feinstein, 1992).

The baseline total scores of the ES-G, whether in the dichotomous or 6-point Likert adaptation, showed a limited ability to predict treatment responder status using the machine learning-based classification approach. For this task, AUC values were barely above chance level (AUCs = .63 and .60 for BDI-II; .69 and .67 for WHO-5). This means that either the ES-G baseline scores alone, when used in a logistic regression classifier, may not serve as a robust predictor of whether an individual will be a responder to psychotherapy, or it may be due to the small sample size of this analysis ($n = 25$). Studies have estimated that sample sizes of 75 to 100 are needed to achieve robust results (Beleites et al., 2012). Significantly better results were observed when predicting group membership (clinical vs. non-clinical). The original ES-G achieved an AUC of .88 and a BAC of .82. At the same time, the Likert version showed slightly lower values (AUC = .85, BAC = .79). These results indicate a strong ability of the ES-G to discriminate between clinical and non-clinical populations, which is considered an essential criterion for clinimetric outcome measures (Fava et al., 2018).

Both versions of the ES-G demonstrated good sensitivity to change, as reflected by their significant associations with symptom improvement. This supports their ability to reflect outcome changes in clinical trials, which is also a key requirement for clinimetric instruments (Kellner, 1972).

The ES-G demonstrated strong clinical validity by effectively distinguishing between groups with differing depression histories. It distinguished particularly well between healthy participants, who have never experienced a major depressive episode (MDE), and all other subthreshold or full MDE groups, and perhaps most importantly, between individuals with current MDE and those with subthreshold symptoms. This ability to detect residual or subclinical symptoms following remission is especially relevant in the clinical evaluation of recovery, as such symptoms are known to hinder complete remission and substantially increase the risk of relapse (Conradi et al., 2008, 2012; Verhoeven et al., 2018). However, ES-G total scores did not significantly differ between individuals in complete remission and those with current subthreshold symptoms, indicating limited discriminative ability within the subthreshold range. These results were supported by a second analysis examining the ability of the ES-G to differentiate between BDI-II-based symptom severity groups. While participants with no or minimal depressive symptoms (BDI-II $\leq$ 13) showed significantly higher ES-G scores than all other symptom severity groups, no significant difference was observed between groups with mild and moderate depressive symptoms. These findings are in line with previous results reported for the Japanese version of the Euthymia Scale (Sasaki et al., 2021).

Results from the ROC analyses suggest that the ES-G total score may serve as a useful screening indicator for depression in both clinical and non-clinical populations. The ES-G demonstrated good discriminative ability in the non-clinical sample (AUC = .88) and excellent performance in the clinical sample (AUC = .94) according to the interpretation guidelines of AUC scores proposed by Metz (1978). In the non-clinical sample, a cutoff score of ≥ 7 provided a sensitivity of 88.7% and specificity of 71.9% (BAC = .80). In the clinical sample, a slightly lower threshold of ≥ 5 yielded the best balance (BAC = .86) between sensitivity (92.6%) and specificity (80.0%). These group-specific cutoffs are consistent with recommendations by von Glischinski et al. (2019), who propose different BDI-II cutoffs depending on the clinical setting. But even cutoff points identified as optimal would miss some individuals with depression and wrongfully classify others. This highlights the importance of structured diagnostic interviews when diagnosing depression.

While both versions of the ES-G showed satisfactory incremental validity beyond the WHO-5, the original scale accounted for a slightly larger proportion of additional variance in psychological well-being (ΔR^2 = .08) compared to the Likert version (ΔR^2 = .06).

Comparing the original dichotomous version of the ES-G with the adapted Likert version, a clear pattern was found: the original version constantly outperformed the Likert version across all validation metrics, including predictive accuracy (BAC), sensitivity to change (R^2), group differentiation (ω^2), and incremental validity (ΔR^2). These findings provide empirical evidence for the assumption made by the authors of the ES that the dichotomous response format increases the sensitivity of the scale (Fava & Bech, 2016; Guidi & Fava, 2022). These results suggest that the ES-G should be used in the original dichotomous response format.

Implications

With the exception of the findings on dimensionality, which are not of primary interest in clinimetrics, the results of this study align closely with previous validation studies of the Euthymia Scale (ES). The German version (ES-G) demonstrates strong sensitivity, clinical validity, and practical utility as a brief self-report instrument. While it does not replace structured diagnostic interviews, its high discriminative ability (AUCs of .88 in non-clinical and .94 in clinical samples) suggests that it may be an efficient screening tool for depression in both clinical and non-clinical populations. This may inform clinicians about who may benefit from further assessment.

Importantly, the underlying construct of euthymia offers a clinically meaningful, integrative framework that goes beyond the reductionist focus on symptomatology (Fava & Bech, 2016; Fava & Guidi, 2020a; Guidi & Fava, 2020). In this sense, the scale may be particularly useful for psychotherapeutic approaches that aim to improve positive mental health outcomes. For instance, in interventions such as the Well-Being Therapy (WBT; Fava, 2016), which specifically targets euthymia, the ES-G could be employed as a weekly monitoring tool to track progress in psychological well-being, complementing traditional symptom-based outcome measures and helping clinicians assess whether treatment is not only reducing psychopathology but also increasing positive mental health.

Although the Euthymia Scale (ES) provides a measure of positive mental health, it is important to note that it should be assessed together with scales measuring dysthymia. As conceptualized by Guidi & Fava (2022), euthymia and dysthymia are considered two ends of a clinical continuum, where dysthymia encompasses features like demoralization, subjective incompetence, chronic worrying, mental pain, rigidity, and abnormal reactivity to environmental stimuli (Eysenck, 1953). Therefore, to gain a comprehensive understanding of mental health and well-being, the ES is best used combined with clinimetric instruments that capture these facets of distress or dysfunction, such as the Kellner's Symptom Questionnaire (SQ; Benasi et al., 2020), the PsychoSocial Index (PSI; Piolanti et al., 2016; Sonino & Fava, 1998), or the Mental Pain Questionnaire (MPQ; Fava et al., 2019; Guidi et al., 2019; Svicher et al., 2019).

Strengths and Limitations

This study assessed several important components of validity and sensitivity as recommended for clinimetric rating scales (Carrozzino et al., 2021c; G. A. Fava et al., 2012; Feinstein, 1987). By including both clinical and non-clinical samples, a differential perspective on these populations was made possible. State-of-the-art, robust, and appropriate statistical methods (e.g., Welch's ANOVA, bootstrapped omega^2, ROC curve analysis, Rasch model analysis, cross-validated predictive modeling) were employed to provide a comprehensive validation of the ES-G. Including clinical data from two timepoints enabled longitudinal analyses.

Furthermore, this study followed open science principles by preregistering all analyses and transparently disclosing reporting methods and deviations from the preregistered analysis plan. All R code used for the statistical analyses is openly accessible via the GitHub repository: https://github.com/NicoSteffen/Clinimetric_Properties_ES.git.

However, this study also has several limitations. First, the non-clinical sample is not demographically representative of the general population. Age is not normally distributed, and the average age is relatively young. The sample includes roughly four times as many female participants as male participants, and most have an academic background or are currently enrolled at a university. While the clinical sample better reflects typical clinical populations, its size was quite small, not meeting the preregistered sample size goal. Even when combining both samples, the overall sample size is only just sufficient to ensure statistically valid results in the validity analyses.

Additionally, only self-report measures (i.e., a questionnaire version of the Mini-International Neuropsychiatric Interview [MINI]) were used for diagnostic classification. The reliance on a self-report version of the MINI, rather than a clinician-administered structured interview, may have led to some misclassification of diagnostic status. Thus, the derived cutoff scores should be interpreted with caution and ideally be replicated using structured clinical interviews.

Some statistical limitations also apply; for example, the parametric bootstrapping function used to determine an appropriate cutoff value for the largest PCAR eigenvalue, as implemented in the easyRasch package (Johansson, 2025a), has not been systematically evaluated yet. Given these limitations, the findings should be interpreted with some caution.

Deviations from Pre-Registration

There are some deviations from the preregistered analysis plan. First, the order of research objectives in this report does not match the preregistered order. The order was changed to group objectives according to the corresponding CLIPROM criteria and to improve the overall logic flow.

Two preregistered objectives are not explicitly addressed in the final report: content validity of the ES-G is not discussed in detail, but relevant theoretical considerations are presented in the introduction. Further, the objective "Can ES baseline total scores predict current psychological distress scores?” was omitted due to conceptual redundancy.

There are some changes in the evaluation of the Rasch analysis: contrary to the preregistration, outfit statistics are not reported, following updated recommendations from the authors of the easyRasch package. The Evaluation of the Rasch model was instead carried out in line with their latest recommendations.

For some analysis objectives, parametric procedures were planned, but due to violations of normality and homogeneity of variances, appropriate robust alternatives have been applied.

Another deviation is found in the assessment of the Psychological Well-Being Scale (PWB), which was only administered in the non-clinical sample. As a result, analyses including the PWB could only be conducted in the non-clinical sample.

Furthermore, although the preregistration included testing incremental validity across all six PWB subscales, the present report focuses on the total score to preserve brevity and clarity.

Lastly, the cutoff determination was conducted separately for the clinical and the non-clinical sample instead of calculating one cutoff score. This is based on results from a meta-analysis (von Glischinski et al., 2019), which recommends the use of separate BDI-II cutoff values depending on the population.

Future Research

To further validate the findings of this study, additional research using the ES-G is needed. Future studies should be conducted in demographically representative samples to improve the generalizability of the results. Moreover, clinical validation studies should include larger patient samples to further evaluate the clinical utility of the scale.

The reported cutoff values for screening purposes should also be validated in larger samples, ideally using not only BDI-II scores but also systematically applied structured diagnostic interview criteria as the reference standard.

Another promising instrument in the assessment of euthymia is the Clinical Interview of Euthymia (CIE; Fava & Guidi, 2020a), which provides more nuanced clinical information than the self-report ES but has not yet been systematically validated. Future research might therefore focus on conducting a clinimetric evaluation of the CIE, thereby expanding the available toolbox for the assessment of euthymia.

In addition, longitudinal clinical studies with follow-up assessments of euthymia are needed to better understand its role in the recovery process and its potential as a prognostic marker for long-term outcomes.

Conclusion

The findings of this study suggest that the German version of the Euthymia Scale (ES-G) is a valid, sensitive, and clinically meaningful clinimetric instrument for assessing euthymia, that can be used in transdiagnostic settings. It demonstrated good performance across multiple clinimetric criteria, including predictive and clinical validity, sensitivity to change, and clinical discrimination. In clinical practice, euthymia may serve as a valuable endpoint for redefining recovery, not only by detecting the absence of symptom burden but also by capturing the presence of positive mental health resources, such as resilience, balanced well-being, and a sense of purpose in life. This aligns with recent proposals to redefine remission in mood disorders, including both symptom relief and restoration of well-being (Guidi & Fava, 2022). Given its ease of administration, the ES-G may also serve as a valuable screening tool in both clinical and non-clinical settings. However, further research in larger and more diverse samples is needed to confirm its utility and the generalizability of these findings.

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Appendix

Appendix A – German Adaptation of the Euthymia Scale

Table A1

English and German items of the Euthymia Scale (ES)

Item	English version	German version	Answer format
1	If I become sad, anxious or angry it is for a short time	Wenn ich traurig, ängstlich oder wütend werde, hält es nur für kurze Zeit an	richtig/falsch
2	I do not keep thinking about negative experiences	Ich denke nicht ständig über negative Erfahrungen nach	richtig/falsch
3	I am able to adapt to changing situations	Ich kann mich an veränderte Situationen anpassen	richtig/falsch
4	I try to be consistent in my attitudes and behaviors	Ich bemühe mich um beständige Einstellungen und Verhaltensweisen	richtig/falsch
5	Most of the time I can handle stress	Meistens bin ich in der Lage, mit Stress gut umzugehen	richtig/falsch
6	I generally feel cheerful and in good spirits	Ich bin im Allgemeinen froh und guter Laune	richtig/falsch
7	I generally feel calm and relaxed	Ich bin im Allgemeinen ruhig und entspannt	richtig/falsch
8	I generally feel active and vigorous	Ich bin im Allgemeinen aktiv und energisch	richtig/falsch
9	My daily life is filled with things that interest me	Mein Alltagsleben ist voller Dinge, die mich interessieren	richtig/falsch
10	I wake up feeling fresh and rested	Ich fühle mich beim Aufwachen frisch und ausgeruht	richtig/falsch

Appendix B – Grouping Criteria

Table B1

Grouping strategy for depression history

Group	Past MDE	Current MDE	Interpretation
0	no	no	No history of MDE - healthy
1	yes	no	Full remission
2	no	subthreshold	First subthreshold episode
3	yes	subthreshold	History of MDE + current subthreshold
4	yes	yes	History of MDE + current MDE

Note. Past MDE: endorsed ≥ 5 symptoms = yes, < 5 symptoms = no, based on the MINI questionnaire for lifetime episode; Current MDE: 5−9 symptoms = yes, 1−4 symptoms = subthreshold, 0 symptoms = no, based on the MINI questionnaire for current 2-week episodes.

Appendix C – Assumption Checks for Parametric Analyses

Table C1

Kurtosis, Skew and Shapiro Wilk Normality-Test Results of Study Variables

Variable	Skew	Kurtosis	Shapiro wilk test *p*-values
ES-G	-0.75	-0.19	< .001***
ES-G Likert	-0.34	0.24	.033*
GSI	1.05	0.30	< .001***
WHOQOL-BREF	-0.53	-0.43	< .001***
CDRISC	-0.47	-0.02	< .001***
PWB	-0.50	-0.08	.002**
BDI-II	1.16	0.71	< .001***
WHO-5	-0.34	-0.56	< .001***

Note. *p*-values < .05 indicate deviation from normality.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table C2

Levene's and Shapiro-Wilk Tests for Welch ANOVAs

ANOVA Model	Scale / Group	Levene's test *p*-values	Shapiro-Wilk test *p*-values
MINI history of MDE and current MDE Groups	ES-G	< .001***	
	0		< .001***
	1		.135
	2		.004**
	3		< .001***
	4		.028*
MINI history of MDE and current MDE Groups	ES-G Likert	.024*	
	0		.088
	1		.969
	2		.218
	3		.370
	4		.451
BDI-II symptom Severity Groups	ES-G	< .001***	
	0		< .001***
	1		.254
	2		.399
	3		.006**
BDI-II symptom Severity Groups	ES-G Likert	.117	
	0		.012**
	1		.679
	2		.610
	3		.134

Note. Levene's test *p*-values < .05 indicate violation of homogeneity of variances; Shapiro-Wilk test *p*-values < .05 indicate deviation from normality.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Figure C3

Residuals vs. Fitted Plot for ES-G Model from Sensitivity to Change Analysis

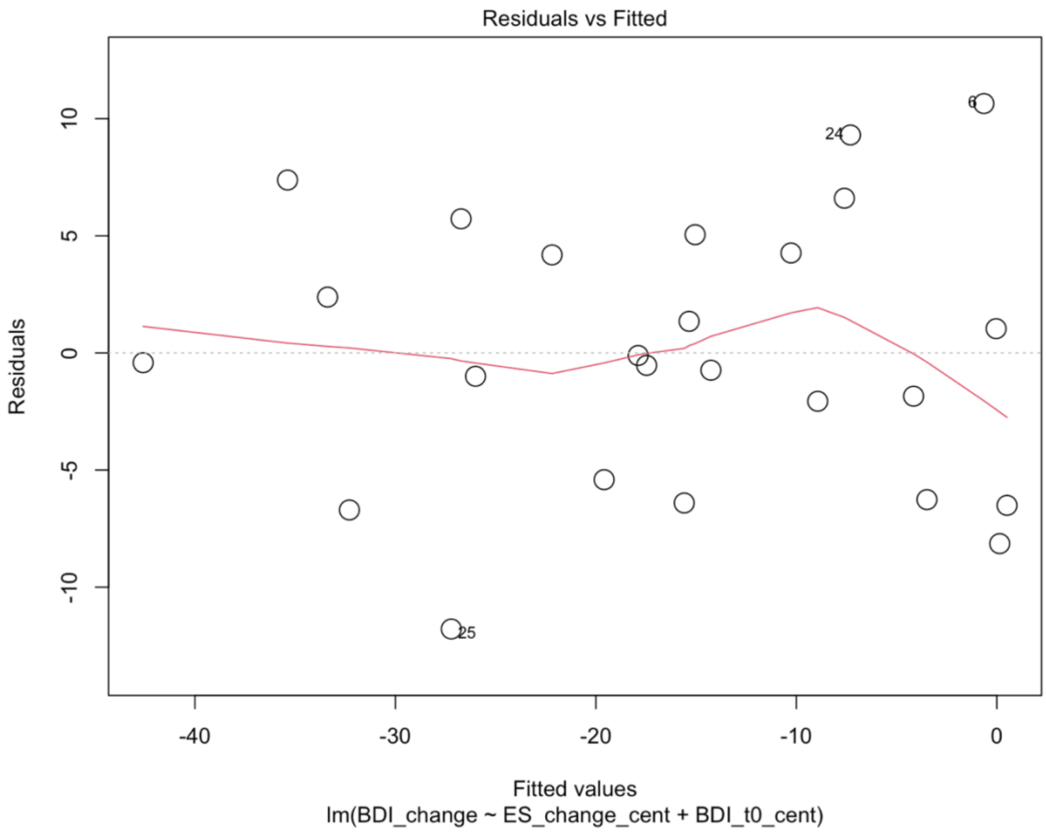


Figure C4

Residuals vs. Fitted Plot for ES-G Likert Model from Sensitivity to Change Analysis

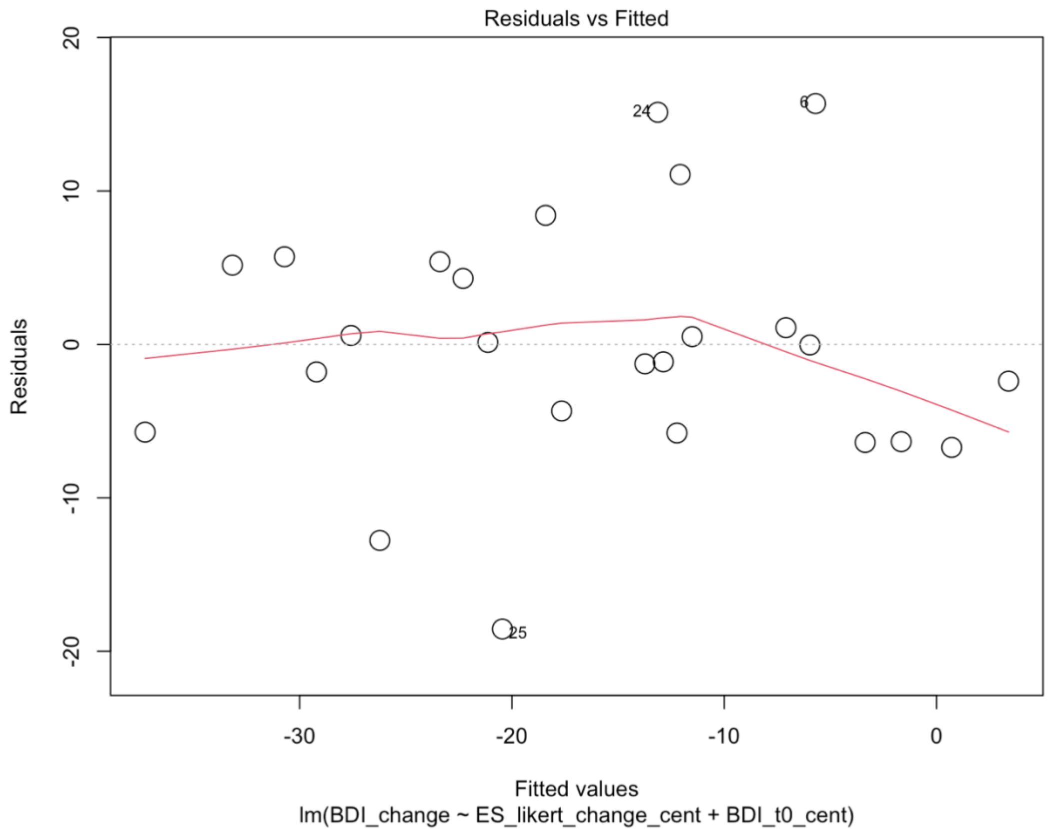


Figure C5

Residuals vs. Fitted Plot for ES-G Model from Incremental Validity Analysis

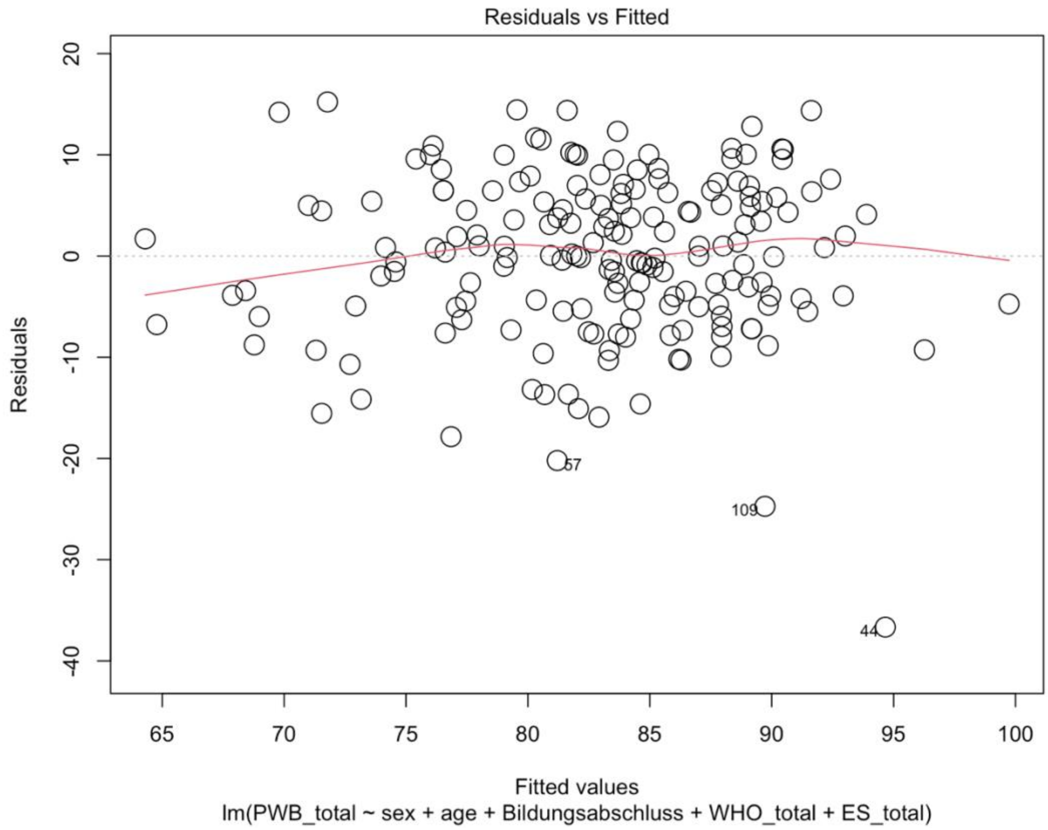
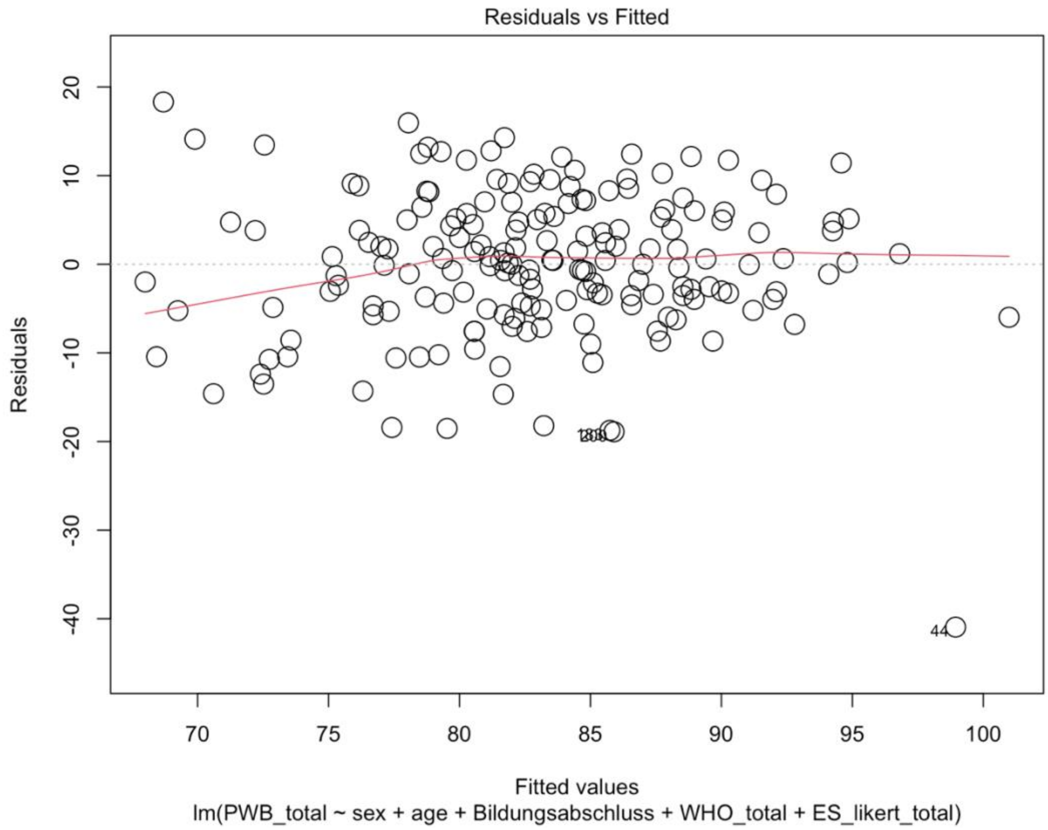


Figure C6

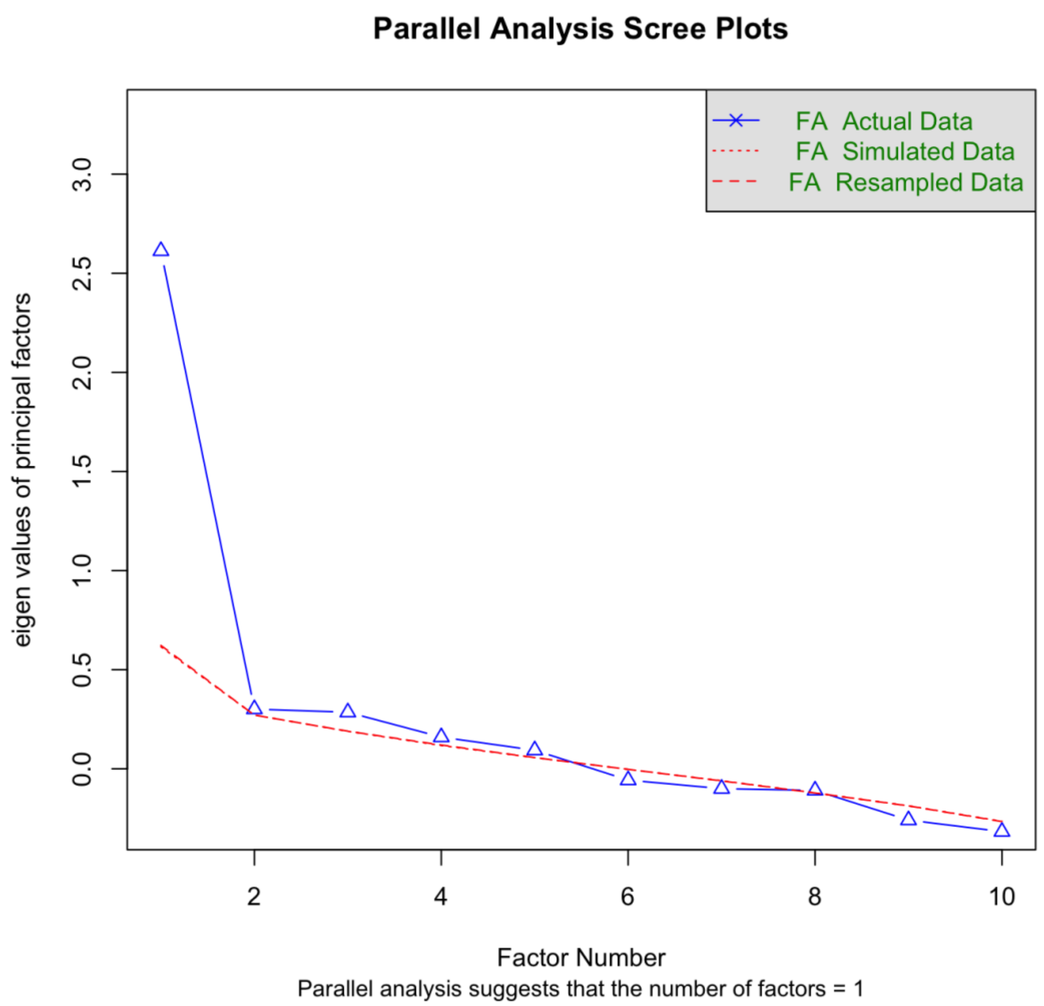
Residuals vs. Fitted Plot for ES-G Likert Model from Incremental Validity Analysis



Appendix D – Parallel Analysis

Figure D1

Parallel Analysis Scree Plot based on Factor Analysis



Note. The blue line represents eigenvalues from the actual data; the red dotted and dashed lines represent the 95th percentile eigenvalues from simulated and resampled data, respectively.

Appendix E – Post-Hoc Comparisons

Table E1

Games-Howell Comparisons of ES-G Total Scores by History of MDE and Current MDE Groups

Group	*n*	Mean (*SD*)	Games-Howell comparison *p*-values			
			0	1	2	3
0	52	8.83 (1.31)				
1	17	7.47 (1.74)	.051			
2	52	7.60 (1.71)	< .001***	.999		
3	44	6.36 (1.66)	< .001***	.189	.005**	
4	41	3.83 (2.25)	< .001***	< .001***	< .001***	< .001***

Note. Group 0 = no history of MDE; Group 1 = full remission; Group 2 = first subthreshold depressive episode; Group 3 = past MDE + current subthreshold; Group 4 = past MDE + current MDE; *n* = number of participants in each group; Mean (*SD*) = mean values and standard deviations from each group.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table E2

Games-Howell Comparisons of ES-G Likert Total Scores by History of MDE and Current MDE Groups

Group	*n*	Mean (*SD*)	Games-Howell comparison *p*-values			
			0	1	2	3
0	52	36.20 (7.53)				
1	17	32.70 (4.09)	.119			
2	52	32.40 (5.97)	< .042*	1.00		
3	44	28.80 (4.93)	< .001***	.026	.012*	
4	41	21.50 (6.87)	< .001***	< .001***	< .001***	< .001***

Note. Group 0 = no history of MDE; Group 1 = full remission; Group 2 = first subthreshold depressive episode; Group 3 = past MDE + current subthreshold; Group 4 = past MDE + current MDE; *n* = number of participants in each group; Mean (*SD*) = mean values and standard deviations from each group.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table E3

Games-Howell Comparisons of ES-G Total Scores by Symptom Severity Groups

Group	*n*	Mean (*SD*)	Games-Howell comparison *p*-values		
			0	1	2
0	132	8.14 (1.46)			
1	28	5.89 (1.40)	< .001***		
2	20	5.20 (2.50)	< .001***	.829	
3	33	3.15 (1.91)	< .001***	< .001***	.013*

Note. Group 0 = minimal depression; Group 1 = mild depression; Group 2 = moderate depression; Group 3 = severe depression; *n* = number of participants in each group; Mean (*SD*) = mean values and standard deviations from each group.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table E4

Games-Howell Comparisons of ES-G Likert Total Scores by Symptom Severity Groups

Group	*n*	Mean (*SD*)	Games-Howell comparison *p*-values		
			0	1	2
0	132	34.20 (6.18)			
1	28	28.30 (4.26)	< .001***		
2	20	23.80 (6.86)	< .001***	.151	
3	33	19.50 (6.11)	< .001***	< .001***	.055

Note. Group 0 = minimal depression; Group 1 = mild depression; Group 2 = moderate depression; Group 3 = severe depression; *n* = number of participants in each group; Mean (*SD*) = mean values and standard deviations from each group.

* *p* < .05; ** *p* < .01; *** *p* < .001.

Appendix F – Receiver Operating Characteristics Curves

Figure F1

ROC Curve for Non-Clinical Group

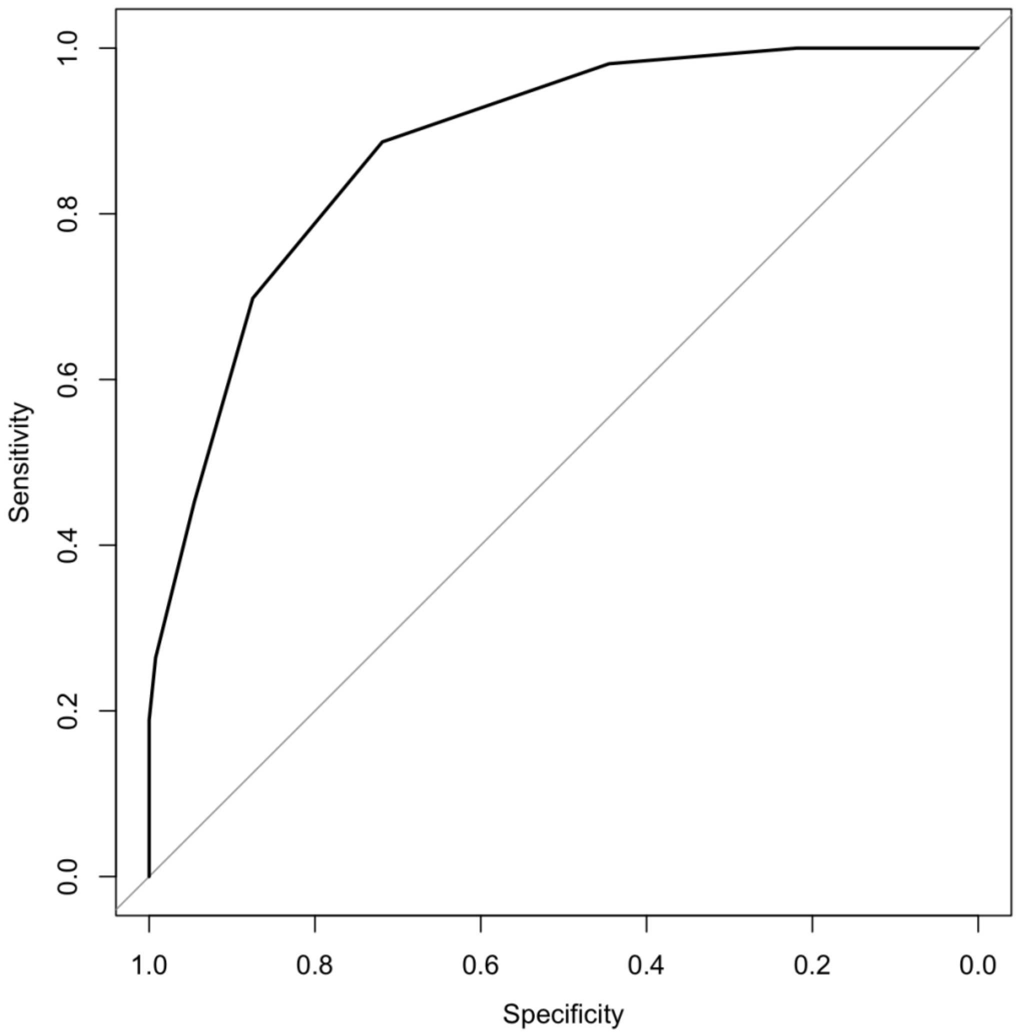
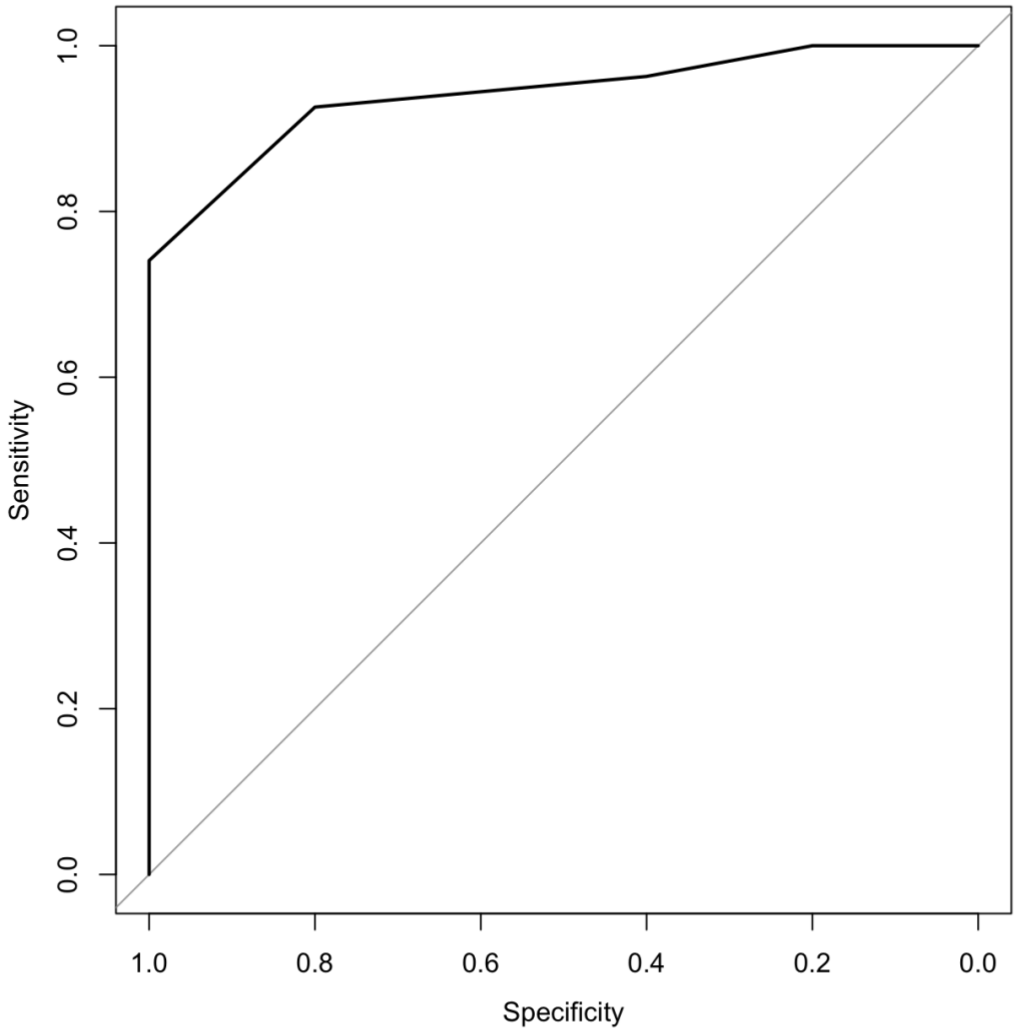


Figure F2

ROC Curve for Clinical Group



Declaration of Authorship

I hereby declare that the thesis submitted is my own unaided work. All direct or indirect sources used are acknowledged as references. Furthermore, this work has not been submitted in the same or a similar form or in part for any other examination.

Munich, 15.07.2025 Nico Steffen