



An Investigation into Psychophysiological and Emotional Responses to Perceived Threat

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¹ Liverpool Experts by Experience

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Introductory Chapter

The relationship between the body and mind (or psyche) has been considered throughout history within, and outside of, scientific domains. In fact, in the periods of human history which predate the scientific revolution mind-body theories of mental health were the norm (e.g., the ‘Humoral Theory’; Kalachanis & Tsagkaris, 2020). In the 17th century, French philosopher René Descartes described the mind as a nonphysical entity that influences, and is influenced by, the physical entity of the body but which also exists as a separate entity in of itself (Descartes, 1641), this is the school of thought known as ‘dualism’. Over time, and with the birth of psychology as a science in the late 19th century, the mind has been subjected to increased scientific interest. Yet it appears that remnants of dualistic thinking remain (Leitan & Murray, 2014), with physical and psychological phenomena typically being researched and ‘treated’ separately. Continuing to consider the mind as separate from the body may be sound in spiritual or religious contexts, for example in beliefs relating to a person’s mind, soul or spirit living on after their body has deceased (San Filippo, 2006), but dualistic thinking within psychological research and practice may have harmful unintended consequences (e.g., not fully appreciating the embodied experience of psychological distress and/or neglecting the physical health of people who experience mental health problems; De Hert et al., 2011).

In recent decades there have been developments in more integrated approaches to mental health (and distress) within clinical psychology, one of which is the development of compassion focused therapy. Compassion focused therapy is underpinned by an evolution informed, biopsychosocial approach to mental health problems and psychotherapy (Gilbert, 2009) and emphasises the need to understand mental health (and its antithesis, mental illness) in the context of innate human motives, needs and mentalities (Gilbert, 2020). Compassion focused therapy considers (and honours) the relationship between the body and the mind and

proponents of it have advocated for greater use of psychophysiological measures (e.g., heart rate variability) in the field of compassion science (Kirby et al., 2017; Rockliff et al., 2008).

Heart rate variability is a widely used metric which is thought to reflect the functioning of the autonomic nervous system (Thayer & Lane, 2000, 2009) and is considered a marker of health and stress (Kim et al., 2018; Thayer et al., 2012). Psychophysiological and emotional responses to threat can be elicited by both external and internal stimuli. One potential source of external threat is the fear of being evaluated by others, which is also referred to as social evaluative threat (Dickerson & Kemeny, 2004). From clinical observations, worries about being judged or evaluated by others are evident across a range of clinical presentations, which leads to the consideration of whether there may be differences in reactivity to social evaluative threat between clinical and non-clinical groups. In the hope of contributing to the (re)integration of the body and mind in psychological research, Chapter I of this thesis systematically reviews literature comparing heart rate variability reactivity to social evaluative threat between clinical and non-clinical groups.

Social evaluative threat research has indicated that (real and imagined) negative evaluations within social contexts are correlated with both self-reported and psychophysiological indices of stress and distress (Bosch et al., 2009; Dickerson & Kemeny, 2004; Lehman et al., 2015). Extending the idea of imagined judgements, a person's 'inner voice' (the way in which a person 'speaks' to and evaluates themselves in their mind) can be an internal source of threat (Gilbert, 2009). The 'inner voice' is thought to (at least in part) originate from external experiences of social dialogue with others in our formative years, which later becomes internalised as a dialogue with the self (Vygotsky, 1987) and attachment and levels of self-criticism may influence responses to compassion focused imagery (Rockliff et al., 2008; Gilbert & Procter, 2006; Kim et al., 2020). The empirical study of Chapter II explores whether the emotional impacts of imagined failure might be mitigated by cultivating

more compassionate inner responses. This study is concerned with exploring empirical support for techniques commonly used psychotherapeutically within compassion focused therapy and other similar approaches.

As a whole the thesis provides both an overview and a detailed specific study of the relationships between imagined stressors (social evaluation or personal failure) and stress, considering both self-reported and psychophysiological measures.

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Chapter I: Systematic Review

Heart Rate Variability Reactivity to Social Evaluative Threat in Clinical (Mental Health) Populations Compared to Non-Clinical Controls: A Systematic Review²

² Target journal: Psychophysiology (see Appendix 1.1 for author guidelines). Journal guidelines stipulate a maximum page count of 30 pages, this page count has been exceeded in order to allow for sufficient detail to be included for assessment purposes.

Abstract

Background

Psychological research typically relies solely on self-report measures to assess responses to stress and assumes that self-report accurately relates to inner and objective experiences of stress. In order to reduce some of the bias inherent to self-report measures (Althubaiti, 2016) and to open up new insights, there have been calls for greater integration of psychophysiological measures (such as heart rate variability) into psychological research (Kirby et al., 2017). Heart rate variability reliability correlates with various physical and mental health phenomena (Kemp & Quintana, 2013) but research does not typically differentiate between resting heart rate variability and heart rate variability reactivity. Resting heart rate variability is thought to reflect a general autonomic capacity to respond flexibly to demands whereas heart rate variability reactivity reflects acute autonomic changes in response to a specific demand (Beauchaine, 2001; Porges, 1995) and there appears to be less evidence on the latter (Laborde et al., 2017). This systematic review evaluated research comparing heart rate variability reactivity to social evaluative threat in adults who have received a mental health diagnosis compared to adults who have not, to determine whether there were any reliable differences in such reactivity.

Method

Searches of CINAHL, EMBASE, PsycINFO and Web of Science for English language, peer-reviewed empirical studies included descriptors for clinical (mental health) populations in conjunction with descriptors for social evaluative threat and heart rate variability. In order to be eligible for inclusion, studies were required to quantitatively compare heart rate variability reactivity between adults (18+ years) who had received a mental health diagnosis and a non-clinical control group. All ‘social evaluative threat’

induction paradigms were included. Demographic information and heart rate variability findings were extracted from the included studies.

Results

Following screening 12 studies were eligible for inclusion. All included studies used the Trier social stress test (Kirschbaum et al., 1993) under controlled conditions, to induce social evaluative threat. Both clinical and non-clinical groups reliably demonstrated heart rate variability changes in the expected direction in response to the stressor but only one study reported group differences in heart rate variability reactivity (Schmalbach et al., 2021). However significant heterogeneity in heart rate variability measurement and reporting and management of confounds makes it difficult to draw firm conclusions.

Conclusion

There were no reliable differences in HRV reactivity in response to social evaluative threat (as induced by the Trier social stress test under laboratory conditions) between adults who had received a mental health diagnosis and those who had not. Only one study reported a difference in HRV reactivity to social evaluative threat, when comparing people with anorexia nervosa diagnoses compared to controls (Schmalbach et al., 2021). There was significant heterogeneity in the measurement and reporting of HRV across the included studies, which may have impacted on findings. On reflection, findings may also have been impacted by the restricted parameters of the review, particularly comparing HRV reactivity on the categorical basis of having received a mental health diagnosis (or not) may have reduced sensitivity to potentially important individual differences (e.g., experiences of trauma or adversity). Future research should endeavour to expand this review protocol.

Introduction

Humans have evolved to be social; from birth, and throughout life, we rely on one another for our physical and psychological survival, development, and regulation. Whilst most species engage in social behaviours for attainment of resources, for procreation or for caring for offspring, humans have developed additional capacities for extended care giving and affiliative ways of living (Ainsworth & Bowlby, 1991; Walker & McGlone, 2013). Developed within clinical psychology and mental health frameworks, Gilbert's social mentalities theory (Gilbert, 2005; Liotti & Gilbert, 2011) describes how our minds are orientated to seek out relationships with others, motivated by innate desires to elicit and provide care, to be sexually and socially attractive and to attain (and maintain) social status. Additionally, the (presumably) uniquely human abilities for self-awareness, imagination and reflection enable us to envisage a sense of self and to consider how we might be seen in the minds of others (Dunbar, 1998, 2009). Whilst these abilities have many evolutionary advantages, enabling us to use social resources to survive and thrive, they also leave us vulnerable to difficult emotions, such as shame, when we perceive that we may be judged negatively by others (Gilbert, 2009; Lehman et al., 2015).

There is a complex and reciprocal relationship between the body and mind. Consequently, threat to one's social status is experienced at both a physiological and psychological level. The social self-preservation theory (Dickerson & Kemeny, 2004) asserts that when the 'social self' (i.e. one's social value or status) is threatened, feelings of low social worth are elicited along with reductions in self-esteem, and increases in cortisol, a 'stress hormone' released by the hypothalamic-pituitary-adrenal (HPA) axis. The term 'social evaluative threat' refers to an incidence where an aspect of the self could be negatively judged by others, whether or not this judgement actually occurs (Dickerson & Kemeny, 2004). Under laboratory conditions, using the Trier social stress test (Kirschbaum et al.,

1993), the induction of social evaluative threat has been associated with various physiological and psychological responses, including increased proinflammatory cytokines (Dickerson et al., 2009), increased cortisol, pre-ejection period (an index of sympathetic activity), shame and anxiety and decreased heart rate variability (an index of cardiac vagal tone; Bosch et al., 2009). Naturalistic research also supports these findings; Lehman et al. (2015) measured ambulatory blood pressure in healthy students for three days and evaluated their cardiovascular and (self-reported) emotional responses to experiences of social evaluative threat in their daily lives. Social evaluative threat was associated with increased anxiety, worry, shame, embarrassment and anger, and a trend towards increased systolic blood pressure and heart rate. Thus, it seems that social evaluative threat provokes stress reactions in individuals which are experienced on both psychological and physiological levels.

Scientific inquiry into the reciprocal heart-brain connection is not new, as far back as the 19th century French physician Claude Bernard wrote on this topic. Darwin (1872), citing Bernard, highlighted that "...when the heart is affected it reacts on the brain; and the state of the brain again reacts through the pneumogastric [vagus] nerve on the heart; so that under any excitement there will be much mutual action and reaction between these, the two most important organs of the body" (p.71-72, as cited in Thayer & Lane, 2009, p.81). Yet despite the long history of inquiry, psychophysiological understandings of mental health remain limited and largely absent from practice in clinical psychology. In recent decades, the polyvagal theory (Porges, 1995, Porges, 2011) has proposed a framework for understanding the autonomic nervous systems of mammals. Prior to the introduction of the polyvagal theory the mammalian autonomic nervous system was thought to be made up of two branches, 1) the sympathetic nervous system (the defensive 'fight or flight' mechanism) and 2) the parasympathetic nervous system (the 'rest and digest' mechanism; Porges, 2009). Porges (1995) introduced the idea that the parasympathetic nervous system has evolved over time,

from defensive (reptilian) structures responsible for freezing in the face of threat (the ‘dorsal’ branch) to phylogenetically newer (mammalian) structures conducive of social engagement (the ‘ventral’ branch), with the two branches having different effects on the heart. It is proposed that in conditions of safety the ‘ventral’ branch of the vagus nerve slows the heart and inhibits sympathetic (fight or flight) arousal, enabling a calm physiological state conducive of social affiliative affects and behaviours (Porges, 1995; Porges, 2007, 2009, 2011). During stress this ‘vagal brake’ is withdrawn, enabling defensive (fight or flight) states, which under extreme stress can result in (‘dorsal’ vagal) freeze, characterised by significant reductions in heart rate (bradycardia; Porges, 2009; Reed et al., 1999).

Vagally-mediated heart rate variability (HRV) is thought to reflect the functioning of the autonomic nervous system (Porges, 2007; Thayer & Lane, 2000; Thayer & Lane, 2009), with higher resting HRV typically reflecting increased self-regulation (Reynard et al., 2011) and social engagement (Geisler et al., 2013) abilities and better physical and mental health (see Kemp & Quintana, 2013 for a review). The ease and non-invasive nature of HRV measurement makes it an ethical and accessible method (Laborde et al., 2017) and its theoretical links to the polyvagal theory (Porges, 2011) and observed relationship with a range of physical and mental health phenomena (Kemp & Quintana, 2013) has spurred considerable interest in using it as an index of autonomic stress in psychological (Kirby, 2017) and psychophysiological (Laborde et al., 2017) research.

Chalmers et al. (2014) meta-analysed studies investigating differences in HRV in participants with an anxiety disorder diagnosis compared to non-clinical controls (N = 36 studies). Overall, high frequency HRV was reduced in the clinical group, with small to moderate effect sizes. Though group differences in samples with diagnoses of obsessive-compulsive disorder or social phobia (or where anxiety diagnoses were grouped) were non-significant, which may be (at least in part) due to inconsistency in findings across studies and

limited sample sizes. Medication use and co-morbidities were not found to be significant moderators and there were no differences observed in low frequency HRV between clinical groups and non-clinical controls overall or for specific diagnoses (Chalmers et al., 2014). Differences in high frequency HRV metrics (but not low frequency HRV) may highlight differences specifically related to the parasympathetic nervous system, which is more accurately reflected in high frequency measures. Alvares et al. (2016), in their meta-analysis (N = 140 studies), also found reduced HRV in populations with ‘axis 1’ diagnoses compared to non-clinical controls, with small to medium effects for anxiety, mood and substance use diagnoses and a large effect for psychotic diagnoses. When medication use was accounted for, small but significant effects of lower HRV in the clinical group remained, with tetracyclic antidepressants and clozapine being associated with lower HRV. In general, there seems to be a theme of lower HRV across mental health diagnoses, with some possible exceptions (e.g., obsessive compulsive disorder and social phobia; Chalmers et al., 2014). A further exception is found in anorexia (Peyser et al., 2021) and bulimia nervosa (Peschel et al., 2016), with the majority of studies demonstrating higher HRV in clinical groups compared to controls. Lower HRV across a range of mental health diagnoses may indicate a transdiagnostic autonomic nervous system dysregulation associated with distress, whereas higher HRV in those with an eating disorder diagnosis may be (at least partly) attributable to ‘hibernation states’ associated with reduced food intake or calorie restriction (Scolnick et al., 2014).

Furthermore, most reviews summarising differences in HRV between clinical and non-clinical groups do not specifically examine differences in HRV reactivity to stress (Chalmers et al., 2014; Alvares et al., 2016; Peyser et al., 2020). Whilst resting HRV reflects a person’s general capacity to respond flexibly to demands, HRV reactivity reflects acute changes in self-regulation and physiological state in response to a specific demand

(Beauchaine, 2001; Porges, 1995) and therefore resting HRV and HRV reactivity may reveal distinct patterns of similarities and differences (Laborde et al., 2017). Reviews which have evaluated differences in HRV reactivity between clinical and non-clinical groups have shown inconsistent findings. Peschel et al. (2016) observed reduced HRV reactivity to stress in participants with bulimia nervosa diagnoses compared to controls and that ‘normalisation’ of HRV may be (at least partly) achieved through treatment. Hamilton and Alloy (2016) found that in samples of adults who currently met criteria for depression, the majority of studies reported that depression was associated with ‘atypical reactivity’ to stress, representing a blunted stress response or an increase in HRV in response to various types of stressors. Studies which included those with ‘remitted depression’ showed less obvious differences between clinical and non-clinical controls. Findings from these reviews suggest that differences in HRV reactivity may be state dependent.

Rationale and Objectives for this Review

Whilst previous reviews have evidenced differences in resting HRV between clinical and non-clinical groups, the reasons for why these differences occur is still not understood. As lower resting HRV is thought to reflect a reduced psychophysiological capacity to flexibly respond to stress (Porges, 2009; Thayer & Lane, 2000; Thayer & Lane, 2009), it may be that there are differences in reactivity to stress between people who meet criteria for a mental health diagnosis and those who do not. This is an assumption which underpins the stress-vulnerability model (Zubin & Spring, 1977) which proposes that some people are biologically predisposed to having a smaller ‘stress bucket’ (i.e. less capacity to flexibly respond to stress) and thus may be more likely to develop mental health problems in response to stressors. This model remains commonly used in clinical practice, yet its underlying assumptions appear to have little empirical support. This review will begin to evaluate the assumption of ‘difference in reactivity to stress’ by synthesising research investigating HRV

reactivity to social evaluative threat. What is considered adaptive (or ‘typical’) HRV reactivity may depend on the type of demand or stressor (Thayer et al., 2009) therefore this review evaluates HRV reactivity to social evaluative threat only. This review firstly, 1) evaluates whether there are any differences in HRV reactivity to social evaluative threat in adults who have received a mental health diagnosis, compared to those who have not and subsequently, 2) outlines patterns of any observed differences.

Considering the observed differences in HRV between clinical and non-clinical groups reported in previous reviews (Alvares et al., 2016; Chalmers et al., 2014; Peschel et al., 2016; Peyser et al., 2020) along with the assumption that resting HRV is associated with HRV reactivity (Laborde et al., 2017; Porges, 2007) we might expect that group differences in HRV reactivity will be identified. If group differences are not reliably observed, then this may indicate that 1) there are no real differences between clinical and non-clinical groups in their reactivity to social evaluative threat at the level of HRV, 2) HRV reactivity may not be as sensitive as resting HRV in differentiating between groups and/or 3) mental health diagnosis status may be an insufficient comparator to reveal reliable differences. If reliable group differences are found across diagnoses, then this may lend support to transdiagnostic psychophysiological understandings of mental health (and its antithesis, mental illness).

Method

This systematic review was undertaken and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009) and was registered with the International Prospective Register of Systematic Reviews (PROSPERO) a priori (registration no.: CRD42020195624).

Searches

Searches were completed in the following databases: CINAHL, EMBASE, PsycINFO and Web of Science on 1st August 2021. Search term descriptors for clinical populations were used in conjunction with descriptors for social evaluative threat and HRV measurement (see Table 1 for search strategies). Though the review does not endeavour to explore differences in reactivity to social evaluate threat between neurodivergent and neurotypical populations, the decision was made to include some terms relating to neurodevelopmental diagnoses (e.g., ‘autism’ and ‘Asperger’s syndrome’) due to the potential for research investigations into autism also indirectly exploring associated mental health diagnoses, given the high level of overlap (Stone & Iguchi, 2011), and to ensure that the searches were as inclusive as possible. Title and abstract screening, full text screening and hand-searching was completed by the first author (EL). Hand-searches of the references lists from the included articles did not reveal any additional papers for inclusion.

Eligibility Criteria

To be eligible for inclusion studies were required to evaluate HRV response to social evaluative threat, by measuring HRV over at least two time points (pre-social evaluative threat stress and during or after social evaluative threat). Studies were also required to include a clinical group with adults (18+ years) with any mental health diagnosis, as diagnosed by a structured clinical interview, and a non-clinical control group. All social evaluative threat paradigms were included. Inclusion was limited to quantitative, peer-reviewed empirical

articles written in English. Reviews, conference abstracts and non-peered reviewed empirical articles were excluded.

Table 1*Search Strategies*

Database	Search Strategy
CINHAL	((("social evaluat*" OR "TSST" OR "Trier social stress test" OR "Montreal Imaging Stress Task" OR "MIST") AND ("heart rate variability" OR "HRV" OR "cardiac vagal tone" OR "cardiac vagal control" OR "RSA" OR "respiratory sinus arrhythmia")) AND ("addiction" OR "anorexia nervosa" OR "anxiety" OR "Asperger's syndrome" OR "autism" OR "bipolar affective disorder" OR "complex PTSD" OR "complex trauma" OR "depersonal* disorder" OR "depress*" OR "dereal*" OR "dissociation" OR "eating disorder" OR "mental disorder" OR "mental illness" OR "obsessive compulsive disorder" OR "OCD" OR "panic" OR "personality disorder" OR "phobia" OR "post-traumatic stress disorder" OR "psychiatric disorder" OR "psychiatric illness" OR "psychological disorder" OR "psychological illness" OR "psychopathology" OR "psychosis" OR "PTSD" OR "schizo*"))).af [Peer reviewed] [Languages eng]
EMBASE	((("social evaluat*" OR "TSST" OR "Trier social stress test" OR "Montreal Imaging Stress Task" OR "MIST") AND ("heart rate variability" OR "HRV" OR "cardiac vagal tone" OR "cardiac vagal control" OR "RSA" OR "respiratory sinus arrhythmia")) AND ("addiction" OR "anorexia nervosa" OR "anxiety" OR "Asperger's syndrome" OR "autism" OR "bipolar affective disorder" OR "complex PTSD" OR "complex trauma" OR "depersonal* disorder" OR "depress*" OR "dereal*" OR "dissociation" OR "eating disorder" OR "mental disorder" OR "mental illness" OR "obsessive compulsive disorder" OR "OCD" OR "panic" OR "personality disorder" OR "phobia" OR "post-traumatic stress disorder" OR "psychiatric disorder" OR "psychiatric illness" OR "psychological disorder" OR "psychological illness" OR "psychopathology" OR "psychosis" OR "PTSD" OR "schizo*"))).af [Publication types Journal] [English language] [Languages English]
PsycINFO	((("social evaluat*" OR "TSST" OR "Trier social stress test" OR "Montreal Imaging Stress Task" OR "MIST") AND ("heart rate variability" OR "HRV" OR "cardiac vagal tone" OR "cardiac vagal control" OR "RSA" OR "respiratory sinus arrhythmia")) AND ("addiction" OR "anorexia nervosa" OR "anxiety" OR "Asperger's syndrome" OR "autism" OR "bipolar affective disorder" OR "complex PTSD" OR "complex trauma" OR "depersonal* disorder" OR "depress*" OR "dereal*" OR "dissociation" OR "eating disorder" OR "mental disorder" OR "mental illness" OR "obsessive compulsive disorder" OR "OCD" OR "panic" OR "personality disorder" OR "phobia" OR "post-traumatic stress disorder" OR "psychiatric disorder" OR "psychiatric illness" OR "psychological disorder" OR "psychological illness" OR "psychopathology" OR "psychosis" OR "PTSD" OR "schizo*"))).af [Peer reviewed] [Languages English]
Web of Science	((ALL=("social evaluat*" OR "TSST" OR "Trier social stress test" OR "Montreal Imaging Stress Task" OR "MIST") AND ALL=("heart rate variability" OR "HRV" OR "cardiac vagal tone" OR "cardiac vagal control" OR "RSA" OR "respiratory sinus arrhythmia")) AND ALL=("addiction" OR "anorexia nervosa" OR "anxiety" OR "Asperger's syndrome" OR "autism" OR "bipolar affective disorder" OR "complex PTSD" OR "complex trauma" OR "depersonal* disorder" OR "depress*" OR "dereal*" OR "dissociation" OR "eating disorder" OR "mental disorder" OR "mental illness" OR "obsessive compulsive disorder" OR "OCD" OR "panic" OR "personality disorder" OR "phobia" OR "post-traumatic stress disorder" OR "psychiatric disorder" OR "psychiatric illness" OR "psychological disorder" OR "psychological illness" OR "psychopathology" OR "psychosis" OR "PTSD" OR "schizo*")))) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article)

Quality Assessment

Each of the included articles were quality assessed using a tool that the author devised, based on items from the Newcastle-Ottawa Scale (NOS) form for cohort studies (Wells et al., 2000), and the potential confounds which may be associated with HRV

measurement (as outlined by Laborde et al., 2017). Included articles were quality assessed independently by the principal investigator (EL) and the research supervisor (KL). The NOS form for cohort studies broadly assesses three quality domains: sample selection, comparability of groups and outcome, the scores from which are then used to estimate an overall quality rating. The quality assessment for this review followed a similar process. For the selection domain, studies were evaluated as to whether the clinical group was representative and for the suitability of selection of the non-clinical controls. For the comparability domain, studies were rated on whether they matched groups by demographics a priori and to what extent they excluded or controlled for other potential confounds (e.g., age, sex, menstrual cycle stage, use of oral contraception, sleep, exercise, body mass index, weight, height, waist-to-hip ratio, diet and caffeine intake, smoking status, alcohol use and medication; Laborde et al., 2017). For the outcome domain, studies were evaluated on the quality of HRV measurement, whether HRV data loss was reported, whether baseline differences in HRV were considered and whether sample attrition was adequately handled and reported. An overall quality rating was calculated from the sum of stars allocated for each domain, creating a star rating out of 10 for each study with higher stars indicating greater quality. See Appendix 1.2 for quality assessment tool criteria.

Data Extraction

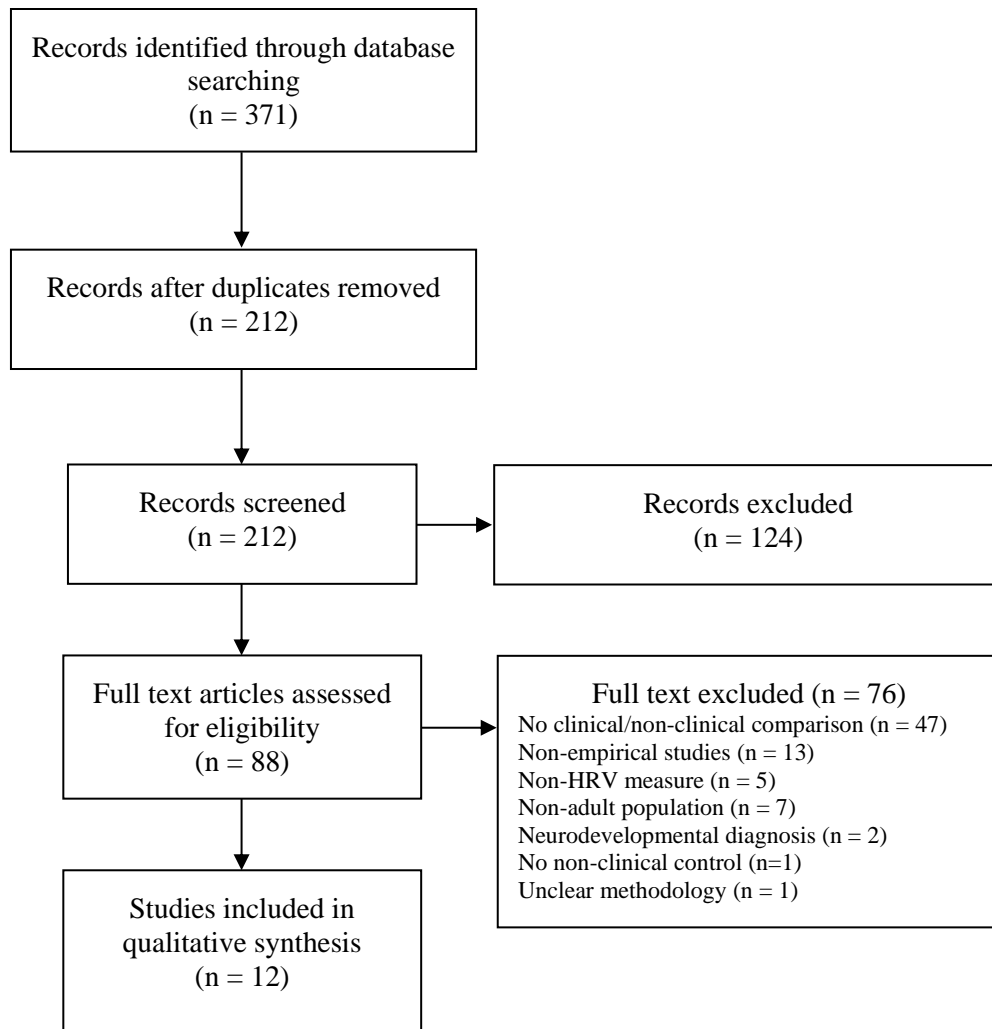
Study characteristics data (i.e., author(s), year, country, study design, setting, sample size and description for clinical and non-clinical groups, type of HRV measures and social evaluative threat paradigm employed and the measurement points at which HRV was collected for analysis) were extracted. Data reflecting HRV reactivity to social evaluative threat for clinical and control groups was also extracted and a qualitative synthesis of these findings is offered.

Results

The search strategy yielded 371 results, 212 after duplicates were removed. After title and abstracts were screened 88 articles were retained. The full texts of these 88 articles were then screened for eligibility. Following this process, 15 articles met the inclusion criteria. One study was excluded due to having an unclear methodology (Woodward et al., 2008), unsuccessful attempts were made to contact the author of this study prior to exclusion. Two further studies (Dijkhuis et al., 2019; Lackschewitz et al., 2008) were excluded at the full text screening stage as they represented studies exploring only neurodevelopmental diagnoses with no mental health investigations. Therefore, 12 studies were included for synthesis (see Figure 1).

Figure 1

PRISMA Diagram



Study Characteristics

Table 2 reports study characteristics for the included studies. The 12 included studies were conducted from 2006 to 2021 and represented a range of mental health diagnoses including depression in populations with a metastatic breast cancer diagnosis (N=1; Giese-Davis et al., 2006) and in populations at risk of cardiovascular disease (N=1; Taylor et al., 2006), panic disorder (N=3; Petrowski et al., 2010; Petrowski et al., 2012; Petrowski et al., 2017), social phobia (N=2; García-Rubio et al., 2017; Klumbies et al., 2014), eating disorders (N=2; Het et al., 2015; Het et al., 2020), anorexia nervosa (N =1; Schmalbach et al., 2021),

first episode schizophrenia (N=1; Reed et al., 2020) and schizophrenia spectrum disorders (N=1; Andersen et al., 2018). Several mental health diagnoses were not represented, including bipolar disorder, obsessive compulsive disorder, post-traumatic stress disorder or any of the personality disorder diagnoses.

Seven of the included studies were completed in Germany (García-Rubio et al., 2017; Het et al., 2015; Het et al., 2020; Klumbies et al., 2014; Petrowski et al., 2010; Petrowski et al., 2012; Schmalbach et al., 2021). The remainder were completed in the United States (N=4; Andersen et al., 2018; Giese-Davis et al., 2006; Reed et al., 2020; Taylor et al., 2006) and Spain (N=1; Petrowski et al., 2017). Ethnicity/race data was only available for 4 studies, 2 of which reported ‘% White’ participants as 96% (clinical group) and 80% (controls; Taylor et al., 2006) and 93.2% (clinical group) and 77.8% (controls; Giese-Davies et al., 2006). Andersen et al. (2018) reported number of ‘White’, ‘Black’, ‘Asian’ and ‘Hispanic’ participants as: ‘White’ (N=9/19 clinical group, N=10/20 controls), ‘Black’ (N=9/19 clinical group, N=4/20 controls), ‘Asian’ (N=1/19 clinical group, N=5/20 controls) and ‘Hispanic’ (N=0/19 clinical group, N=1/20 controls). Reed et al. (2020) was the only study to provide a more detailed description of sample ethnicities: ‘African American’ (N=10/28 clinical group, N=6/29 controls), ‘Asian American’ (N=3/28 clinical group, N=10/29 controls), ‘European Americans’ (N=7/28 clinical group, N=5/29 controls), ‘Latino/Latina’ (N=16/28 clinical group, N=7/29 controls) and ‘Mixed’ (N=2/28 clinical group, N=1/29 controls).

All studies used the Trier social stress test (TSST; Kirschbaum, 1993) as the psychosocial (social evaluative threat) stressor, yet studies varied considerably in their TSST protocol. The included studies also employed a range of HRV metrics, with 7 studies including 2 or more metrics (García-Rubio et al., 2017; Giese-Davis et al., 2006; Het et al., 2015; Taylor et al., 2006; Petrowski et al., 2010; Petrowski et al., 2017; Schmalbach et al., 2021). The most commonly used metrics were the high frequency band of HRV (HF HRV;

N=7) and the time-domain measure of root mean square of the successive differences (RMSSD; N=6). The least commonly used was the standard deviation of NN intervals (SDNN; N=1), the very low frequency band of HRV (VLF HRV; N=2). Only 1 study (Reed et al., 2020) used a change statistic (vagal suppression), calculated by subtracting respiratory sinus arrhythmia (RSA) score at the anticipation phase from the RSA score at baseline, with greater scores indicating greater reduction in HRV in response to stress.

The studies either used analysis of variance (Andersen et al., 2018; García-Rubio et al., 2017; Het et al., 2015; Het et al., 2020; Klumbies et al., 2014; Petrowski et al., 2010; Petrowski et al., 2017; Petrowski et al., 2012; Reed et al., 2020; Schmalbach et al., 2021) or regressive models assuming autoregressive covariance (Giese-Davies et al., 2006; Taylor et al., 2006) to assess main effects of time, group and group x time interactions.

Quality Assessment

Table 3 reports quality assessment ratings for selection, comparability and outcome domains, as well as an overall estimated quality score for each study, with higher star ratings indicating greater quality. Quality ratings ranged from 3 (Het et al., 2015) to 8 stars (Andersen et al., 2018; Giese-Davies et al., 2006) out of a maximum of 10. The level of agreement of quality assessment ratings were 72%, 50% and 81% for the selection, comparability and outcome domains, respectively. There were greater discrepancies for the comparability domain due subjective interpretation of the extent to which each study had accounted for relevant confounds, discrepancies were resolved through discussion.

Selection and Comparability

Most of the included studies were characterised by small samples, with some comparing unequally sized clinical and control groups (Het et al., 2020; Petrowski et al., 2017; Taylor et al., 2006), limiting the statistical validity, representativeness and generalisability of findings. Only 2 studies reported (a priori) power analysis calculations

(Petrowski et al., 2017; Schmalbach et al., 2021). Whilst all studies made efforts to select suitable non-clinical controls, 3 of the studies either did not ensure that non-clinical controls were screened by structured clinical interview or this was not evident in the reporting (García-Rubio et al., 2017; Petrowski et al., 2010; Petrowski et al., 2012), indicating potential issues of classification bias. Moreover, the extent to which non-clinical controls were matched to clinical counterparts varied, with 6 studies not matching groups a priori (Andersen et al., 2018; Giese-Davis et al., 2006; Het et al., 2015; Het et al., 2020; Klumbies et al., 2014; Reed et al., 2020), which contributed to the reduction in quality rating for these studies. Four of the studies included either a female only (Giese-Davies et al., 2006; Het et al., 2015; Het et al., 2020) or male only (Andersen et al., 2018) sample, all of which provided a clear rationale for doing so in the context of the diagnoses being more or less prevalent amongst males or females and the desire to reduce variation in HRV associated with sex in their small sample, though it does limit their generalisability. The extent to which studies excluded, or controlled for, potential confounding variables varied substantially but only 1 study (Giese-Davies et al., 2006) failed to report excluding or controlling for any potential confounds.

Outcome

All studies used valid and reliable methods of obtaining and analysing HRV, either via electrocardiogram (Andersen et al., 2018; Giese-Davies et al., 2006; Reed et al., 2020; Taylor et al., 2006) or chest belt (García-Rubio et al., 2017; Het et al., 2015; Het et al., 2020; Klumbies et al., 2014; Petrowski et al., 2010; Petrowski et al., 2012; Petrowski et al., 2017; Schmalbach et al., 2021). However, some did not report how data was cleaned (Garcia-Rubio et al., 2017; Het et al., 2015; Het et al., 2020; Petrowski et al., 2012) or used software to automatically eliminate artefacts (Klumbies et al., 2014; Petrowski et al., 2010; Petrowski et

al., 2017; Schmalbach et al., 2021). Reporting of percentage of data loss after artefacts were removed only occurred in 2 of the studies (Giese-Davies et al., 2006; Taylor et al., 2006).

Consideration of baseline differences between groups was outlined in 7 studies (García-Rubio et al., 2017; Giese-Davies et al., 2006; Klumbies et al., 2014; Petrowski et al., 2012; Petrowski et al., 2017; Reed et al., 2020; Schmalbach et al., 2021) however was accounted for within the statistical analysis in 2 studies only (Giese-Davies et al., 2006; Reed et al., 2020), in which baseline values were subtracted from each HRV measurement. Statements of attrition were also rare but either attrition did not appear to be an issue or attrition was adequately described in the majority of studies; there did appear to be significant sample attrition in 3 of the studies (Klumbies et al., 2014; Het et al., 2020; Schmalbach et al., 2021) with inadequate reporting of reasons for attrition or implications upon findings.

Table 2*Study Characteristics*

Author(s) (Year)	Country	Setting	Sample (N)	Sex F, M	Age Mean (SD)	HRV Measure(s)	SET Paradigm Measurement Points
Taylor et al. (2006)	US	Lab	Clinical Depression and cardiovascular disease risk (48)	32, 16	62.3 (6.4)	RSA _{tf} , HF, LF, VLF	TSST <i>baseline, anticipation, interview, math, recovery 1, recovery 2</i>
Giese-Davies et al. (2006)	US	Lab	Controls Non-clinical controls matched by age and cardiovascular risk (20)	8, 12	62.5 (6.0)		
			Clinical Depression and metastatic breast cancer (45)	All F	NR	RSA _{tf} , HF, LF, VLF	TSST <i>baseline, anticipation, interview, math, recovery 1, recovery 2</i>
			Controls Non-clinical controls with metastatic breast cancer diagnosis (45)	All F	NR		
Petrowski et al. (2010)	Germany	Lab	Clinical Panic disorder (25)	15, 10	32.2 (10.03)	RMSSD, HF, LF, LF/HF	TSST <i>anticipation, interview, math, recovery</i>
			Controls Non-clinical controls matched by age and sex (25)	15, 10	32.4 (10.13)		
Petrowski et al. (2012)	Germany	Lab	Clinical Panic disorder with agoraphobia (14)	8, 6	35.7 (11.90)	RMSSD	TSST <i>anticipation, interview, math, recovery</i>
			Controls Non-clinical controls matched by age, sex and use of oral contraceptives (14)	8, 6	35.7 (12.7)		
Klumbies et al. (2014)	Germany	Lab	Clinical Social phobia (88)***	44, 44	29.69 (9.55)	RMSSD	TSST <i>baseline, anticipation, interview, math, recovery 1, recovery 2</i>
			Controls Non-clinical controls (78)***	37, 41	30.22 (9.96)		

Table 2 Cont.

Author(s) (Year)	Country	Setting	Sample (N)	Sex F, M	Age Mean (SD)	HRV Measure(s)	SET Paradigm Measurement Points
Het et al. (2015)	Germany	Hospital/ Lab	Clinical Eating disorders (28)	All F	25.10 (8.10)	HF, LF	TSST <i>anticipation, interview</i>
			Controls Non-clinical controls (26)	All F	22.9 (4.7)		
Petrowski et al. (2017)	Spain	Lab	Clinical Panic disorder (38)	18, 20	35.55 (10.12)	RMSSD, HF, LF, LF/HF	TSST <i>anticipation, post-math, recovery</i>
			Controls Non-clinical controls matched by age and sex (23)	14, 9	33.24 (11.88)		
García-Rubio et al. (2017)	Germany	Lab	Clinical Generalised social phobia (39)	20, 19	19.16 (1.12) ^a 20.16 (2.31) ^b	RMSSD, LF/HF	TSST <i>baseline, introduction, anticipation, interview, math, recovery</i>
			Controls Non-clinical controls (41)	20, 21	19.17 (1.83) ^a 19.96 (1.83) ^b		
Andersen et al. (2018)	US	Lab	Clinical Schizophrenia spectrum disorders (19)	All M	26.26 (4.19)	RSA	TSST <i>baseline, stress phase, recovery 1, recovery 2</i>
			Controls Non-clinical controls (20)	All M	23.65 (4.67)		
Reed et al. (2020)	US	Lab	Clinical First episode schizophrenia (38)	8, 30	22.16 (3.55)	VS	Adapted TSST <i>baseline, anticipation</i>
			Controls Non-clinical controls (29)	9, 20	22.72 (3.38)		
Het et al. (2020)	Germany	Hospital	Clinical Eating disorders (13)	All F	21.00 (1.30)	HF	TSST <i>anticipation, interview</i>
			Controls Non-clinical controls (22)	All F	23.10 (1.10)		
Schmalbach et al. (2021)	Germany		Clinical Anorexia nervosa (19)	17, 2	26.05 (5.49)	SDNN, RMSSD HF, LF, LF/HF	TSST <i>baseline, anticipation, (before) interview, (after) math, recovery 1, recovery 2, recovery 3</i>
			Controls Non-clinical controls (19)	17, 2	24.23 (5.54)		

^a = Mean age (and standard deviation) for females, ^b = Mean age (and standard deviation) for males, F = Female, M = Male, NR = Mean age NR. median ages 55 and 52 for clinical and control groups, respectively, HRV = Heart rate variability, RSA = Respiratory sinus arrhythmia, measure of high frequency HRV, RSA_{adj} = Respiratory sinus arrhythmia, measure of high frequency HRV adjusted for respiration, HF = High frequency HRV (0.15 - 0.40Hz range), LF = Low frequency HRV (0.04 - 0.15Hz range), VLF = Very low frequency HRV (0.0033 and 0.04Hz range), LF/HF= A ratio of low frequency to high frequency, RMSSD = Root mean square of the successive differences, SDNN = Standard deviation of NN intervals, VS = Vagal suppression, SET = Social evaluative threat, TSST = Trier social stress test

Table 3*Quality Assessment of Included Studies*

Author (Year)	Quality Domain								
	Selection		Comparability		Outcome			Overall Quality	
	Representativeness of clinical group (★)	Selection of non-clinical controls (★)	Groups matched a priori (★)	Exclusion of/control for confounds (★★)	HRV Measurement (★★)	Data Loss (★)	Baseline considerations (★)	Sample attrition (★)	(out of 10 ★)
Taylor et al. (2006)		★	★	★	★★	★		★	***** (7)
Giese-Davies et al. (2006) ^a	★	★		★	★★	★	★	★	***** (8)
Petrowski et al. (2010)			★	★★	★ ^c			★	***** (5)
Petrowski et al. (2012)			★	★★	★		★	★	***** (6)
Klumbies et al. (2014)	★	★		★	★ ^c		★		***** (5)
Het et al. (2015) ^a				★	★			★	*** (3)
Petrowski et al. (2017)		★		★	★ ^c		★	★	***** (5)
García-Rubio et al. (2017)			★	★★	★		★	★	***** (6)
Andersen et al. (2018) ^b		★	★	★★	★★		★	★	***** (8)
Reed et al. (2020)	★			★★	★★		★	★	***** (7)
Het et al. (2020) ^a		★		★★	★				**** (4)
Schmalbach et al. (2021)		★	★	★★	★ ^c		★		***** (6)

^a = Female only sample, ^b = Male only sample, ^c = Artefacts automatically eliminated using software

Study Findings

Table 4 outlines descriptions of the HRV metrics used in the included studies. Table 5 reports a summary of findings.

The TSST Induces Social Evaluative Threat in Clinical and Non-Clinical Groups

The TSST is a widely used standardised protocol for the induction of moderate psychosocial stress (social evaluative threat) in psychophysiological research (Kirschbaum, 1993). There was considerable variability between TSST methodologies used within the reviewed studies. The standardised protocol consists of: a resting baseline prior to the TSST (45 minutes; in a separate room), psychosocial stress (15 minutes) and a resting recovery (90 minutes). The psychosocial stress phase involves the participant being instructed by two panel members that they should prepare for a free speech interview where they will talk about why they are qualified for a job (whilst being observed by the panel members and being recorded), the participant then has 3 minutes to prepare before the panel members return and the interview is completed (5 minutes), immediately after the interview the participant is asked to count backwards in a prime number (e.g. 17) from a high number and is stopped before they get to zero (maximum 5 minutes). For a detailed description of the TSST protocol please see (Kudielka et al., 2007).

The studies varied in the protocol phases which they included, and the time allocated to each of the included phases. Three studies (Giese-Davies et al., 2006; Klumbies et al., 2014; Taylor et al., 2006) included ‘baseline, anticipation, interview, math, recovery 1 and recovery 2’ phases, thus measuring HRV at these 6 time points. García-Rubio et al. (2018) also included 6 phases (and 6 HRV measurements), but the phases differed (‘baseline, introduction, anticipation, interview, math and recovery’). Two studies (Petrowski et al., 2010; Petrowski et al., 2012) included ‘anticipation, interview, math and recovery’, measuring HRV at 4 time points. Andersen et al. (2018) also included 4 phases (and 4 HRV

measurements) but these phases differed ('baseline, stress, recovery 1 and recovery 2'). Petrowski et al. (2017) included 3 HRV measurements across three phases ('anticipation, post-math, recovery'). Three studies included 2 phases (and 2 HRV measurements) only; 2 included 'anticipation and interview' (Het et al., 2015; Het et al., 2020) and 1 included 'baseline and anticipation' only (in order to control for speech influences; Reed et al., 2020). To note, 5 of the included studies did not include a resting baseline (Petrowski et al., 2010; Petrowski et al., 2012; Petrowski et al., 2017; Het et al., 2015; Het et al., 2021) and 1 study adapted the content of the TSST, to include a 'not guilty defence' in response to a false accusation of shoplifting (instead of interview and math task), without clear rationale for this change in the context of the sample (participants experiencing first episode schizophrenia; Reed et al., 2020). Despite this significant heterogeneity in TSST methodology, 11 studies reported a significant main effect of time (with HRV scores changing in the expected direction). Reed et al. (2020) did not report statistical testing of time effects but reported vagal suppression from baseline to anticipation for both clinical and non-clinical groups, indicating that the TSST had the (desired) effect of inducing social evaluative threat.

Group Differences

Whilst the primary aim of this review was to determine the presence (or absence) of reliable differences in HRV reactivity to social evaluative threat between clinical and non-clinical groups, overall group differences in HRV at baseline and throughout the TSST were first reviewed. Of the 7 studies which included statistical testing of baseline differences, 4 found no significant differences in resting HRV between clinical and non-clinical groups (Petrowski et al., 2012; Petrowski et al., 2017; Reed et al., 2020; Schmalbach et al., 2021) and 3 found significant differences in at least 1 HRV metric (Giese-Davies et al., 2006; García-Rubio et al., 2017; Andersen et al., 2018). Of note, the Petrowski et al. (2017) study did not include a resting baseline and rather used the anticipation phase to explore baseline

differences. Giese-Davies et al. (2006) found significantly lower resting HF, LF and VLF HRV but not RSA_{tf} (a metric accounting for respiratory influences) in the clinical group (participants with depression and metastatic breast cancer diagnoses). García-Rubio et al. (2017) found significantly lower resting RMSSD and higher LF/HF ratio in the clinical group (participants with a generalised social phobia diagnosis) and Andersen et al. (2018) found significantly lower resting RSA in clinical group (participants with schizophrenia spectrum disorder diagnoses).

The pattern of reduced HRV observed by Giese-Davies et al. (2006) was sustained at each phase of the TSST. In the Andersen et al. (2018) study group differences were only evident at baseline and not during any other phases of the TSST. The García-Rubio et al. (2017) study demonstrated significantly higher LF/HF ratio in those with a generalised social phobia diagnosis throughout the TSST whereas group differences in RMSSD HRV reached significance at baseline only. Schmalbach et al. (2021) found higher HF and lower HF HRV during the TSST for those with an anorexia nervosa diagnosis compared to controls. Three further studies did not test group differences in resting HRV but found significant group differences between clinical and non-clinical groups during the TSST (Taylor et al., 2006; Het et al., 2015; Het et al., 2020). Taylor et al. (2006) found significantly lower RSA_{tf} in participants with a diagnosis of depression and comorbid risk of cardiovascular disease, no significant differences in HF, LF or LF/HF ratio were found (Taylor et al., 2006). Contrastingly, Het et al. (2015) found significantly higher HF HRV (and a trend towards reduced LF/HF ratio) in female inpatients with a diagnosis of either anorexia or bulimia nervosa, with no significant differences in LF HRV. Het et al. (2020) and Schmalbach et al. (2021) also found higher HF HRV in demographically similar eating disorder populations. However, Het et al. (2020) repeated the TSST before and after an inpatient treatment programme and demonstrated that post-treatment no significant group differences remained.

HRV Reactivity to Social Evaluative Threat

Ten studies statistically tested for group x time interactions which were interpreted to evaluate whether clinical and non-clinical group demonstrated different HRV reactivity to the TSST (García-Rubio et al., 2017; Giese-Davies et al. 2006; Het et al., 2015; Het et al., 2020; Klumbies et al., 2014; Petrowski et al., 2010; Petrowski et al., 2017; Reed et al., 2020; Schmalbach et al., 2021; Taylor et al., 2006). Of these, only 1 reported a significant group x time interaction, suggesting that the majority found no differences in HRV reactivity (or recovery) to the TSST. Schmalbach et al. (2021) found that those with an anorexia nervosa diagnosis showed a blunted HRV response (less of a decrease in RMSSD and HF HRV and less of an increase in LF HRV) in response to the TSST compared to controls. Reed et al. (2020) reported a trend towards the clinical group (participants experiencing first episode schizophrenia) having lower vagal suppression (less of a decrease in HRV) than non-clinical controls (from baseline to anticipation) but this finding did not reach significance.

Two studies notably differed in their methods of analysis but reported no differences in HRV reactivity between clinical and non-clinical groups. Petrowski et al. (2010) did not include an interaction term within their analysis but rather analysed group differences (across the two days that the TSST was repeated) and included graphical representation of the HRV trajectories from the start of the experiment (preparation) to the end (recovery). The authors report that the clinical group (participants with a panic disorder diagnosis) demonstrated a significant increase in LF/HF ratio during the stressor on the first (but not the second) day, this increase was not observed in the non-clinical group and there were no differences in RMSSD reactivity between clinical and non-clinical groups. Andersen et al. (2018) completed planned contrasts which demonstrated a group difference in HRV trajectories between baseline and the end of the TSST (recovery 2), however the linear contrasts analysis used was not sensitive to the non-linear trajectory of HRV throughout the six different stages

of the TSST therefore group x time interaction cannot be established. Visual examination of the graphical data showed that clinical and non-clinical groups followed a similar trajectory from baseline, during the TSST and post-TSST (recovery).

Table 4

Descriptions of HRV Metrics used in Included Studies (Amended from Laborde et al. [2017] and Shaffer & Ginsberg [2017])

Metric	Description	Physiological Parameters	Expected Responses to Stress
Time Domain			
Standard Deviation of N-N intervals (SDNN)	Standard deviation of all R-R intervals.	Cyclic components responsible for heart rate	Decrease
Root Mean Square of Successive Differences (RMSSD)	The RMSSD is less affected by respiration than RSA across several tasks and is more influenced by the parasympathetic nervous system than SDNN.	Vagal tone	Decrease
Frequency Domain			
Very-low frequencies (VLF; 0.0033–0.04 Hz)	Measurement of the VLF band of HRV	Long-term regulation mechanisms, thermoregulation and hormonal mechanisms	Decrease
Low frequencies (LF; 0.04–0.15 Hz).	Measurement of the LF band of HRV	Mix of sympathetic and vagal activity, baroreflex activity	Increase ^c
High Frequencies (HF; 0.15–0.40 Hz)	Measurement of the HF band of HRV. The HF is known as the respiratory band because it corresponds to HR variations related to the respiratory cycle. The HF band is also referred to as respiratory sinus arrhythmia (RSA) within the literature ^a	Vagal tone ^b	Decrease
Transfer Function Respiratory Sinus Arrhythmia (RSA _{TF})	RSA with controls for the influence of respiration	Vagal tone	Decrease
Low Frequencies/High Frequencies ratio (LF/HF)	Low frequencies/high frequencies ratio	Proposed mix of sympathetic and vagal activity but controversial due to debates surrounding what LF and HF represent	Increase

Table 4 Cont.

Metric	Description	Physiological Parameters	Expected Responses to Stress
Change Measure Vagal suppression (VS) ^d	Calculated as RSA during TSST speech anticipation minus RSA during the 4-min baseline	Vagal withdrawal	Greater VS = greater vagal withdrawal

^a = Laborde et al. (2017) advise against the use of RSA when referring to the HF band, recommending the use of HF when referring to vagal tone and RSA for description of the heart rate variations related to inspiration and expiration

^b = Shaffer & Ginsberg (2017) highlight that HF is vulnerable to respiratory influences and conclusions drawn about changes in vagal tone should be interpreted in the context of this

^c = Typically reported that LF reflects sympathetic activation (i.e. higher LF, greater sympathetic activation) however LF reflects mix of sympathetic and parasympathetic activity therefore is difficult to interpret

^d = As reported in Reed et al. (2020)

Table 5*Summary of Findings from Included Studies*

Author (Year)	Clinical Group (N)	Control Group (N)	Baseline Differences	Group Differences	Time	HRV Reactivity
Taylor et al. (2006)	Depression and cardiovascular disease risk (48)	Non-clinical controls matched by age and cardiovascular risk (20)	NR	Y- ↓ RSA _{Atf} in clinical group (HF, LF, LF/HF ratio NS)	Y	N
Giese-Davies et al. (2006)	Depression and metastatic breast cancer (45)	Non-clinical controls with metastatic breast cancer diagnosis (45)	↓ HF, LF & VLF in clinical group (RSA _{Atf} NS)	Y - ↓ HF, & VLF in clinical group (RSA _{Atf} NS, LF NR)	Y	N
Petrowski et al. (2010)	Panic disorder (25)	Controls matched by age and sex (25)	NR	N	Y	*
Petrowski et al. (2012)	Panic disorder with agoraphobia (14)	Non-clinical controls matched by age, sex and use of oral contraceptives (14)	NS	N	Y	N
Klumbies et al. (2014)	Social phobia (88)	Non-clinical controls (78)	NR	N	Y	N
Het et al. (2015)	Eating disorders (28)	Non-clinical controls (26)	NR	Y - ↑ HF in clinical group (LF NS)	Y	N
Petrowski et al. (2017)	Panic disorder (38)	Controls matched by age and sex (23)	NS ^a	N	Y	N
García-Rubio et al. (2017)	Generalised social phobia (39)	Non-clinical controls (41)	↓ RMSSD & ↑ LF/HF ratio in clinical group	Y - ↑ LF/HF ratio in clinical group (RMSSD NS)	Y	N
Andersen et al. (2018)	Schizophrenia spectrum disorders (19)	Non-clinical controls (20)	↓ RSA in clinical group	N	Y	**
Reed et al. (2020)	First episode schizophrenia (38)	Non-clinical controls (29)	NS	N	NR	N

Table 5 Cont.

Author (Year)	Clinical Group (N)	Control Group (N)	Baseline Differences	Group Differences	Time	HRV Reactivity
Het et al. (2020)	Eating disorders (13)	Non-clinical controls (22)	NR	Y - ↑ HF in clinical group	Y	N
Schmalbach et al. (2021)	Anorexia nervosa (19)	Non-clinical controls matched by age and gender (19)	NS	Y - ↑ HF & ↓ LF in clinical group	Y	Y – Less decrease in RMSSD & HF & less increase in LF (SDNN & LF/HF NS)

Y = Yes, N= No; NR = Not reported, NS = Non-significant; RMSSD = Root mean square of the successive differences; RSA = Respiratory sinus arrhythmia; RSA_{af} = Respiratory sinus arrhythmia, measure of high frequency HRV adjusted for respiration; HF = High frequency HRV; LF = Low frequency HRV; VLF = Very low frequency HRV; LF/HF = Low frequency/high frequency ratio; ^a= No resting baseline, anticipation phased used for assessment of baseline differences; * = Group x time interaction not statistically tested, separate ANOVAs completed for clinical and non-clinical groups; ** = Group x time interaction evaluated using linear planned contrasts (not accounting for non-linear changes in HRV throughout TSST, from baseline to recovery). Visual examination revealed similar HRV response to social evaluative threat between clinical and non-clinical groups

Discussion

This review evaluated research comparing HRV reactivity to social evaluative threat between adults who have, and have not, received a mental health diagnosis. As previous reviews have revealed reliable differences in HRV between clinical and non-clinical groups (Alvares et al., 2016; Chalmers et al., 2014; Hamilton & Alloy, 2016; Kemp et al., 2010; Peschel et al., 2016; Peyser et al., 2021), it was expected that group differences in HRV reactivity in response to social evaluative would also be observed. Yet despite both clinical and non-clinical populations demonstrating the expected stress response to the TSST protocol, only one study³ reported significant differences in HRV reactivity between groups with a sample of (predominantly female) adults with an anorexia nervosa diagnosis, compared to age and sex matched controls (Schmalbach et al., 2021). This lack of reliable group differences in HRV reactivity in response to psychosocial stress contradicts the stress vulnerability model (Zubin & Spring, 1977), which proposes that some people have a reduced psychophysiological capacity to flexibly response to stress (i.e., a smaller ‘stress bucket’ or a less adaptive vagal ‘brake’ in polyvagal terms; Porges, 2011) and therefore are more vulnerable to developing mental health problems when faced with stressors. Whilst the stress vulnerability model does not propose any hypotheses about HRV, presumably if those who have smaller ‘stress buckets’ are more likely to develop mental health problems then people who meet criteria for mental health diagnoses should demonstrate a reduced capacity to flexibly respond to stress and (in theory) this should be reflected by different patterns of HRV reactivity (Porges, 2007; 2011). This is not what was observed within this review.

Whilst reliable differences in how clinical and non-clinical groups respond to social evaluative threat (HRV reactivity) were not evidenced, some studies did reveal group

differences in HRV at baseline (N=3; Andersen et al., 2018; García-Rubio et al., 2017; Giese-Davies et al., 2006) and/or throughout the TSST (N=6; García-Rubio et al., 2017; Giese-Davies et al., 2006; Het et al., 2015; Het et al., 2020; Schmalbach et al., 2021; Taylor et al., 2006) on at least one HRV metric, which may suggest that clinical and non-clinical groups (on the whole) respond similarly to psychosocial stress but that clinical groups may (in some cases) have lower or higher HRV overall, as has been observed in previous reviews (Alvares et al., 2016; Chalmers et al., 2014; Hamilton & Alloy, 2016; Kemp & Quintana, 2010; Peyser et al., 2020; Peschal et al., 2016). Additionally, those with eating disorder diagnoses may be more likely to demonstrate profiles of hyperactive parasympathetic (Het et al., 2015; Het et al., 2020; Schmalbach et al., 2021) and hypoactive parasympathetic (Schmalbach et al., 2021) nervous system activity. The only study to demonstrate a difference in HRV reactivity between clinical and non-clinical groups indicated that those with an anorexia nervosa diagnosis showed less RMSSD and HF decrease and less LF increase in response to stress compared to controls (Schmalbach et al., 2021), reflecting less of a parasympathetic vagal withdrawal and less sympathetic activation in response to stress, which may be (at least in part) due to the physiological effects of starvation and/or intermittent dieting (Scolnick, Mostofsky, & Keane, 2014). Previous review research, (Peschal et al., 2016), including a range of laboratory stressors, also found reduced HRV reactivity to stress in those with a diagnosis of bulimia nervosa (Peschal et al., 2016).

The included studies which reported lower HRV in clinical populations represented participants with a depression diagnosis and comorbid risk of cardiovascular disease (Taylor et al., 2006), females diagnosed with depression and metastatic breast cancer (Giese-Davies et al., 2006), university students who met criteria for a generalised social phobia diagnosis (García-Rubio et al., 2017) and males with a diagnosis of a schizophrenia spectrum disorder (Andersen et al., 2018). The studies which did not find any group differences also represented

heterogenous populations, including participants with panic disorder (Petrowski et al., 2010; Petrowski et al., 2012; Petrowski et al., 2017), social phobia (Klumbies et al., 2015) and first episode schizophrenia (Reed et al., 2020) diagnoses. Reed et al. (2020) reported a trend towards lower vagal suppression in the clinical group which may not have reached significance due to small sample sizes (N = 38 and 29 for clinical group and controls, respectively) or the use of anticipation phase only (rather than the interview/math task) being insufficient to evoke enough of a stress response to differentiate groups.

Of note, five of the six studies which observed group differences in HRV had either comorbid physical health diagnoses or there was a physical component to the mental health diagnosis (metastatic breast cancer diagnosis, anorexia or bulimia nervosa, cardiovascular risk; Giese-Davies et al., 2006; Het et al., 2015; Het et al., 2020; Schmalbach et al., 2021; Taylor et al., 2006, respectively). In addition to this, the Taylor et al. (2006) study included an older adult sample (mean age \approx 62 years) therefore the findings regarding group differences in HRV reactivity to social evaluative threat between those who have (and do not have) a diagnosis of depression in this sample should be held cautiously as the sample is unlikely to adequately represent those with depression in the general population (Hasin et al., 2017). Arguably the group difference may be (at least partly) attributable to physical factors rather than the presence (or absence) of a mental health diagnosis. The exception to this was the García-Rubio (2017) study, which included a physically healthy sample with generalised social phobia diagnoses and controls. This sample was characteristically different to all other included studies, as participants were recruited from a university setting, all participants were screened by psychometrics at the first stage of recruitment (those who met psychometric thresholds were offered a structured clinical interview) and control participants do not appear to have been formally screened or matched to the clinical group a priori. Therefore, methodological issues should be held in mind when considering this finding.

Furthermore, it was common for studies to report group differences on some (but not all) HRV metrics. A range of time- and frequency-domain metrics were used across the studies, with several studies including two or more metrics. HRV metrics differ in the extent to which they reflect parasympathetic and sympathetic nervous system influences on the heart. For instance, over short-term measurement, HF HRV, RSA, RMSSD and SSNN are all thought to predominantly reflect the influence of parasympathetic (vagal) influence on the heart, whereas LF HRV is thought to reflect sympathetic influence, though the latter is debated (Goldstein et al., 2011). The LF/HF ratio is described as reflecting the balance between sympathetic (LF) and parasympathetic (HF) influences, with higher LF/HF ratio typically representing greater sympathetic dominance (García-Rubio et al., 2017). However, the relationship between sympathetic and parasympathetic branches of the autonomic nervous system is much more complex than this and the use of this metric is controversial (Billman, 2013; Heathers, 2014). It is necessary for researchers who are planning psychophysiological research to understand which physiological processes specific HRV metrics are proposed to measure (and the limitations to these) to ensure valid conclusions are drawn. Whilst a comprehensive discussion of HRV metrics is beyond the scope of this review, Shaffer and Ginsberg (2017) provide an overview of commonly used metrics and Laborde et al. (2017) provide recommendations for the use of HRV in psychophysiological research.

Additionally, whilst most studies adequately reported participant selection, HRV collection and analysis, there was variation in the information provided on artefact identification, data cleaning and data loss, with only two studies reporting percentage of data loss (Giese-Davies et al., 2006; Taylor et al., 2006). This is an important consideration as even one misidentified beat can have a significant influence on overall HRV calculation (Berntson & Stowell, 1998). To promote standardisation Quintana et al. (2016) have published ‘guidelines for reporting articles on psychiatry and heart rate variability

[GRAPH]’. Also, the included studies were characterised by small sample sizes and there was notable heterogeneity in the TSST protocol used, the measurement and reporting of HRV and the extent to which baseline differences and confounds (e.g., medication use, caffeine, exercise, sleep, food/drink intake, oral contraception, menstrual cycle stage etc.; Laborde et al., 2017) were accounted for. Whilst the TSST seemed effective in inducing psychosocial stress despite notable variations in protocol, other methodological issues may have influenced the findings.

Implications on Research and Practice

It is widely accepted that HRV is associated with physical and mental health and illness (Kemp & Quintana, 2013; Porges, 2007, Thayer & Lane, 2000) and is a reliable marker of stress (Kim et al., 2018) and resilience (An et al., 2020), with the assumption that higher resting HRV is (usually) better (Laborde et al., 2017). Though the ‘higher is better’ assumption does not always hold true, as higher HRV may sometimes reflect a hypoactive sympathetic nervous system (e.g., in eating disorder populations; Het et al., 2015; Het et al., 2020; Schmalbach et al., 2021) and/or defensive ‘dorsal’ vagal dominance in polyvagal terms (Porges, 2007). This review points to there being no reliable differences in HRV reactivity to social evaluative threat (as induced by the TSST) between clinical and non-clinical groups. Findings of this nature, demonstrating qualitatively similar responses (e.g., reduction in HRV in response to psychosocial stress) regardless of mental health diagnosis status, may contribute to counteracting the (still pervasive) stigma associated with a range of mental health diagnoses.

It should be acknowledged that whilst it is common practice, comparing people on the basis of whether they meet psychiatric diagnostic criteria (or not) is a crude, group-level approach to exploring difference and there will likely have been individual differences in HRV reactivity within both clinical and non-clinical groups that this group-level comparison

was not sufficiently sensitive to reveal. Whilst group-level comparisons provide us with potentially useful insights, it is important for clinical psychologists to be sensitive to individual differences in psychophysiological experiences of stress. Especially in the context of the validity concerns surrounding psychiatric diagnosis (Allsop et al., 2019; Kinderman, 2015). Compassion-focused therapy literature suggests a highly complex and individual HRV response (Rockliff et al., 2008), which is thought to be influenced by each person's unique genetic and biological make-up, life experiences and the interactions between these (Gilbert, 2010). People's bodies and minds are sensitised and conditioned to respond differently to stress, overall and when faced with specific demands (or stressors). The way in which people respond to stress is thought to be (at least in part) shaped by their early life experiences and attachments (Ainsworth & Bowlby, 1991; Gilbert, 2009). Therefore, whilst the current review does not find reliable support for a relationship between HRV reactivity and mental health diagnoses, it remains possible that there is a relationship between HRV reactivity and individual differences in the severity of reported mental health phenomena (such as depression, anxiety, paranoia etc.).

Limitations and Directions for Future Research

This review evaluated empirical research comparing HRV reactivity to social evaluative threat between adults with a mental health diagnosis, as diagnosed by a structured clinical interview, and non-clinical controls. Therefore, the findings cannot be applied to younger aged or neurodiverse populations. The review was limited to English language articles which (whilst necessary) risks introducing bias. In comparing the literature on the basis of mental health diagnoses, this review has inevitably perpetuated a categorical approach to mental health and an alternative, continuum-based approach (Kinderman et al., 2015) to comparing clinical and non-clinical groups (e.g., using psychometric measures instead of diagnosis) is encouraged for future research.

A more general limitation of the review is the restriction of the review to peer-reviewed journal articles only which, whilst ensuring a certain level of quality, potentially risks publication bias. The inclusion of grey literature was beyond the scope of this review but may be considered for inclusion in future reviews on this topic. Additionally, the review was similarly restrictive with regard to the method for assessing social evaluative threat as it only included ‘formal’ social evaluative threat paradigms. All the included studies used the TSST as the social evaluative threat stressor (completed within controlled conditions) which limits the generalisability and ecological validity of the findings. Furthermore, the studies included in this review only represent acute HRV reactivity in response to social evaluative threat. None of the included studies used longer term ambulatory measures, which may illicit different findings in similar populations (Carr et al., 2018).

Furthermore, whilst HRV measurement may provide a window through which to examine stress responses (or lack thereof) to different demands/stressors, it is important for future research to evaluate to extent to which HRV (and other psychophysiological measures) correlate with subjective experiences. It is tempting to assume that changes in HRV (i.e., an autonomic stress or relaxation response) objectively assesses a person’s experience of stress, yet this is not necessarily the case. In fact, one of the studies included in this review showed a discordance between psychophysiological and self-reported experience of stress (Klumbies et al., 2014), which reminds us to be cautious when using psychophysiological measures to interpret psychological concepts and to beware of the temptation to be drawn into assumptions of ‘objectivity’. This review was limited by not including synthesis of psychological measures alongside HRV and future research should endeavour to do so in order to assess how strongly and reliability psychophysiological and (self-reported) psychological phenomena correlate.

Conclusion

Research in clinical psychology tends to rely solely on self-report outcome measures, which are subject to a range of biases (Althubaiti, 2016); the integration of psychophysiological measures (such as HRV) into psychological research has the potential to provide new insights into mental health (Kirby et al., 2017). However, as this review has highlighted, it is important that these understandings are revealed through high quality research, which adequately measures, reports and appropriately analyses HRV metrics (including control of confounds; Laborde et al., 2017). The absence of reliable differences in HRV reactivity between clinical and non-clinical groups reported in this review may reflect: 1) that there are (in fact) no reliable differences in HRV reactivity between clinical and non-clinical groups and both groups respond similarly to psychosocial stress (as induced by the TSST in controlled conditions), 2) that HRV reactivity is not as sensitive as resting HRV in its ability to differentiate groups, 3) that comparing groups on the basis of mental health diagnosis is insufficient and/or 4) that findings were impacted by the restricted protocol of the review and the varying quality of the included studies. Future reviews may wish to expand this protocol to evaluate studies which have included 1) broader sample demographics (e.g., younger or neurodiverse populations), 2) ambulatory HRV measurement, 3) self-report measures alongside HRV, 3) other types of demands/stressors and/or 4) a continuum (rather than categorical) approach to mental health experiences.

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Bridging Chapter

In order to contribute to psychophysiological understandings of psychosocial stress, Chapter I reviewed research comparing HRV reactivity to social evaluative threat, a scenario in which an aspect of the self could be negatively judged by others, whether the judgement occurs or not (Dickerson & Kemeny, 2004). It was planned that Chapter II would continue with an empirical investigation comparing HRV reactivity to compassion focused and relaxation imagery. Unfortunately, due to the coronavirus pandemic restrictions, this empirical project had to be terminated. Instead, Chapter II explores emotional responses to different types of imagined ‘inner voice tones’ in the context of recalled failure and to what extent these responses are moderated by levels of self-reassurance, self-criticism, attachment avoidance and attachment anxiety.

It has long been recognised that a hostile ‘inner world’ is associated with adverse emotional outcomes. In 1917, Freud wrote about ‘anger turned inward’, which he referred to as anger toward another being directed inward towards the self and leading to self-attacking (Freud, 1917). More recently, within compassion focused therapy it has been theorised that imagined critical inner voices can activate and maintain the ‘threat’ system (psychologically and physiologically) in much the same way as external threats (Gilbert, 2009).

Neuropsychological research has since provided evidence that self-critical imagery activates regions of the brain associated with ‘threat’ responding (Kim et al., 2020). Furthermore, compassion focused imagery practices may downregulate threat responses by activating the parasympathetic, ‘soothing’ system (Matos et al., 2017), though these practices may be experienced as more or less ‘soothing’ depending on a person’s level of self-reassurance (Kim et al., 2020), self-criticism (Duarte et al., 2015; Halamová et al., 2019) or attachment style (Duarte et al., 2015; Kim et al., 2020). Chapter II empirically examines ‘positive’ and

‘negative’ emotional responses to compassionate and critical voice tone imagery and moderators of these responses.

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Chapter II: Empirical

Do Attachment Style, Self-Criticism and Self-Reassurance Moderate the Experience of Internally Generated Critical, Compassionate and ‘As Usual’ Voice Tones?⁴

⁴ Target journal: Psychotherapy: Theory, Research and Practice (see Appendix 2.1 for author guidelines). The author guidelines stipulate a maximum word count of 5,000 words but this has been surpassed to enable inclusion of sufficient detail for assessment purposes.

Abstract

Background

Compassion focused therapy was born out of clinical observations that those who were high in self-criticism and shame demonstrated less favourable emotional outcomes in cognitive behavioural psychotherapy despite engaging with techniques (Lee, 2005), which is thought to be influenced by the presence of hostile, harsh or critical inner voice tones (Gilbert, 2009b). It has been proposed that adverse early attachment experiences are internalised as negative ‘internal working models’ through which a person then relates to themselves and/or others (Bowlby, 1988; Bretherton, 1999) and may result in critical/attacking styles of self-relating (Mikulincer & Shaver, 2007) and critical inner voice tones (Gilbert, 2009b). In attempts to remedy this, soothing voice tone cues are commonly used alongside other sensory cues in compassion focused imagery (Irons & Beaumont, 2017) yet the relative contribution of the voice tone component of the imagery to emotional outcomes is not known. This is the first study to empirically examine emotional responses to different types of voice tone imagery (compassionate and critical) with the same verbal content and in the absence of other sensory cues.

Method

An experimental design; online study with an international general population adult sample (N = 236). The sample was predominantly female ($\approx 72\%$), white British ($\approx 69.5\%$) and aged 44 or under (80.93%). The majority of participants completed the study within the United Kingdom ($\approx 76\%$) and had no prior experience of compassion focused therapy or training ($\approx 82\%$). The study procedure reflected the sequence that people are guided through when engaging in compassion focused imagery during compassionate mind training, in that all participants were first (audio) guided to recall a scenario of personal failure before then being guided to imagine saying a ‘reassuring statement’ to themselves (with no instruction on how to say this) then were guided to

imagine saying the same statement to the self in either a 1) compassionate or 2) critical voice tone. Participants completed both compassionate and critical voice tone imagery, though order was counterbalanced. Self-reported feelings of ‘relaxation’, ‘safeness/contentment’ and ‘negative affect’ were recorded at baseline and following the baseline ‘as usual’ voice tone imagery and the compassionate and critical voice tone imagery.

Results

Mixed analysis of variance analyses, with voice tone imagery (compassionate and critical) as the within-subjects factor and self-reassurance, self-criticism, attachment anxiety and attachment avoidance (dichotomised as ‘high’ and ‘low’) as the between-subjects factor, showed that all participants showed more feelings of ‘relaxation’ and ‘safeness/contentment’ and less ‘negative affect’ in response to the compassionate voice tone imagery and less feelings of ‘relaxation’ and ‘safeness/contentment’ and more ‘negative affect’ in response to the critical voice tone imagery. Self-reassurance moderated the emotional responses (though at a trend level only for ‘negative affect’), in that those who reported higher self-reassurance showed more feelings of ‘relaxation’ and ‘safeness/contentment’ in response to compassion focused imagery and less ‘negative affect’ in response to the critical imagery. The inverse relationship was found for self-criticism but only for ‘negative affect’. Attachment anxiety moderated emotional response to critical imagery, in that those who reported higher attachment anxiety demonstrated less feelings of ‘relaxation’ and ‘safeness/contentment’ following the critical imagery than those who reported lower attachment anxiety. Attachment avoidance did not appear to moderate emotional responses to the voice tone imagery in this sample.

Conclusion

As expected, there were more favourable emotional responses to compassionate voice tone imagery, compared to critical voice tone imagery (with the same voice content). This

suggests that critical and compassionate voice tone cues can differentially influence emotional responses over and above the influence of the imagined verbal content and in the absence of other sensory cues, this supports the use of techniques aimed at cultivating more compassionate inner voice tones. Furthermore, there appeared to be a general protective effect of higher levels of self-reassurance whereas higher self-criticism was associated with greater 'negative affect' following both compassionate and critical voice tone imagery in this sample. Attachment anxiety moderated feelings of 'relaxation' and 'safety/contentment' in response to critical voice tone imagery only, in that those who reported higher attachment anxiety had less feelings of 'relaxation' and 'safety/contentment' following the critical imagery, potentially indicating a greater threat sensitivity to the critical voice tone.

Introduction

Compassion and Compassion Focused Therapy

For thousands of years the contemplative traditions have recognised the value of compassion for physical, psychological, social and spiritual wellbeing (Chase, 2003; Dalai Lama & Chan, 2012) and in the past three decades or so scientific inquiry into compassion and its clinical applications has gained traction (Germer & Neff, 2013; Gilbert, 2014; Gilbert, 2020). Various definitions of ‘compassion’ exist but most share elements of 1) a recognition of suffering, 2) an understanding that suffering is universal, 3) feelings of sympathy, empathy or concern for suffering, 4) a tolerance of the distress associated with witnessing suffering and 5) a motivation to act to alleviate it (Strauss et al., 2016, p. 25). Gilbert (2014), inspired by Buddhist definitions, defines compassion as “a sensitivity to suffering in self and others, with a commitment to try to alleviate and prevent it” (p. 19).

Within the context of compassion focused therapy (CFT), compassion is thought to be born out of evolved caring motives which exist alongside, and sometimes in conflict with, other human motives such as competitive drives towards sex, resources and status (Gilbert, 2020). CFT integrates elements from various schools of psychotherapy with neuroscientific, evolutionary, social, developmental and Buddhist theory (Gilbert, 2009a, 2009b, 2014) and involves the clinical application of various techniques (e.g., psychoeducation, soothing rhythm breathing, letter writing, imagery; Irons & Beaumont, 2017) which are known collectively as ‘compassionate mind training’. Notably, CFT promotes the understanding of psychological distress in the context of all levels of human experience (e.g., biological, psychological, social) and draws on psychophysiological understandings from the works of Depue and Morrone-Strupinsky (2005), LeDoux (1998), Panksepp (2010) and Porges (1995, 2007) in its approach to formulation and intervention. The CFT ‘three systems’ model of affect regulation proposes that humans have evolved to have (at least) three systems for survival and continuation of the

species: 1) the threat system which is activated in response to internal or external threats and associated with emotions such as anger, anxiety and disgust and defensive behaviours (e.g., fight, flight or freeze), 2) the drive system, which is associated with reward and resource seeking and feelings of excitement, drive and joy and 3) the affiliative/soothing system, which is associated with detecting and responding to cues of (social) safeness that facilitate calm, content and open states (Gilbert, 2020).

Compassionate mind practices aim to develop compassionate motivation, sensitivity and distress tolerance and to reduce self-criticism and shame. To date, research has shown positive outcomes for both compassionate mind training (Maratos et al., 2019; Matos et al., 2017) and CFT (Craig et al., 2020) in non-clinical and clinical samples, respectively. For example, Matos et al. (2017) evaluated psychological and physiological outcomes of a two-week compassionate mind training programme (compared to waiting list controls in a non-clinical sample) and found that those within the compassionate mind training group reported increased feelings of safeness, contentment, relaxation, self-compassion and compassion for, and from, others and decreases in stress, shame, self-criticism and fears of compassion. The compassionate mind training group also demonstrated improvements in heart rate variability (an index of parasympathetic activity), which support the idea that compassion focused practices downregulate threat and enhance safe and affiliative responses via activation of the parasympathetic ‘social engagement’ system (Kirby et al., 2017; Porges, 2007). Similarly, Craig et al. (2020), in their recent systematic review (N = 29 studies), found CFT to be effective for, and acceptable to, people experiencing a range of mental health problems, with outcomes such as improvements in mood, anxiety, trauma-related experiences, self-compassion, shame, and self-criticism.

Compassion Focused Imagery

Research has now begun to examine the relative contribution of different components of compassionate mind training (e.g., compassion focused imagery). Imagery is a powerful

technique for stimulating physiological and emotional responses and is used in various forms of psychotherapy (Stopa, 2009). Compassion focused imagery typically involves engaging in a multi-sensory experience of imagining the body posture, voice tone, non-verbal and para-verbal elements of a compassionate self or other (Gilbert, 2009; Irons & Beaumont, 2017), the multi-sensory nature of these practices reflect the evolutionary and neuroscientific theory underpinning CFT. For example, the polyvagal theory (Porges, 2007) proposes that mammals ‘neurocept’ (i.e., perceive at the level of the nervous system) signals of threat and safety through various cues associated with the parasympathetic and sympathetic nervous system (e.g., facial expression, eye contact, posture, voice tone). Compassion focused imagery has been associated with positive psychological and physiological outcomes, such as decreases in shame (Naismith et al., 2019), higher heart rate variability (compared to other types of imagery; Halamová et al., 2019) in non-clinical samples and increases in self-reassurance and happiness in a clinical sample (inpatients who met diagnostic criteria for ‘psychotic disorders’; Ascone et al., 2017). Yet as compassion focused imagery typically involves a range of sensory cues, the relative importance of each is not yet understood.

Inner Voice Tone

One of the components of the multi-sensory experience of cultivating a compassionate image is the imagined inner voice tone. The tone of a person’s internally generated voice has been considered important in CFT since its conception; the development of CFT was (at least partly) driven by clinical observations that those high in shame and self-criticism demonstrated less favourable emotional outcomes despite engaging in cognitive behavioural techniques (Lee, 2005). It was observed that those high in shame and self-criticism were able to generate ‘alternative’ thought content but did not feel reassured at an emotional level, which appeared to be associated with the presence of harsh, hostile or self-critical inner voices (Gilbert, 2009b; Gilbert & Procter, 2006). The importance of (external) voice tone in the ‘neuroception’ of safety

and threat is also highlighted in the polyvagal theory (Porges, 2007, 2011), which proposes that there is a mid-range frequency band within which mammals can ‘neurocept’ safety and (high and low) frequencies outside of this safety band are likely to be processed as signs of threat. If external voice tones can cue distinct psychophysiological responses to safety or threat, it seems reasonable to expect that internally generated inner voice tones may also result in different emotional responses. Though these responses are likely to be affected by individual sensitisation and learning associated with threat and safety. Vygotsky’s (1987) sociocultural theory proposes that a person’s inner voice (also known as inner speech) develops through experiences of social dialogue with others in the formative years which is later internalised as a dialogue with the self. Attachment theory suggests that early attachment experiences create internalised ‘working models’ through which we learn to relate to ourselves and others (Bowlby, 1988; Bretherton, 1999). Compassionate mind approaches have thus drawn on research relating to attachment and early experiences as a potential source of self-criticism and self-reassurance (Gilbert, 2009b, 2020; Irons et al., 2006; Irons & Beaumont, 2017).

Attachment, Self-Criticism and Self-Reassurance

Attachment theory was originally developed from the work of Bowlby (1988) and Ainsworth (Ainsworth & Bowlby, 1991) in the context of parent-infant interaction research. Attachment refers to a child ‘attaching’ to their primary caregiver to enable their survival and learning to use them as a ‘secure base’ from which to explore and as a ‘safe haven’ to return to for comfort, when needed (Cassidy & Shaver, 2018). Infant attachment has typically been categorised into four types: 1) secure, 2) insecure – avoidant, 3) insecure – ambivalent and 4) disorganised (Bowlby & Ainsworth, 1991; Main & Solomon, 1986). Securely attached children seek comfort from their caregiver when distressed and return to exploration once adequate comfort has been received. Parental sensitivity and responsiveness to distress are proposed to be antecedents to secure attachment; if an infant’s distress is sensitively

responded to then they will be likely to develop a secure attachment (Bowlby, 1988). In contrast, infants who experience caregivers as 'rejecting' of their distress (e.g., ignoring, becoming annoyed, ridiculing) or as inconsistent and/or preoccupied with their own needs may avoid their caregiver when distressed and minimise outward displays of negative emotion (i.e., avoidant attachment) or display extreme negative emotion (i.e., ambivalent attachment). These three attachment types tend to be fairly consistent, whereas disorganised attachment typically occurs when the caregiver is both the source of comfort and distress (e.g., in the case of child abuse) which results in the infant not knowing how to relate to their attachment figure and displaying unpredictable attachment behaviours (Benoit, 2004).

Parent-infant attachment is commonly assessed via observation of scenarios in which the attachment system is activated in real time (e.g., the strange situation; Bowlby & Ainsworth, 1991). Whilst it is widely accepted that early life experiences influence adult attachment styles there are issues with attempting to measure childhood attachment retrospectively (Ravitz et al., 2010). Therefore, research tends to focus on measuring adult attachment either via interview (e.g., Hesse, 2008) or (more commonly) through self-report measures (e.g., Wei et al., 2007). Adult attachment may also be categorised into four types: 1) secure/autonomous, 2) avoidant/dismissing, and 3) anxious/preoccupied, and 4) unclassifiable, which roughly map onto the four types of infant attachment (Hesse, 2008). Though, arguably, categorical approaches to attachment are overly simplistic and restrictive therefore there may be benefit in assessing attachment insecurity (i.e., attachment anxiety and attachment avoidance) in adults dimensionally (Crittenden & Landini, 2011). Attachment anxiety relates to a negative view of self, a preoccupation with the responsiveness of others, an expectation of abandonment or insufficient love and hyperactivation of attachment behaviours and attachment avoidance relates to a negative view of others, avoidance of intimacy and dependence, self-reliance and reduced attachment behaviours (Benoit, 2004).

Self-criticism may be an outcome of insecure attachment experiences which have been internalised to become a self-critical/self-attacking ‘internal working model’ through which the person relates to themselves (Mikulincer & Shaver, 2007). Review research indicates that insecure attachment, and self-criticism more specifically, have been shown to positively correlate with a range of mental health problems, including mood disorders, interpersonal problems (and diagnosed personality disorders), eating disorders, social anxiety disorder, and psychotic experiences (Mikulincer & Shaver, 2012; Werner et al., 2019). Furthermore, evidence suggests that attachment insecurity (Baldwin et al., 2020; Rockliff et al., 2008) and self-criticism (Duarte et al., 2015; Halamová et al., 2019) may moderate people’s emotional and/or physiological responses to compassion focused imagery, where greater attachment insecurity and self-criticism are associated with less positive and/or more aversive outcomes.

An additional factor to consider when assessing emotional responses to compassion focused imagery is individual differences in ability to self-reassure in the face of threat. Trait self-reassurance has been found to moderate emotional responses to compassion focused imagery in non-clinical populations, with higher self-reassurance being associated with greater reductions in shame (Naismith et al., 2019). Irons et al. (2006), with a sample of (predominantly female) students, found that self-criticism and self-reassurance differentially mediated the relationship between recalled parental experiences and (self-reported) depression, in that ‘inadequate’ self-criticism partially mediated the relationship between experiences of rejection and overprotection and depression, but not between parental warmth and depression, and ‘self-hatred’ self-criticism mediated the relationship between parental rejection and self-reported depression scores, but not between recalled overprotection and warmth and depression. Whereas self-reassurance mediated the relationship between recalled parental warmth and depression, but not between recall of rejection and overprotection and

depression. Importantly, this highlights that self-reassurance and self-criticism are distinct concepts, and not just the opposites of one another, making the case for assessment of their unique contributions to emotional responses.

Study Aims and Hypotheses

Voice tone has always been considered an important component of compassionate mind training and in the clinical application of these techniques within CFT (Gilbert, 2009a). To my knowledge, this is the first study to empirically examine the relative contribution of the voice tone component of compassion focused imagery. Specifically, this study tests whether there are differences in (self-reported) ‘positive’ and ‘negative’⁵ emotional responses to compassionate versus critical imagery (in the context of recalling a scenario of personal failure) and whether these responses are moderated by levels of self-criticism, self-reassurance, attachment anxiety and attachment avoidance. It was hypothesised that:

- 1) There would be differences in ‘positive’ and ‘negative’ emotional response to critical and compassionate voice tone imagery. Specifically, 1a) there will be more ‘positive’ emotional response to compassionate imagery and 1b) more ‘negative’ emotional response to critical imagery.
- 2) Levels of self-reassurance, self-criticism, attachment anxiety and attachment avoidance would moderate emotional response to compassionate and critical imagery with 2a) people who report higher self-reassurance demonstrating greater ‘positive’ emotion following compassionate imagery and less ‘negative’ emotional response following critical imagery and 2b) people who report higher self-criticism, attachment anxiety and attachment avoidance demonstrating less ‘positive’ and more ‘negative’ emotion following both compassionate and critical imagery.

This study also included a (non-experimental) condition within which participants were

⁵ ‘Positive’ emotional responses describe self-reported feelings of ‘relaxation’ and ‘safety/contentment’, ‘negative’ emotional responses describe self-reported feelings of ‘negative affect’.

asked to imagine saying a reassuring statement to themselves in the absence of any instruction on the voice tone in which to say the statement. Exploratory analyses were used to evaluate whether imagining the recalled failure scenario and saying the reassuring statement alone (in the absence of any manipulation of inner voice tone) would elicit an emotional response and (if so) the nature of this response.

Design

The study employed an experimental, repeated measures design using the Qualtrics online survey platform (<https://www.qualtrics.com>). An expert by experience (AB) from the Liverpool Experts by Experience group provided feedback on the accessibility and acceptability of the study and amendments were made following feedback⁶.

Approval

Approval for this study was obtained from the University of Liverpool Doctorate in Clinical Psychology Research Review Committee and the Institute of Population Health Research Ethics Committee (ref: 9930; see Appendix 2.2 and 2.3). Following study information being provided, informed consent to partake was obtained using an electronic consent form via the Qualtrics platform.

Participants

A priori power analysis completed using G*Power 3 (Faul et al., 2007) indicated that, in order for a mixed analysis of variance (ANOVA) to detect a small to medium effect size (Cohen's $f = 0.15$ to 0.25), at an alpha level of $.05$ and power of 0.95 , with 10 groups (5 dichotomised moderators) and 2 measurements, with a between measures correlation of 0.5 , an estimated sample size of between 110 and 280 would be required. Two hundred and thirty-six participants (18+ years) were recruited via the University of Liverpool intranet, social media advertisements and (electronic) word of mouth. Participants were required to have sufficient use of English language and access to technology to enable them to partake but no other exclusion criteria were applied. Table 6 provides an overview of sample demographics. The sample was predominantly female ($\approx 72\%$), white British ($\approx 69.5\%$) and aged 44 or under (80.93%) and the majority of participants were either employed full time ($\approx 58.5\%$), part time ($\approx 11\%$) or in

⁶ There are plans for AB to also contribute to the development of a lay summary for participants who have indicated a wish to receive a summary of the findings.

education ($\approx 12\%$). Most completed the study within the United Kingdom ($\approx 76\%$) and had no prior experience of compassion focused therapy or training ($\approx 82\%$).

Approach to Statistical Analysis

Data was exported from the Qualtrics online survey platform (<https://www.qualtrics.com>) to a compatible file format and then imported into IBM SPSS Statistics (Version 27), this software was used for all data analysis. The dataset comprised of: 1) demographic information, including age category, gender, location (inside or outside of the United Kingdom), ethnicity, employment status and whether the participant had had previous experience of compassion focused therapy, 2) the three dependent variables (self-reported feelings of ‘relaxation’, ‘safety/contentment’ and ‘negative affect’ measured at baseline, following the ‘as usual’ voice tone baseline condition and following the critical and compassionate voice tone experimental conditions) and 3) the five moderator variables (self-reported self-reassurance, ‘inadequate self’ self-criticism, ‘hated self’ self-criticism, attachment anxiety and attachment avoidance) measured at baseline only. The demographic information obtained was predominantly categorical but there was a free text option for additional information regarding locations outside of the United Kingdom and if ‘other’ was selected for employment status. All dependent and moderator variables were scale level data.

Descriptive statistics were firstly completed for the demographic variables to establish the characteristics of the sample and on the dependent and moderator variables to examine the values and distributions of sample scores to assess their suitability for use in parametric analyses (e.g., assessment of normality of distribution). As recommended by Field (2017) various data transformations (e.g., log, square root, reciprocal) were tried to reduce issues of skewness and kurtosis (prior to completion of the parametric analyses) and the one which resulted in the most normally distributed data was selected. Further to this, in order to test group-level differences in emotional response to compassionate and critical voice tone

imagery, three mixed ANOVAs were completed, one for each of the dependent variables (i.e., 'relaxation', 'safeness/contentment' and 'negative affect') with voice tone (critical and compassionate) as the within subjects factor (as participants completed both voice tones) and level of self-reassurance, 'inadequate self' self-criticism, attachment anxiety and attachment avoidance (dichotomised as high and low) as between subjects factors. The decision to dichotomise the moderator variables was made in light of this being common practice in compassion focused literature and thus to make the results of this research comparable to others that have used this approach. The potential issues associated with dichotomisation have been considered, including treating all values above (or below) a cut off as belonging the same category and the potential reduction in power associated with this (Altman & Royston, 2006). Though it is not anticipated that the dichotomisation of moderator variables would pose a problem to the power to detect findings in this study as it was accounted for in the power analysis a priori. Where significant results were observed from the repeated measures ANOVA analysis, subsequent t-tests were used to further examine the directionality and effect size of the findings; where main effects of voice tone were observed paired samples t-tests were used due to the repeated nature of the data and where main or interaction effects with moderator variables were observed independent samples t-tests due to the moderator variables differing between subjects.

Three paired samples t-tests were used to explore whether feelings of 'relaxation', 'safeness/contentment' and 'negative affect' changed and to what extent from baseline to following the 'as usual' voice condition to assess whether imagining saying a 'reassuring statement' to the self in the context of failure (and in the absence of any voice tone cues) would be sufficient to elicit an emotional response. As described, paired samples t-tests were employed due to the same participants repeating the measures from baseline to post- the 'as usual' voice tone baseline condition. The post- 'as usual' voice tone scores were not included

in the repeated measures ANOVAs as this was always completed first, was not an experimental condition and there were no a priori hypotheses relating to emotional responses to the 'as usual' voice tone.

Table 6*Sample Demographics*

Demographic Category	N (of 236)	%	Cumulative %
Age			
18-24	28	11.86	11.86
25-29	77	32.63	44.49
30-34	47	19.92	64.41
35-39	25	10.59	75.00
40-44	14	5.93	80.93
44-49	4	1.69	82.63
50-54	13	5.51	88.14
55-59	13	5.51	93.64
60-64	5	2.12	95.76
65-69	5	2.12	97.88
70-74	2	0.85	98.73
75+	3	1.27	100.00
Gender			
Female	170	72.03	72.03
Male	64	27.12	99.15
Non-binary	1	0.42	99.58
Did not wish to disclose	1	0.42	100.00
Location			
United Kingdom	180	76.27	76.27
Outside of United Kingdom	56	23.73	100.0
Ethnicity			
Asian or Asian British: Indian	14	5.93	5.93
Asian or Asian British: Pakistani	2	0.85	6.78
Asian or Asian British: Bangladeshi	6	2.54	9.32
Asian or Asian British: Chinese	2	0.85	10.17
Any other Asian background	7	2.97	13.14
Black, African, Caribbean or Black British: African	9	3.81	16.95
Black, African, Caribbean or Black British: Caribbean	2	0.85	17.80
Any other Black, African or Caribbean background	2	0.85	18.65
White: English, Welsh, Scottish, Northern Irish or British	164	69.49	88.14
White: Irish	5	2.12	90.26
Any other White background	14	5.93	96.19
Mixed or Multiple ethnic groups: White and Black Caribbean	4	1.70	97.89
Mixed or Multiple ethnic groups: White and Asian	1	0.42	98.42
Other ethnic group: Arab	1	0.42	98.73
Any other ethnic group	2	0.85	99.58
Did not wish to disclose	1	0.42	100.00
Employment Status			
Unemployed	15	6.36	6.36
Employed full time	138	58.47	64.83
Employed part time	27	11.44	76.27
Student	28	11.86	88.14
Other (e.g., retired, self-employed, unable to work due to illness/disability)	24	10.17	98.31
Did not wish to disclose	4	1.69	100.00
Previous CFT Experience^a			
Yes	43	18.22	18.22
No	193	81.78	100.00

^a Previous experience of compassion focused therapy or training.

Procedure

Figure 2 provides an illustration of the study procedure. Participants were provided with study information in electronic format via the Qualtrics platform and consent to partake was obtained via the same medium. Participants were asked to complete the study in a quiet, distraction-free environment (see Appendix 2.4 and 2.5 for participant information sheet and consent form). Participation was anonymous and participants were provided with a unique identifier. All participants provided demographic information and completed the baseline measures (1. the ‘negative affect’ subscale of the positive and negative affect schedule [PANAS; Watson et al., 1988]), 2. the ‘safeness/contentedness’ and ‘relaxed’ subscales of the types of positive affect scale (Gilbert et al., 2008), 3. the ‘experience in close relationship scale short form’ (ECR-SF; Wei et al., 2007) and 4. the ‘forms of self-criticising/attacking and self-reassuring scale’ (FSCRS; Gilbert et al., 2004). Following this, participants were guided (via audio recording) to recall a recent scenario in which they had made a mistake/failed at something (see Appendix 2.6 for script). Participants were instructed to click next once they had a scenario in mind. Participants were then guided (via audio recording) to imagine saying a reassuring statement to themselves without any specific instructions on the characteristics of the voice tone to use (referred to the ‘as usual’ imagery), the reassuring statement also appeared on the screen (see Appendix 2.7 for script). Following the ‘as usual’ voice tone imagery participants repeated the emotion measures and were then randomly allocated to either the compassionate or critical voice tone imagery. Participants were again guided (via audio recording) to recall the mistake/failure scenario and to imagine saying the same reassuring statement to themselves in either a critical or compassionate voice tone. This was then repeated for the second experimental voice tone imagery. All participants completed both the compassionate and critical voice conditions (see Appendix 2.8 and 2.9 for scripts); order of completion was counterbalanced (to reduce the likelihood of order effects). Participants repeated the emotion measures again after

each of the two experimental conditions. Following completion of the final imagery participants were provided with a written debrief, contact details for the principal investigator and signposting to resources/support (signposting to resources/support was also available at each stage of the study in case it was required). Participants were then offered the option of being entered into a prize draw⁷.

Measures

See Appendices 2.10 to 2.14 for details of measures used.

1. *Demographic information form*. Completed at baseline.

2. *Forms of self-criticising/attacking and self-reassuring scale (FSCRS; Gilbert et al., 2004)*

A 22 item self-report measure consisting of three subscales measuring two forms of trait self-criticism and trait self-reassurance: 9 items measuring a sense of personal inadequacy (e.g., ‘I am easily disappointed with myself’) and 5 items⁸ measuring self-hatred (e.g., ‘I call myself names’) and 8 items measuring trait self-reassurance (e.g., ‘I find it easy to forgive myself’), rated on a 5-point Likert scale (0 = ‘not at all like me’ to 4 = ‘extremely like me’). Subscale Cronbach’s α = .86 to .90 (Gilbert et al., 2004). Completed at baseline.

Cronbach’s alphas (in non-clinical samples) range from .89 to .91 (inadequate-self), from .82 to .89 (hated-self) and from .82 to .88 (reassured-self). Completed at baseline.

3. *The experiences in close relationship scale-short form (ECR-SF; Wei et al., 2007)*

A 12 item self-report measure consisting of two subscales relating to trait patterns of adult attachment: attachment anxiety and attachment avoidance. Each item is rated on a 7-point Likert scale (1 = ‘strongly agree’ to 7 = ‘strongly disagree’. Cronbach’s α .78 and .84 for anxiety and

⁷ Prize draw provided the opportunity to win 1 of 9 £50 Amazon vouchers.

⁸ Of note, item 9 (‘I have become so angry with myself that I want to hurt or injure myself’) was omitted in order to reduce the likelihood of distress therefore only 4 of the 5 items of the ‘hated self’ subscale were measured and used for analysis. It was not anticipated that the removal of this item would significantly impact on the psychometric properties of the subscale as it was the lowest loading item on the ‘hated self’ subscale in a confirmatory factor analysis completed by Baião et al. (2015).

avoidance subscales, respectively (Wei et al., 2007). Completed at baseline.

4. Positive and Negative Affect Schedule (PANAS) - Watson et al. (1988)

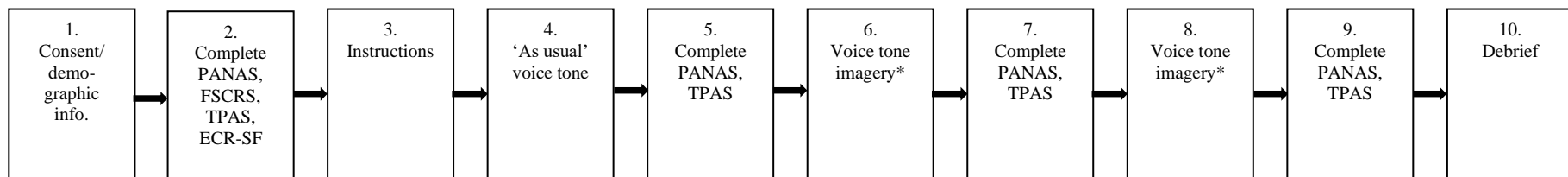
A 20 item self-report measure with two subscales measuring ‘positive’ and ‘negative affect’ (10 items each). To note, only the ‘negative affect subscale’ 10 items were use within this study to measure ‘negative’ emotional experience (e.g., distressed, upset, scared, guilty, hostile), rated on a 5-point Likert scale (1 = ‘very slightly or not at all’ to 5 = ‘extremely’). The ‘positive affect’ subscale was not used as ‘positive’ emotional responses were assessed via ‘the type of positive affect scale’ (Gilbert et al., 2008). Subscale Cronbach’s $\alpha > .80$) and good test-retest reliability ($r > .60$; Vera-Villarroel et al., 2019). Completed at baseline and post the ‘as usual’, compassionate and critical voice tone imageries.

5. The type of positive affect scale (TPAS; Gilbert et al., 2008)

An 18 item self-report measure consisting of three subscales measuring the degree to which people experience different types of positive emotions by rating ‘feeling words’ on a 5-point Likert scale (0 = ‘not characteristic of me’ to 4 = ‘very characteristic of me’). The three subscales represent: 1. activating positive affect (e.g., excited, dynamic, active), 2. relaxed positive affect (e.g., relaxed, calm, peaceful) and 3. safeness/contentment positive affect (e.g., safe, secure, warm). Only the ‘relaxed’ (6 items) and the ‘safeness/contentment’ (4 items) subscales are used in this study as theoretically these two subscales are associated with the ‘soothing/affiliative’ system of the ‘three systems’ model of affect regulation in compassion focused therapy, whereas the ‘activating’ subscale is more associated with the ‘drive’ system. Engagement of the ‘soothing/affiliative’ system is a key aim in compassionate mind training (and its clinical application via compassion focused therapy) and therefore feelings of ‘relaxation’ and ‘safeness/contentment’ were outcomes of interest in this study. Subscale Cronbach’s α range from .73 to .83 (Gilbert et al., 2008). Completed at baseline and post the ‘as usual’, compassionate and critical voice tone imageries.

Figure 2

Flowchart of Procedure (Approximate Study Duration: \approx 45 Minutes)



* Order of completion of compassionate and critical voice tone imagery was counterbalanced to reduce likelihood of order effects.

PANAS = Positive and negative affect schedule ('negative affect' scale only); measuring 'negative' emotional experience.

FSCRS = The forms of self-criticism and self-reassurance scale; measuring levels of trait self-criticism and self-reassurance.

TPAS = Types of positive affect scale; measuring 'relaxed' and 'safeness/contentment' emotional experience.

ECR-SF = Experiences in close relationship scale-short form; measuring levels of 'attachment anxiety' and 'attachment avoidance'.

Results

Analyses were conducted using IBM SPSS Statistics (Version 27). Descriptive and internal consistency statistics for the three dependent variables and the five moderator variables are shown in Table 7. All subscales showed good internal consistency (Cronbach's $\alpha = 0.79$ to 0.97). Descriptive statistics, histograms and Q-Q plots revealed that the PANAS 'negative affect' subscale was positively skewed (skewness statistics ranged from 1.12 to 2.04) and leptokurtic (kurtosis statistics ranged from 0.58 to 4.62). Therefore, all PANAS variables were transformed. Various transformations (i.e., log, square root and reciprocal) were tried and the reciprocal transformation was chosen as it demonstrated the closest to normal distribution, though some skew/kurtosis remained (post-transformation skewness statistics ranged from -0.66 to 0.14 and kurtosis statistics ranged from -1.19 to -0.56). As the PANAS scores were reciprocally transformed high scores indicated less 'negative affect'. Some of the TPAS 'relaxed' and 'safeness/contentment' subscales also showed mild-moderate skewness/kurtosis and transformations were attempted. In light of the TPAS scores being approximately normal (as observed via histograms and Q-Q plots), and the various transformations (i.e., log, square root and reciprocal) not reducing skew/kurtosis, the decision was made not to transform any of the TPAS subscale scores. The FSCRS 'hated self' subscale was also positively skewed (skewness statistic = 1.031; the majority of participants scored low on this measure), due to plans to dichotomise this variable the decision was made not to subject it to transformation. Descriptive statistics indicated that the ECR-SF 'attachment avoidance' subscale was somewhat leptokurtic (kurtosis statistic = 0.896) yet appeared approximately normal on visual examination (of histogram and Q-Q plot) and various transformations (i.e., log, square root and reciprocal) did not improve kurtosis therefore this variable was not transformed.

Table 7*Descriptive and Internal Consistency Statistics of Dependent and Moderator Variables*

Measure	N	Baseline		Post 'As Usual'		Post 'Compassionate'		Post 'Critical'	
		Mean (SD)	Cronbach's α	Mean (SD)	Cronbach's α	Mean (SD)	Cronbach's α	Mean (SD)	Cronbach's α
TPAS 'Relaxed'	236	19.03 (5.61)	0.93	18.72 (6.75)	0.95	20.22 (6.96)	0.96	17.12 (7.44)	0.97
TPAS 'Safe/Contentment'	236	15.07 (3.48)	0.86	14.26 (4.11)	0.91	14.96 (4.26)	0.93	12.88 (4.95)	0.94
PANAS 'Negative Affect' ^a	236	14.81 (5.76)	0.90	17.08 (7.14)	0.92	14.29 (5.92)	0.92	18.61 (8.30)	0.94
FSCRS 'Reassured Self'	236	26.29 (6.84)	0.90	-	-	-	-	-	-
FSCRS 'Hated Self'	236	7.95 (3.70)	0.81	-	-	-	-	-	-
FSCRS 'Inadequate Self'	236	27.54 (8.46)	0.90	-	-	-	-	-	-
ECR-SF 'Attachment Anxiety'	236	23.17 (6.04)	0.79	-	-	-	-	-	-
ECR-SF 'Attachment Avoidance'	236	25.53 (4.64)	0.82	-	-	-	-	-	-

^a = Before reciprocal transformation

- = Measured at baseline only

Emotional Responses to Critical and Compassionate Voice Tone Imagery

As normative data is available for the FSCRS (Baião et al., 2015), the FSCRS ‘reassured self’ and ‘inadequate self’ subscales were split into ‘high’ and ‘low’ values at their normative medians for a non-clinical population (21 and 18, respectively). The FSCRS ‘hated self’ subscale was unable to be dichotomised by the non-clinical median ‘cut-off’ (of 3) as no participants scored below this threshold. Consideration was given as to whether to dichotomise this variable based on the clinical ‘cut-off’ (of 13) but as this would have resulted in comparing significantly unequal ‘high’ and ‘low’ groups (N = 210 and 26, respectively) and in this being the only variable to split using a clinical threshold so, instead, the decision was made to remove the variable from further analyses. The ECR-SF ‘attachment anxiety’ and ‘attachment avoidance’ measures were split at the 50th percentile of possible scores (24; as per Wei et al., 2007).

Table 8 shows descriptive statistics for the dichotomised moderators and Table 9, Table 10 and Table 11 show descriptive statistics for the three dependent variables at ‘high’ and ‘low’ levels of the moderator variables. Mean FSCRS ‘reassured self’ subscale scores were higher than those previously reported in non-clinical samples, mean FSCRS ‘inadequate self’ subscale scores were higher than in non-clinical samples and similar to clinical sample means, the FSCRS ‘hated self’ subscale scores were higher than those reported in non-clinical populations but still lower than non-clinical means (Baião et al., 2015).

In order to test differences in emotional response between the compassionate and critical voice tone imagery conditions (hypotheses 1, 1a and 1b) and potential moderating effects of self-reassurance, self-criticism, attachment anxiety and attachment avoidance (hypotheses 2, 2a and 2b), three mixed ANOVA analyses were completed with the type of voice tone imagery (compassionate and critical) as the within subjects factor, FSCRS ‘reassured self’ (high and low), FSCRS ‘inadequate self’ (high and low), ECR-SF ‘attachment anxiety’ (high and low) and ECR-SF ‘attachment avoidance’ (high and low) as between subject factors and the emotion measures

(PANAS 'negative affect', TPAS 'safeness/contentment' and TPAS 'relaxed' subscales) as the dependent variables. As groups were dichotomised post hoc, group sizes were unequal. Due to this the Welch test was employed for all post hoc analyses as it is robust to unequal sample sizes and variances.

Table 8*Descriptive Statistics for the Four Dichotomised Moderator Variables*

	N		Mean (SD)	
	Low	High	Low	High
FSCRS 'Reassured Self'	58	178	17.50 (3.14)	29.15 (5.04)
FSCRS 'Inadequate Self'	38	198	14.87 (2.57)	29.97 (6.87)
ECR-SF 'Attachment Anxiety'	143	93	19.31 (3.93)	29.12 (3.24)
ECR-SF 'Attachment Avoidance'	107	129	21.79 (2.94)	28.62 (3.32)

Table 9

Descriptive Statistics and Comparison of Mean Scores for the TPAS 'Relaxed' Subscale for High and Low Levels of the Moderator Variables

	N	Baseline Mean (SD)	Post 'As Usual' Mean (SD)	Post 'Compassionate' Mean (SD)	Post 'Critical' Mean (SD)
FSCRS 'Reassured Self'					
Low Self-Reassurance	58	15.50 (5.19)***	15.78 (6.14)***	17.12 (6.96)***	14.35 (7.00)***
High Self-Reassurance	178	20.17 (5.26)	19.67 (6.74)	21.22 (6.67)	18.02 (7.37)
FSCRS 'Inadequate Self'					
Low Self-Criticism (Inadequacy)	38	20.97 (5.67)*	20.76 (7.07) ^a	22.08 (7.41)	19.47 (7.80)*
High Self-Criticism (Inadequacy)	198	18.65 (5.53)	18.32 (6.63)	19.86 (6.83)	16.67 (7.30)
ECR-SF 'Attachment Anxiety'					
Low Attachment Anxiety	143	19.56 (5.64)	19.39 (6.86) ^b	20.45 (7.29)	17.96 (7.25)*
High Attachment Anxiety	93	18.20 (5.48)	17.68 (6.46)	19.85 (6.43)	15.83 (7.58)
ECR-SF 'Attachment Avoidance'					
Low Attachment Avoidance	107	20.07 (5.00)**	19.40 (6.85)	21.25 (6.88)*	18.30 (7.15)*
High Attachment Avoidance	129	18.16 (5.95)	18.15 (6.64)	19.36 (6.93)	16.14 (7.55)

^a = Trend toward significance (p = .055)

^b = Trend toward significance (p = .053)

* = Significant at p < .05

** = Significant at p < .01

*** = Significant at p < .001

Table 10

Descriptive Statistics and Comparison of Mean Scores for the TPAS 'Safeness/Contentment' Subscale for High and Low Levels of Moderator Variables

	N	Baseline Mean (SD)	Post 'As Usual' Mean (SD)	Post 'Compassionate' Mean (SD)	Post 'Critical' Mean (SD)
FSCRS 'Reassured Self'					
Low Self-Reassurance	58	13.03 (3.52)***	12.10 (4.20)***	12.40 (4.58)***	10.93 (4.80)***
High Self-Reassurance	178	15.74 (3.21)	14.97 (3.84)	15.80 (3.81)	13.51 (4.84)
FSCRS 'Inadequate Self'					
Low Self-Criticism (Inadequacy)	38	16.16 (3.28)*	15.26 (3.92)	15.95 (4.38)	14.29 (4.87) ^a
High Self-Criticism (Inadequacy)	198	14.86 (3.49)	14.07 (4.13)	14.77 (4.23)	12.61 (4.93)
ECR-SF 'Attachment Anxiety'					
Low Attachment Anxiety	143	15.39 (3.54)	14.65 (4.02)	15.14 (4.28)	13.45 (4.62)*
High Attachment Anxiety	93	14.58 (3.35)	13.67 (4.21)	14.69 (4.25)	11.99 (5.32)
ECR-SF 'Attachment Avoidance'					
Low Attachment Avoidance	107	15.45 (3.63)	14.69 (4.39)	15.52 (4.31) ^b	13.73 (4.78)*
High Attachment Avoidance	129	14.76 (3.33)	13.91 (3.86)	14.50 (4.18)	12.17 (4.99)

^a = Trend toward significance (p = .057)

^b = Trend toward significance (p = .066)

* = Significant at p < .05

** = Significant at p < .01

*** = Significant at p < .001

Table 11

Descriptive Statistics and Comparison of Mean Scores for the PANAS 'Negative Affect' Subscale (Before Reciprocal Transformation) for High and Low Levels of Moderator Variables

	N	Baseline Mean (SD)	Post 'As Usual' Mean (SD)	Post 'Compassionate' Mean (SD)	Post 'Critical' Mean (SD)
FSCRS 'Reassured Self'					
Low Self-Reassurance	58	17.26 (7.41)**	18.50 (6.96)	15.66 (6.31) ^a	20.74 (9.44)*
High Self-Reassurance	178	14.01 (4.88)	16.61 (7.16)	13.84 (5.74)	17.92 (7.80)
FSCRS 'Inadequate Self'					
Low Self-Criticism (Inadequacy)	38	12.82 (3.97)**	14.24 (5.16)***	12.08 (3.14)***	15.66 (6.39)**
High Self-Criticism (Inadequacy)	198	15.19 (5.98)	17.62 (7.35)	14.71 (6.23)	19.18 (8.51)
ECR-SF 'Attachment Anxiety'					
Low Attachment Anxiety	143	13.68 (4.64)***	15.92 (6.09)**	13.51 (4.75)*	17.23(7.09)**
High Attachment Anxiety	93	16.54 (6.83)	18.85 (8.24)	15.48 (7.23)	20.74(9.53)
ECR-SF 'Attachment Avoidance'					
Low Attachment Avoidance	107	13.29 (4.05)***	16.06 (6.59)*	13.52 (5.18) ^b	17.14 (7.33)*
High Attachment Avoidance	129	16.07 (6.62)	17.92 (7.49)	14.92 (6.42)	19.84 (8.87)

^a = Trend toward significance (p = .055)

^b = Trend toward significance (p = .065)

* = Significant at p < .05

** = Significant at p < .01

*** = Significant at p < .001

Positive Emotional Responses

See Table 12 for ANOVA results for ‘positive’ emotional responses.

Main Effects

There was a main effect of type of voice tone imagery on the TPAS ‘relaxed’ and ‘safeness/contentment’ subscales ($F(1, 231) = 28.972, p < .001, \eta^2 = .11$ and $F(1, 231) = 27.435, p < .001, \eta^2 = .11$, respectively). Post hoc paired samples t-tests showed that feelings of ‘safeness/contentment’ and ‘relaxation’ were significantly higher following the compassionate voice tone imagery ($t(235) = 8.74, p < .001$, Cohen’s $d = .57$ and $t(235) = 9.38, p < .001$, Cohen’s $d = .61$, respectively), as hypothesised (hypotheses 1 and 1a).

There was also a main effect of level of self-reassurance (FSCRS ‘reassured self’) on the TPAS ‘relaxed’ and ‘safeness/contentment’ subscales ($F(1, 231) = 12.967, p < .001, \eta^2 = .05$ and $F(1, 231) = 19.88, p < .001, \eta^2 = .08$, respectively). Post hoc independent t-tests showed that following both compassionate and critical voice tone imagery those in the ‘high self-reassurance’ group scored higher in ‘relaxation’ ($t(101.35) = -3.43, p < .001$, Cohen’s $d = -.51$ and $t(93.47) = -3.94, p < .001$, Cohen’s $d = -.61$, respectively) and ‘safeness/contentment’ ($t(97.62) = -3.547, p < .001$, Cohen’s $d = -.54$ and $t(84.24) = -5.108, p < .001$, Cohen’s $d = -.85$), indicating that those who reported higher self-reassurance felt more ‘relaxed’ and ‘safe/content’ (compared to those lower in self-reassurance) following both imageries. See Figure 3 and Figure 4 for plots showing main effects. This finding supported hypotheses 2 and 2a.

Interaction Effects

For both TPAS ‘safeness/contentment’ and ‘relaxation’ subscales there was a significant voice tone condition*ECR-SF ‘attachment anxiety’ interaction ($F(1, 231) = 4.354, p < .038, \eta^2 = .02$ and $F(1, 231) = 4.520, p < .035, \eta^2 = .02$, respectively). See Figure 5 and Figure 6 for plots showing interaction effects. For the TPAS ‘safeness/contentment’ subscale

there was also a trend towards a voice tone condition*FSCRS ‘reassured self’ interaction (see Figure 7). Post hoc independent t-tests (with ‘high’ and ‘low’ attachment anxiety as the grouping variable) showed less reported ‘relaxation’ and ‘safeness/contentment’ following the critical voice tone imagery for those in the ‘high attachment anxiety’ group ($t(190.33) = 2.15, p = .033$, Cohen’s $d = .29$ and $t(176.90) = 2.18, p = .031$, Cohen’s $d = .30$, respectively) but there were no significant differences following the compassionate voice tone condition ($t(213.43) = .67, p = .504$, Cohen’s $d = .09$ and $t(197.75) = .80, p = .427$, Cohen’s $d = .11$).

There were no main or interaction effects for the FSCRS ‘inadequate self’ or the ECR-SF ‘attachment avoidance’ subscales, which indicates that level of self-criticism and attachment avoidance did not significantly moderate ‘positive’ emotional responses to the compassionate and critical voice tone imageries.

Table 12*ANOVA Results for TPAS 'Relaxed' and 'Safeness/Contentment' Subscales*

	TPAS 'Relaxed'			TPAS 'Safeness/Contentment'		
	<i>F(df)</i>	<i>p</i>	ηp^2	<i>F(df)</i>	<i>p</i>	ηp^2
Within-Subjects Effects						
Voice Tone Imagery Type ^a	28.97 (1,231)	<.001	.11	27.44 (1,231)	<.001	.11
Voice Tone*Inadequate Self ^b	0.17 (1,231)	.681	.00	0.36 (1,231)	.548	.00
Voice Tone*Reassured Self ^b	0.59 (1,231)	.442	.00	3.80 (1,231)	.053	.02
Voice Tone*Attachment Anxiety ^c	4.35 (1,231)	.038	.02	4.52 (1,231)	.035	.02
Voice Tone*Attachment Avoidance ^c	0.02 (1,231)	.890	.00	0.50 (1,231)	.479	.00
Between-Subjects Effects						
Inadequate Self ^b	1.73 (1,231)	.190	.01	0.96 (1,231)	.329	.00
Reassured Self ^b	12.97 (1,231)	<.001	.05	19.88 (1,231)	<.001	.08
Attachment Anxiety ^c	0.39 (1,231)	.534	.00	0.56 (1,231)	.455	.00
Attachment Avoidance ^c	2.60 (1,231)	.108	.01	2.52 (1,231)	.114	.01

^a = Post compassionate and critical voice conditions^b = Forms of Self-Criticising/Attacking and Self-Reassurance Scale (FSCRS)^c = Experiences in Close Relationship Scale – Short Form (ECR-SF)

Figure 3

Estimated Marginal Means for TPAS 'Relaxed' Subscale Grouped by Levels of Self-Reassurance (Low=<21, High=>22)

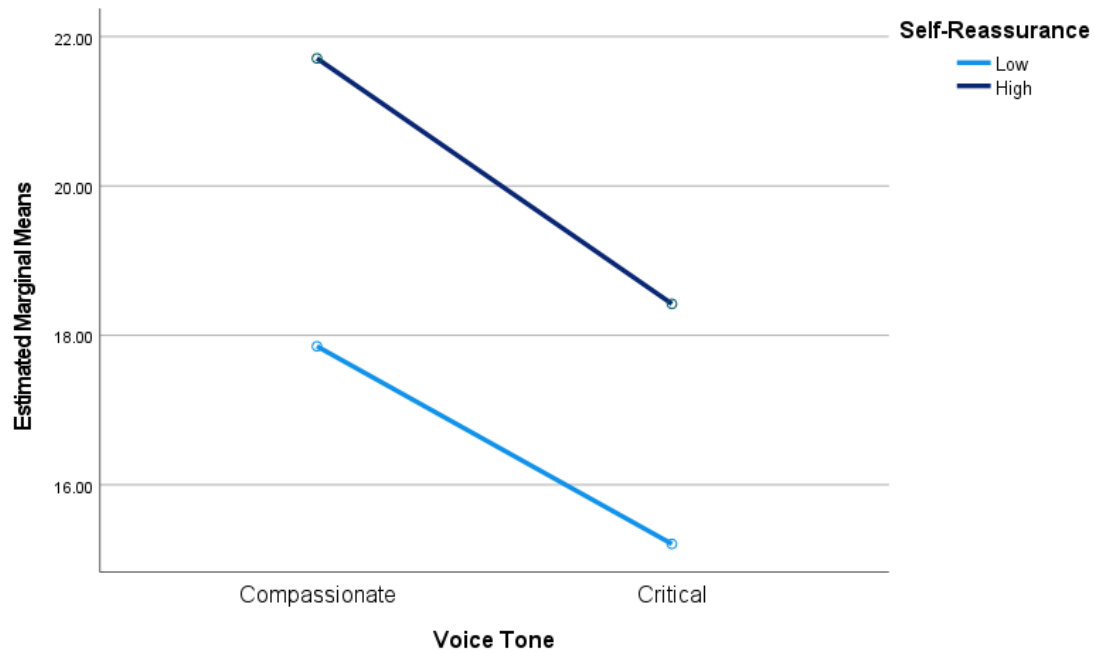


Figure 4

Estimated Marginal Means for TPAS 'Safeness/Contentment' Subscale Grouped by Level of Self-Reassurance (Low=<21, High=>22)

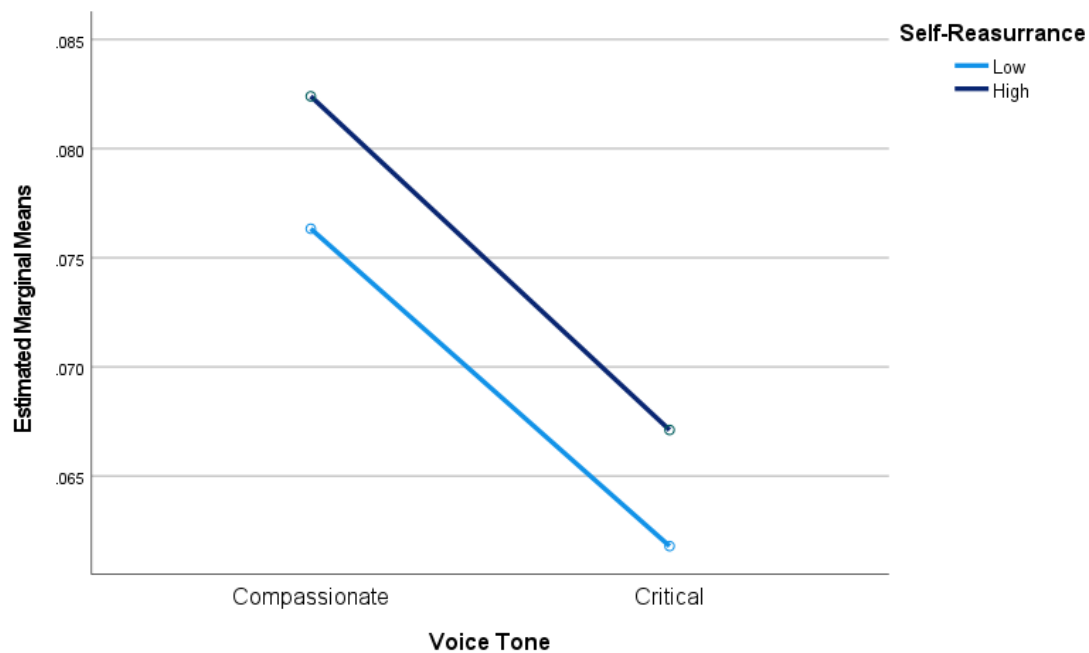


Figure 5

Estimated Marginal Mean Scores for TPAS 'Relaxed' Subscale Grouped by Level of Attachment Anxiety (Low =< 24, High =>25)

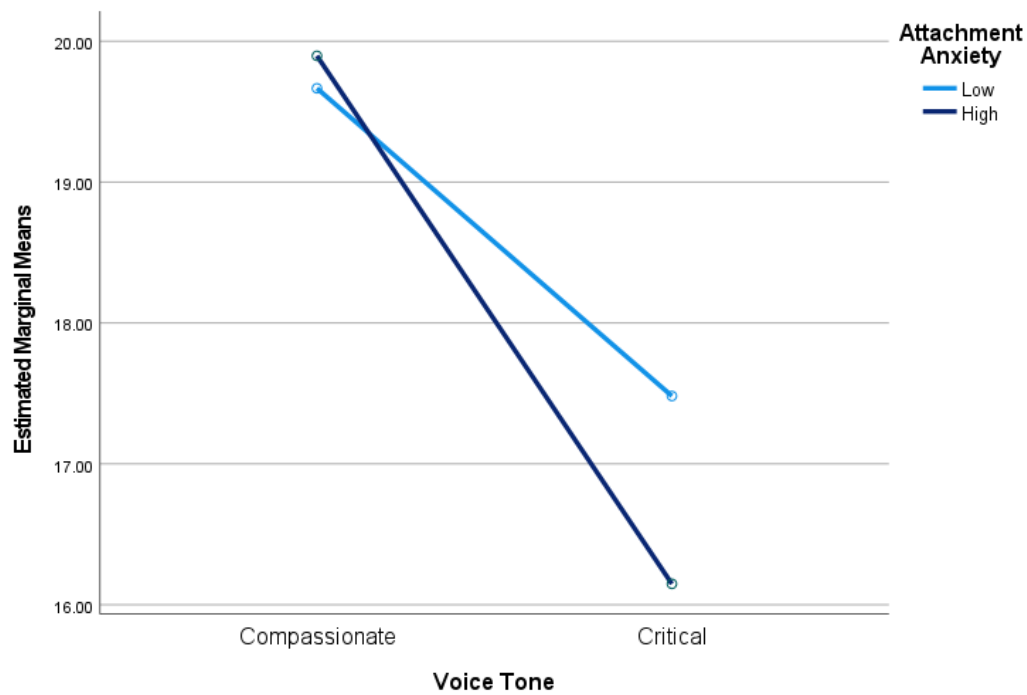


Figure 6

Estimated Marginal Means for TPAS 'Safeness/Contentment' Subscale Grouped by Level of Attachment Anxiety (Low=<24, High=>25)

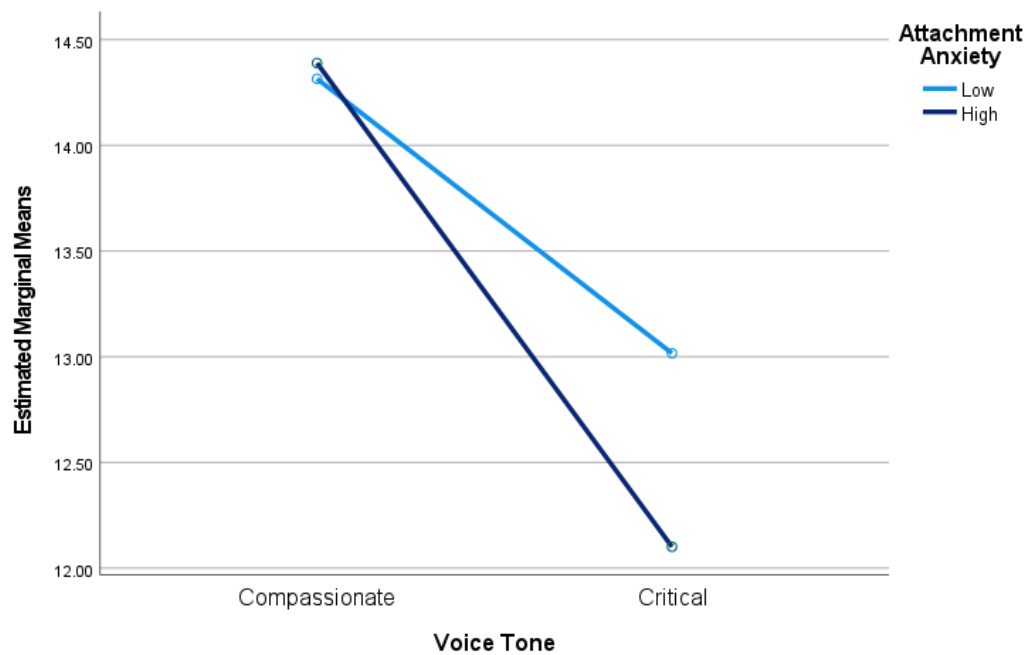
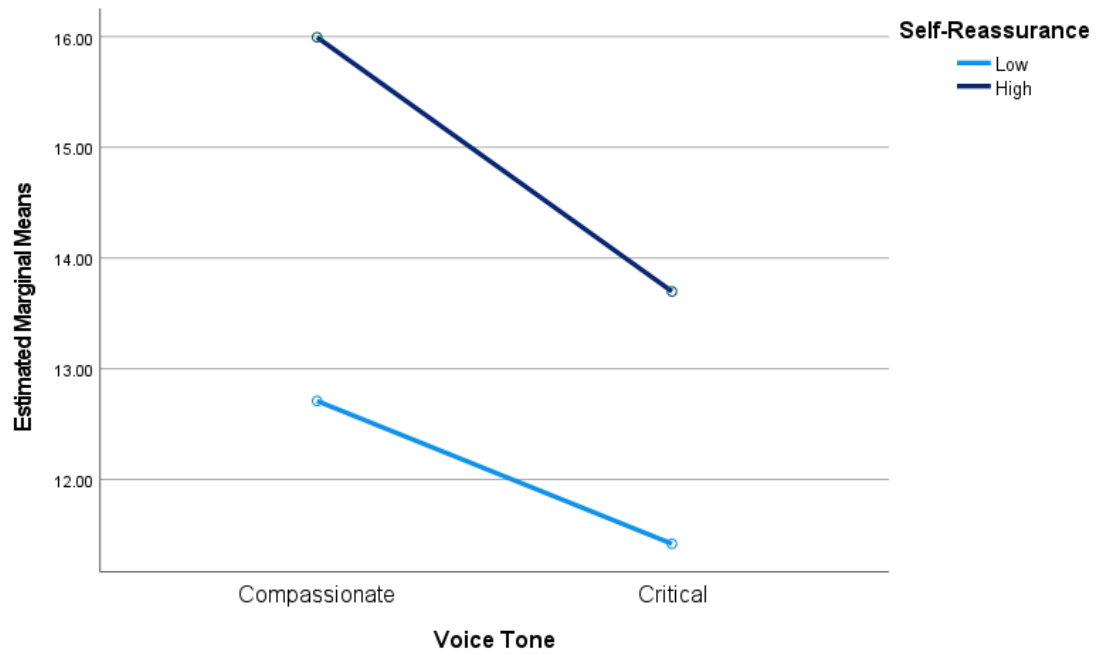


Figure 7

Estimated Marginal Means for TPAS 'Safeness/Contentment' Subscale Grouped by Level of Self-Reassurance (Low=< 21, High => 22)



Negative Emotional Responses

See

Table 13 for ANOVA results for ‘negative’ emotional responses.

Main Effects

There was a main effect of type of voice tone imagery on ‘negative affect’ ($F(1, 231) = 52.500, p < .001, \eta^2 = .19$). Post hoc paired samples t-tests showed that ‘negative affect’ was significantly lower following the compassionate condition ($t(235) = 11.38, p < .001$, Cohen’s $d = .74$), demonstrating less ‘negative’ emotional response to the compassionate condition and a more ‘negative’ emotional response to the critical condition, as hypothesised (hypotheses 1 and 2).

There was also a main effect of level of self-criticism (FSCRS ‘inadequate self’) on ‘negative affect’ ($F(1, 231) = 4.86, p = .028, \eta^2 = .02$). Post hoc independent t-test showed that ‘negative affect’ was significantly higher for the ‘high self-criticism’ group following both critical and compassionate voice tone imagery ($t(52.37) = 2.65, p = .010$, Cohen’s $d = .47$ and $t(61.92) = 3.22, p = .002$, Cohen’s $d = .49$, respectively), indicating that those who reported high self-criticism demonstrated greater ‘negative’ emotional response, than those who reported less self-criticism, across both types of imagery. See Figure 8 for plot of main effects. There were no other significant main effects. There was a trend towards significance for a main effect of level of self-reassurance (FSCRS ‘self-reassurance’; $F(1, 231) = 3.53, p = .062, \eta^2 = .015$). At a descriptive level, those lower in self-reassurance scored higher in ‘negative affect’ following both compassionate and critical imageries.

Interaction Effects

For the PANAS ‘negative affect’ subscale, there were no significant interactions between voice tone imagery condition and FSCRS ‘inadequate self’, as described the FSCRS ‘inadequate self’ moderated ‘negative’ emotional responses to both voice tone imageries similarly.

There were no main or interaction effects for the ECR-SF ‘attachment anxiety’ or ECR-SF ‘attachment avoidance’, indicating that ‘attachment anxiety’ and ‘attachment avoidance’ did not moderate emotional responses to the voice tone imageries.

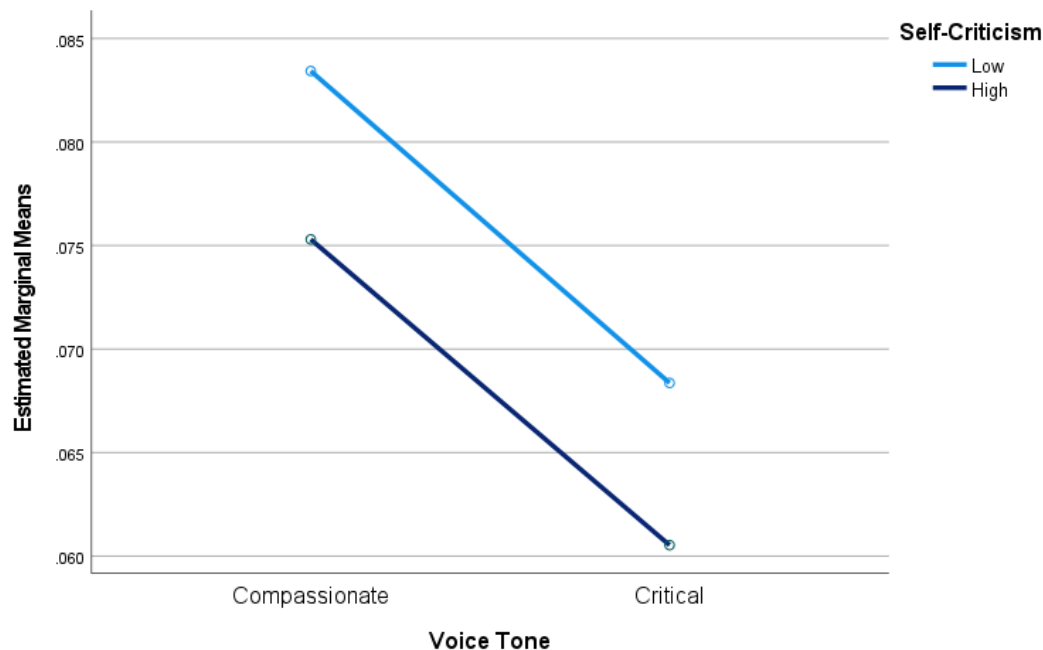
Table 13*ANOVA results for PANAS 'negative affect' subscale*

	<i>F(df)</i>	<i>p</i>	ηp^2
Within-Subjects Effects			
Voice Tone Imagery Type ^a	52.50 (1,231)	<.001	.19
Voice Tone*Inadequate Self ^b	0.01 (1,231)	.936	.00
Voice Tone*Reassured Self ^b	0.06 (1,231)	.811	.00
Voice Tone*Attachment Anxiety ^c	0.31 (1,231)	.576	.00
Voice Tone*Attachment Avoidance ^c	0.60 (1,231)	.441	.00
Between-Subjects Effects			
Inadequate Self ^b	4.86 (1,231)	.028	.02
Reassured Self ^b	3.53 (1,231)	.062	.02
Attachment Anxiety ^c	2.48 (1,231)	.117	.01
Attachment Avoidance ^c	2.60 (1,231)	.108	.01

^a = Post compassionate and critical voice conditions^b = Forms of Self-Criticising/Attacking and Self-Reassurance Scale (FSCRS)^c = Experiences in Close Relationship Scale – Short Form (ECR-SF)

Figure 8

Estimated Marginal Means for PANAS 'Negative Affect' Subscale Grouped by Levels of Self-Criticism (Low=<18, High=>19)



Note: The PANAS 'negative affect' subscale was reciprocally transformed so lower scores = higher 'negative affect'.

Baseline to Post the 'As Usual' Condition

Whilst there were no specific hypotheses relating to the 'as usual' condition, exploratory analyses were completed to investigate whether imagining saying the reassuring statement to the self in the absence of any instruction on how to say it would result in an emotional response. Three paired samples t-tests were completed to assess differences in PANAS 'negative affect', TPAS 'relaxed' and TPAS 'safeness/contentment' scores from baseline to post the 'as usual' imagery (which was completed first, see Figure 2 for procedure). There were significant differences from baseline to post the 'as usual' voice tone condition for the (reciprocally transformed) PANAS 'negative affect' subscale ($t(235) = 5.33$, $p < .001$, Cohen's $d = .35$) and the TPAS 'safeness/contentment' subscale ($t(235) = 3.77$, $p < .001$, Cohen's $d = .25$), indicating that 'negative affect' increased, and feelings of

‘safety/contentment’ decreased, following the ‘as usual’ condition. There were no differences between baseline and post the ‘as usual’ condition scores for the TPAS ‘relaxed’ subscale, indicating no significant changes to feelings of ‘relaxation’.

Discussion

To the best of my knowledge, this is the first study to examine the relative contribution of the voice tone component of compassion focused imagery. Specifically, the study used an experimental design to investigate whether there were differences in ‘positive’ and ‘negative’ emotional response to compassionate and critical voice tone imagery (with the same ‘reassuring statement’ content) in the context of a recalled scenario of failure (see Appendices 2.6 to 2.9 for scripts). The study also investigated whether effects were moderated by levels of self-reassurance, self-criticism, attachment anxiety and/or attachment avoidance.

The first hypothesis was supported, in that there were more ‘positive’, and less ‘negative’, emotional responses to compassionate voice tone imagery and more ‘negative’ and less ‘positive’ emotional responses to critical imagery. Following the compassionate voice tone imagery there were more reported feelings of ‘relaxation’ and ‘safety/contentment’ and less ‘negative affect’. In contrast, following the critical voice tone imagery where there were less reported feelings of ‘relaxation’ and ‘safety/contentment’ and more ‘negative affect’ reported. This intuitively makes sense and supports hypotheses within the CFT model that compassion focused imagery practices activate the parasympathetic ‘soothing’ system which is associated with greater feelings of relaxation and safety/contentment whereas critical imagery activates sympathetic ‘threat’ responses (Gilbert, 2020; Kirby et al., 2017). This finding provides empirical evidence to support existing qualitative feedback provided by participants who are guided through a similar compassion focused imagery during compassionate mind training programmes (C. Irons, personal communication, July 26, 2021).

Furthermore, it was hypothesised that levels of self-reassurance, self-criticism, attachment anxiety and attachment avoidance would moderate emotional responses to

compassionate and critical voice tone imagery. This hypothesis was only partially supported, in that 1) self-reassurance was found to moderate ‘positive’ emotional responses (and at a trend level for ‘negative’ emotional responses) following both compassionate and critical voice tone imagery, 2) self-criticism was found to moderate ‘negative’ (but not ‘positive’) emotional responses following both compassionate and critical voice tone imagery and 3) attachment anxiety was found to moderate ‘positive’ emotional responses to critical voice tone imagery only. Attachment avoidance was not found to moderate either ‘positive’ or ‘negative’ emotional experience to either imagery type. Each of these findings (or lack thereof) will now be explored.

Self-Reassurance Moderates Emotional Responses to Compassionate and Critical Voice Tone Imagery

Self-reassurance moderated ‘positive’ and ‘negative’ emotional responses following both compassionate and critical imagery (though at a trend level only for ‘negative affect’). Specifically, those who reported higher self-reassurance showed greater feelings of ‘relaxation’ and ‘safety/contentment’ and less ‘negative affect’ following both voice tone imageries compared to those reporting lower self-reassurance, who showed less feelings of ‘relaxation’ and ‘safety/contentment’ and more ‘negative affect’ following both voice imageries. This finding provides further evidence of there being a general protective element to being able to provide reassurance to the self in the face of threat/stress, which was not shown to be either significantly enhanced or weakened by either compassionate or critical voice tone imagery in this study. This supports the idea that self-reassurance is a self-relating style that originates from the compassionate motivational system and serves to ‘soothe’ through activation of the parasympathetic system (Gilbert, 2014). Recent neuroscientific research also supports the threat/stress buffering effect of self-reassurance; Kim et al. (2020) investigated neural and self-report responses relating to pain and negative emotion with (non-

clinical) participants engaging with ‘emotional’ (i.e., responding to a failure) or ‘neutral’ statements whilst being self-critical or self-reassuring. It was found that both neural and self-reported markers of pain and negative emotion were suppressed during self-reassurance compared with self-criticism.

Self-Criticism Moderates ‘Negative’ Emotional Responses to Compassionate and Critical Voice Tone Imagery

Interestingly, self-criticism (as measured by the FSCRS ‘inadequate self’ subscale) moderated ‘negative’ (but not ‘positive’) emotional responses, with those reporting higher self-criticism showing more ‘negative affect’ following both the compassionate and critical voice tone imagery. This suggest that there may have been a general ‘threat’ response to both imagery conditions for those higher in self-criticism (as indicated by greater ‘negative affect’). Duarte et al. (2016) observed a similar general ‘threat’ response (as measured by change in salivatory alpha amylase) in people reporting high self-criticism across both compassion focused and control imagery (though not for the non-active control), in that those reporting higher self-criticism showed a greater increase in alpha amylase, indicating more of a ‘threat’ response than those reporting lower self-criticism. The authors concluded that this may indicate a general ‘sensitivity’ to threat in those reporting higher criticism, potentially associated with increased self-monitoring and/or self-evaluation associated with performance. Furthermore, Duarte et al. (2016) assessed whether level of self-criticism influenced changes in ‘positive and negative affect’ (PANAS), state adult attachment (Gillath et al., 2009), relaxation and safeness/contentment (TPAS) from baseline to post-imagery and only found significant results for feelings of safeness/contentment. Specifically, those reporting higher self-criticism seemed to feel more ‘unsafe’ at baseline and throughout (compared to those reporting lower self-criticism) and feelings of safeness significantly improved following the ‘control imagery’ (imagining walking in the countryside) but not following the compassion

focused imagery. A strength of this study was that it used stratified sampling to allocate participants to ‘high’ and ‘low’ self-criticism groups a priori but the sample was small (N = 25) which may have reduced the power to detect group differences.

Attachment Anxiety Moderated ‘Positive’ Emotional Responses to Critical Voice Tone Imagery

Level of attachment anxiety moderated ‘positive’ (but not ‘negative’) emotional responses to critical voice tone imagery only, in that those with higher attachment anxiety demonstrated less feelings of ‘relaxation’ and ‘safeness/contentment’ following the critical (but not the compassionate) voice tone imagery. In polyvagal terms (Porges, 2007) this could point to the parasympathetic ‘vagal brake’ having been withdrawn in response to the critical imagery to an extent which resulted in a reduction in ‘positive’ feelings but not so much that ‘negative’ feelings arose, though (of course) this is not possible to ascertain without supporting psychophysiological parameters. As higher attachment anxiety typically relates to more negative views of the self, a preoccupation with the responsiveness of others, an expectation of abandonment or insufficient love/care and hyperactivation of attachment behaviours (Benoit, 2004), this finding may suggest that the warm nature of the compassionate voice tone imagery buffered the emotional response to the recollection of personal failure, whereas the critical voice tone did not buffer and/or accentuated this ‘threat’ response due to its hostile nature, potentially evoking existing negative views of the self.

Kim et al. (2020) used brain imaging methods to explore the moderating effects of attachment style on neural activity during self-criticism and found differential effects of secure and insecure attachment; specifically that at greater levels of amygdala response (indicating a greater ‘threat’ response), more securely attached individuals showed greater lingual gyrus activation, and more avoidantly attached individuals showed less lingual gyrus activation (an area of the brain associated with mental imagery). As the lingual gyrus is

implicated in mental imagery it may be that those with more secure attachments are drawing on internalised ‘secure images’ during ‘threat’ whereas those with more insecure attachments may have less available ‘images’ to draw on. However, in this study attachment avoidance did not appear to moderate either ‘positive’ or ‘negative’ emotional responses to compassionate and critical voice tone imagery which may reflect a genuine absence of moderating effect or may be associated with issues relating to 1) the failure scenario and/or 2) the measurement of attachment, which is discussed further in the ‘limitations and directions for future research section’ below.

Feelings of ‘Safeness/Contentment’ Decreased and ‘Negative Affect’ Increased from Baseline to Post the ‘As Usual’ Condition

The procedure in this study was completed in such a way as to reflect the way in which compassion focused imagery is facilitated during compassionate mind training (i.e., encouraging the bringing to mind of a mistake/failure and the imagining of saying a ‘reassuring statement’ to the self, initially in the absence of any instruction on how to say the statement, before beginning to cultivate a compassionate image). Whilst there were no hypotheses relating to the ‘as usual’ condition, which was completed first for all participants (see Figure 2 for study procedure), exploratory analyses showed that ‘safeness/contentment’ reduced from baseline to post the ‘as usual’ condition and ‘negative affect’ increased, which may suggest that participants had a ‘threat’ response to recalling the scenario of personal failure and that imagining saying the reassuring statement to the self (in the absence of any guidance of how to say it) was not sufficient to buffer this threat response. Though it was also noted that reported feelings of ‘relaxation’ did not change from baseline to post the ‘as usual’ condition. This finding appears to corroborate clinical observations that the creation of ‘alternative thought’ content may not be sufficient to improve emotional outcomes (Gilbert, 2009). Furthermore, as exploratory analyses showed significant differences in ‘relaxation’,

‘safeness/contentment’ and ‘negative affect’ between the ‘high’ and ‘low’ levels of the moderator variables at baseline (see Tables 9 to 11 for details) these moderators may have influenced emotional responses to the ‘as usual’ condition, though this would need to be tested in future research with a priori hypotheses.

Clinical Implications

Whilst much more research with clinical populations is required before any conclusions can be confidently draw, the findings from this study appear to point to the fact that those who report higher self-criticism and low self-reassurance are likely to find that compassion focused imagery does not lift their ‘negative’ mood as much as those who report lower self-criticism and higher self-reassurance. Additionally, those who report higher self-criticism, attachment anxiety and lower self-reassurance may also experience more adverse emotional reactions to critical inner voice tones than those who report lower self-criticism and higher self-reassurance. Clinical populations are likely to report lower levels of self-reassurance and higher levels of self-criticism (Baião et al., 2015) and more insecure ways of relating (Mikulincer & Shaver, 2012), and it is possible that the effects observed in this non-clinical study may not be consistent when assessed at higher levels of self-criticism (including higher levels of ‘self-hatred’). This warrants further consideration, and evaluation, of adjustments that may be required to enable positive effects from compassion focused imagery.

The study clearly indicates that the imagined voice tone of a mental image offering reassurance is important when instructing individuals to create a mental image responding to their distress around a failure scenario. For clinicians, this importantly highlights that offering reassuring statements such as that used in the current study (*it’s okay to feel like this - these situations often trigger difficult feelings, but these will pass. Everyone makes mistakes, and it’s not the end of the world*) is not sufficient to overcome natural negative affect resulting

from perceived or actual failure experiences. The instructions regarding imagining a compassionate voice tone were minimal (approximately 1 minute) but induced a significant reduction in reported ‘negative affect’, even for individuals reporting high self-criticism and low self-reassurance. Thus, for clinicians using self-reassurance techniques both within and outside of the CFT therapeutic models, it is important to consider the ‘how’ of self-reassurance, rather than focusing on the content of what is said.

Limitations and Directions for Future Research

Firstly, one of the strengths of this study is that it includes a large, international general population sample (though $\approx 76\%$ completed the study within the United Kingdom). Most psychological research includes samples that are Western, educated, industrialized, rich and democratic (WEIRD; Apicella et al., 2020) and the use of university student/staff samples is commonplace in the compassion focused literature (Baldwin et al., 2020; Duarte et al., 2016; Halamová et al., 2019; Rockliff et al., 2008) which limits the generalisability of findings. It is important that active attempts are made to diversify samples to include those who are not WEIRD because many people with whom we work clinically will not be WEIRD either. Though it should also be noted that whilst a level of English language proficiency was required to complete the study, potential differences in understanding and responses relating to language and other cultural factors were not measured and warrant consideration in future research. Additionally, this study was completed with a non-clinical sample and would benefit from repetition in clinical populations, who are likely to demonstrate differences in concepts of interest (e.g., self-reassurance, self-criticism; Baião et al., 2015), to assess whether findings are replicated. Though CFT has showed positive outcomes with a range of clinical populations (Craig et al., 2020), there appears to be a scarcity of research specifically exploring responses to compassion focused imagery in clinical populations.

Furthermore, this study was limited by its requirement to be completed online (due to coronavirus restrictions) and the lack of inclusion of checks to assess the extent to which participants were able to engage and/or how they subjectively experienced each of the imagery practices and the personal failure scenario. Future research should endeavour to include checks (e.g., perceived vividness of imagery, engagement and threat response ratings) and may wish to consider the inclusion of quantitative/qualitative self-report checks or other methods, such as video-based facial and/or body tracking (Chang et al., 2018). Relatedly, whilst participants were asked to complete the study in quiet, distraction free environment, the influence of distractions or issues relating to engagement with the online format cannot be ruled out.

More broadly, to increase ecological validity, the procedure in this study reflected the process by which people are guided through compassion focused imagery during compassionate mind training meaning. However, the repeated nature of the procedure, which included the ‘as usual’ voice tone first for all participants, could have made it vulnerable to priming and/or demand effects. For example, emotional responses to the compassionate and critical voice tone imageries may have been influenced by individual differences in how compassionate or critical the person’s ‘as usual’ voice tone was, but as these individual differences are likely to be random and the experimental (critical and compassionate) conditions were counterbalanced it is not anticipated that the results in this study were substantially impacted by these (or other) individual differences. As participants completed each of the imagery tasks immediately after one another demand effects cannot be ruled out and, though it was not feasible for this study, the addition of breaks in between tasks may reduce the likelihood of demand effects in future research. Future research may also wish to compare findings from procedures which do, and do not, include an ‘as usual’ imagery task to evaluate whether the main effect of voice tone remains consistent.

Whilst this study was unable to incorporate any psychophysiological measures due to its online nature, many studies exploring compassion focused imagery have included psychophysiological outcomes, such as measurement of heart rate variability (Rockliff et al., 2008; Baldwin et al., 2020; Halamová et al., 2019) or salivatory alpha amylase (Maratos & Sheffield, 2020; Duarte et al., 2016). In particular, the use of heart rate variability has been advocated for by compassion researchers due to it being a widely accepted measure of parasympathetic nervous system activity (Kirby et al., 2017). In order to further develop psychophysiological understandings of psychological distress it would be desirable for future research to evaluate psychophysiological responses alongside self-reported emotional responses to compassionate and critical voice tone imagery, firstly, to assess whether differences are reflected at both levels of measurement and, secondly, to explore the correlations between the two forms of measurement. It should be considered that the inclusion of psychophysiological measures further adds to the case for including checks, as self-reported subjective experiences may differ from physiological outcomes (Maratos & Sheffield, 2020).

Finally, there are measurement issues that may have influenced the results in this study. Surprisingly, this study did not find ‘attachment avoidance’ to be a moderator of emotional responses to compassionate or critical voice tone imagery and found mixed results for the moderation effects of attachment anxiety and self-criticism. This inconsistency in findings may be (at least in part) explained by the issues around attempting to measure complex phenomena, like attachment, using self-report methods and/or the nature of the ‘failure’ scenario used in this study. The ‘failure’ scenario involved asking participants to recall an incident of personal failure but was not interpersonal in nature therefore may have been less likely to activate negative ‘working models’ of attachments and associated adverse emotional responses (Mikulincer & Shaver, 2007), particularly in a non-clinical sample. In addition to

this, the measure used to assess attachment in this study (ECR-SF; Wei et al., 2007) is a short-form version of a widely used measure of attachment (the Experiences in Close Relationships Scale; Brennan et al., 1998), which demonstrates good psychometric properties (Wei et al., 2007) but appears to be less widely used across the literature than some other measures of adult attachment. Also, more generally there are issues around measuring attachment, an inherently relational construct, via self-report methods rather than assessing attachment behaviours between people in real time. Whilst in depth elaboration of issues relating to the measurement of attachment is beyond the scope of this discussion, future research should aim to consider measurement issues relating to this complex construct (see Ravitz et al., 2010 for a review of adult attachment measures).

Another measurement issue relates to the decision to remove the FSCRS ‘hated self’ subscale from the analyses in this study due to floor effects. Floor effects for this measure are common in non-clinical populations (Baião et al., 2015) and therefore future research should consider the use of stratified sampling to avoid falling victim to this issue (as is employed in Duarte et al., 2016). Additionally, some research (Duarte et al., 2016; Halamová et al., 2019) has used a composite score, summing the totals of the FSCRS ‘inadequate self’ and ‘hated self’ subscales to represent overall level of self-criticism. In this study the decision was made to use the FSCRS ‘inadequate self’ and ‘hated self’ subscales separately as confirmatory factor analysis appears to support a three-factor model (Baião et al., 2015), however the use of a composite score may have revealed different findings. Therefore, future research may wish to compare whether the moderating effects of self-criticism diverge when using subscale or composite scores.

Conclusion

The present study provides empirical support for one of the main theoretical assumptions inherent to CFT; that the nature of a person’s inner voice tone directly influences

their emotional response (over and above the influence of the ‘inner speech’ content). This study has shown that the voice tone component of compassion focused imagery is sufficient to elicit differential emotional responses to compassionate and critical voice tone imagery, even in the absence of other sensory cues. This idea that has long been central to the CFT theory and training but has not, up until now, received empirical backing. Findings showed that compassionate inner voice tones were associated with ‘positive’ emotional responses related to the parasympathetic ‘soothing’ system (i.e., feelings of ‘relaxation’ and ‘safety/contentment’), whereas critical inner voice tones were associated with increased ‘negative affect’ (threat-based emotional responses). Though the findings relating to the extent to which levels of self-reassurance, self-criticism, attachment anxiety and attachment avoidance moderate emotional responses to voice tone imagery were mixed, there was evidence of self-reassurance and self-criticism moderating emotional responses to compassionate and critical imagery in similar (but inverse) ways whereas, unexpectedly, attachment anxiety only appeared to moderate responses to critical imagery.

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Appendix 1: Appendices for Chapter I

1.1 Psychophysiology author guidelines

Journal Aims and Scope

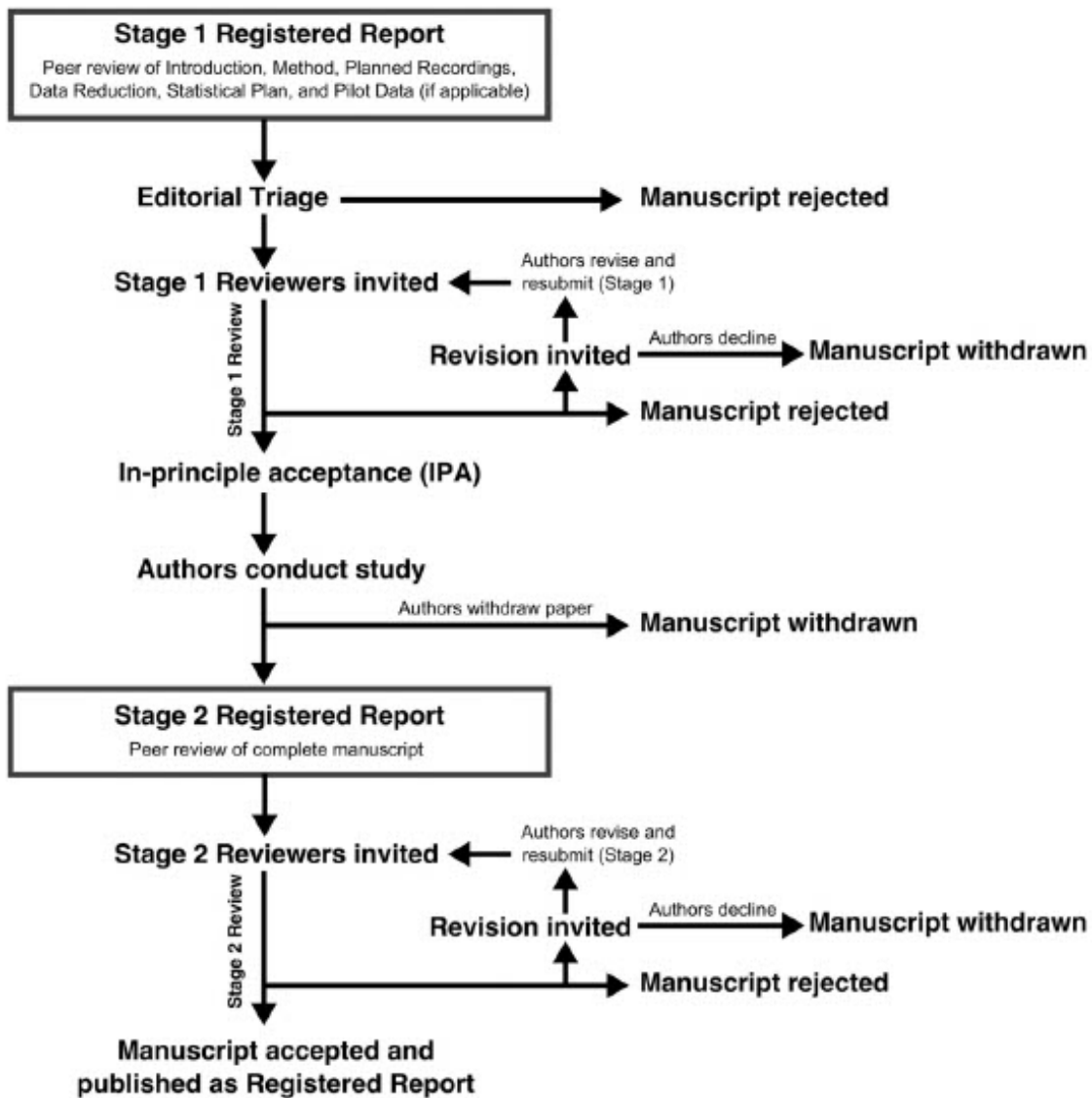
Founded in 1964, *Psychophysiology* is the most established journal specifically dedicated to the dissemination of **psychophysiological science**. The journal continues to play a key role in advancing **human neuroscience** in its many forms and methodologies (including central and peripheral measures), covering research on the interrelationships between the physiological and psychological aspects of brain and behavior. Typically, studies published in *Psychophysiology* include psychological independent variables and non-invasive physiological dependent variables (hemodynamic, electromagnetic and optical brain imaging and/or peripheral measures such as respiratory sinus arrhythmia, electromyography, pupillography, and many others). The vast majority of studies published in the journal involve human participants. Research based on animal models is published only occasionally, usually in the context of special topic issues where this work is central to the topic and to psychophysiological theory. For additional information regarding the aims and scope of the journal see Fabiani, 2015.

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Psychophysiology publishes original articles reporting experimental studies in any area of psychophysiological research. It also welcomes theoretical papers, evaluative reviews of literature (including meta-analyses), and methodological developments (e.g., novel experimental and recording procedures and statistical analyses directly relevant to psychophysiological research and providing integration with psychophysiological theory). Selected archival documents of the Society for Psychophysiological Research (such as award citations and obituaries) are also published in the journal. A few times a year the Journal also publishes special issues on topics central to psychophysiology. Letters to the Editor or commentary papers on other articles are not accepted.

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Subsequent pages. Unless there are compelling reasons for variation, subsequent pages will include Method (section 2.), Results (section 3.), and Discussion (section 4.), with subsections as needed. Further sections are ordered as follows, with each section beginning on a new page: References, Author Notes, Footnotes, Tables, Figure Captions, and Figures. The Author Note includes grant funding sources, any acknowledgments, a conflict of interest statement, and the name and email address for reprints. Grant funding sources should be also provided at submission and will be linked with the published paper. Each table and figure should be on a separate page. Supplementary materials. Optional supplementary material (e.g., ancillary analyses, additional figures, audio or video files) can be uploaded together with the required manuscript files. Please use common formats accessible to most readers (e.g., Text: pdf; Audio: MP3, AAC, WMA. Video: QuickTime, MPEG, AVI). Supplementaru materials are hosted on the Journal web site and permanently linked to the paper via the DOI.

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Effect sizes and confidence intervals. When describing results, authors are strongly encouraged to report measures of effect size in addition to probability values. If effect sizes are not reported, sufficient detail should be provided to enable effect size computation. In addition, whenever possible, confidence intervals should be reported to reduce the focus on point estimations and facilitate comparisons across studies. Power analyses are strongly encouraged and required when relatively small samples are involved and/or when reporting null effects.

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Editorial Assistant

1.2 Quality assessment criteria

Domain	Criteria	Star rating
Representativeness of 'clinical' group (*)	1. Truly representative of the average patient with mental illness (eg, severity of illness, comorbidities) in the community* 2. Somewhat representative of the average (eg, severity of illness, comorbidities) in the community* 3. Representative of selected group 4. No description of the derivation of the cohort	* *
Selection of 'non-clinical controls' (*)	1. 'Non-clinical controls' similar to the 'clinical' group apart from mental health diagnosis and have completed structured interview screening 2. 'Non-clinical controls' similar to 'clinical' group but no structured interview screening completed/self-report screening only 3. 'Non-clinical controls' different to the 'clinical' group	*
Groups matched by demographics a priori (*)	1. Yes - on at least one major demographic characteristic (e.g. sex, age) a priori 2. No matching of groups a priori	*
Exclusion of/control for other confounds (**)	1. Several potential confounds excluded/controlled for 2. Some effort to exclude/control for potential confounds 3. Potential confounds not excluded/controlled for	** *
HRV Measurement (**)	1. Valid/reliable HRV method used (e.g. ECG, chest belt) and artefact manually eliminated 2. Valid/reliable HRV method used (e.g. ECG, chest belt) and artefact automatically eliminated by software or method of data cleaning not reported 3. Not valid/reliable HRV method used (e.g. finger sensor)	** *
Data loss (*)	1. HRV data loss reported 2. HRV data loss not reported	* *

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Domain	Criteria	Star rating
Baseline considerations (*)	1. The study considered baseline difference in HRV between groups (e.g. tested for group differences) 2. The study did not consider baseline differences in HRV between groups	★
Sample attrition (*)	1. Sample attrition did not appear to be an issue in the study (though statement of attribution not necessarily reported) or 2. Amount of sample attrition unlikely to affect overall results 3. Sample attrition seems to be an issue but is not adequately reported	★ ★
Total no. of ★ = overall quality rating		

Appendix 2: Appendices for Chapter II

2.1 Psychotherapy: Theory, Research and Practice author guidelines

Sections

1. Submission
2. Aims and Scope
3. Manuscript Categories and Requirements
4. Preparing the Submission
5. Editorial Policies and Ethical Considerations
6. Author Licensing
7. Publication Process After Acceptance
8. Post Publication
9. Editorial Office Contact Details

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3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

- Articles should adhere to the stated word limit for the particular article type. The word limit excludes the abstract, reference list, tables and figures, but includes appendices.

Word limits for specific article types are as follows:

- Research articles: 5000 words

2.1 Cont.

- Qualitative papers: 6000 words
- Review papers: 6000 words
- Special Issue papers: 5000 words

In exceptional cases the Editor retains discretion to publish papers beyond this length where the clear and concise expression of the scientific content requires greater length (e.g., explanation of a new theory or a substantially new method). Authors must contact the Editor prior to submission in such a case.

Please refer to the separate guidelines for [Registered Reports](#).

All systematic reviews must be pre-registered.

Brief-Report COVID-19

For a limited time, the *Psychology and Psychotherapy: Theory, Research and Practice* are accepting brief-reports on the topic of Novel Coronavirus (COVID-19) in line with the journal's main aims and scope (outlined above). Brief reports should not exceed 2000 words and should have no more than two tables or figures. Abstracts can be either structured (according to standard journal guidance) or unstructured but should not exceed 200 words. Any papers that are over the word limits will be returned to the authors. Appendices are included in the word limit; however online supporting information is not included.

4. PREPARING THE SUBMISSION

Free Format Submission

Psychology and Psychotherapy: Theory, Research and Practice now offers free format submission for a simplified and streamlined submission process.

Before you submit, you will need:

- Your manuscript: this can be a single file including text, figures, and tables, or separate files – whichever you prefer. All required sections should be contained in your manuscript, including abstract, introduction, methods, results, and conclusions. Figures and tables should have legends. References may be submitted in any style or format, as long as it is consistent throughout the manuscript. If the manuscript, figures or tables are difficult for you to read, they will also be difficult for the editors and reviewers. If your manuscript is difficult to read, the editorial office may send it back to you for revision.
- The title page of the manuscript, including a data availability statement and your co-author details with affiliations. (*Why is this important? We need to keep all co-authors informed of the outcome of the peer review process.*) You may like to use [this template](#) for your title page.

Important: the journal operates a double-blind peer review policy. Please anonymise your manuscript and prepare a separate title page containing author details. (*Why is this important? We need to uphold rigorous ethical standards for the research we consider for publication.*)

- An ORCID ID, freely available at <https://orcid.org>. (*Why is this important? Your article, if accepted and published, will be attached to your ORCID profile. Institutions and funders are increasingly requiring authors to have ORCID IDs.*)

To submit, login at <https://www.editorialmanager.com/paptrap/default.aspx> and create a new submission. Follow the submission steps as required and submit the manuscript.

If you are invited to revise your manuscript after peer review, the journal will also request the revised manuscript to be formatted according to journal requirements as described below.

Revised Manuscript Submission

Contributions must be typed in double spacing. All sheets must be numbered.

Cover letters are not mandatory; however, they may be supplied at the author's discretion. They should be pasted into the 'Comments' box in Editorial Manager.

Parts of the Manuscript

The manuscript should be submitted in separate files: title page; main text file; figures/tables; supporting information.

Title Page

You may like to use [this template](#) for your title page. The title page should contain:

- A short informative title containing the major key words. The title should not contain abbreviations (see Wiley's [best practice SEO tips](#));
- A short running title of less than 40 characters;
- The full names of the authors;

2.1 Cont.

- The author's institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted;
- Abstract;
- Keywords;
- Data availability statement (see [Data Sharing and Data Accessibility Policy](#));
- Acknowledgments.

Authorship

Please refer to the journal's Authorship policy in the Editorial Policies and Ethical Considerations section for details on author listing eligibility. When entering the author names into Editorial Manager, the corresponding author will be asked to provide a CRediT contributor role to classify the role that each author played in creating the manuscript. Please see the [Project CRediT](#) website for a list of roles.

Abstract

Please provide an abstract of up to 250 words. Articles containing original scientific research should include the headings: Objectives, Design, Methods, Results, Conclusions. Review articles should use the headings: Purpose, Methods, Results, Conclusions.

Keywords

Please provide appropriate keywords.

Acknowledgments

Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned. Thanks to anonymous reviewers are not appropriate.

Practitioner Points

All articles must include Practitioner Points – these are 2-4 bullet point with the heading 'Practitioner Points'. They should briefly and clearly outline the relevance of your research to professional practice. (The Practitioner Points should be submitted in a separate file.)

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As papers are double-blind peer reviewed, the main text file should not include any information that might identify the authors.

The main text file should be presented in the following order:

- Title
- Main text
- References
- Tables and figures (each complete with title and footnotes)
- Appendices (if relevant)

Supporting information should be supplied as separate files. Tables and figures can be included at the end of the main document or attached as separate files but they must be mentioned in the text.

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- The journal uses British/US spelling; however, authors may submit using either option, as spelling of accepted papers is converted during the production process.

References

References in published papers are formatted according to the Publication Manual of the American Psychological Association (6th edition). However, references may be submitted in any style or format, as long as it is consistent throughout the manuscript.

Tables

Tables should be self-contained and complement, not duplicate, information contained in the text. They should be supplied as editable files, not pasted as images. Legends should be concise but comprehensive – the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as SD or SEM should be identified in the headings.

Figures

2.1 Cont.

Although authors are encouraged to send the highest-quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted.

[Click here](#) for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

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[Click here](#) for Wiley's FAQs on supporting information.

Note: if data, scripts, or other artefacts used to generate the analyses presented in the paper are available via a publicly available data repository, authors should include a reference to the location of the material within their paper.

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For guidelines on editorial style, please consult the [APA Publication Manual](#) published by the American Psychological Association. The following points provide general advice on formatting and style.

- **Language:** Authors must avoid the use of sexist or any other discriminatory language.
- **Abbreviations:** In general, terms should not be abbreviated unless they are used repeatedly and the abbreviation is helpful to the reader. Initially, use the word in full, followed by the abbreviation in parentheses. Thereafter use the abbreviation only.
- **Units of measurement:** Measurements should be given in SI or SI-derived units. Visit the [Bureau International des Poids et Mesures \(BIPM\) website](#) for more information about SI units.
- **Effect size:** In normal circumstances, effect size should be incorporated.
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Manuscript Preparation Tips: Wiley has a range of resources for authors preparing manuscripts for submission available [here](#). In particular, we encourage authors to consult Wiley's best practice tips on [Writing for Search Engine Optimization](#).

Article Preparation Support: [Wiley Editing Services](#) offers expert help with English Language Editing, as well as translation, manuscript formatting, figure illustration, figure formatting, and graphical abstract design – so you can submit your manuscript with confidence.

Also, check out our resources for [Preparing Your Article](#) for general guidance and the [BPS Publish with Impact infographic](#) for advice on optimizing your article for search engines.

5. EDITORIAL POLICIES AND ETHICAL CONSIDERATIONS

Peer Review and Acceptance

Except where otherwise stated, the journal operates a policy of anonymous (double blind) peer review. Please ensure that any information which may reveal author identity is blinded in your submission, such as institutional affiliations, geographical location or references to unpublished research. We also operate a triage process in which submissions that are out of scope or otherwise inappropriate will be rejected by the editors without external peer review. Before submitting, please read [the terms and conditions of submission](#) and the [declaration of competing interests](#).

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The journal requires that clinical trials are prospectively registered in a publicly accessible database and clinical trial registration numbers should be included in all papers that report their results. Authors are asked to include the name of the trial register and the clinical trial registration number at the end of the abstract. If the trial is not registered, or was registered retrospectively, the reasons for this should be explained.

2.1 Cont.

Research Reporting Guidelines

Accurate and complete reporting enables readers to fully appraise research, replicate it, and use it. Authors are encouraged to adhere to recognised research reporting standards.

We also encourage authors to refer to and follow guidelines from:

- [Future of Research Communications and e-Scholarship \(FORCE11\)](#)
- [The Gold Standard Publication Checklist from Hooijmans and colleagues](#)
- [FAIRsharing website](#)

Conflict of Interest

The journal requires that all authors disclose any potential sources of conflict of interest. Any interest or relationship, financial or otherwise that might be perceived as influencing an author's objectivity is considered a potential source of conflict of interest. These must be disclosed when directly relevant or directly related to the work that the authors describe in their manuscript. Potential sources of conflict of interest include, but are not limited to: patent or stock ownership, membership of a company board of directors, membership of an advisory board or committee for a company, and consultancy for or receipt of speaker's fees from a company. The existence of a conflict of interest does not preclude publication. If the authors have no conflict of interest to declare, they must also state this at submission. It is the responsibility of the corresponding author to review this policy with all authors and collectively to disclose with the submission ALL pertinent commercial and other relationships.

Funding

Authors should list all funding sources in the Acknowledgments section. Authors are responsible for the accuracy of their funder designation. If in doubt, please check the Open Funder Registry for the correct nomenclature: <https://www.crossref.org/services/funder-registry/>

Authorship

All listed authors should have contributed to the manuscript substantially and have agreed to the final submitted version. Authorship is defined by the criteria set out in the APA Publication Manual:

"Individuals should only take authorship credit for work they have actually performed or to which they have substantially contributed (APA Ethics Code Standard 8.12a, Publication Credit). Authorship encompasses, therefore, not only those who do the actual writing but also those who have made substantial scientific contributions to a study. Substantial professional contributions may include formulating the problem or hypothesis, structuring the experimental design, organizing and conducting the statistical analysis, interpreting the results, or writing a major portion of the paper. Those who so contribute are listed in the byline." (p.18)

Data Sharing and Data Accessibility Policy

Psychology and Psychotherapy: Theory, Research and Practice recognizes the many benefits of archiving data for scientific progress. Archived data provides an indispensable resource for the scientific community, making possible future replications and secondary analyses, in addition to the importance of verifying the dependability of published research findings.

The journal expects that where possible all data supporting the results in papers published are archived in an appropriate public archive offering open access and guaranteed preservation. The archived data must allow each result in the published paper to be recreated and the analyses reported in the paper to be replicated in full to support the conclusions made. Authors are welcome to archive more than this, but not less.

All papers need to be supported by a data archiving statement and the data set must be cited in the Methods section. The paper must include a link to the repository in order that the statement can be published.

It is not necessary to make data publicly available at the point of submission, but an active link must be included in the final accepted manuscript. For authors who have pre-registered studies, please use the Registered Report link in the Author Guidelines.

In some cases, despite the authors' best efforts, some or all data or materials cannot be shared for legal or ethical reasons, including issues of author consent, third party rights, institutional or national regulations or laws, or the nature of data gathered. In such cases, authors must inform the editors at the time of submission. It is understood that in some cases access will be provided under restrictions to protect confidential or proprietary information. Editors may grant exceptions to data access requirements provided authors explain the restrictions on the data set and how they preclude public access, and, if possible, describe the steps others should follow to gain access to the data.

If the authors cannot or do not intend to make the data publicly available, a statement to this effect, along with the reasons that the data is not shared, must be included in the manuscript.

2.1 Cont.

Finally, if submitting authors have any questions about the data sharing policy, please access the [FAQs](#) for additional detail.

Publication Ethics

Authors are reminded that *Psychology and Psychotherapy: Theory, Research and Practice* adheres to the ethics of scientific publication as detailed in the [Ethical principles of psychologists and code of conduct](#) (American Psychological Association, 2010). The Journal generally conforms to the Uniform Requirements for Manuscripts of the International Committee of Medical Journal Editors (ICJME) and is also a member and subscribes to the principles of the Committee on Publication Ethics (COPE). Authors must ensure that all research meets these ethical guidelines and affirm that the research has received permission from a stated Research Ethics Committee (REC) or Institutional Review Board (IRB), including adherence to the legal requirements of the study country.

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As part of the journal's commitment to supporting authors at every step of the publishing process, the journal requires the submitting author (only) to provide an ORCID iD when submitting a manuscript. This takes around 2 minutes to complete. [Find more information here](#).

6. AUTHOR LICENSING

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8. POST PUBLICATION

Access and Sharing

When the article is published online:

2.1 Cont.

- The author receives an email alert (if requested).
- The link to the published article can be shared through social media.
- The author will have free access to the paper (after accepting the Terms & Conditions of use, they can view the article).
- For non-open access articles, the corresponding author and co-authors can nominate up to ten colleagues to receive a publication alert and free online access to the article.

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9. EDITORIAL OFFICE CONTACT DETAILS

For help with submissions, please contact: Hannah Wakley, Associate Managing Editor (papt@wiley.com) or phone +44 (0) 116 252 9504.

Author Guidelines updated 28th August 2019

2.2 Doctorate in Clinical Psychology. Research Review Committee approval letter



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24 March 2021

RE: Do attachment style, self-criticism, and self-reassurance moderate the experience of internally generated critical, compassionate and 'as usual' voice tones?

Trainee: Emma Limon

Supervisors: Katy Lobley and Luna Centifanti

Dear Emma,

Thank you for your notification of amendment to your proposal submitted to the Chair of the D.Clin.Psychol. Research Review Committee.

I can now confirm that your proposal (*version number 2, dated 31st January 2021*) meets the requirements of the committee and have been approved by the Committee Chair.

Please take this Chairs Action decision as **final** approval from the committee.

You may now progress to the next stages of your research.

I wish you well with your research project.

A handwritten signature in black ink, appearing to read 'Ross White', with a horizontal line underneath.

Dr Ross White
Vice Chair D.Clin.Psychol. Research Review Committee

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2.3 Institute of Population Health Research Ethics Committee approval letter



Institute of Population Health Research Ethics Committee

12 May 2021

Dear Dr Loble

I am pleased to inform you that your application for research ethics approval has been approved. Application details and conditions of approval can be found below. Appendix A contains a list of documents approved by the Committee.

Application Details

Reference: 9930
Project Title: Does the way we respond to ourselves after failure affect the way we feel?
Principal Investigator/Supervisor: Dr Katy Loble
Co-Investigator(s): Miss Chloe Smith, Dr Luna Centifanti, Miss Emma Limon
Lead Student Investigator: -
Department: School of Psychology
Approval Date: 12/05/2021
Approval Expiry Date: Five years from the approval date listed above

The application was **APPROVED** subject to the following conditions:

Conditions of approval

Please note: this approval is subject to the University's research restrictions during the pandemic, as laid out on the [research ethics webpages](#). Therefore, wherever possible, research should be conducted via remote means which avoid the need for face-to-face contact with human participants during the pandemic. The process for requesting an exemption to these restrictions is described on the [research ethics webpages](#).

- All serious adverse events must be reported to the Committee (ethics@liverpool.ac.uk) in accordance with the procedure for reporting adverse events.
- If you wish to extend the duration of the study beyond the research ethics approval expiry date listed above, a new application should be submitted.
- If you wish to make an amendment to the study, please create and submit an amendment form using the research ethics system.
- If the named Principal Investigator or Supervisor changes, or leaves the employment of the University during the course of this approval, the approval will lapse. Therefore it will be necessary to create and submit an amendment form within the research ethics system.
- It is the responsibility of the Principal Investigator/Supervisor to inform all the investigators of the terms of the approval.

Kind regards,

Institute of Population Health Research Ethics Committee

iphethics@liverpool.ac.uk

IPH-REC

2.3 Cont.

Appendix - Approved Documents

(Relevant only to amendments involving changes to the study documentation)

The final document set reviewed and approved by the committee is listed below:

Document Type	File Name	Date	Version
Study Proposal/Protocol	Study Flow Chart Project 1 and 2	26/03/2021	1
Questionnaire	SUIS questionnaire	26/03/2021	1
Questionnaire	early-memories-of-warmth-and-safeness-scale	26/03/2021	1
Questionnaire	three-types-of-positive-affect-scale	26/03/2021	1
Questionnaire	PANAS negative affect subscale	26/03/2021	1
Questionnaire	ECR-SF	26/03/2021	1
Risk Assessment	Risk Assessment Ethics	26/03/2021	1
Evidence Of Peer Review	Chloe Smith Proposal RRC Approval letter 24.03.2021[1]	26/03/2021	1
Evidence Of Peer Review	Emma Limon Proposal RRC Approval letter 24.03.2021[1]	26/03/2021	1
Advertisement	Poster v2	19/04/2021	2
Participant Consent Form	Consent form V2	19/04/2021	2
Participant Consent Form	Consent form V2	19/04/2021	2
Advertisement	Poster v2	19/04/2021	2
Participant Information Sheet	Participant Information Sheet V3	27/04/2021	3
Debriefing Material	Debrief Information V2	27/04/2021	2
Participant Information Sheet	Participant Information Sheet V3	27/04/2021	3
Questionnaire	Forms of Self-Criticism and Self-Reassurance Scale (Item 9 Removed)	28/04/2021	V2

2.4 Participant information sheet



Participant Information

Title: Does the way we respond to ourselves after failure affect the way we feel, and is this influenced by our early life experiences? Version 3 – 27.04.2021

You are being invited to take part in this research project, which is being completed as part of Emma Limon and Chloe Smith's Doctorate in Clinical Psychology at the University of Liverpool. Before you decide to take part in this research project it is important for you to understand why the research is being done and what it will involve. Please take time to read this information carefully and decide if you want to take part. You can discuss it with others too if you wish. The Principal Investigators (Emma Limon and Chloe Smith) can be contacted via email (contact information below) if there is anything that is not clear or if you would like more information.

Purpose of the project

Compassion-focused therapy* (and compassionate mind training) uses a range of techniques to encourage people to be more compassionate towards themselves and others, including generating imagined inner voice tones and images. Sometimes imagining being compassionate to themselves can make people feel better but this is not always the case and some people can find this difficult, upsetting or anxiety provoking.

In this project we are interested in investigating whether people's early life experiences (attachment style, early memories of warmth and safety) and traits (level of trait self-criticism and level of trait self-reassurance) affects how they experience generating critical and compassionate responses to an imagined scenario. An example of the kind of thing you will be asked to do would be to imagine a situation similar to losing your keys or phone, and then imagining thinking reassuring thoughts (like 'everyone makes mistakes') to yourself.

*Key word definitions are provided at the bottom of this page.

Why have I been chosen to take part?

This research project is open to anyone 18+ years old with access to a mobile, laptop or desktop device with internet access, including those within and outside of the United Kingdom. Participants must also be able to read English to a sufficient level to be able to read the instructions and the measures. You must also have access to a device with speakers as part of the study involves audio instructions.

Do I have to take part?

You do not have to take part in this research project, your participation is entirely voluntary. You can withdraw your data before the 10th July 2021 without the need to provide any reason for this. If you withdraw for any reason this will not prevent you being able to complete this study (or other studies) in future.

2.4 Cont.



What will happen if I agree to take part?

If you agree to take part you will be asked to complete an online study which will involve completion of questionnaires and imagery exercises (bringing images/voice tones to your mind). The study will take approximately **45-50 minutes** and should be completed in a quiet, distraction free and comfortable space. Please allocate enough time to complete the study as the whole study needs to be completed in one sitting, **you are not able to stop the study and come back to it at a later time**. You will have no direct contact with the Principal Investigators during the study but can ask any questions via email using the 'contact information' below.

How will my data be managed?

The University processes personal data as part of its research and teaching activities in accordance with the lawful basis of 'public task', and in accordance with the University's purpose of advancing education, learning and research for the public benefit. Under UK data protection legislation, the University acts as the Data Controller for personal data collected as part of the University's research. The Research Supervisor acts as the Data Processor for this study, and any queries relating to the handling of your personal data can be sent to klobley@liverpool.ac.uk.

How will my data be collected?	<p>This project will be completed anonymously. You will be provided with a unique ID in order to allow you to withdraw your data in future (should you wish).</p> <p>You will be asked to provide your email address if you should wish to a) be entered into the prize draw and/or b) you wish to receive a summary of the results when the project is completed. Your email address will be stored separately from your data and will only be accessible to the Principal Investigators (Emma Limon and Chloe Smith) for the purpose of contacting you in the event that you win the prize draw and/or with the summary of results. It will not be possible to identify your responses by the email address details that you provide.</p>
How will my data be stored?	<p>The data from this research project will be stored and destroyed in accordance with the University of Liverpool's Research Data Management policy (https://www.liverpool.ac.uk/media/livacuk/computingservices/research-data-management/researchdatamanagementpolicy.pdf).</p>
How long will my data be stored for?	<p>The storing of your data will remain the responsibility of the Principal Investigators until completion of the doctoral program. Following this, the Research Supervisor (Dr Katy Lobley) will be responsible for the data for a minimum of 5 years.</p>
What measures are in place to protect the	<p>Data will be stored securely in accordance with the University of Liverpool's Research Data Management policy</p>

2.4 Cont.



security and confidentiality of my data?	(https://www.liverpool.ac.uk/media/livacuk/computingseries/research-data-management/researchdatamanagementpolicy.pdf).
Will my data be anonymised?	Yes
How will my data be used?	The results will form part of Emma Limon and Chloe Smith's doctoral thesis projects. It is also intended that the research will be published in a peer reviewed journal (but may also be published in other relevant forums). Participants will be asked to provide their email address if they wish to access a summary of the results when the project is complete. If any individual data are presented, the data will be completely anonymous.
Who will have access to my data?	Principal investigators: Emma Limon and Chloe Smith. Research supervisors: Dr Katy Loble and Dr Luna Centifanti
Will my data be archived for use in other research projects in the future?	Data may also be shared (anonymously) with other researchers for the purpose of improving knowledge in the field.
How will my data be destroyed?	Data will be destroyed by the research supervisor (Dr Katy Loble) after a minimum of 5 years.

Are there possible disadvantages and/or risks in taking part?

The study will require sitting in front of a mobile, laptop or desktop device for the duration of the study therefore there may be risks associated with inactivity, we would encourage you to think about whether this will be possible and comfortable for you to do prior to agreeing to take part in the study. Imagining situations where things have gone wrong can lead to mild temporary upset, which for most people should not have a significant impact upon their wellbeing. However, for a minority of individuals it is possible that imagining failure situations might trigger more significant distress that impacts upon their day and wellbeing. In such situations participants are advised to seek additional support (e.g. Samaritans UK – Freephone: 116 123, NHS website for a list of mental health charities and organisations – <https://www.nhs.uk/conditions/stress-anxiety-depression/mental-health-helplines/>) and during the study all participants will be provided with signposting to additional useful support services. Similarly, the questionnaires used can sometimes prompt people to recall difficult experiences, feelings or memories, and for some individuals there is a risk that completing the questionnaires may trigger significant distress. Where this is the case, we would advise participants to seek support as above.

What are the possible benefits of taking part?

There may not be any direct benefits to you from taking part in this research. If you decide to take part, you will be contributing to understandings about how people experience compassion (and criticism) and will be offered to

2.4 Cont.



access a summary of the results following completion of the project should you wish. Following completion of the study you will be asked if you wish to be entered into a draw to win **1 of 9 £50 Amazon vouchers**.

What if I want to withdraw my data?

Should you wish to withdraw your data from the research project you can do so by emailing the Principal Investigators and stating the '**participant's unique ID**' that you will be provided with by the 10th July 2021. If you do not have this unique ID, then it will not be possible to identify your data.

What if I am unhappy or if there is a problem?

If you are unhappy, or if there is a problem, please feel free to let us know by contacting Emma Limon or Chloe Smith (principal investigators, email details below) and we will try to help. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should contact the Research Ethics and Integrity Office at ethics@liv.ac.uk. When contacting the Research Ethics and Integrity Office, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

The University strives to maintain the highest standards of rigour in the processing of your data. However, if you have any concerns about the way in which the University processes your personal data, it is important that you are aware of your right to lodge a complaint with the Information Commissioner's Office by calling 0303 123 1113.

Who is organising and funding the research?

This research is being completed as part of the Doctorate in Clinical Psychology at the University of Liverpool. The project has been reviewed by the University of Liverpool **ETHICS COMMITTEE NAME AND NO.**

Contacts for further information

Principal investigator: Emma Limon (Trainee Clinical Psychologist)

- elimon@liverpool.ac.uk

Principal investigator: Chloe Smith (Trainee Clinical Psychologist)

- c.r.smith@liverpool.ac.uk

Research supervisor(s):

Dr Katy Lobley (Senior University Clinical Tutor) - klobley@liverpool.ac.uk,

Key word definitions:	
Compassion	A recognition that all people suffer and a motivation to help reduce suffering (where possible)
Compassion-focused therapy	A psychotherapy which encourages people to develop compassion towards themselves and others, usually with people who may find

2.4 Cont.



	compassion difficult and who may be experiencing psychological distress
Compassionate mind training	The compassion-focused techniques used in compassion-focused therapy, which can also be taught to people who are not currently experiencing psychological distress as a means of maintaining or improving wellbeing
Attachment style	The ways in which a person thinks, feels and behaves in relationships
Trait self-criticism	How critical a person is of themselves when something goes wrong
Trait self-reassurance	How able a person is to reassure themselves when something goes wrong
Imagery exercises	Being asked to imagine something in your mind

2.5 Consent form



Participant consent form

Version number & date: Version 2 27.04.2021

Research ethics approval number: 9930

Title of the research project: Does the way we respond to ourselves after failure affect the way we feel?

Name of researcher(s): Emma Limon and Chloe Smith

Please initial box

1. I confirm that I have read and have understood the information sheet dated 19.04.2021 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that this study involves taking part in an online questionnaire. ☐
3. I understand that my participation is voluntary and that I am free to stop the study at any time without giving any reason and without my rights being affected. ☐
4. I understand that I can request to withdraw my data from the research by contacting Emma Limon (elimon@liverpool.ac.uk) or Chloe Smith (c.r.smith@liverpool.ac.uk) and providing the 'participant's unique ID'. I understand that without the unique ID the data will be unable to be withdrawn. ☐
5. I understand that my data will be held securely and in line with data protection requirements at the University of Liverpool, will be accessed by the Principal Investigators (Emma Limon and Chloe Smith) and Research Supervisors (Dr Katy Lobley and Dr Luna Centifanti), will be retained for a minimum of 5 years and may be shared (anonymously) for use by other authorised researchers to support other research in the future. ☐
6. I confirm that I am 18+ years of age and agree to take part in this study. ☐

2.6 Failure scenario imagery script

Failure Scenario Instructions:

Bring to mind a recent situation where you made a minor mistake, or accident. You may have broken something, lost something, forgotten something, given wrong information, sent the wrong email, but try to make sure this example didn't have major consequences for you. It should be something which triggered some feelings of frustration, disappointment or embarrassment...

Take your time to settle on a memory...

Once you've got a situation in mind, please click for the next instruction.

Bringing Situation to Mind:

With this situation in mind, take a few minutes to think about it a little more. You may find it helpful to close your eyes...Where were you when the mistake happened? What were you doing? Were other people around? Remember the moment where you had the most intense feelings of frustration, embarrassment or upset. This might be at the same time as the mistake happened, or later when you realised the mistake. Bring to mind the feelings that came up. Try to remember the feelings in your body as well as your emotions, whether your heart raced, you felt hot or cold, whether there were feelings of tension?

(15 seconds of silence)

When you've got this situation clear in your mind, please click for the next instruction.

2.7 ‘As usual’ voice tone imagery script

‘As usual’ Voice Tone Condition

Bring to mind again the original situation where you made a mistake, and the feelings you had, for a few moments. You may find it helpful to close your eyes. We’re now going to see what happens when we respond to ourselves in these types of situations. So inside your mind, with your usual tone of voice and expressions imagine yourself saying the following sentence that appears on screen. (15 seconds of silence before ending the recording to allow for the sentence to appear on screen)

On screen - “It’s okay to feel like this – these situations often trigger difficult feelings but these will pass. Everyone makes mistakes, and it’s not the end of the world”

2.8 Critical voice tone imagery script

Critical Imagery Condition

Bring to mind again the original situation where you made a mistake and the feelings you had for a few moments. You may find it helpful to close your eyes. Now bring to mind how you look and sound when you are feeling critical, harsh, judging and blaming. Try to create a vivid picture of yourself in your mind of how your face appears, the expression in your face and eyes, imagining a frown of disapproval. Creating a strong image in your mind, picture the position and gestures of your body when you are feeling critical and angry. With that image of your critical self in mind, bring to mind the sound of that kind of voice tone that comes with this image. With that image and sound of yourself in mind, imagine your critical self saying the sentence that appears on the screen...(15 seconds of silence before ending the recording to allow for the sentence to appear on screen)

On screen - "It's okay to feel like this – these situations often trigger difficult feelings but these will pass. Remember that everyone makes mistakes, and it's not the end of the world"

2.9 Compassionate voice tone imagery script

Compassionate Voice Tone Condition

Bring to mind again the original situation where you made a mistake and the feelings you had, for a few moments. You may find it helpful to close your eyes. Now imagine how your voice sounds when you are feeling warmth, caring, wise and supportive. Bring to mind the sound of that kind of voice which comes with this attitude of compassion, understanding. It might be the kind of voice that helps you'd speak to someone you care about, when you're trying to be supportive and kind. You might consider the loudness of your voice, how quickly you speak, how gentle your tone is. With the difficult situation in mind, imagine reading the sentence on the screen with this kind and caring voice tone in mind... (15 seconds of silence before ending the recording to allow for the sentence to appear on screen)

On screen - "It's okay to feel like this – these situations often trigger difficult feelings but these will pass. Remember that everyone makes mistakes, and it's not the end of the world"

2.10 Demographic information form



Participant's unique ID: [REDACTED]

This is your unique ID: [REDACTED] - Please take note of this ID as it will be required should you wish to withdraw your data from the study in future.

How old are you?

What is your gender?

What is your ethnicity?

Where are you completing this study from?

☐ United Kingdom (England, Scotland or Northern Ireland)

☐ Outside of United Kingdom (please state country)

What is your employment status?

If 'other' please state...

Have you engaged in compassion-focused therapy or completed any formal training in compassion previously (e.g. compassionate mind training)?

☐ Yes

☐ No

2.11 Forms of Self-Criticising/Attacking and Self-Reassuring Scale (Gilbert et al., 2004)

NB: Item 9 was removed (see design section for details)

**THE FORMS OF SELF-CRITICISING/ATTACKING &
SELF-REASSURING SCALE (FSCRS)**

When things go wrong in our lives or don't work out as we hoped, and we feel we could have done better, we sometimes have *negative and self-critical thoughts and feelings*. These may take the form of feeling worthless, useless or inferior etc. However, people can also try to be supportive of them selves. Below are a series of thoughts and feelings that people sometimes have. Read each statement carefully and circle the number that best describes how much each statement is true for you.

Please use the scale below.

Not at all like me	A little bit like me	Moderately like me	Quite a bit like me	Extremely like me
0	1	2	3	4

When things go wrong for me:

1.	I am easily disappointed with myself.	0	1	2	3	4
2.	There is a part of me that puts me down.	0	1	2	3	4
3.	I am able to remind myself of positive things about myself.	0	1	2	3	4
4.	I find it difficult to control my anger and frustration at myself.	0	1	2	3	4
5.	I find it easy to forgive myself.	0	1	2	3	4
6.	There is a part of me that feels I am not good enough.	0	1	2	3	4
7.	I feel beaten down by my own self-critical thoughts.	0	1	2	3	4
8.	I still like being me.	0	1	2	3	4
10.	I have a sense of disgust with myself.	0	1	2	3	4
11.	I can still feel lovable and acceptable.	0	1	2	3	4
12.	I stop caring about myself.	0	1	2	3	4
13.	I find it easy to like myself.	0	1	2	3	4
14.	I remember and dwell on my failings.	0	1	2	3	4
15.	I call myself names.	0	1	2	3	4
16.	I am gentle and supportive with myself.	0	1	2	3	4
17.	I can't accept failures and setbacks without feeling inadequate.	0	1	2	3	4
18.	I think I deserve my self-criticism.	0	1	2	3	4

© Gilbert et al., 2004

2.11 Cont.

19.	I am able to care and look after myself.	0	1	2	3	4
20.	There is a part of me that wants to get rid of the bits I don't like.	0	1	2	3	4
21.	I encourage myself for the future.	0	1	2	3	4
22.	I do not like being me.	0	1	2	3	4

© Gilbert et al., 2004

2.11 Cont.

THE FORMS OF SELF-CRITICISING/ATTACKING & SELF-REASSURING SCALE (FSCRS)

SCORING:

1. is	I am easily disappointed with myself.	0	1	2	3	4
2. is	There is a part of me that puts me down.	0	1	2	3	4
3. rs	I am able to remind myself of positive things about myself.	0	1	2	3	4
4. is	I find it difficult to control my anger and frustration at myself.	0	1	2	3	4
5. rs	I find it easy to forgive myself.	0	1	2	3	4
6. is	There is a part of me that feels I am not good enough.	0	1	2	3	4
7. is	I feel beaten down by my own self-critical thoughts.	0	1	2	3	4
8. rs	I still like being me.	0	1	2	3	4
10.hs	I have a sense of disgust with myself.	0	1	2	3	4
11.rs	I can still feel lovable and acceptable.	0	1	2	3	4
12.hs	I stop caring about myself.	0	1	2	3	4
13.rs	I find it easy to like myself.	0	1	2	3	4
14.is	I remember and dwell on my failings.	0	1	2	3	4
15.hs	I call myself names.	0	1	2	3	4
16.rs	I am gentle and supportive with myself.	0	1	2	3	4
17.is	I can't accept failures and setbacks without feeling inadequate.	0	1	2	3	4
18.is	I think I deserve my self-criticism.	0	1	2	3	4
19.rs	I am able to care and look after myself.	0	1	2	3	4
20.is	There is a part of me that wants to get rid of the bits I don't like.	0	1	2	3	4
21.rs	I encourage myself for the future.	0	1	2	3	4
22.hs	I do not like being me.	0	1	2	3	4

KEY FOR SUBSCALES:

is=Inadequate self,
rs=reassure self,
hs=hated self

2.12 Experience in Close Relationship-Short Form (Wei et al., 2007)



NovoPsych

Client Information

<i>Client Name</i>	John Blogs
<i>Date of birth (age)</i>	16 December 2000 (20)

Assessment Information

<i>Assessment</i>	Experience in Close Relationship Scale - Short Form (ECR-S)
<i>Date administered</i>	27 April 2021
<i>Assessor</i>	Dr Ben Buchanan'
<i>Time taken</i>	0 minutes 19 seconds

Results

	Total	Percentile
Anxiety Scale	30	86.6
Avoidance Scale	25	92.2

Interpretive Text

No Interpretation

Scoring and Interpretation Information

Results consist of two scores for the two separate factors; attachment anxiety and attachment avoidance. The minimum score for each scale is 7 and a maximum score of 42. In addition, scores are represented in terms of percentile ranks in accordance to Wei et al.'s (1998) undergraduate sample, where higher percentiles represent more difficulties with adult attachment compared to peers.

- Attachment avoidance is defined as involving fear of dependence and interpersonal intimacy, an excessive need for self-reliance, and reluctance to self-disclose.

- Attachment anxiety is defined as involving a fear of interpersonal rejection or abandonment, an excessive need for approval from others, and distress when one's partner is unavailable or unresponsive.

People who score high on either or both of these dimensions are assumed to have an insecure adult attachment orientation. By contrast, people with low levels of attachment anxiety and avoidance can be viewed as having a secure adult attachment orientation (Brennan et al., 1998). In addition, higher scores are significantly and positively related to depression, anxiety, interpersonal distress, or loneliness.

2.12 Cont.



NovoPsych

Client Name		John Blogs						
Client Responses								
		Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1	It helps to turn to my romantic partner in times of need.	7	6	5	4	3	2	1
2	I need a lot of reassurance that I am loved by my partner.	1	2	3	4	5	6	7
3	I want to get close to my partner, but I keep pulling back.	1	2	3	4	5	6	7
4	I find that my partner doesn't want to get as close as I would like.	1	2	3	4	5	6	7
5	I turn to my partner for many things, including comfort and reassurance.	7	6	5	4	3	2	1
6	My desire to be very close sometimes scares people away.	1	2	3	4	5	6	7
7	I try to avoid getting too close to my partner.	1	2	3	4	5	6	7
8	I don't worry about being abandoned.	7	6	5	4	3	2	1
9	I usually discuss my problems and concerns with my partner.	7	6	5	4	3	2	1
10	I get frustrated if my romantic partner is not available when I need them.	1	2	3	4	5	6	7
11	I am nervous when my partner gets too close to me.	1	2	3	4	5	6	7
12	I worry that a romantic partner won't care about me as much as I care about them.	1	2	3	4	5	6	7

2.13 Positive and Negative Affect Schedule (Watson et al., 1988)

NB: Only 'negative affect' scale used

1	2	3	4	5
Very Slightly or Not at all	A Little	Moderately	Quite a Bit	Extremely

	_____ 11. Irritable
	_____ 12. Alert
	_____ 13. Ashamed
	_____ 14. Inspired
	_____ 15. Nervous
	_____ 16. Determined
	_____ 17. Attentive
	_____ 18. Jittery
	_____ 19. Active
	_____ 20. Afraid

2.14 Types of Positive Affect Scale (Gilbert et al., 2008)



TYPES OF POSITIVE AFFECT SCALE

INSTRUCTIONS

Below are a series of words that describe different positive emotions. Some of these emotions relate to feeling lively, energised and excited, whereas others relate to feelings of being relaxed, calm and peaceful. We are interested in the degree to which you commonly experience these feelings.

On the left hand side of the emotion words we would like you to rate how characteristic these feelings are of you by using the following scale:

Not Characteristic of me	Fairly Characteristic of me				Very Characteristic of me
0	1	2	3		4

How Characteristic?

0	1	2	3	4	Secure
0	1	2	3	4	Calm
0	1	2	3	4	Active
0	1	2	3	4	Laid Back
0	1	2	3	4	Lively
0	1	2	3	4	Energetic
0	1	2	3	4	Serene
0	1	2	3	4	Eager
0	1	2	3	4	Dynamic
0	1	2	3	4	Safe
0	1	2	3	4	Warm
0	1	2	3	4	Content
0	1	2	3	4	Excited
0	1	2	3	4	Adventurous
0	1	2	3	4	Tranquil
0	1	2	3	4	Peaceful
0	1	2	3	4	Enthusiastic
0	1	2	3	4	Relaxed

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2.14 Cont.



THE
Compassionate Mind
FOUNDATION

SCORING

Sum the items as follows:

Active positive affect

Energetic
Lively
Adventurous
Active
Enthusiastic
Dynamic
Excited
Eager

Relaxed positive affect

Relaxed
Peaceful
Calm
Tranquil
Laid back
Serene

Safe/warmth positive affect

Safe
Content
Secure
Warm

DESCRIPTION

TYPES OF POSITIVE AFFECT SCALE

The scale was developed to measure the degree to which people experience different positive emotions. Respondents are asked to rate 18 'feeling' words on a 5-point scale to indicate how characteristic it is of them (0= 'not characteristic of me' to 4 = 'very characteristic of me'). Factor analysis revealed three factors or subscales, these are: Activating Positive Affect (e.g., "excited", "dynamic", "active"); Relaxed Positive Affect e.g., "relaxed", "calm", "peaceful") and Safeness/contentment Positive Affect (e.g., "safe", "secure", "warm"). The scale showed good psychometric properties with Cronbach alphas of .83 for Activating Positive Affect and Relaxed Positive Affect, and .73 for Safeness/contentment Positive Affect.

REFERENCE

Gilbert, P., McEwan, K., Mitra, R., Franks, L., Richter, A. & Rockliff, H. (2008). Feeling safe and content: A specific affect regulation system? Relationship to depression, anxiety, stress, and self-criticism. *The Journal of Positive Psychology*, 3, 182-191.

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2.15 Normality Tests for Dependent and Moderator Variables

Dependent Variables

	PANAS1 _TOT	PANAS AU_TOT	PANASCO VT_TOT	PANASCRV T_TOT	TOPAS1_ TOTR	TOPASAU _TOTR	TOPASCOVT _TOTR	TOPASCRVT _TOTR	TOPAS1_ TOTS	TOPASAU _TOTS	TOPASCOVT _TOTS	TOPASCRVT _TOTS
N	236	236	236	236	236	236	236	236	236	236	236	236
Mean	14.8093	17.0763	14.2881	18.6144	19.0254	18.7161	20.2161	17.1186	15.0720	14.2627	14.9619	12.8771
Median	13.0000	14.5000	12.0000	16.0000	19.0000	19.0000	21.0000	18.0000	16.0000	15.0000	16.0000	13.0000
SD	5.76358	7.14310	5.92090	8.30071	5.60769	6.74773	6.95700	7.43731	3.48234	4.11417	4.26398	4.94972
Skew	1.908	1.161	2.041	1.124	-.204	-.122	-.348	.094	-.679	-.477	-.657	-.192
SE Skew	.158	.158	.158	.158	.158	.158	.158	.158	.158	.158	.158	.158
Kurtosis	3.491	.584	4.622	.637	-.576	-.839	-.762	-1.110	.077	-.434	-.277	-1.086
SE Kurtosis	.316	.316	.316	.316	.316	.316	.316	.316	.316	.316	.316	.316
Min.	10.00	10.00	10.00	10.00	6.00	6.00	6.00	6.00	4.00	4.00	4.00	4.00
Max.	37.00	41.00	42.00	48.00	30.00	30.00	30.00	30.00	20.00	20.00	20.00	20.00

2.15 Cont.

Moderator Variables

	FSCRS_TOTHS	FSCRS_TOTIS	FSCRS_TOTRS	ECR_TOTANX	ECR_TOTAVO
N	236	236	236	236	236
Mean	7.9492	27.5381	26.2881	23.1737	25.5254
Median	7.0000	27.0000	26.0000	23.0000	25.0000
SD	3.69784	8.46084	6.84367	6.04447	4.63513
Skew	1.031	-.008	-.026	-.049	.001
SE Skew	.158	.158	.158	.158	.158
Kurtosis	.438	-.856	-.460	-.403	.896
SE Kurtosis	.316	.316	.316	.316	.316
Min.	4.00	10.00	10.00	6.00	10.00
Max.	20.00	45.00	40.00	37.00	38.00

2.15 Cont.

Statistical Tests of Normality

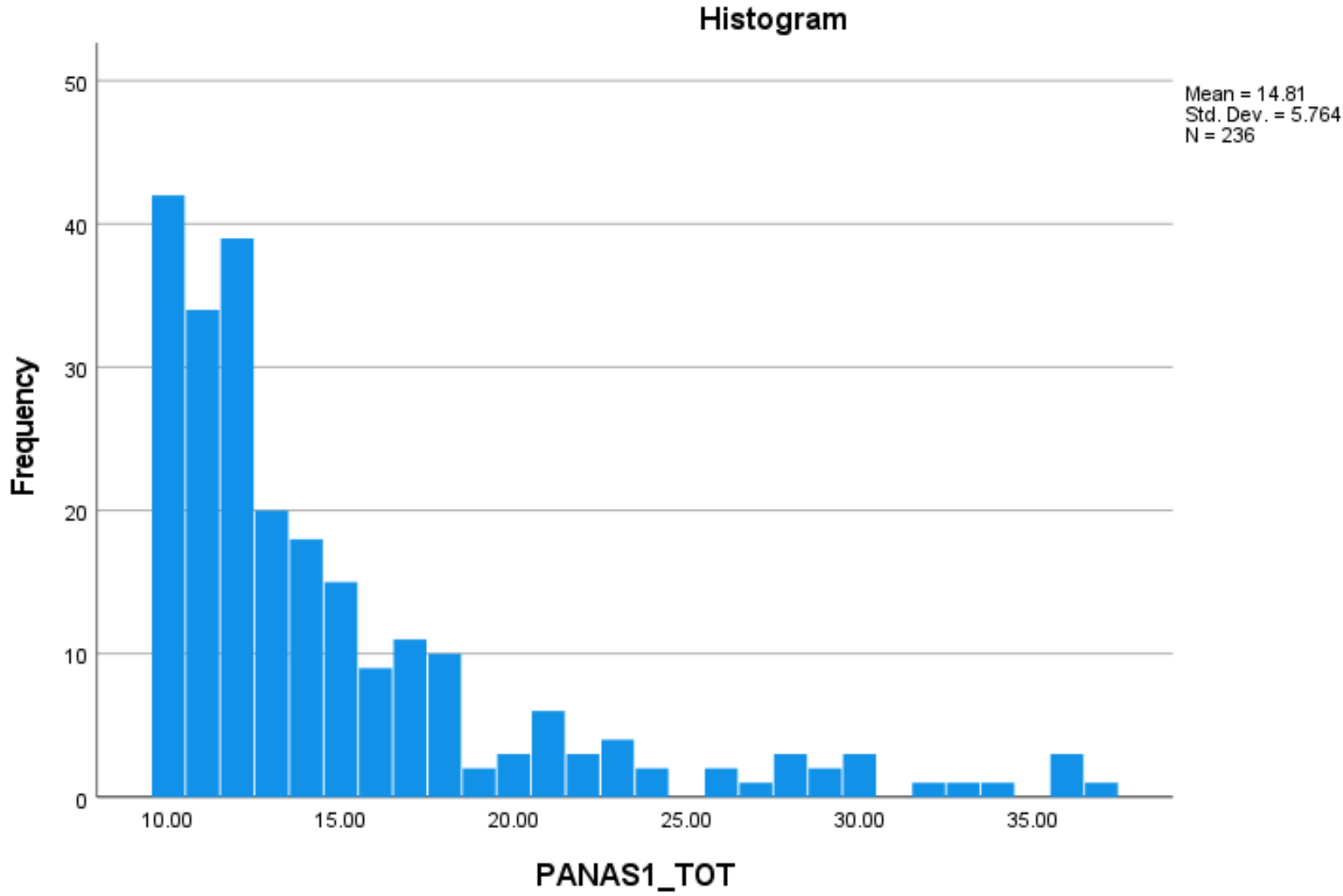
Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PANAS1_TOT	.204	236	.000	.765	236	.000
PANASAU_TOT	.174	236	.000	.860	236	.000
PANASCOVT_TOT	.234	236	.000	.741	236	.000
PANASCRVT_TOT	.150	236	.000	.878	236	.000
TOPAS1_TOTR	.067	236	.013	.983	236	.007

TOPASAU_TOTR	.067	236	.012	.968	236	.000
TOPASCOVT_TOTR	.105	236	.000	.950	236	.000
TOPASCRVT_TOTR	.106	236	.000	.945	236	.000
TOPAS1_TOTS	.130	236	.000	.949	236	.000
TOPASAU_TOTS	.121	236	.000	.952	236	.000
TOPASCOVT_TOTS	.134	236	.000	.921	236	.000
TOPASCRVT_TOTS	.100	236	.000	.944	236	.000
FSCRS_TOTHS	.169	236	.000	.886	236	.000
FSCRS_TOTIS	.074	236	.003	.980	236	.002
FSCRS_TOTRS	.052	236	.200*	.989	236	.058
ECR_TOTANX	.071	236	.005	.990	236	.097
ECR_TOTAVO	.113	236	.000	.974	236	.000

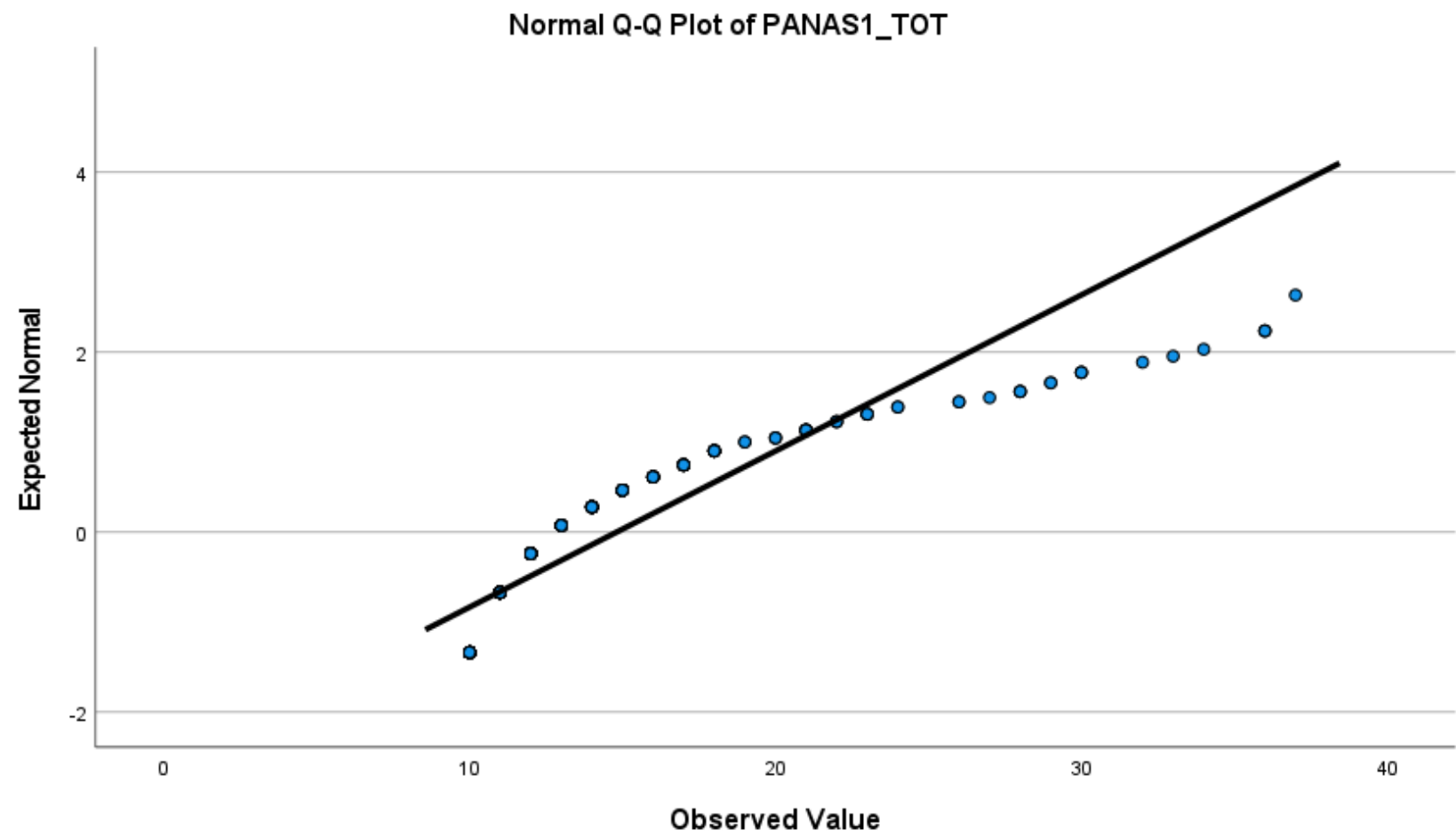
*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

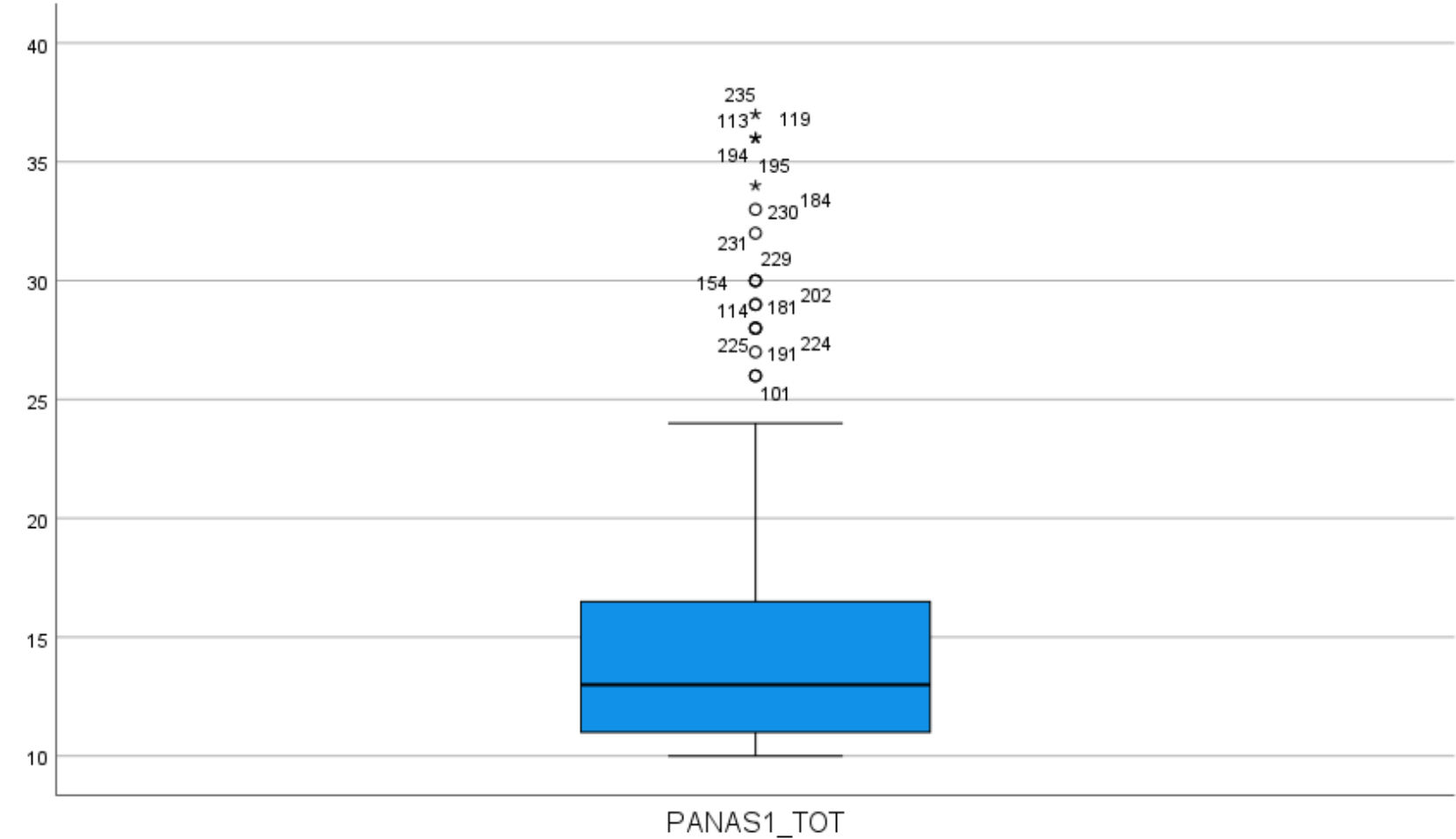
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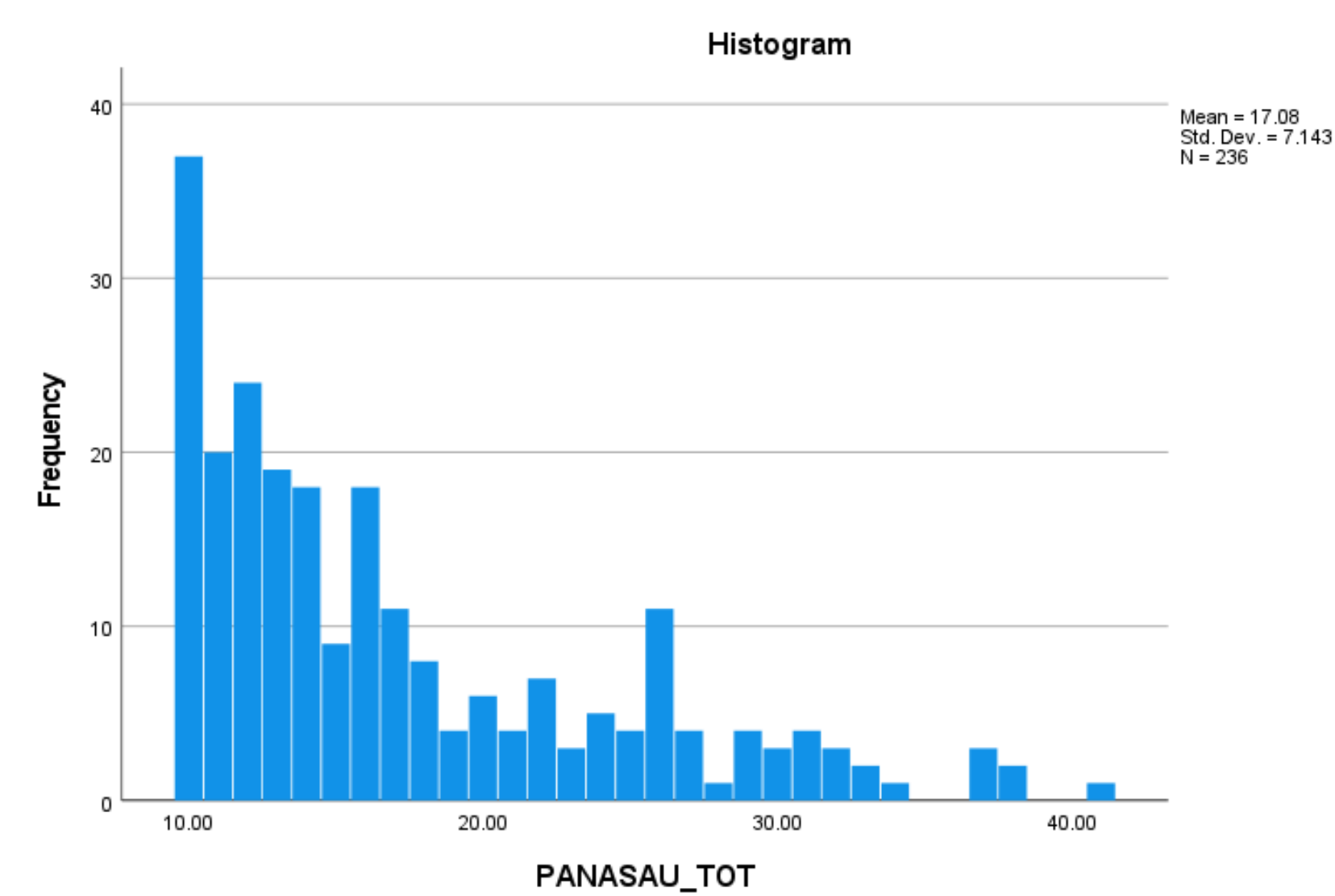
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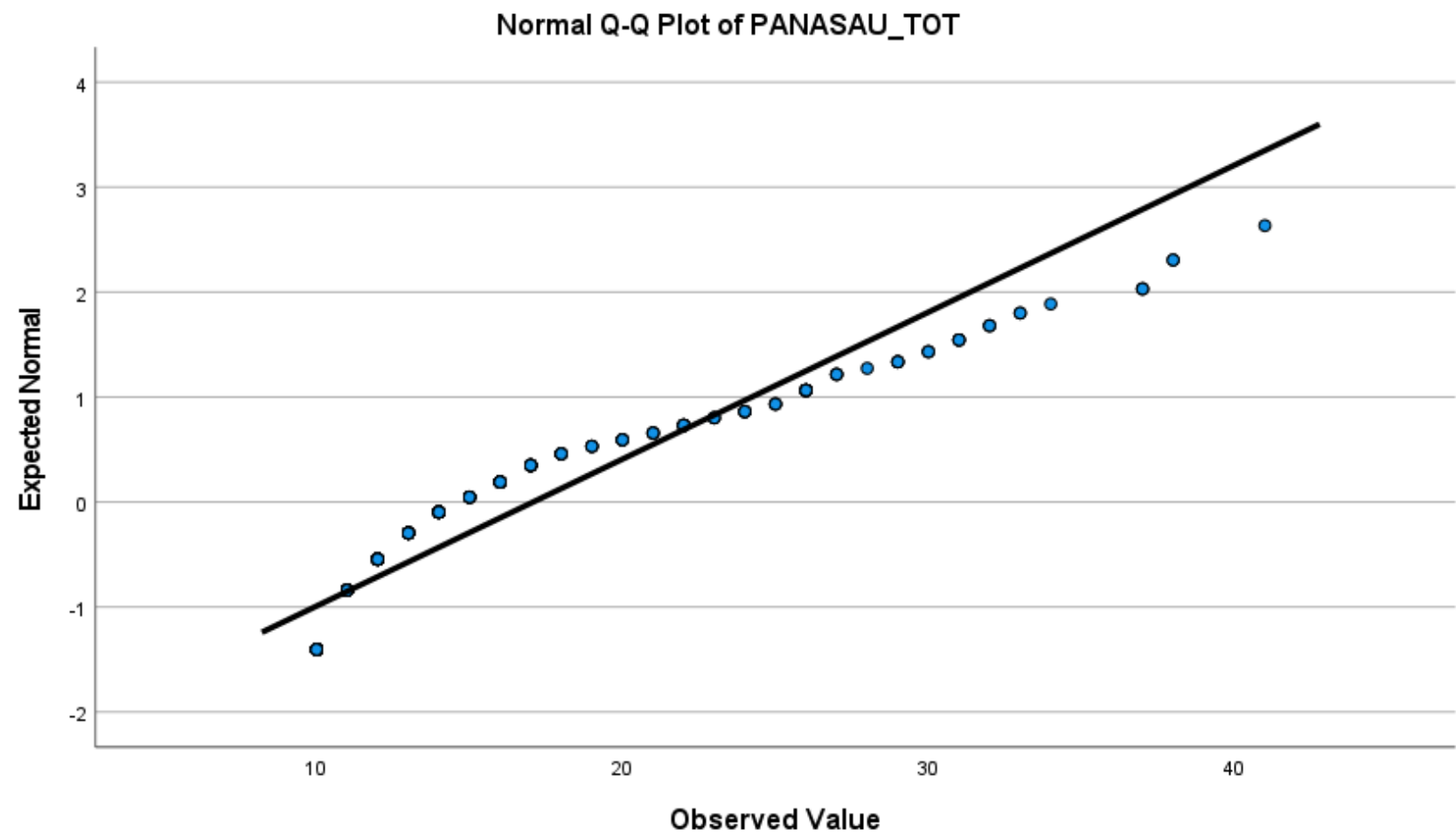
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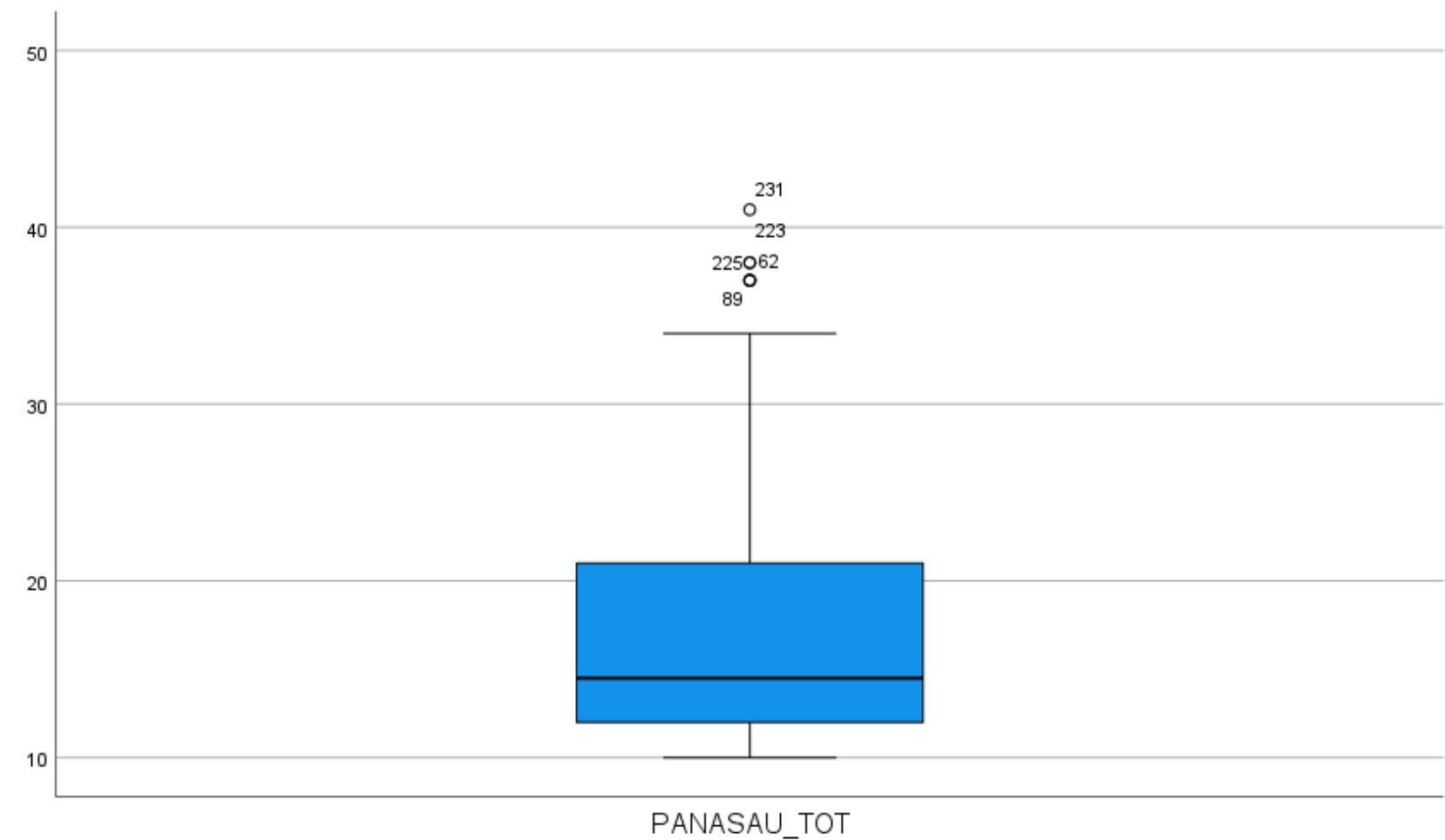
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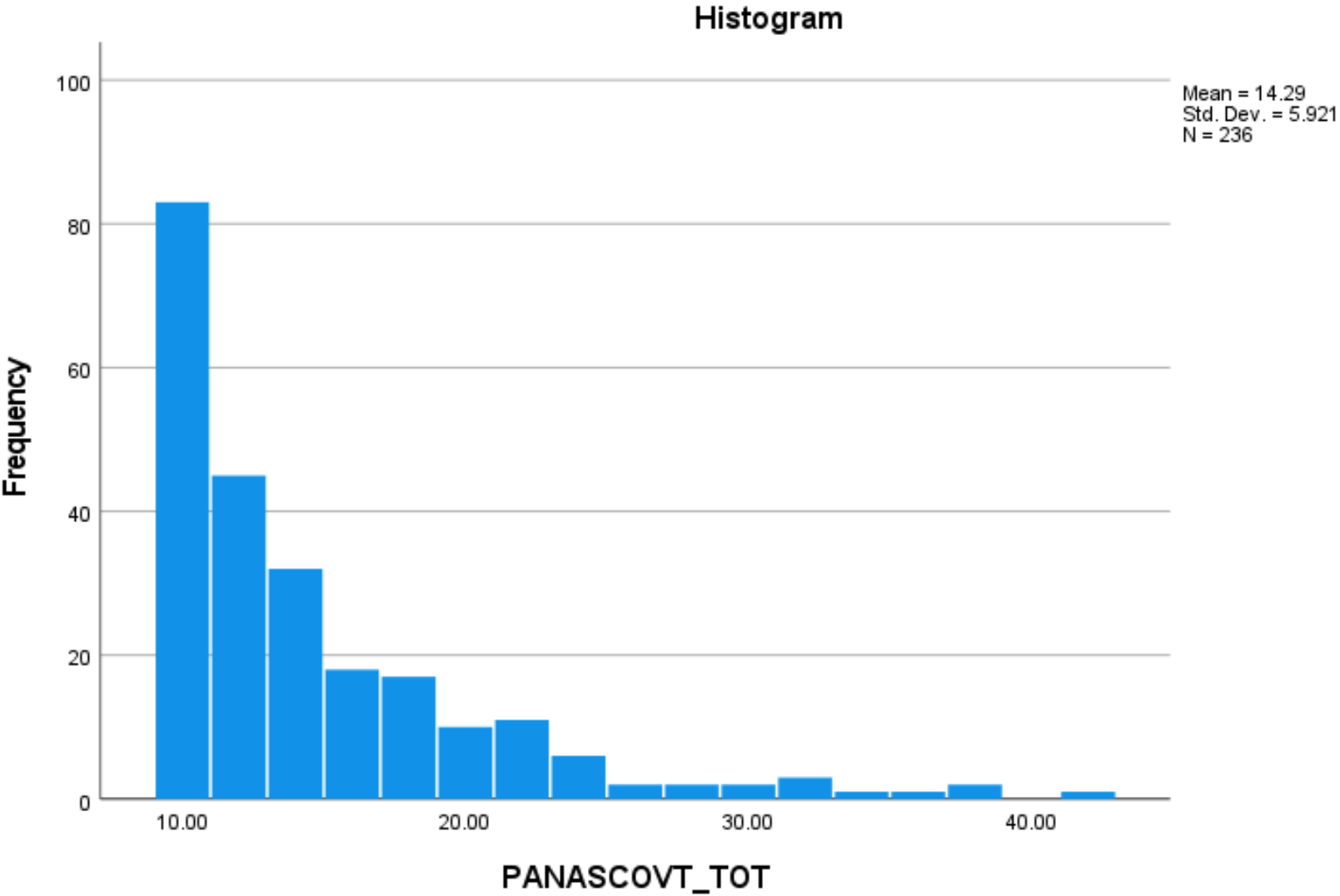
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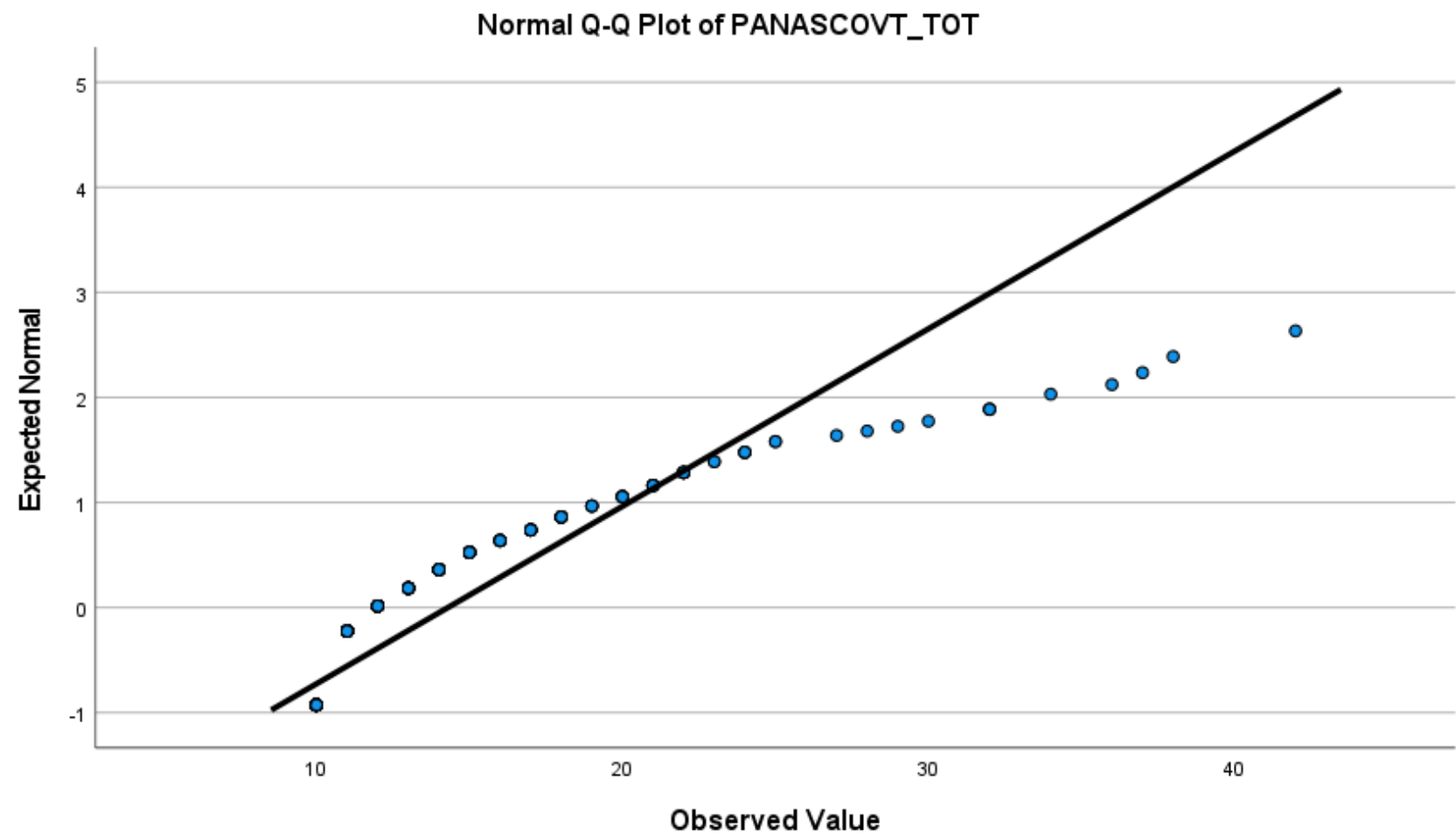
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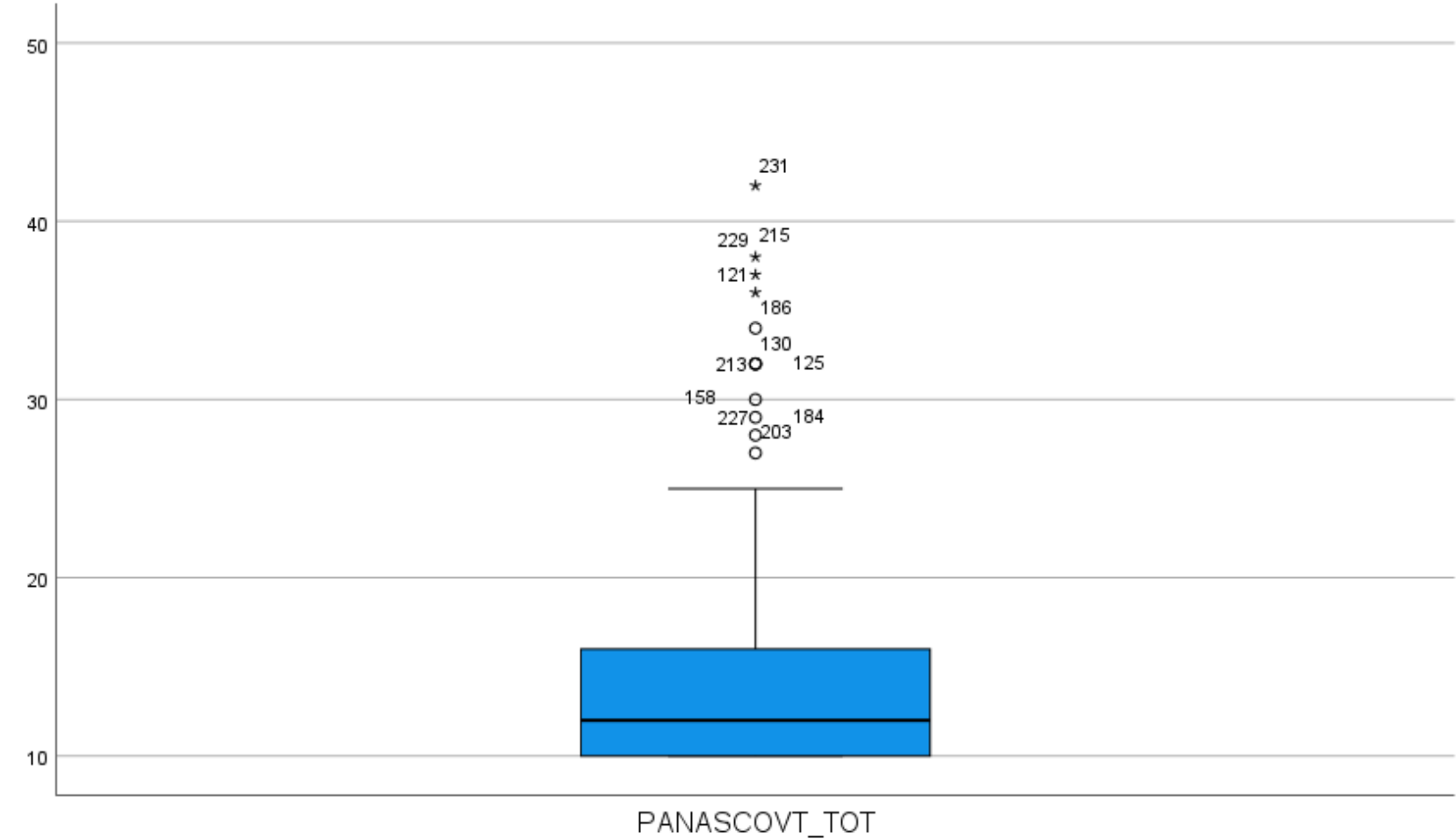
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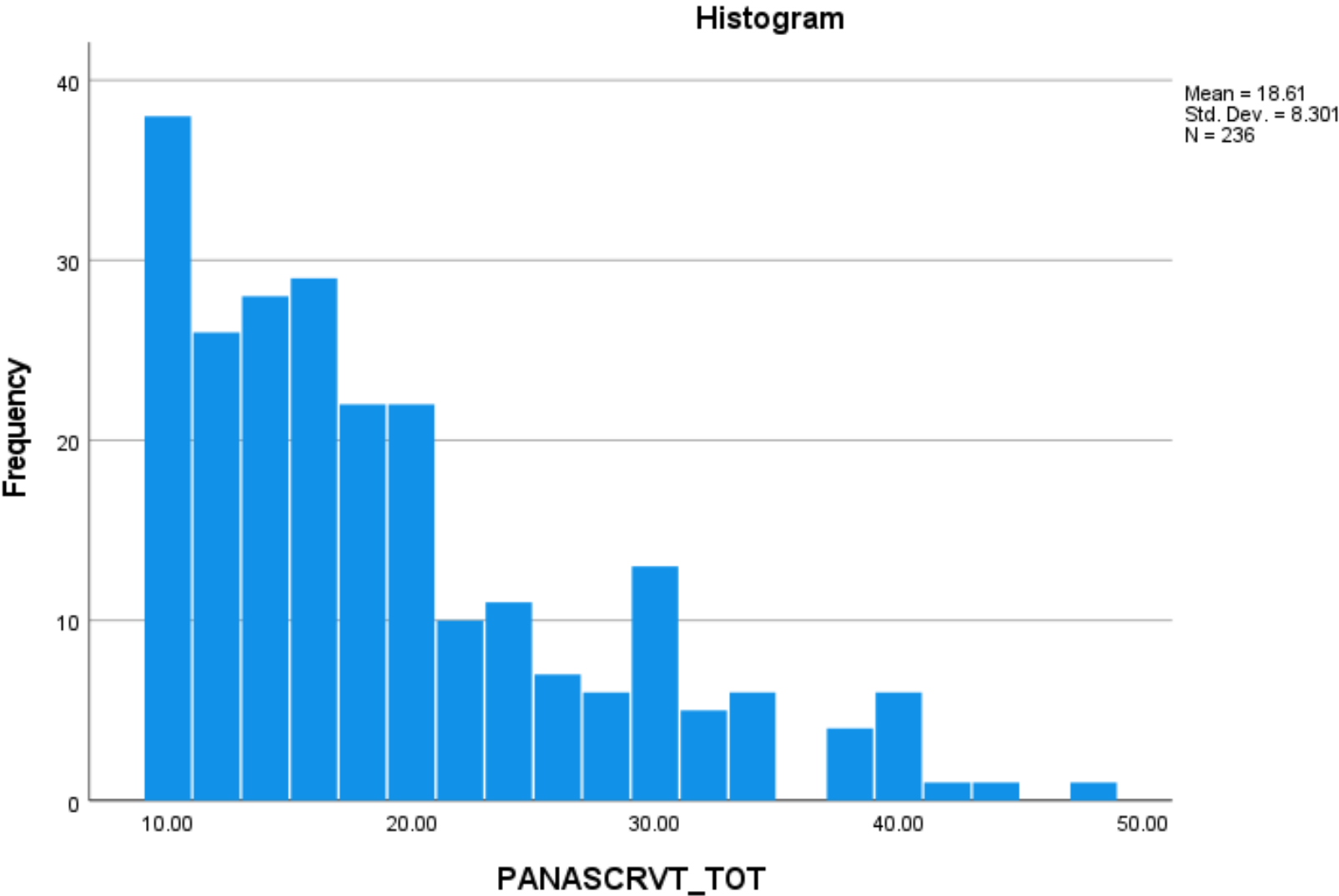
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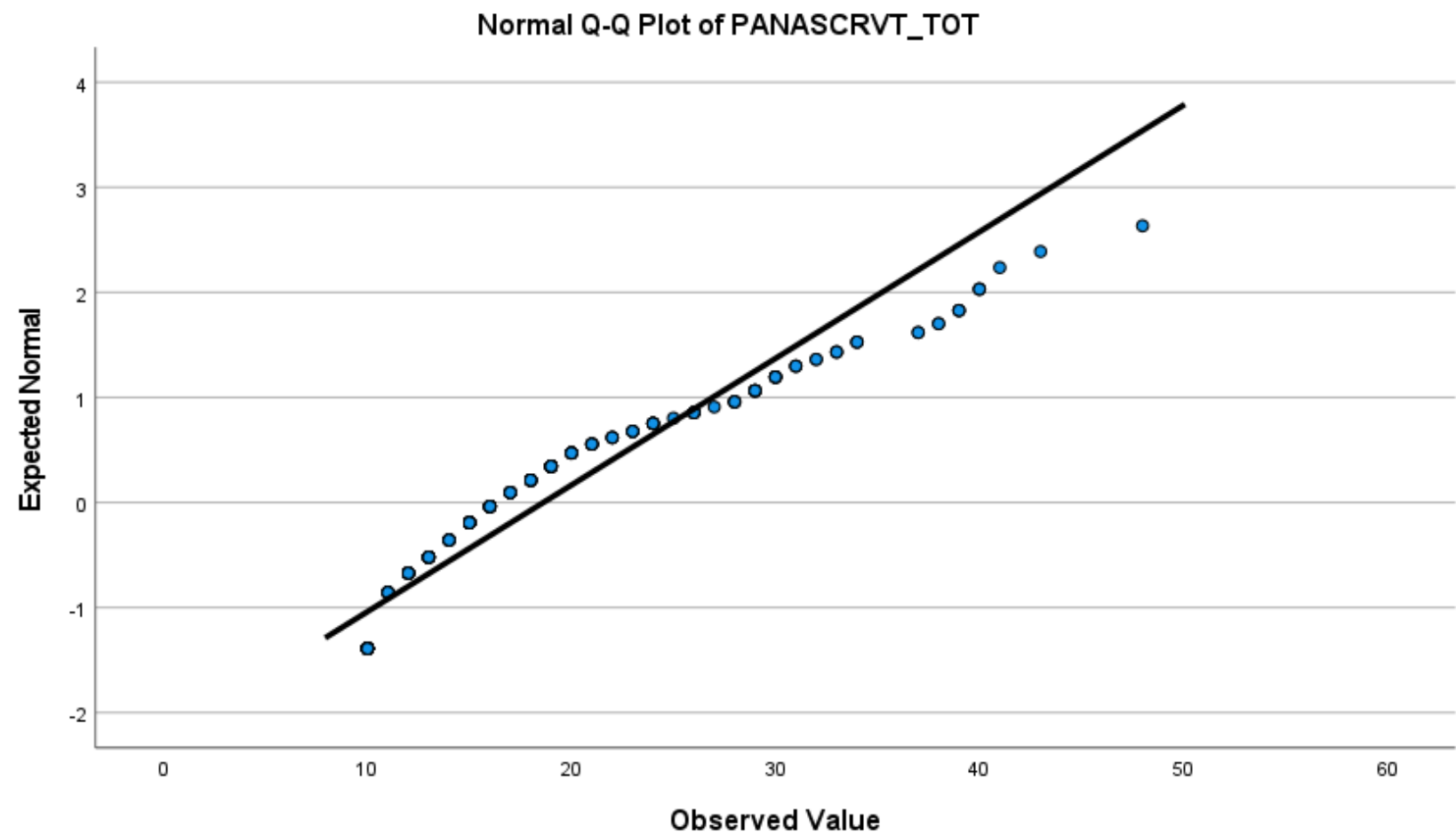
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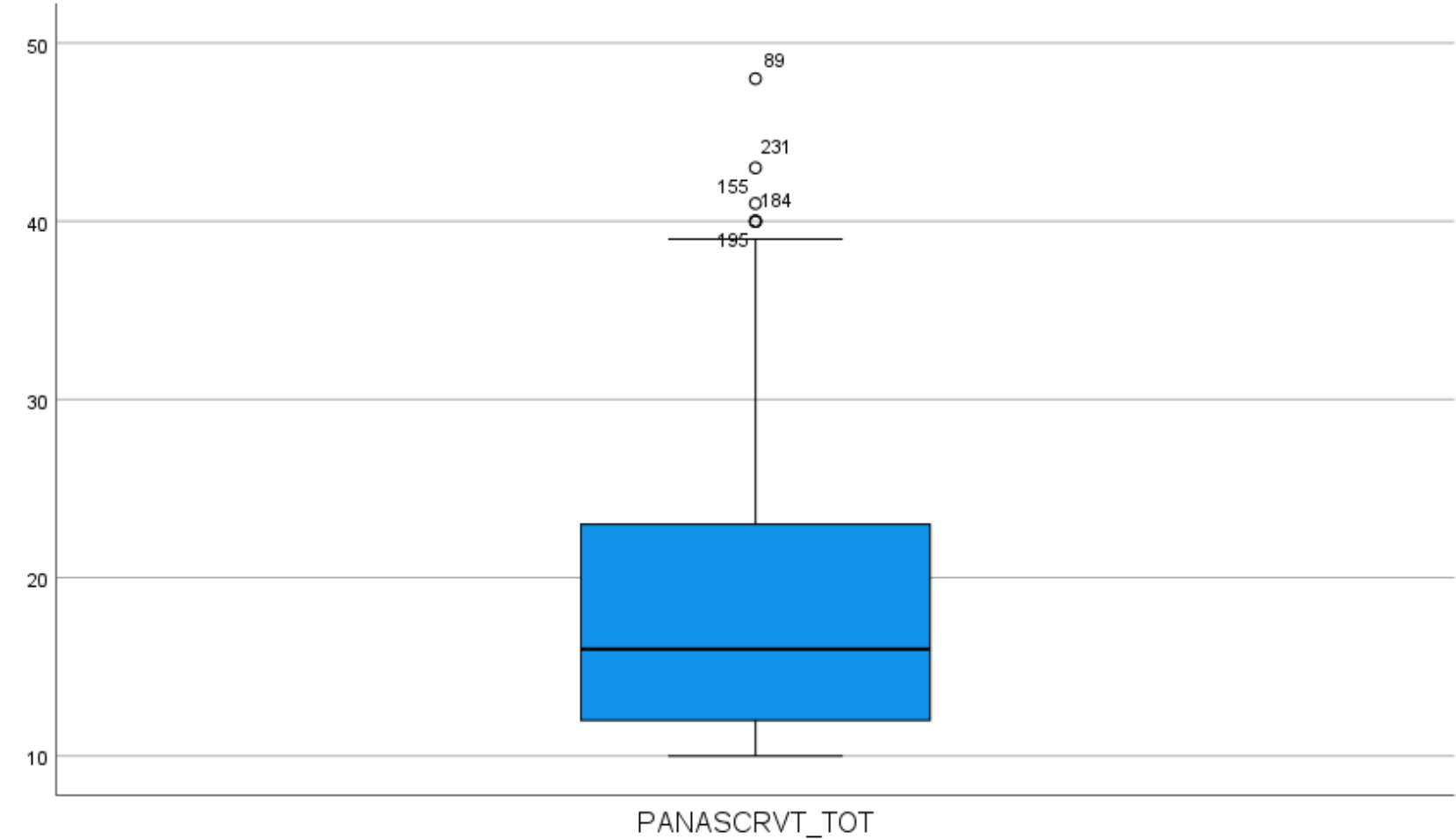
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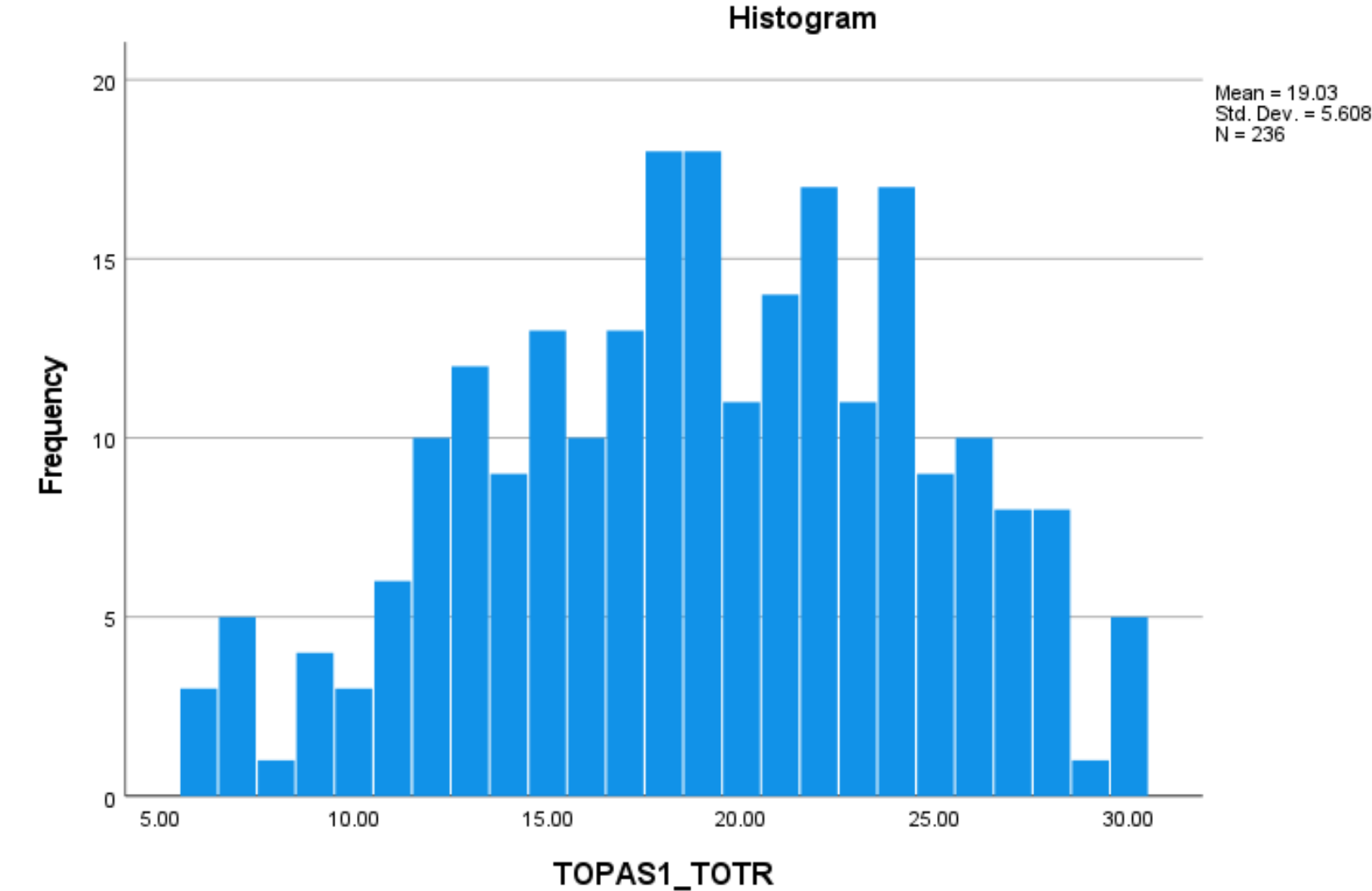
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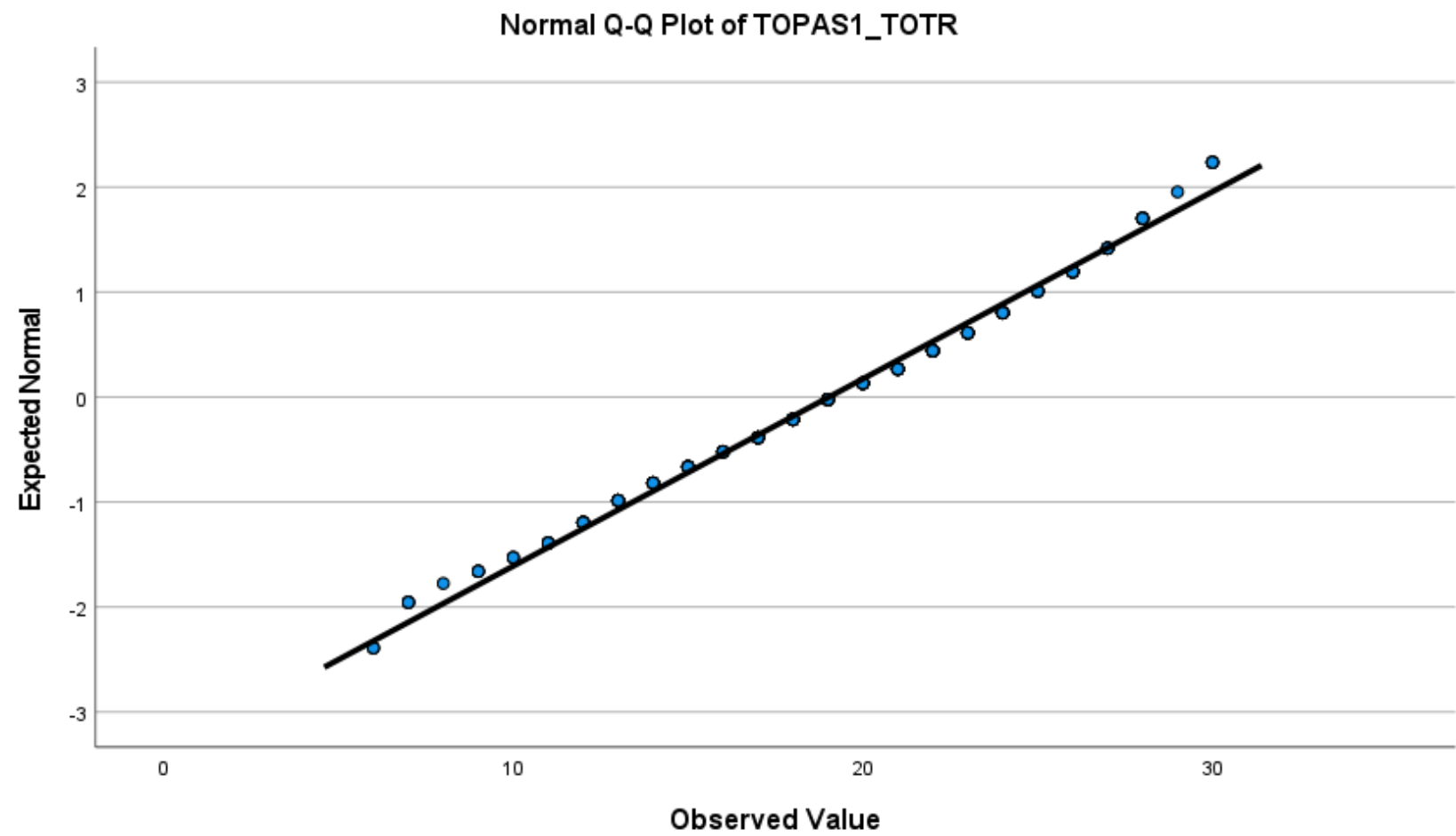
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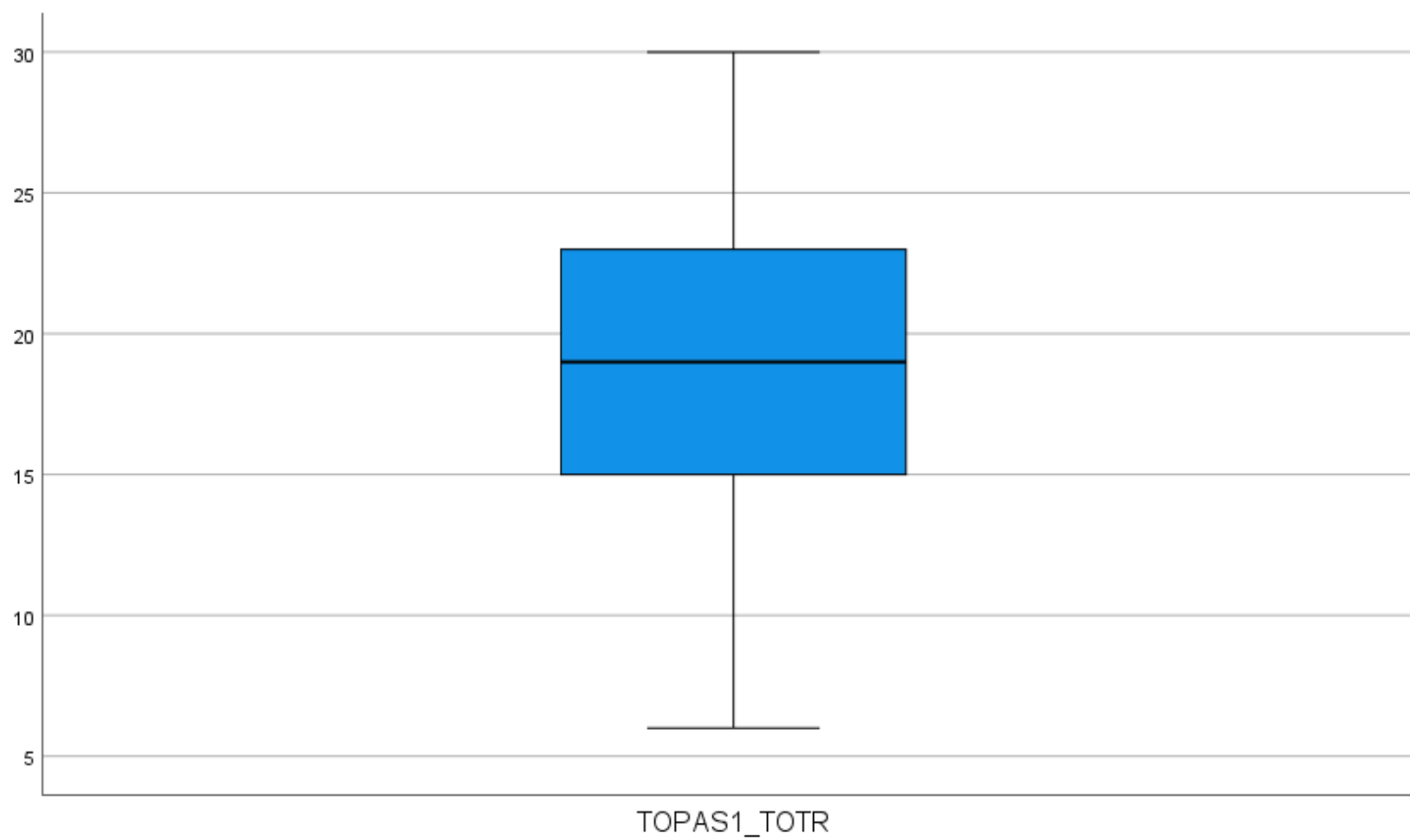
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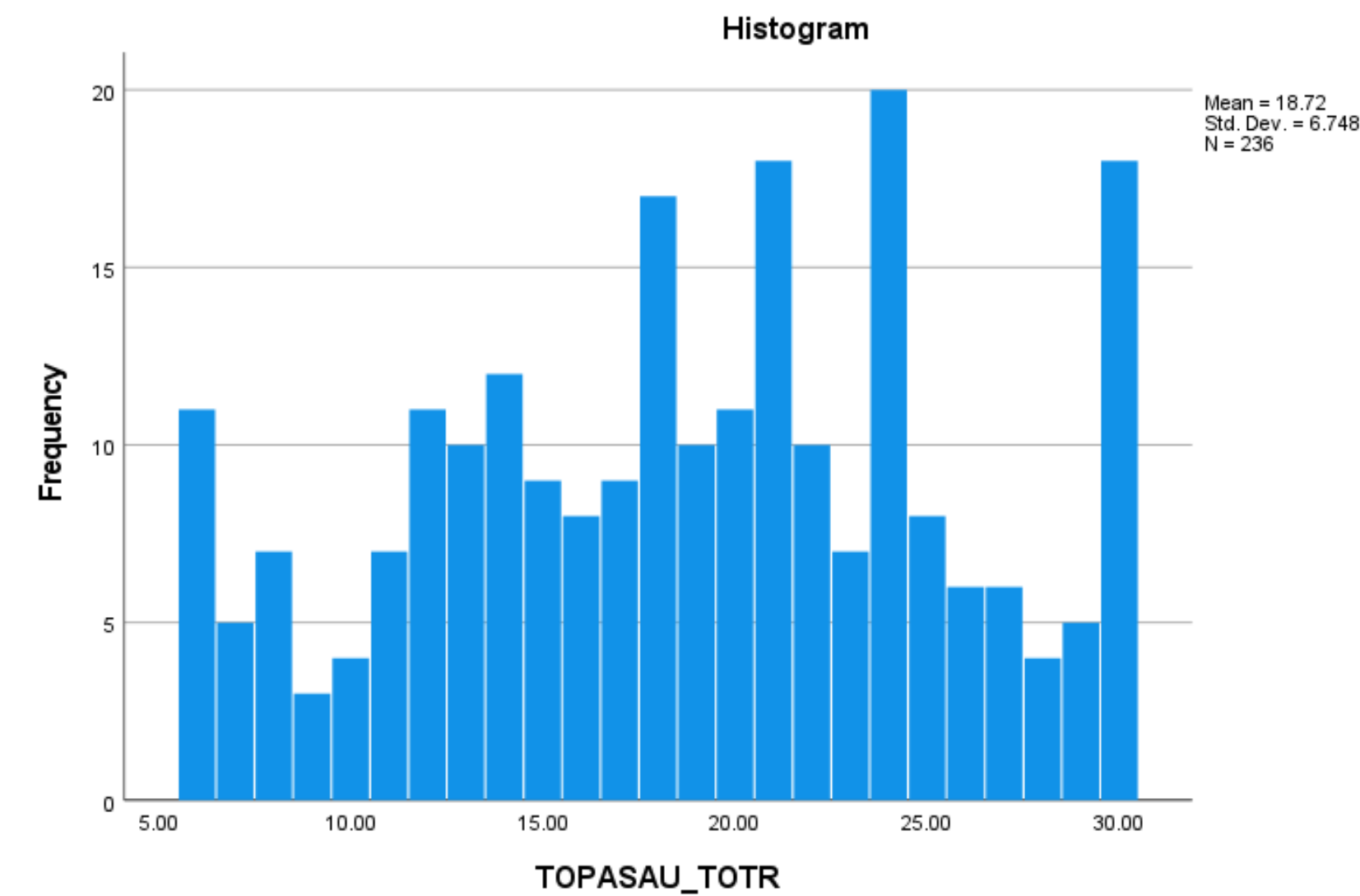
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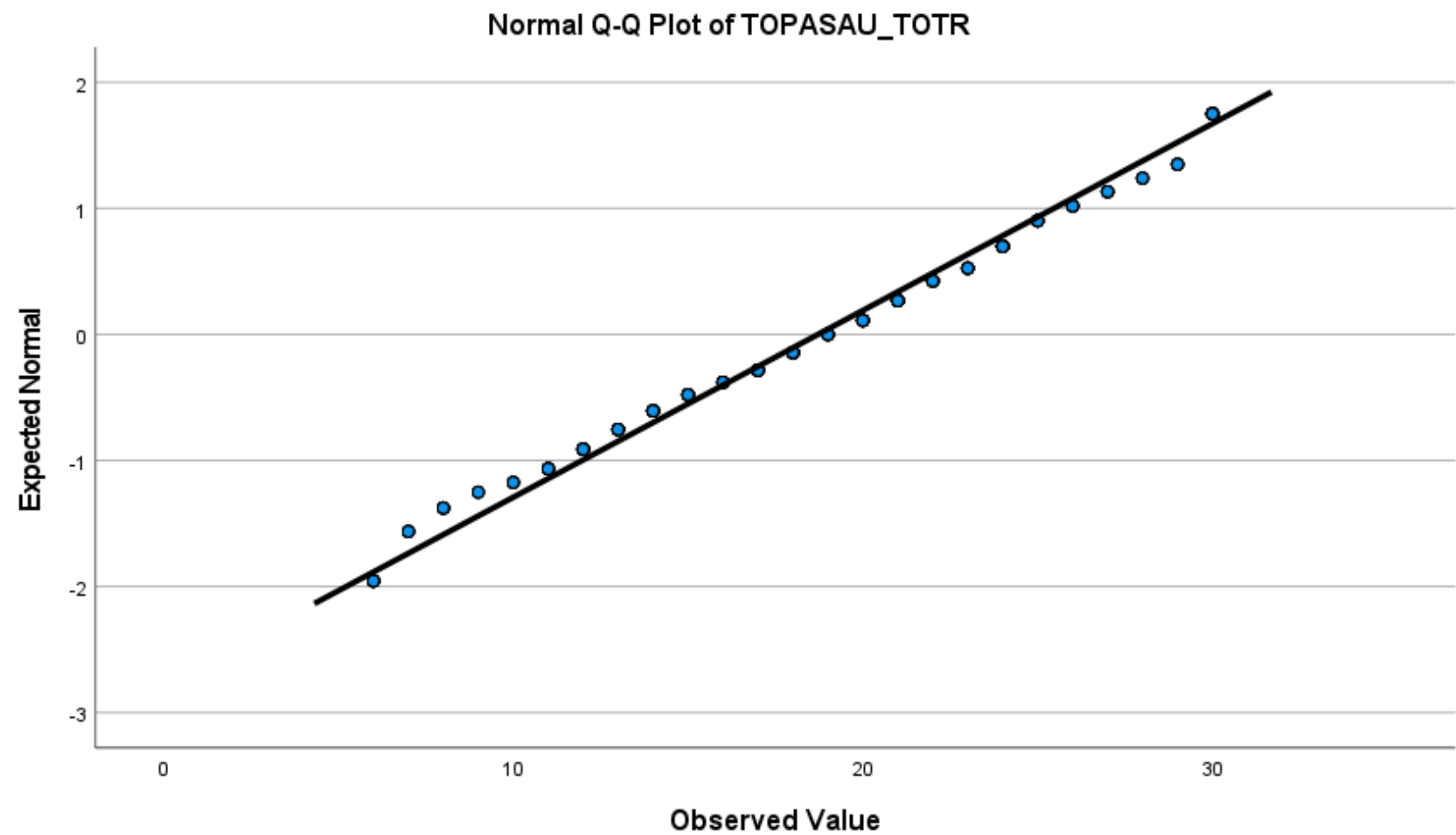
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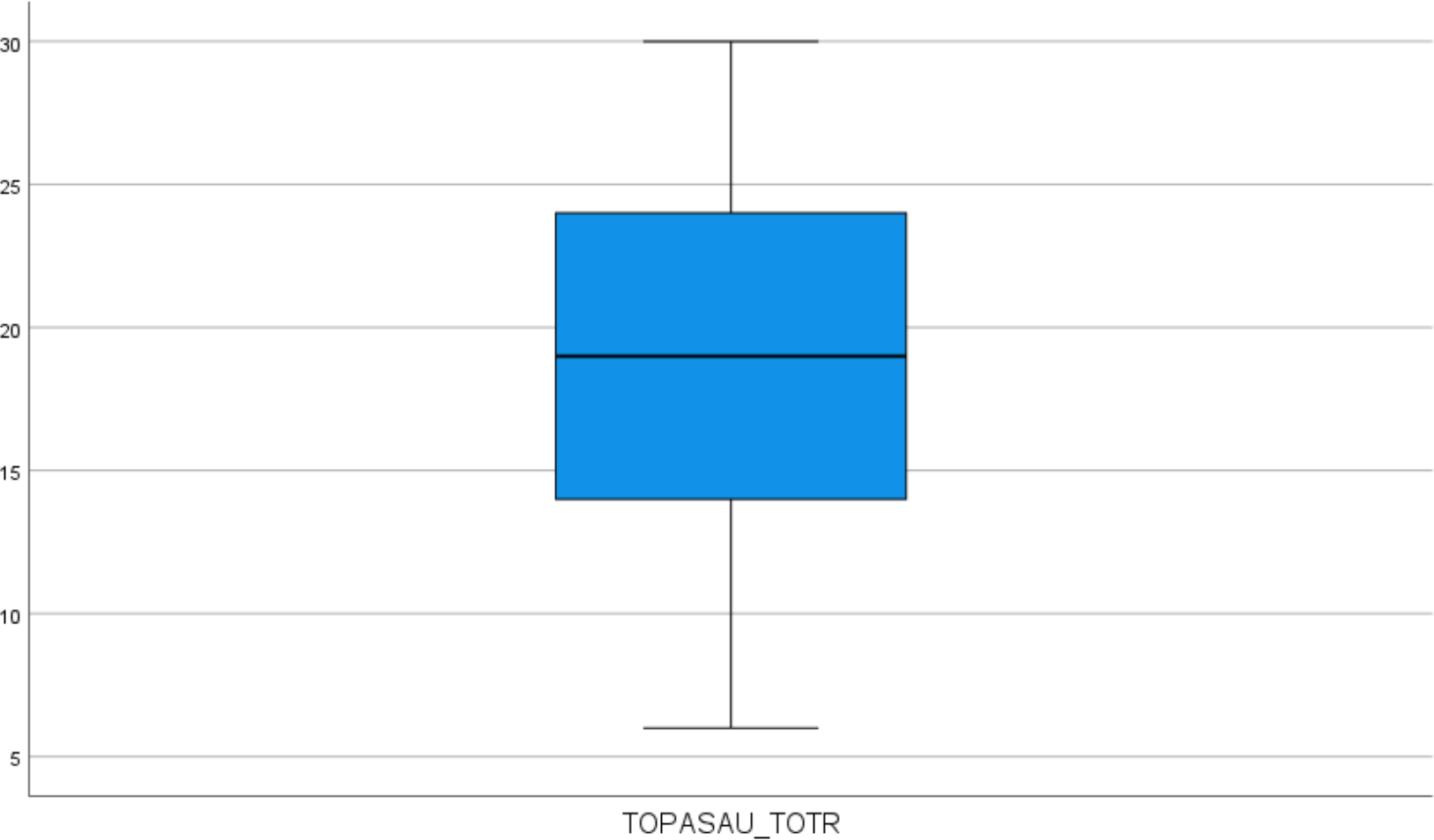
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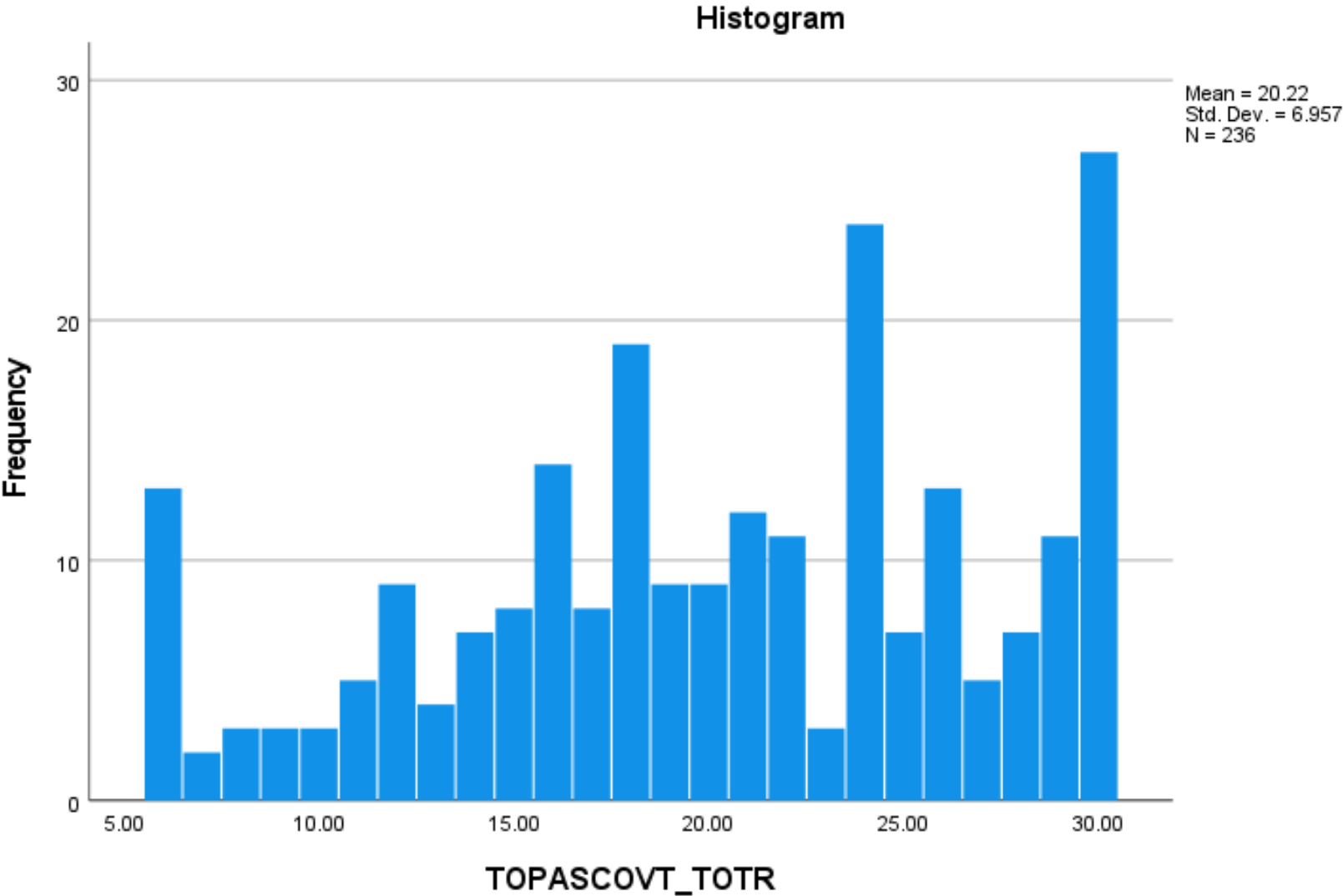
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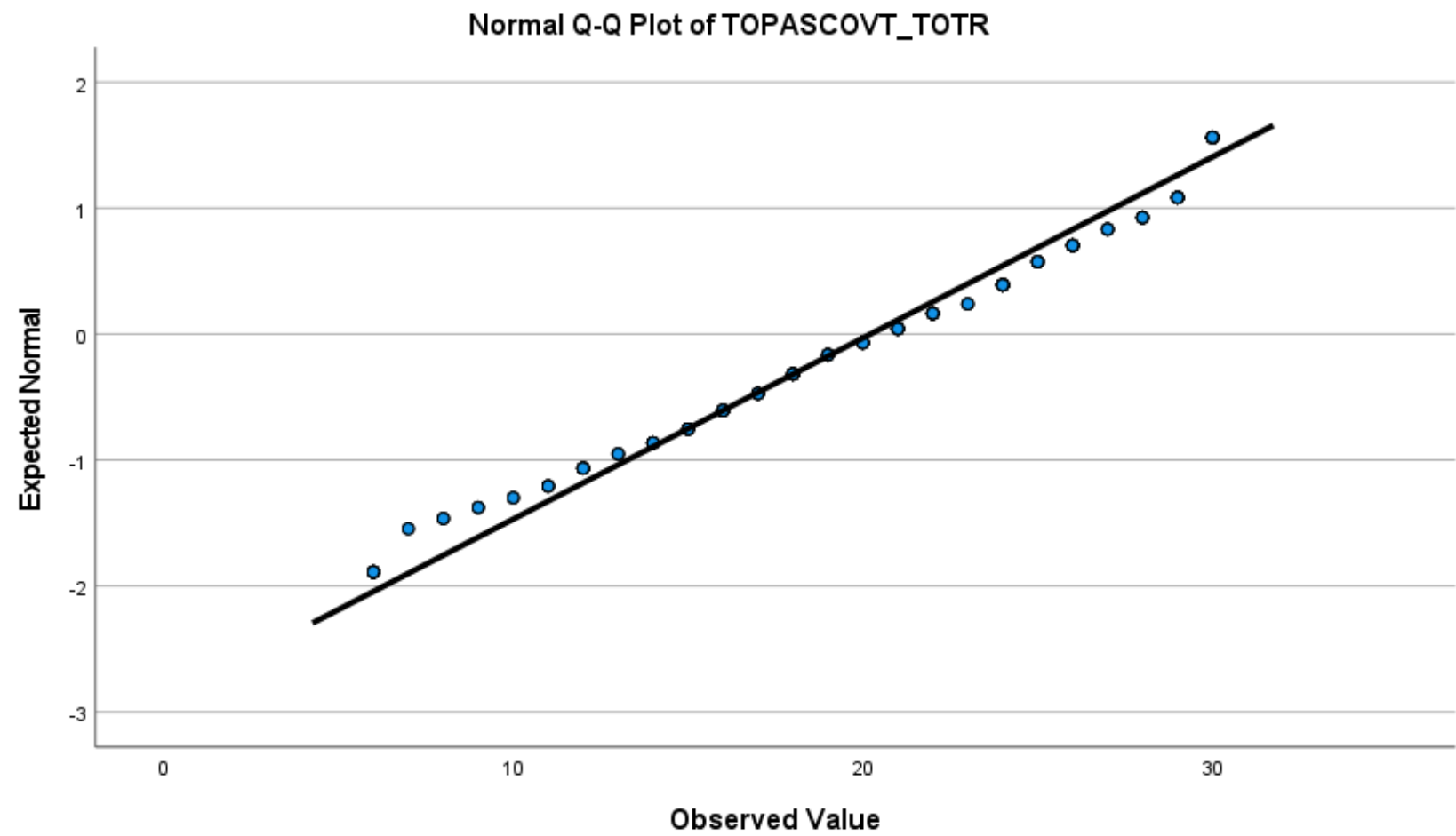
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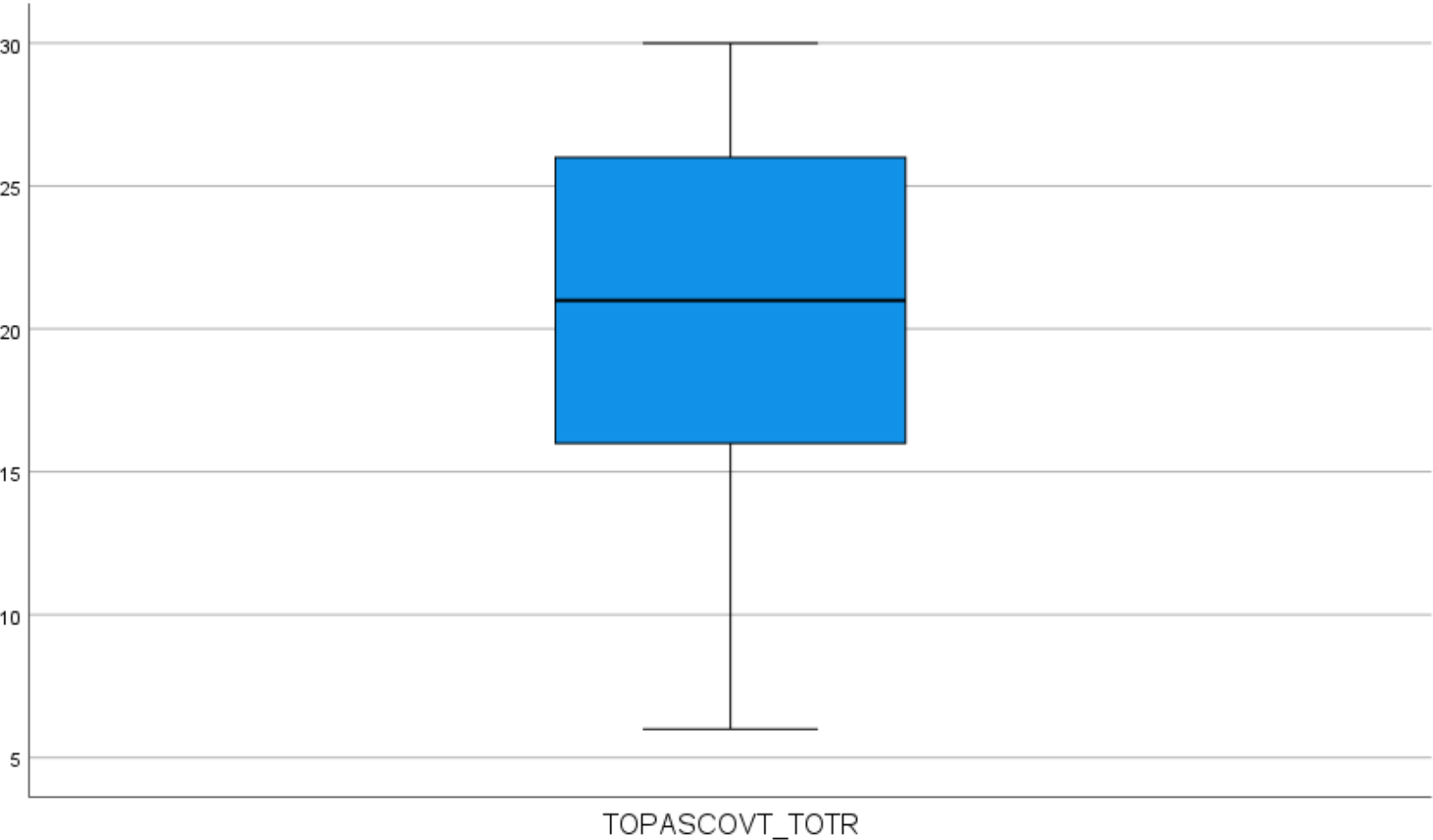
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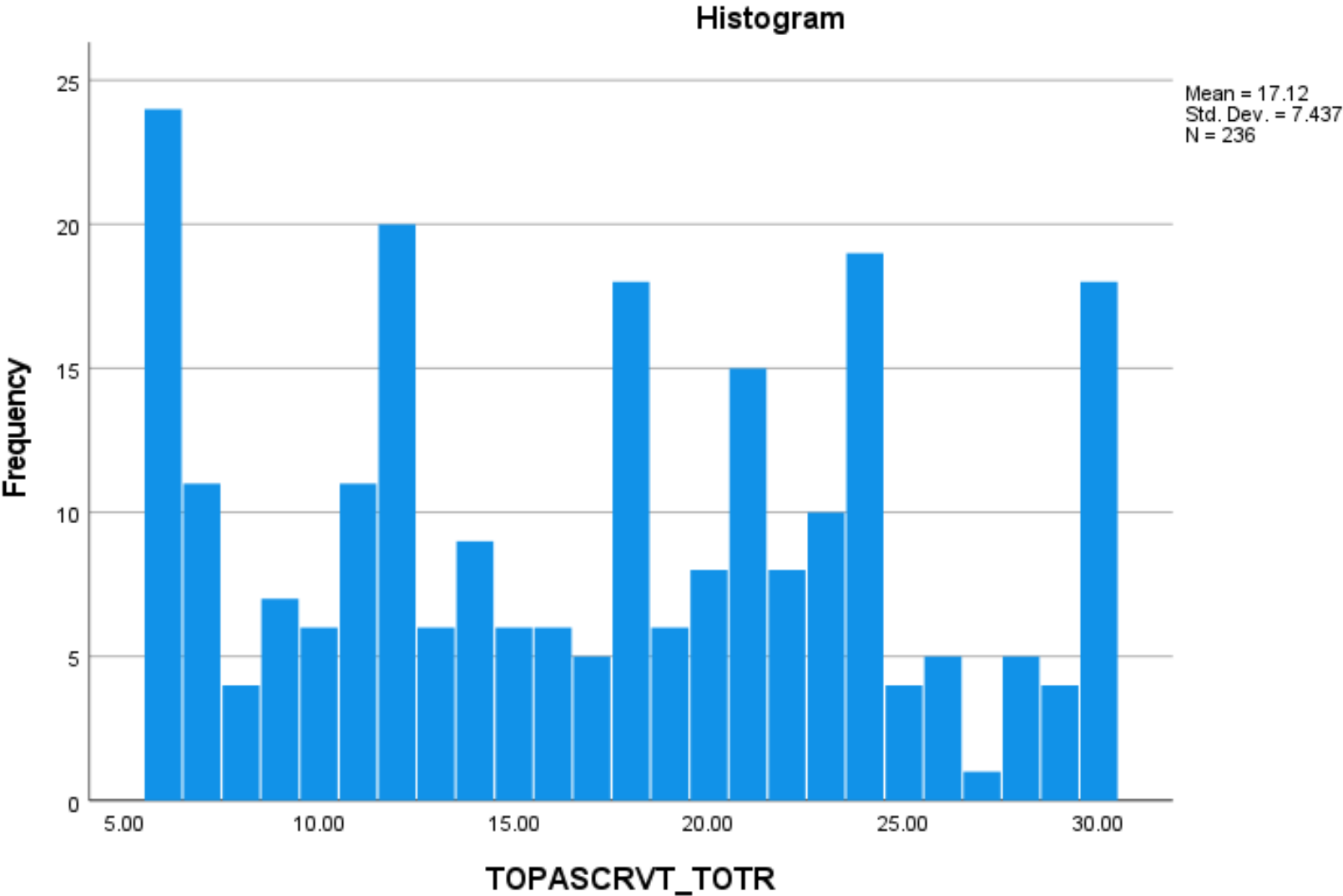
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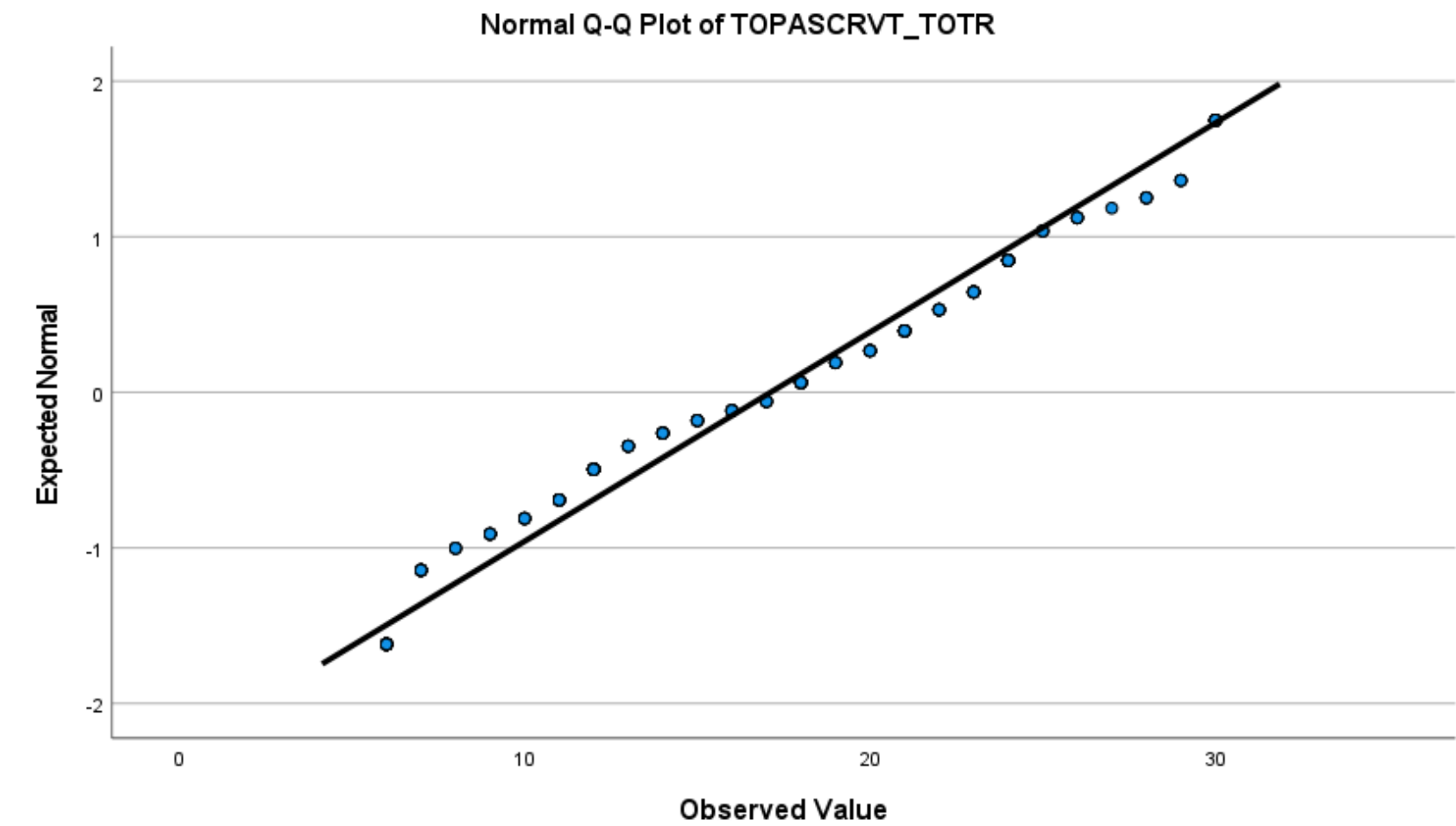
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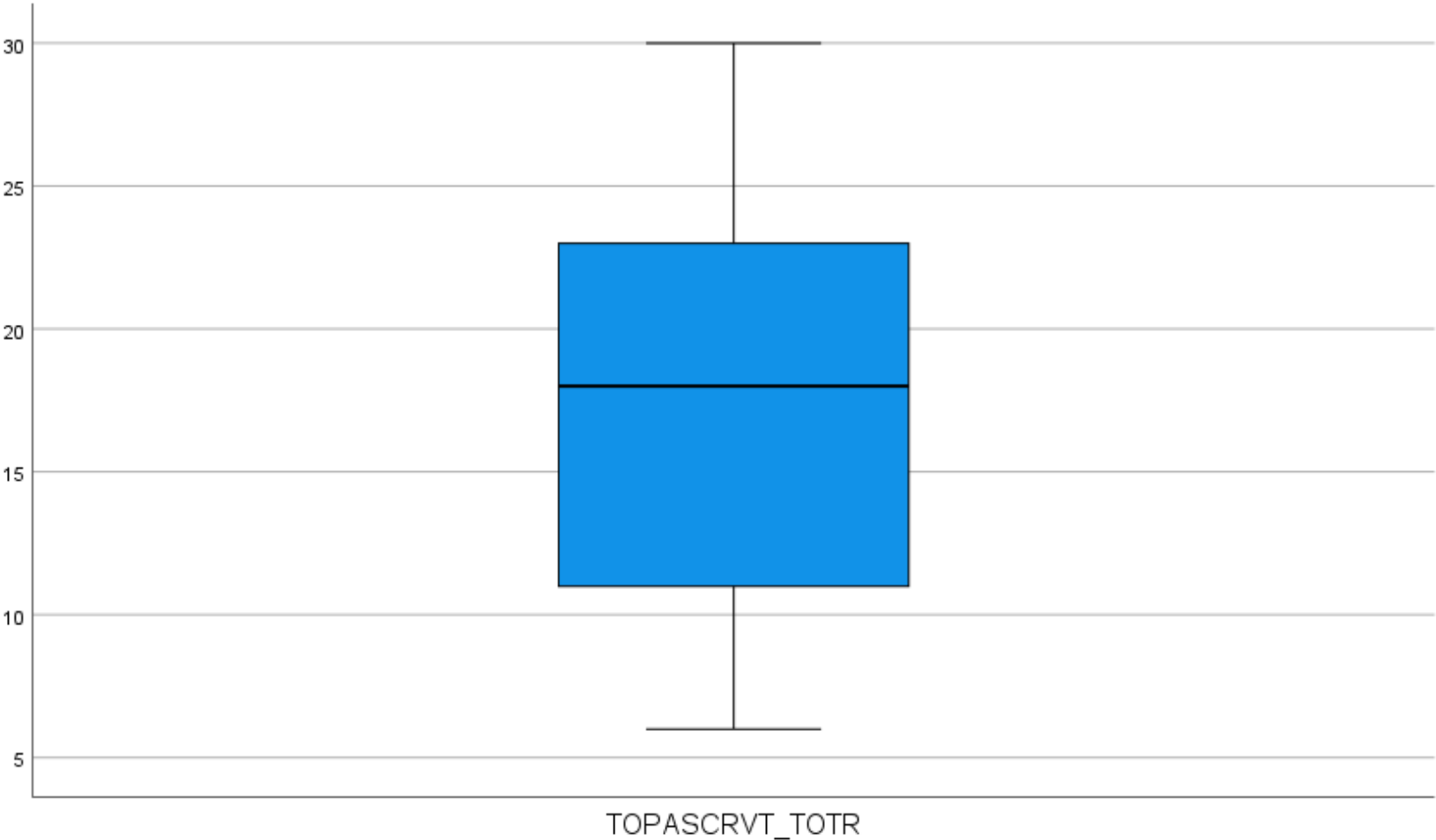
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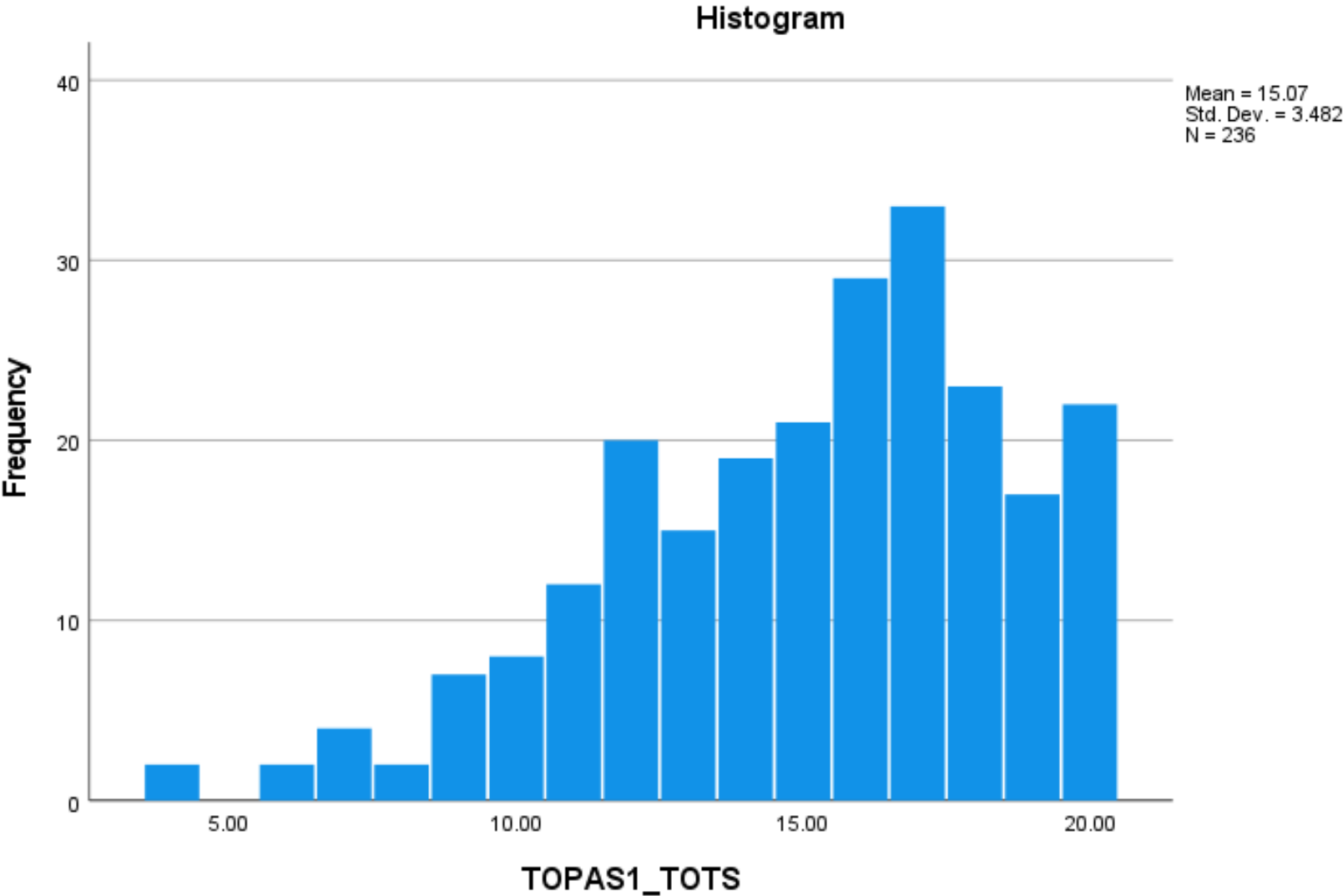
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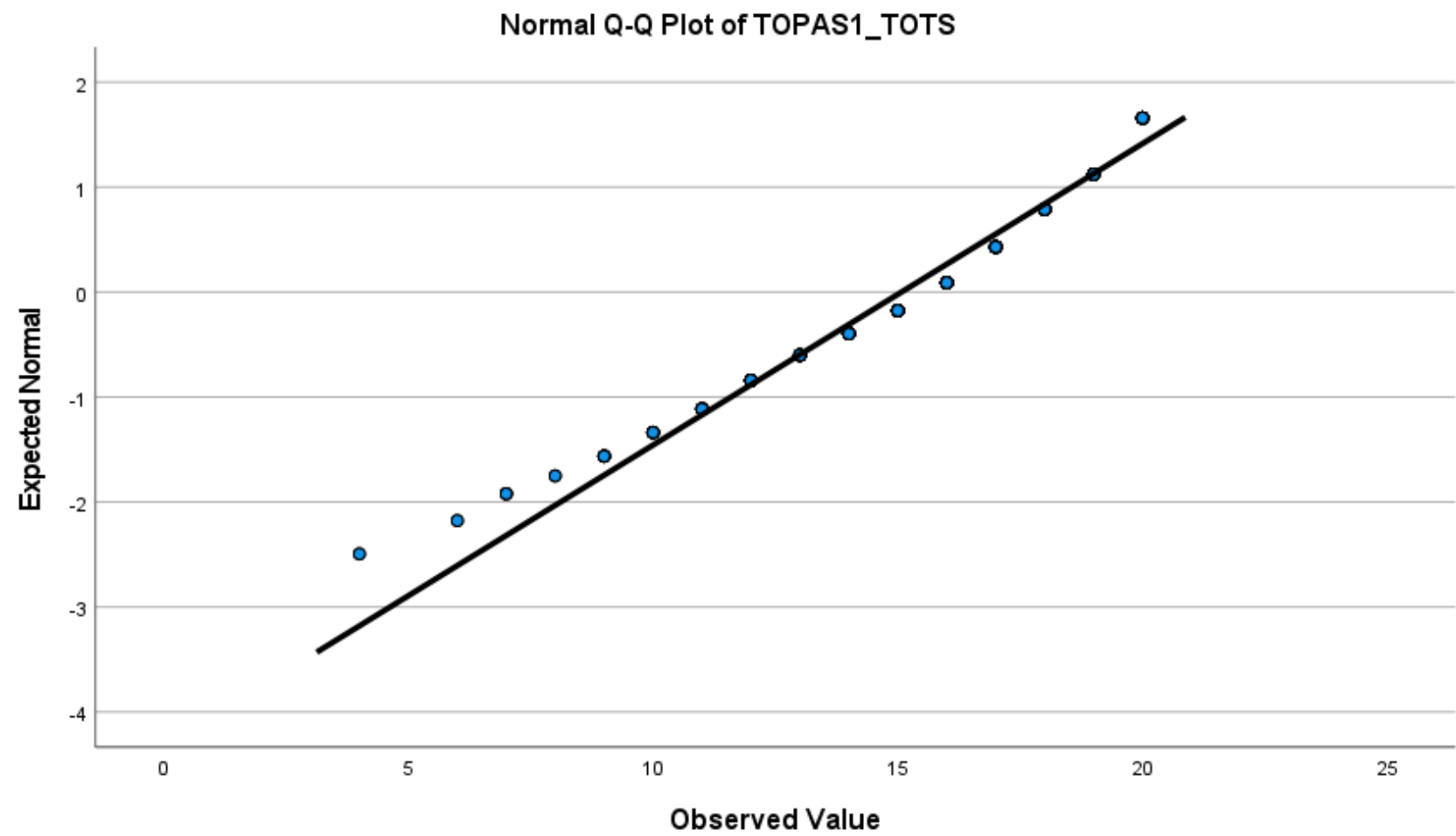
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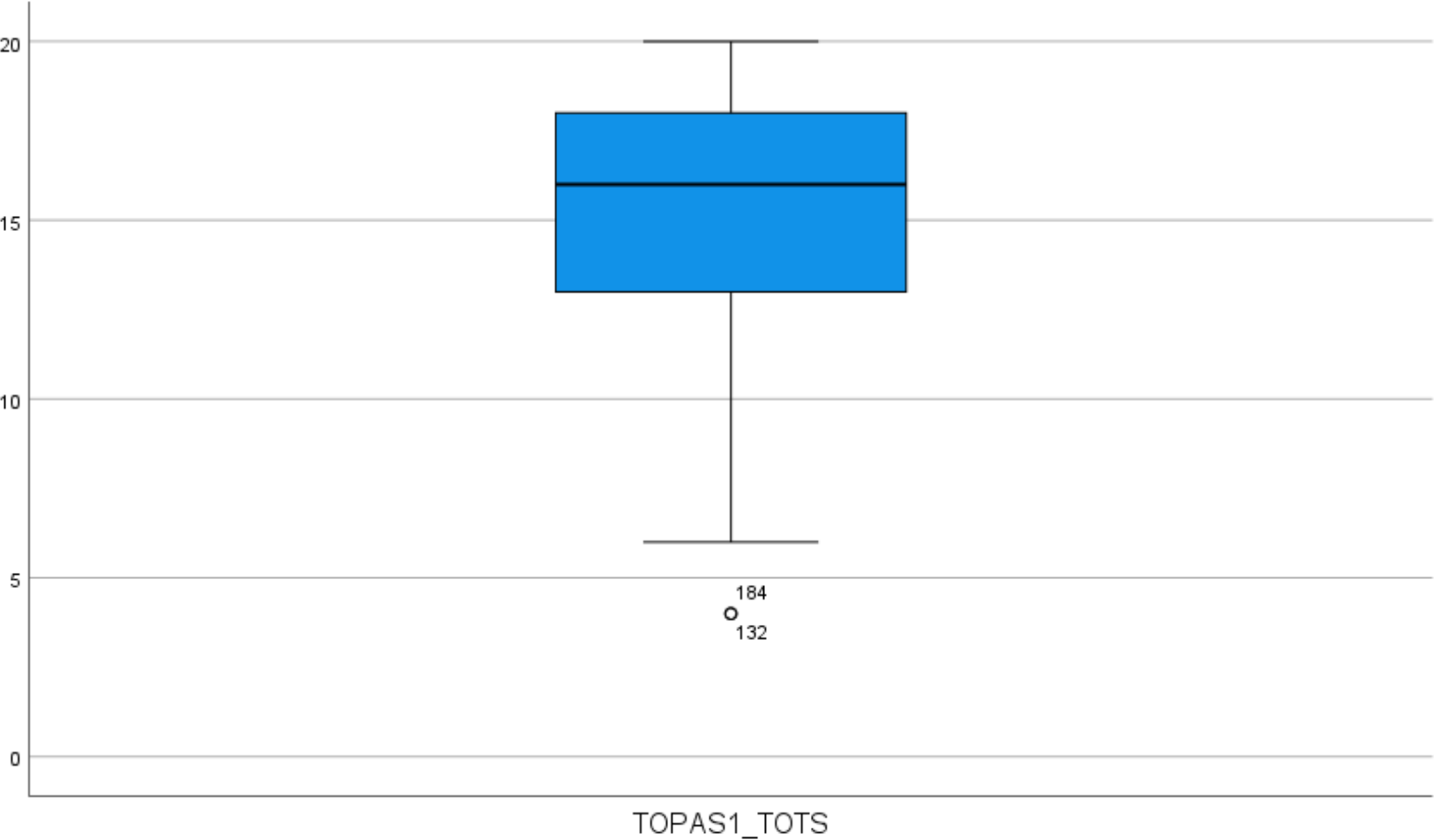
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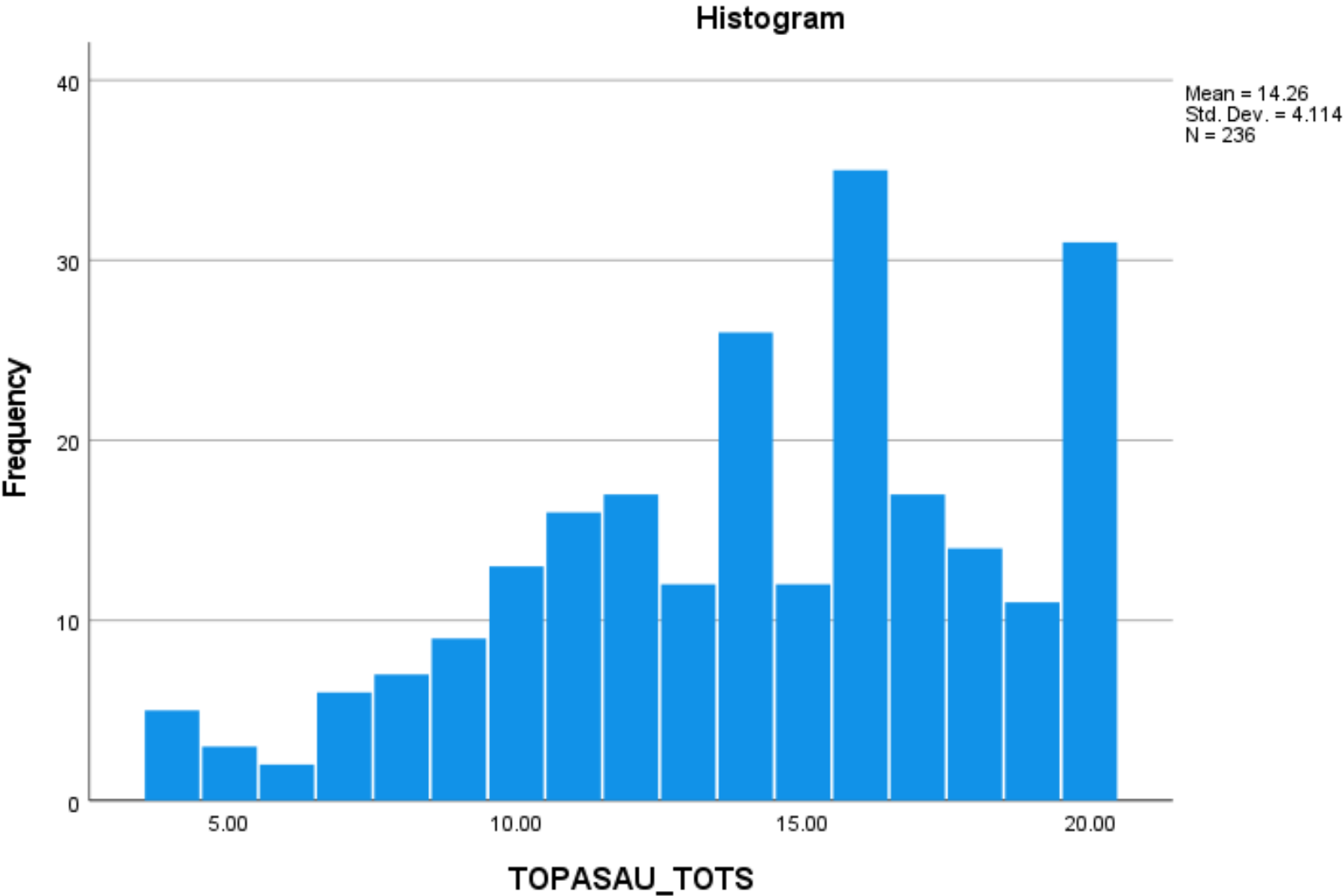
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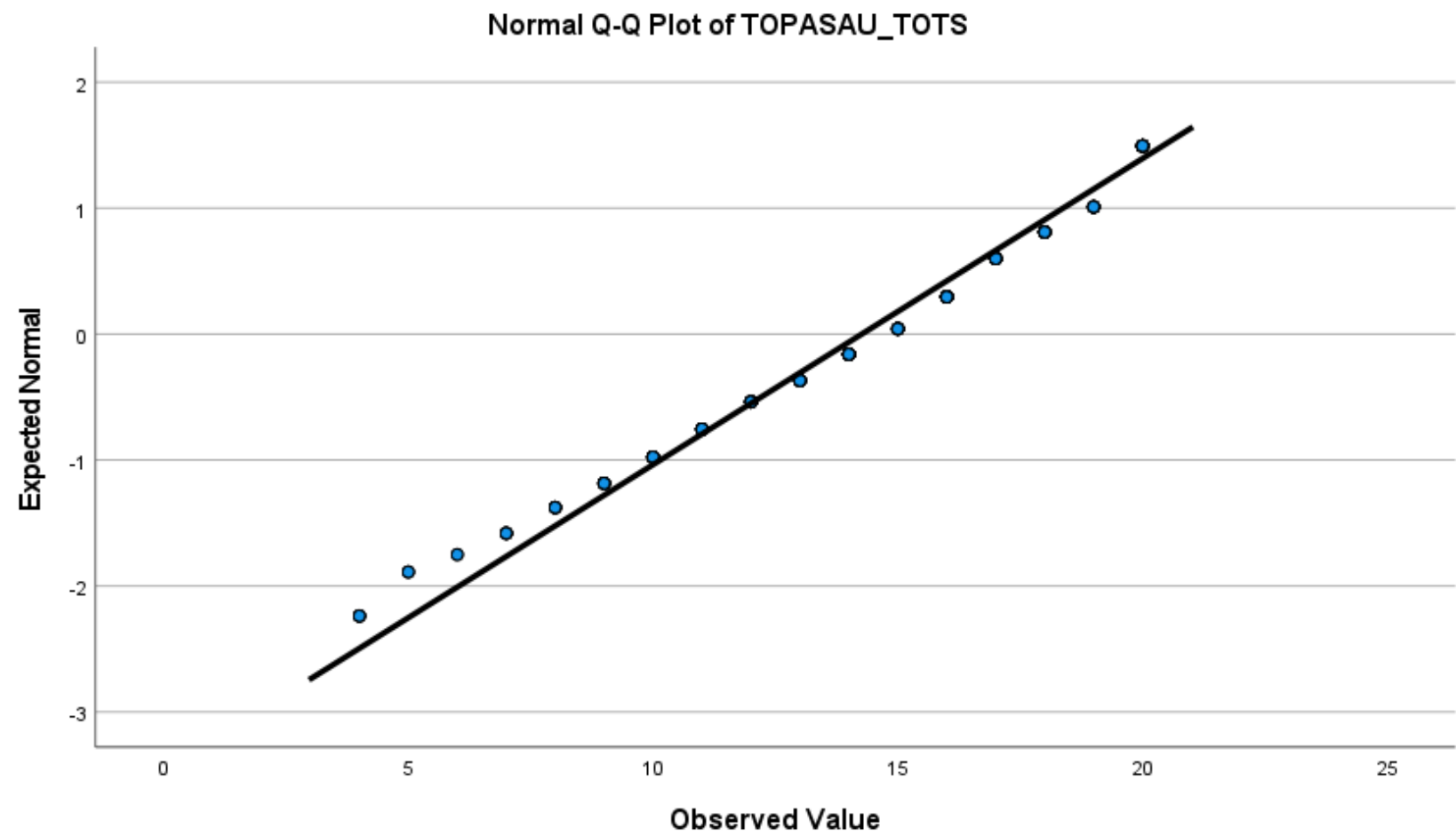
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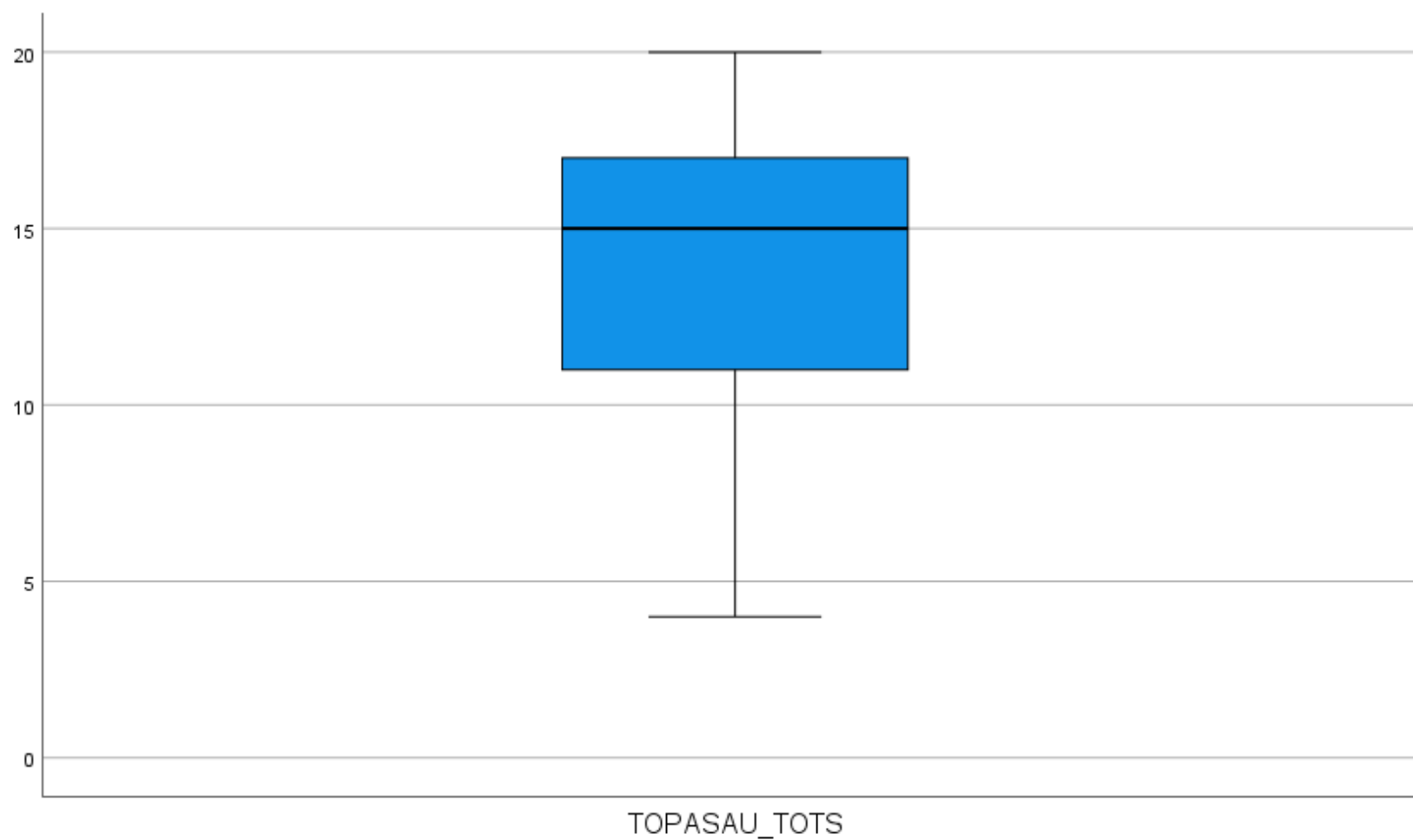
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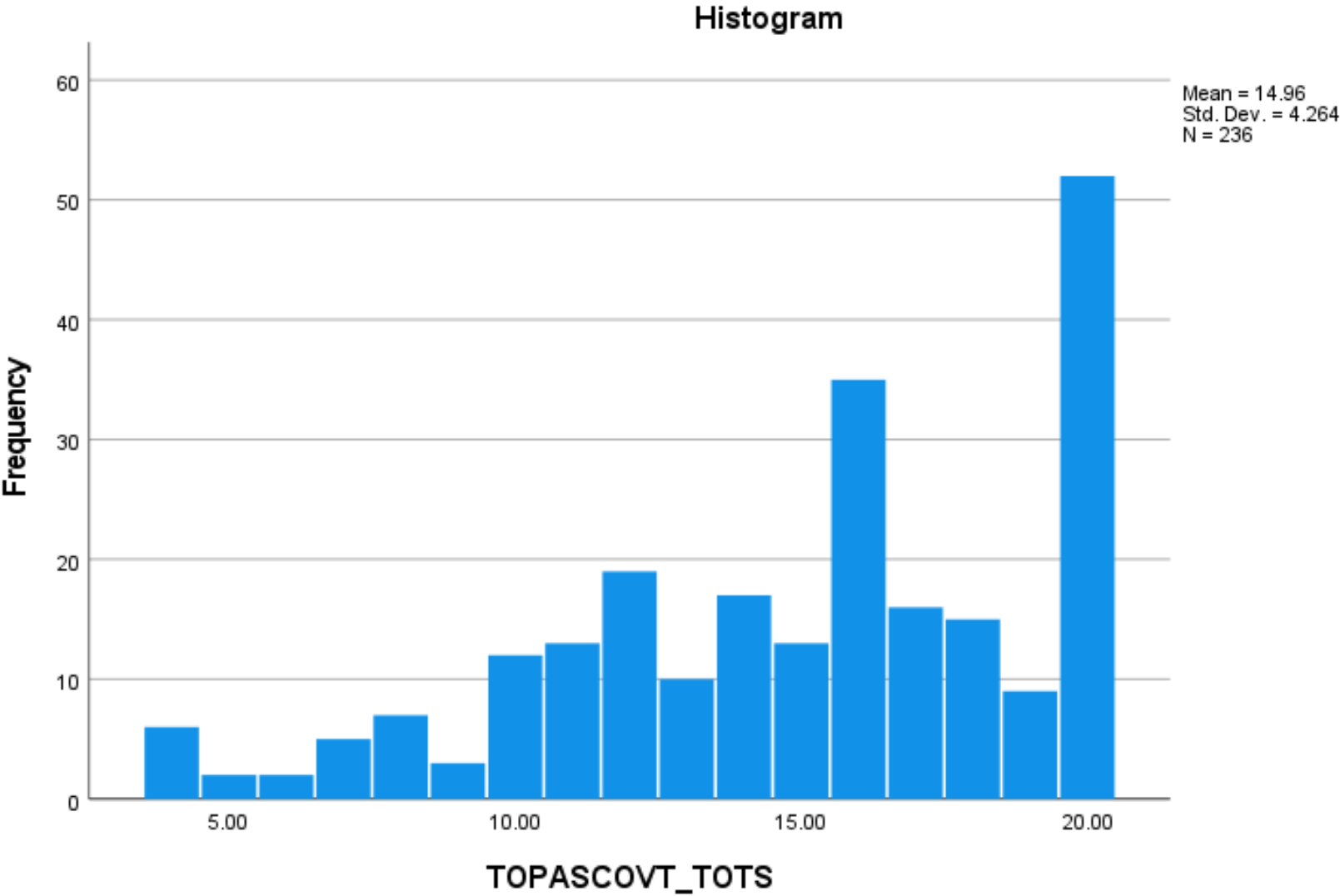
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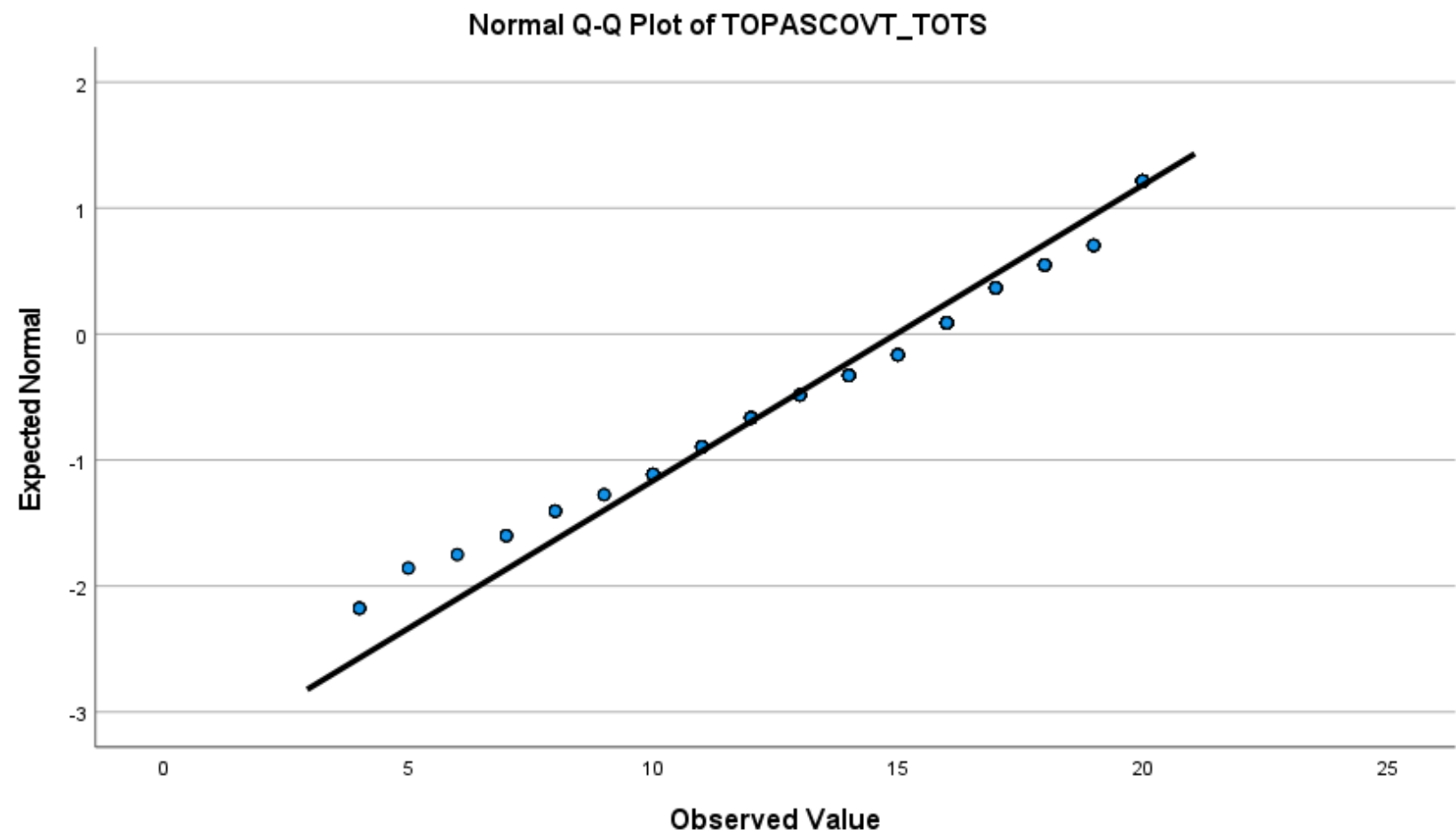
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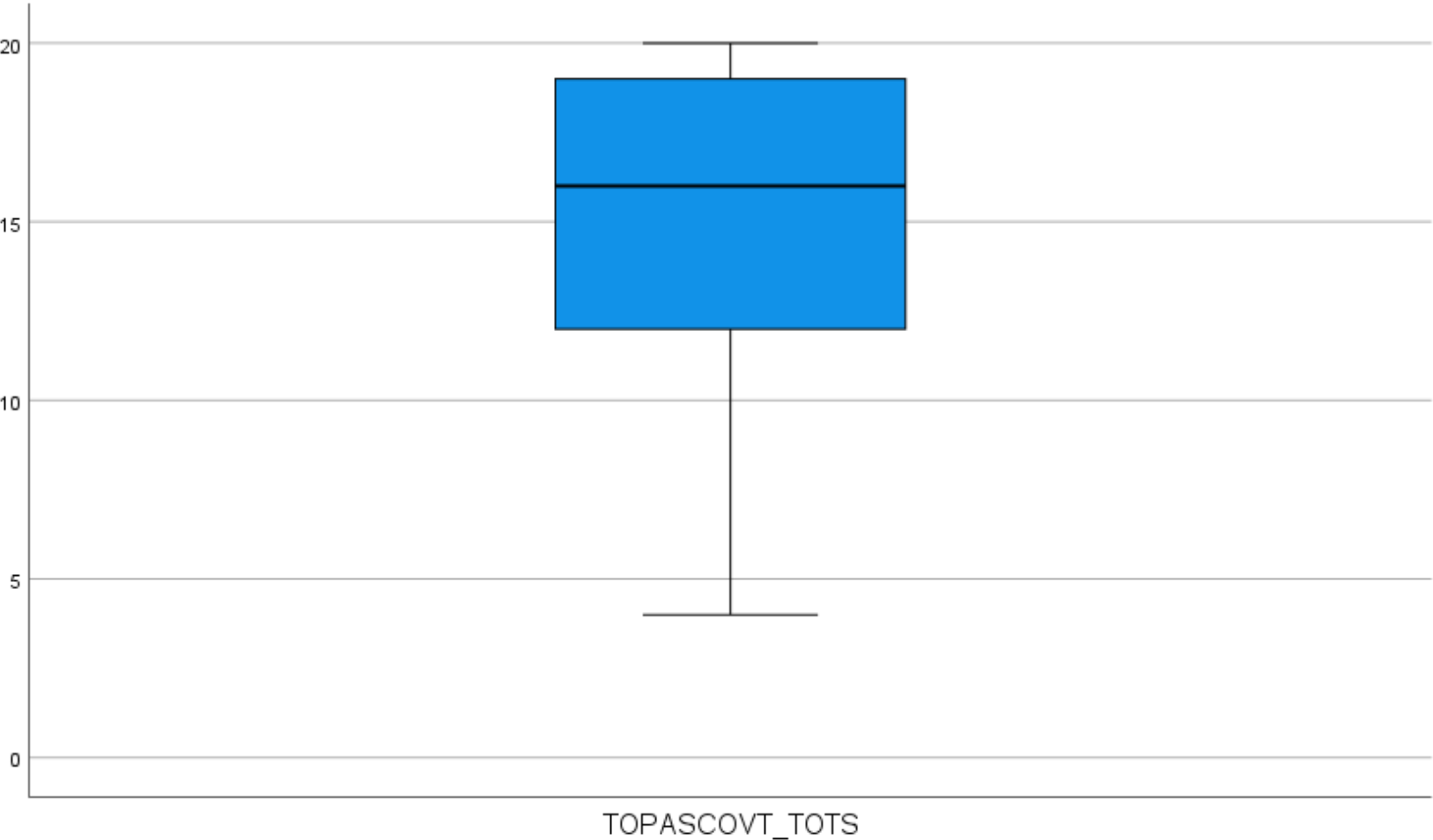
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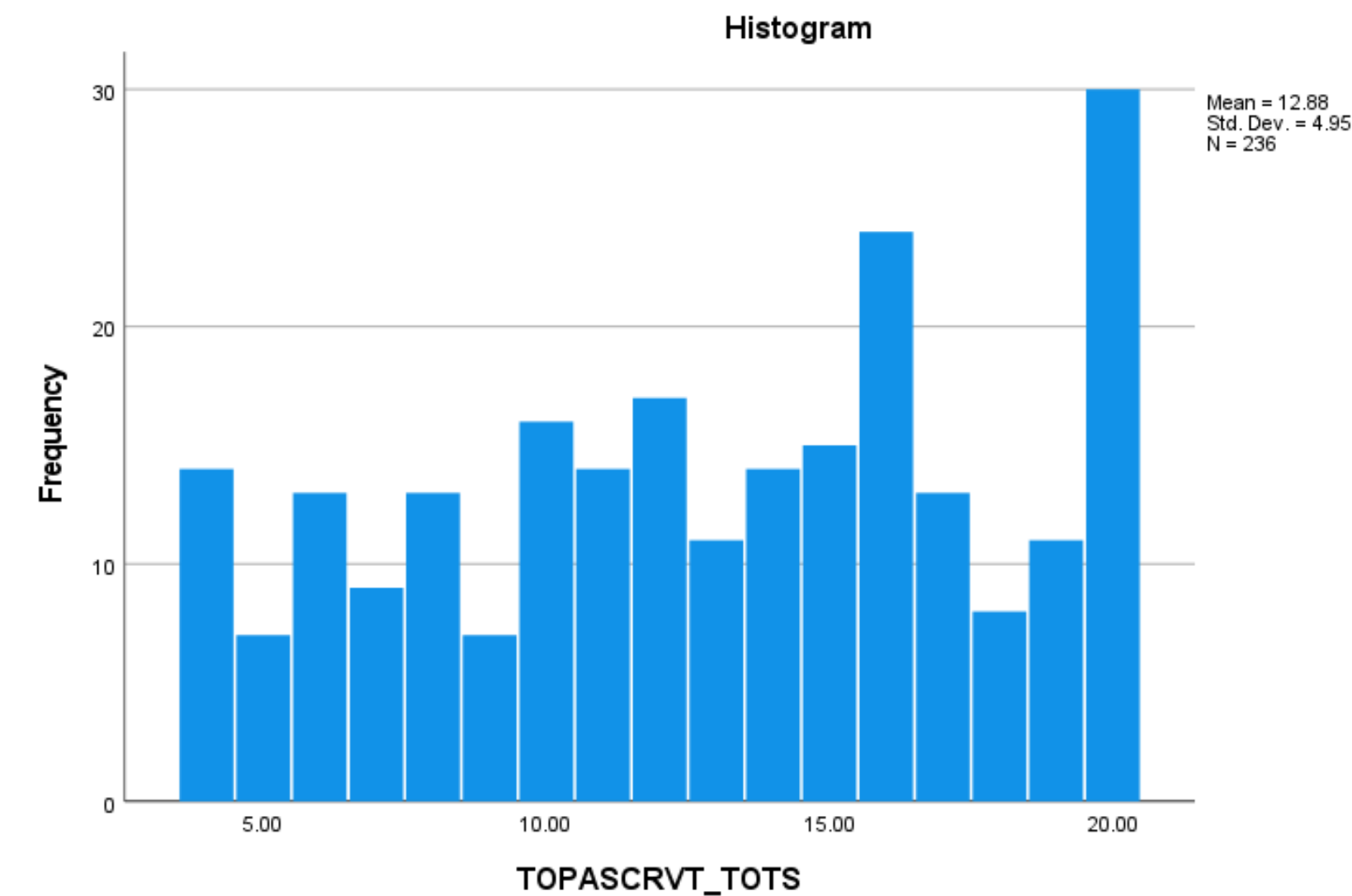
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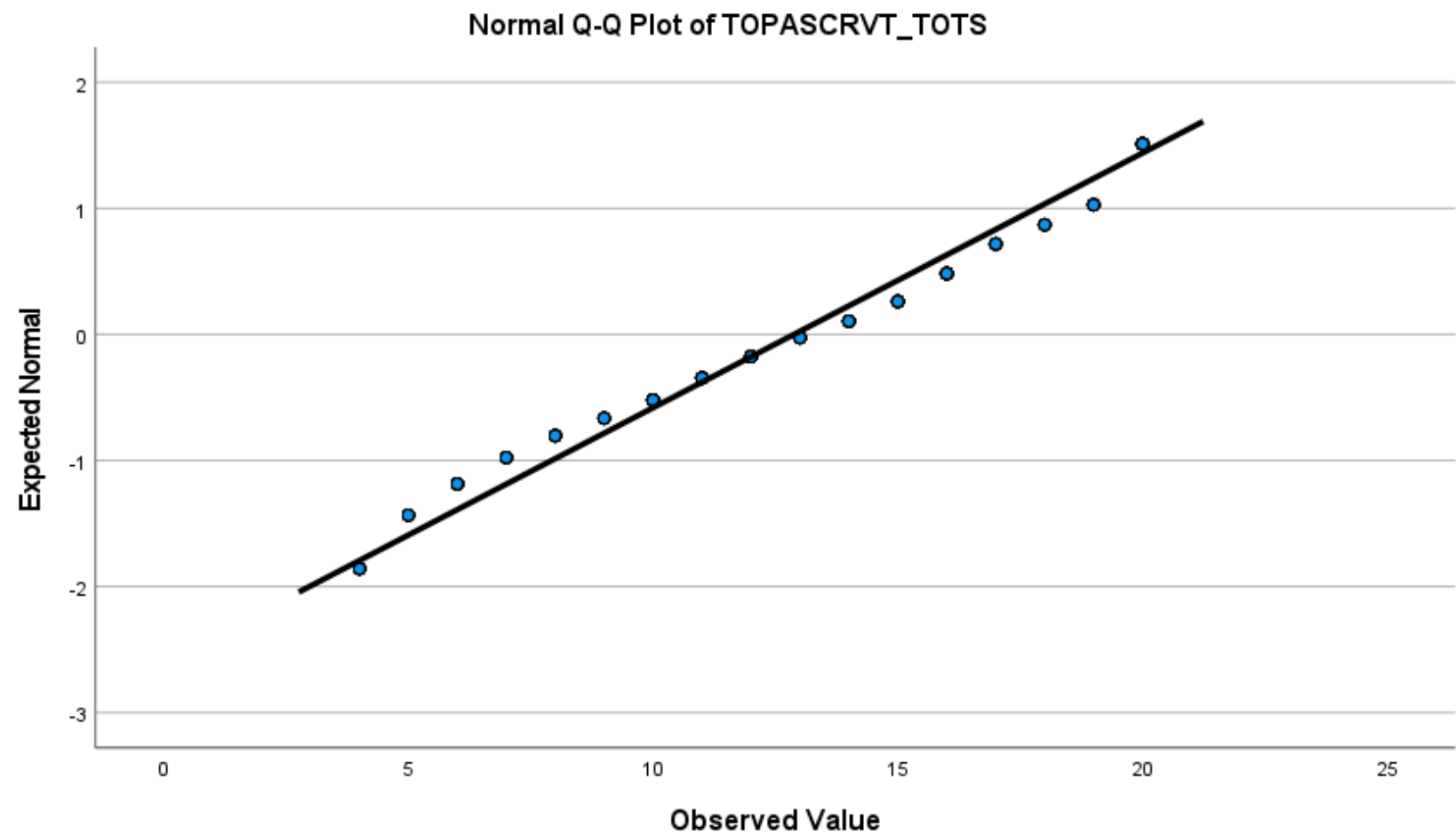
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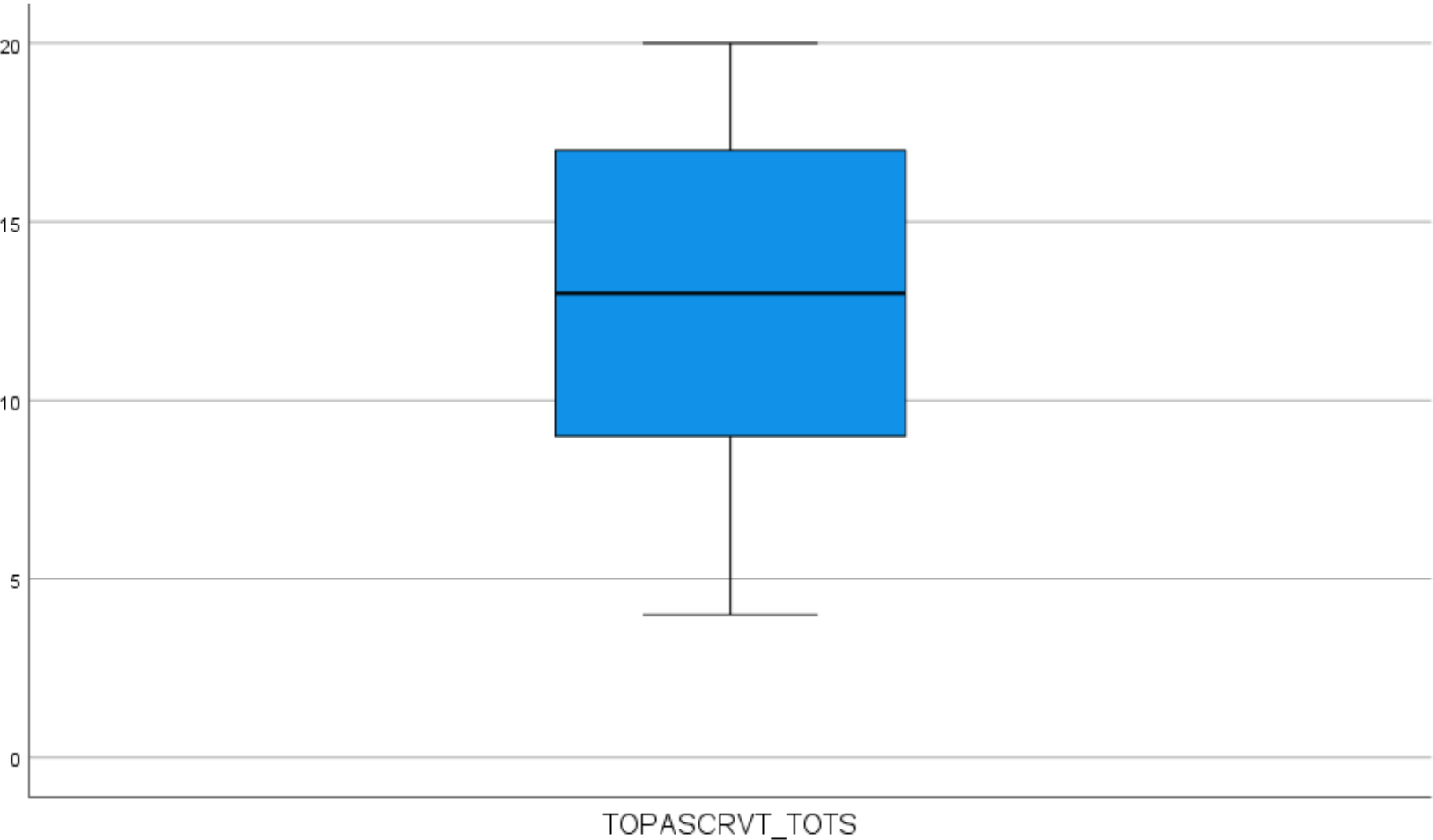
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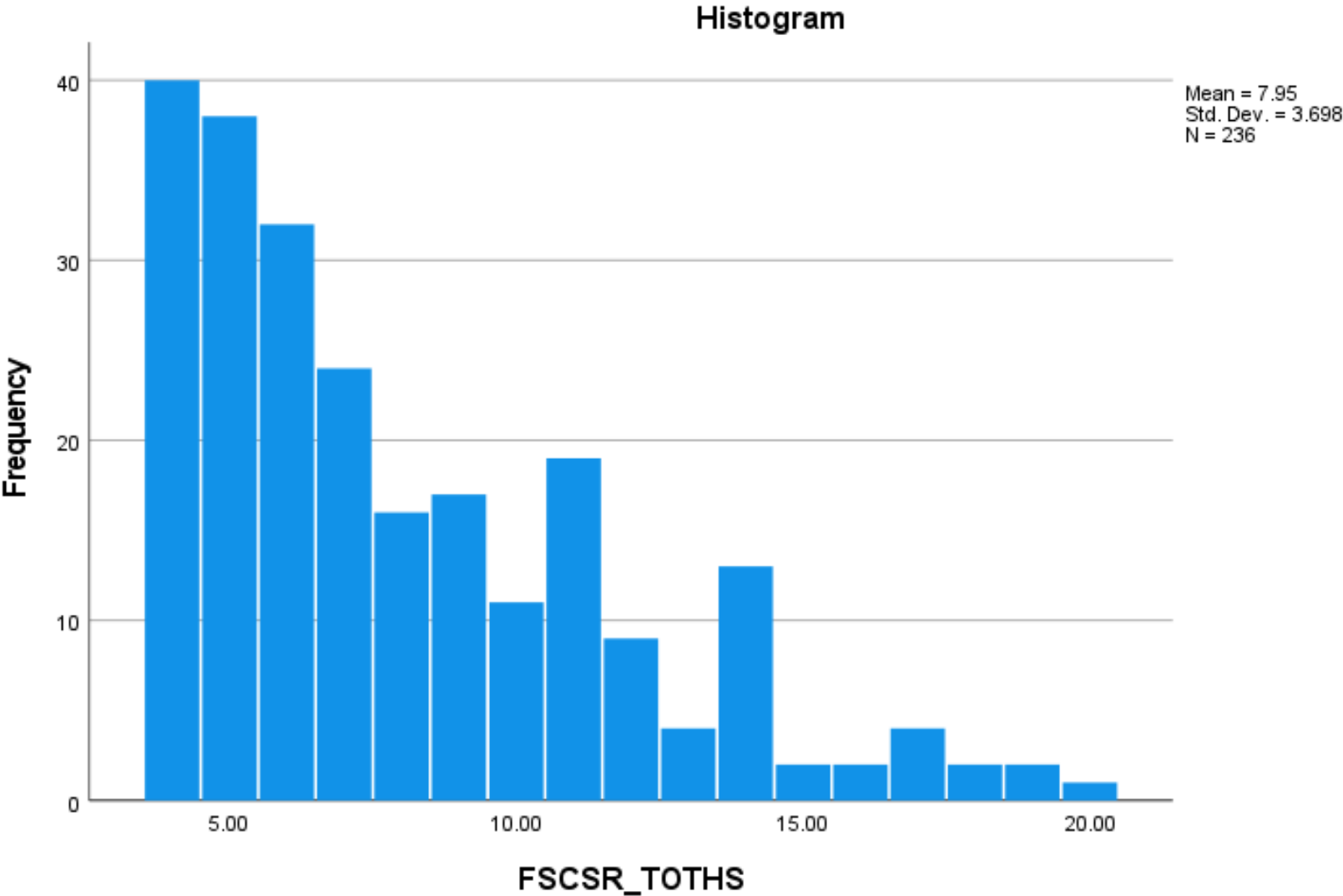
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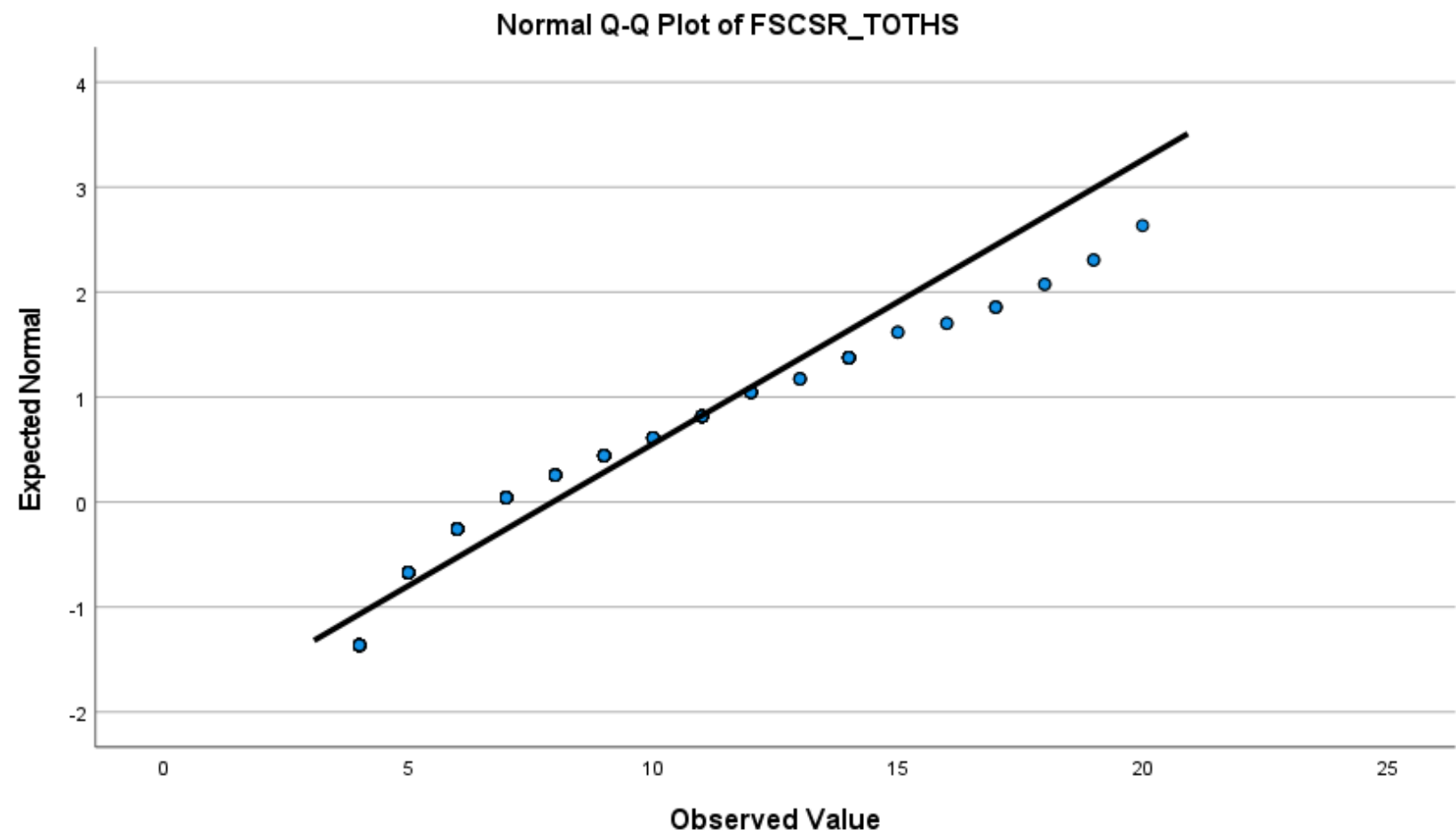
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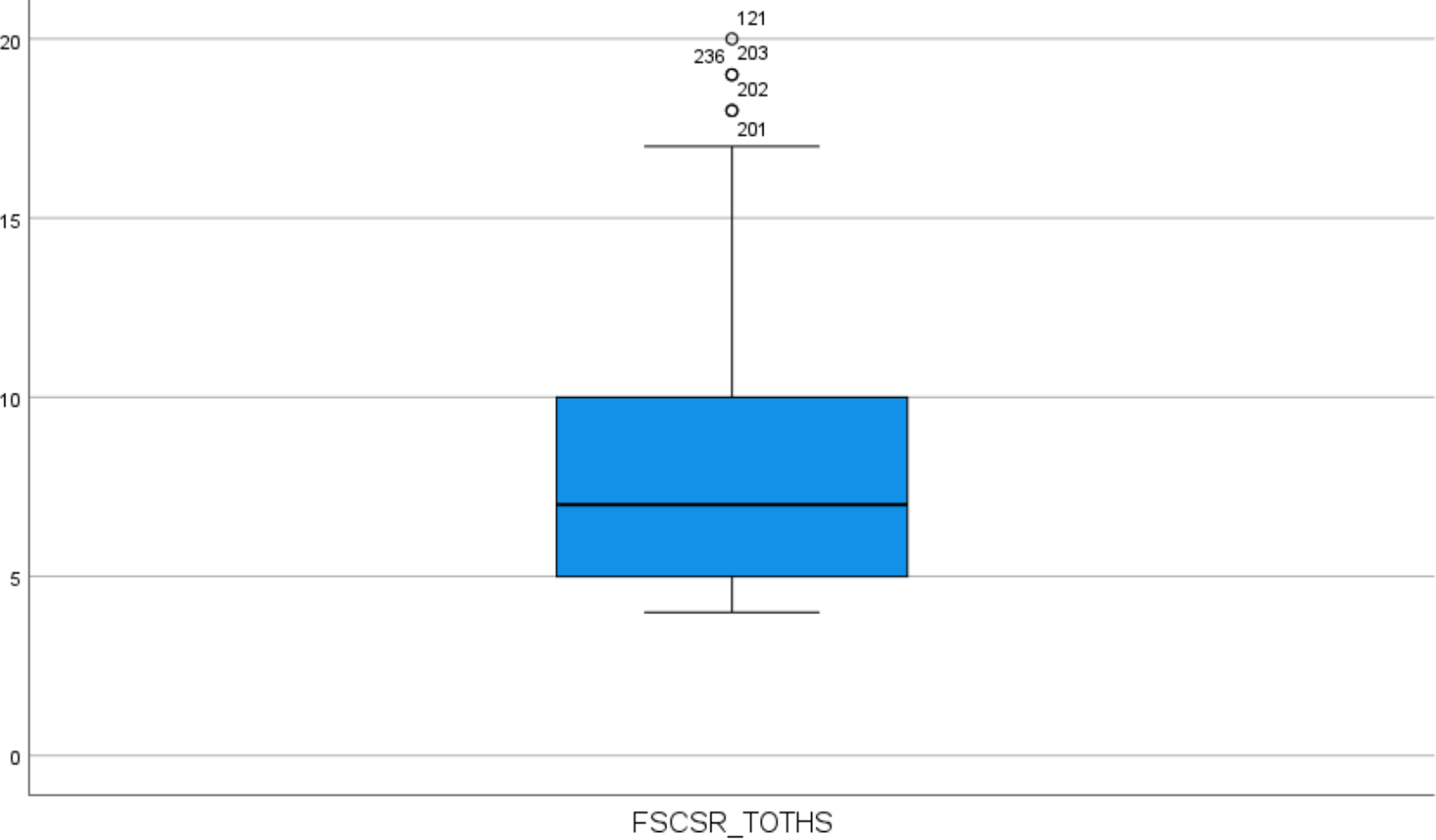
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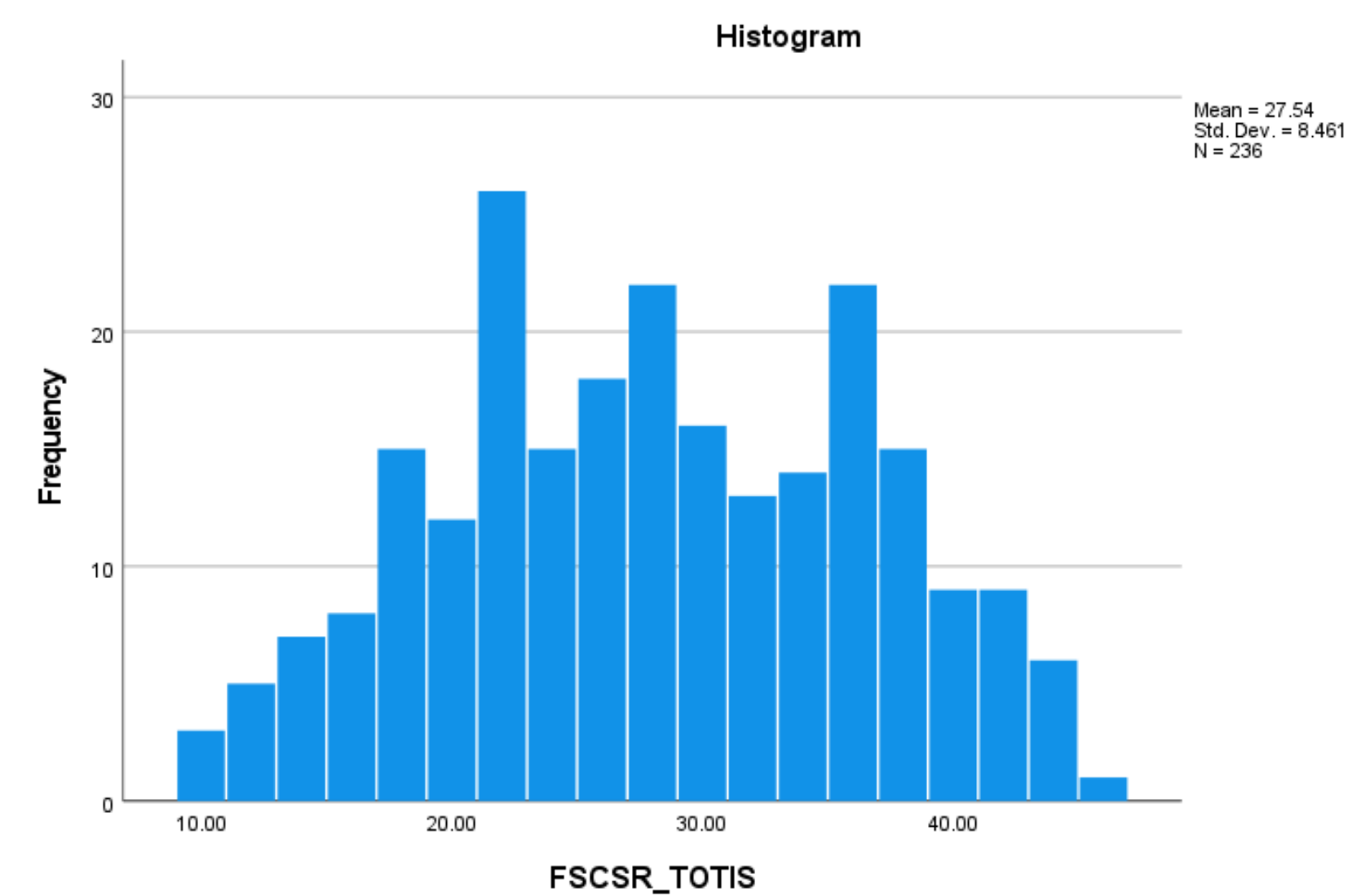
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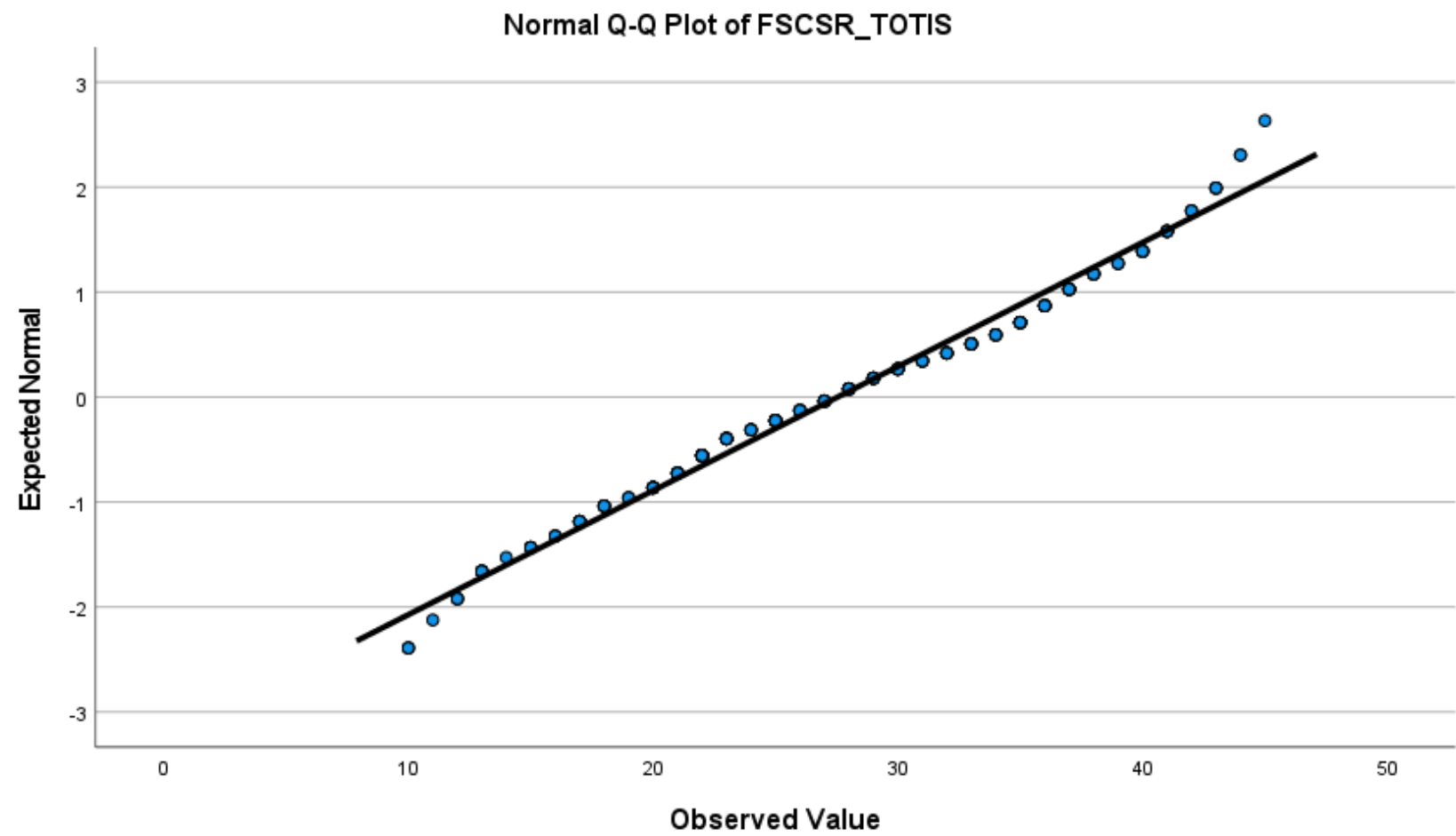
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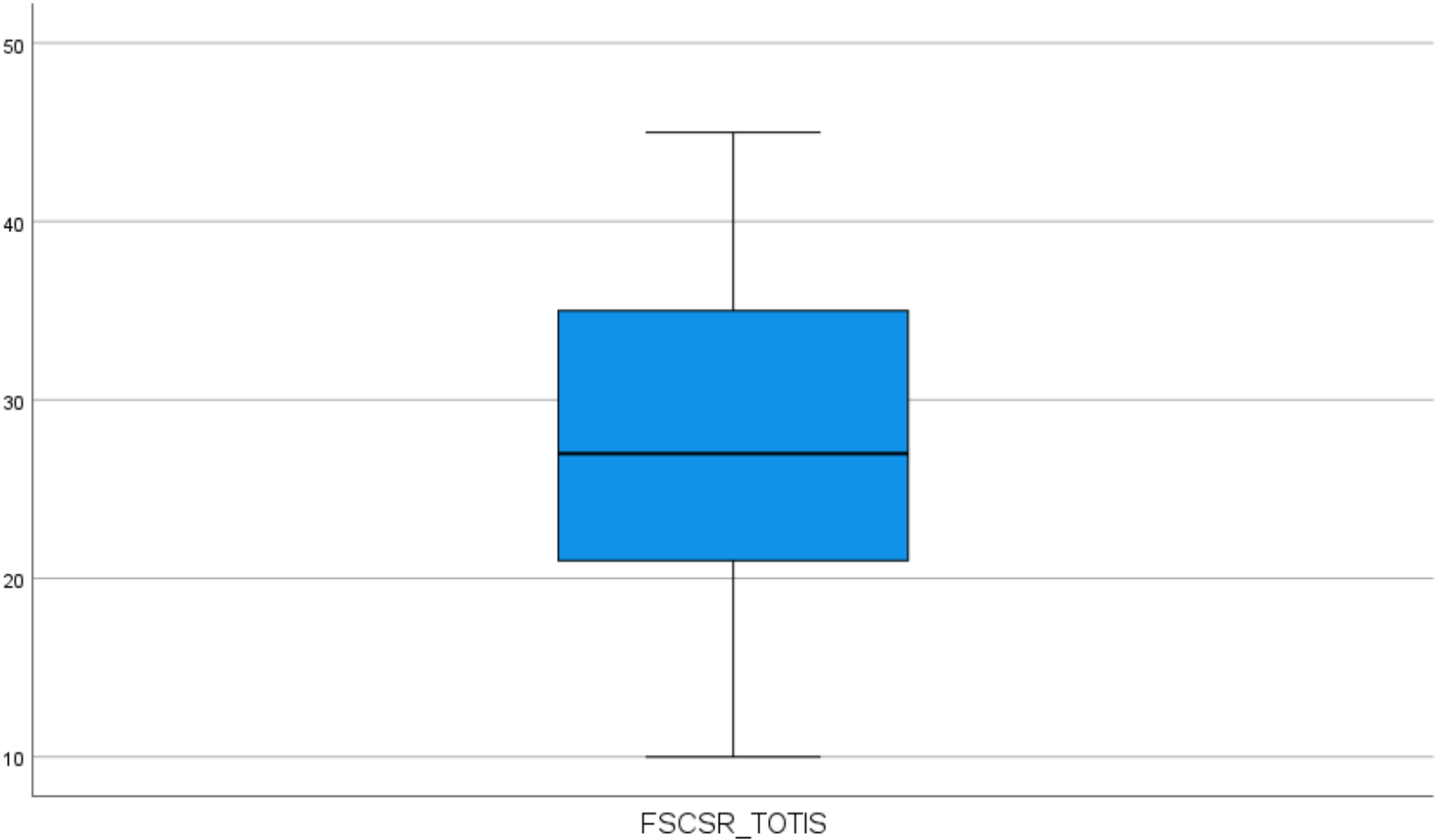
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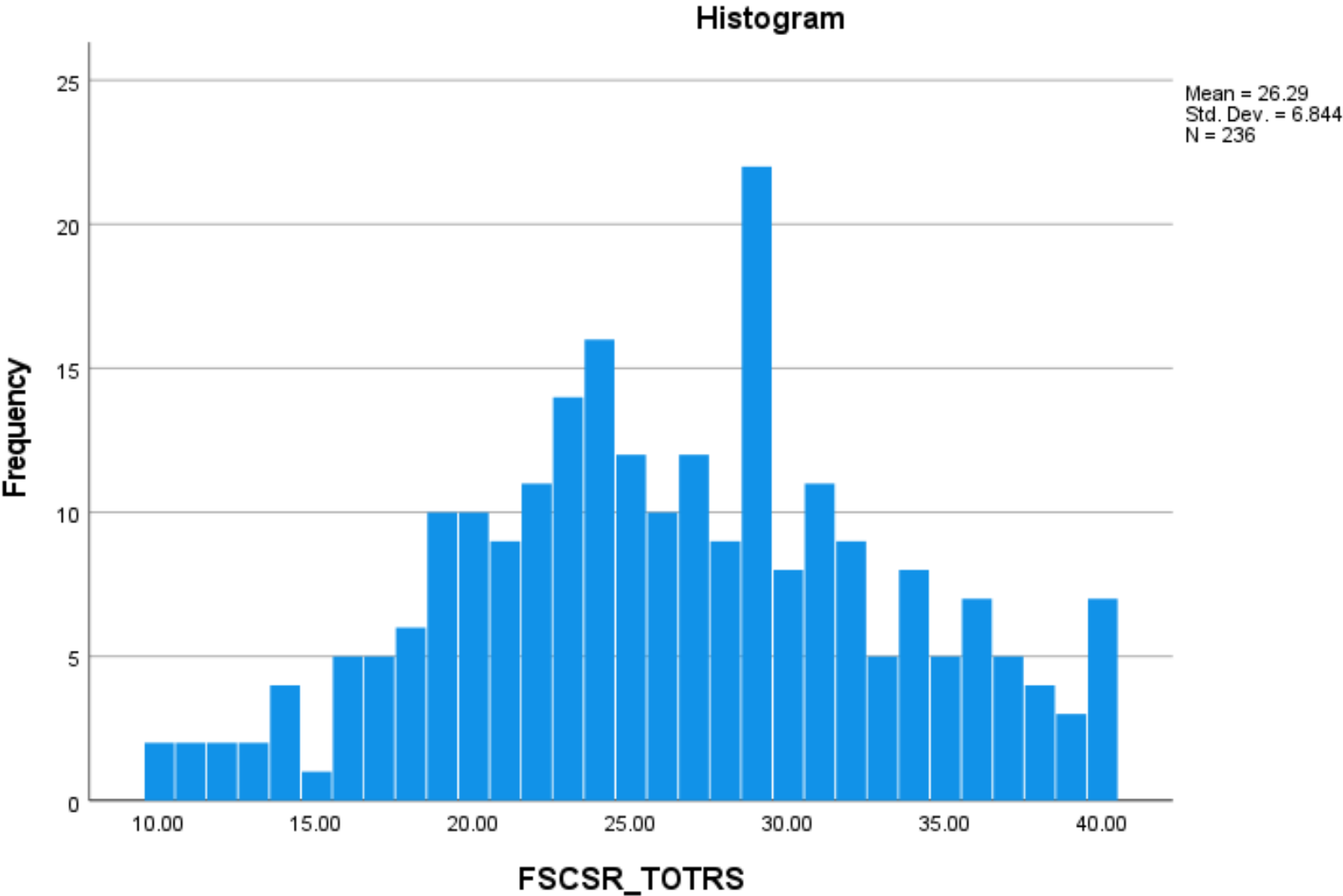
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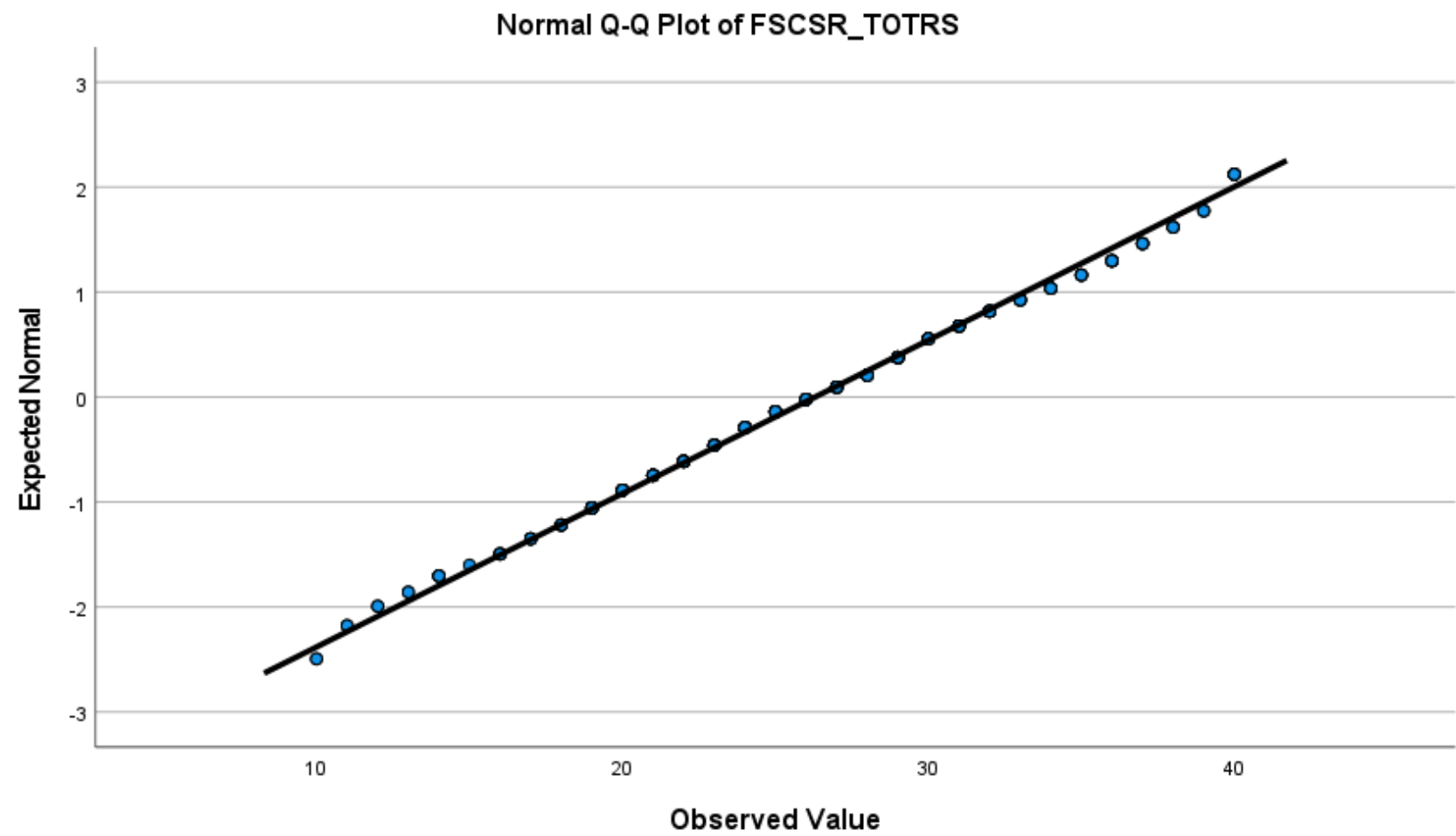
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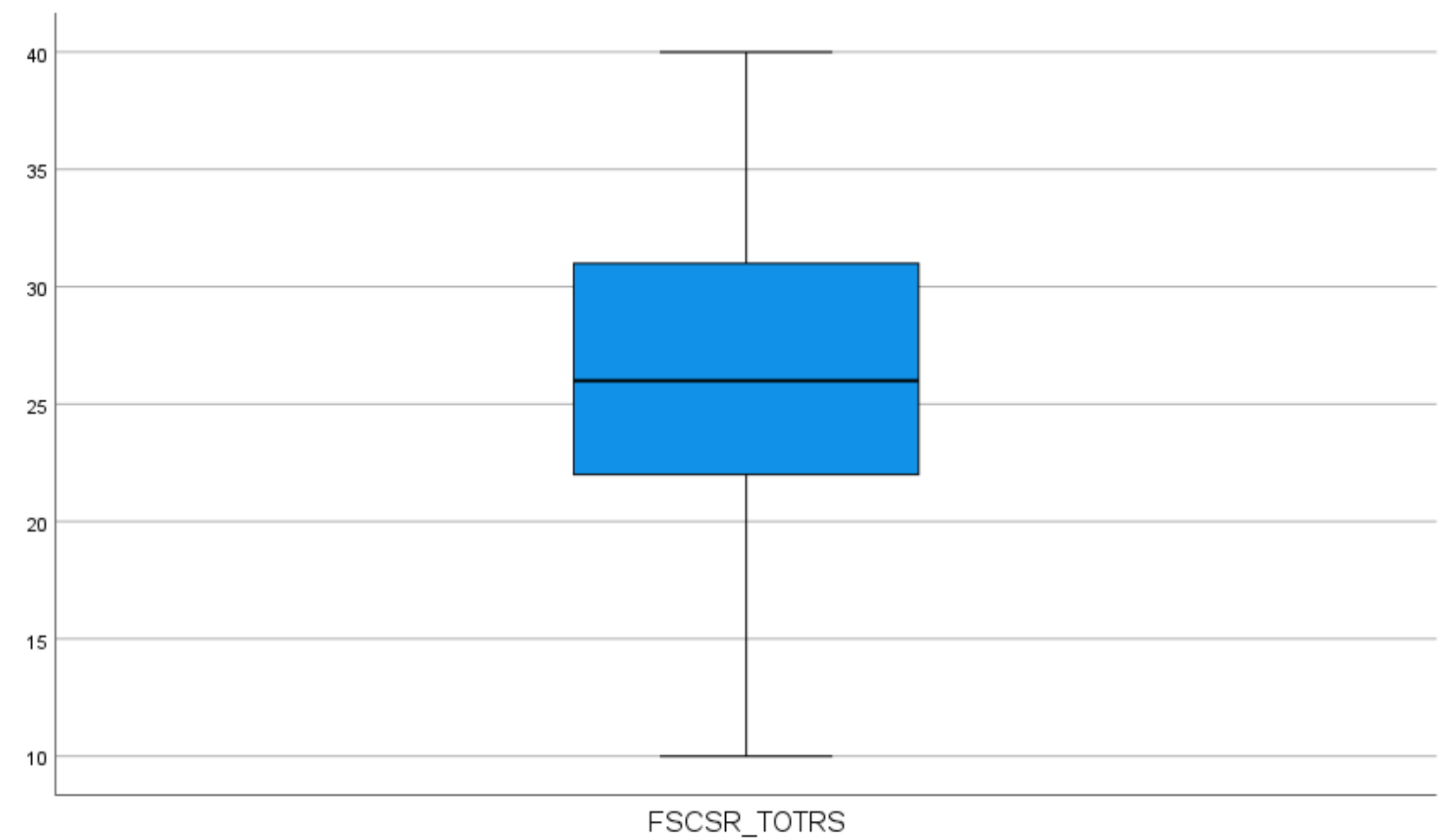
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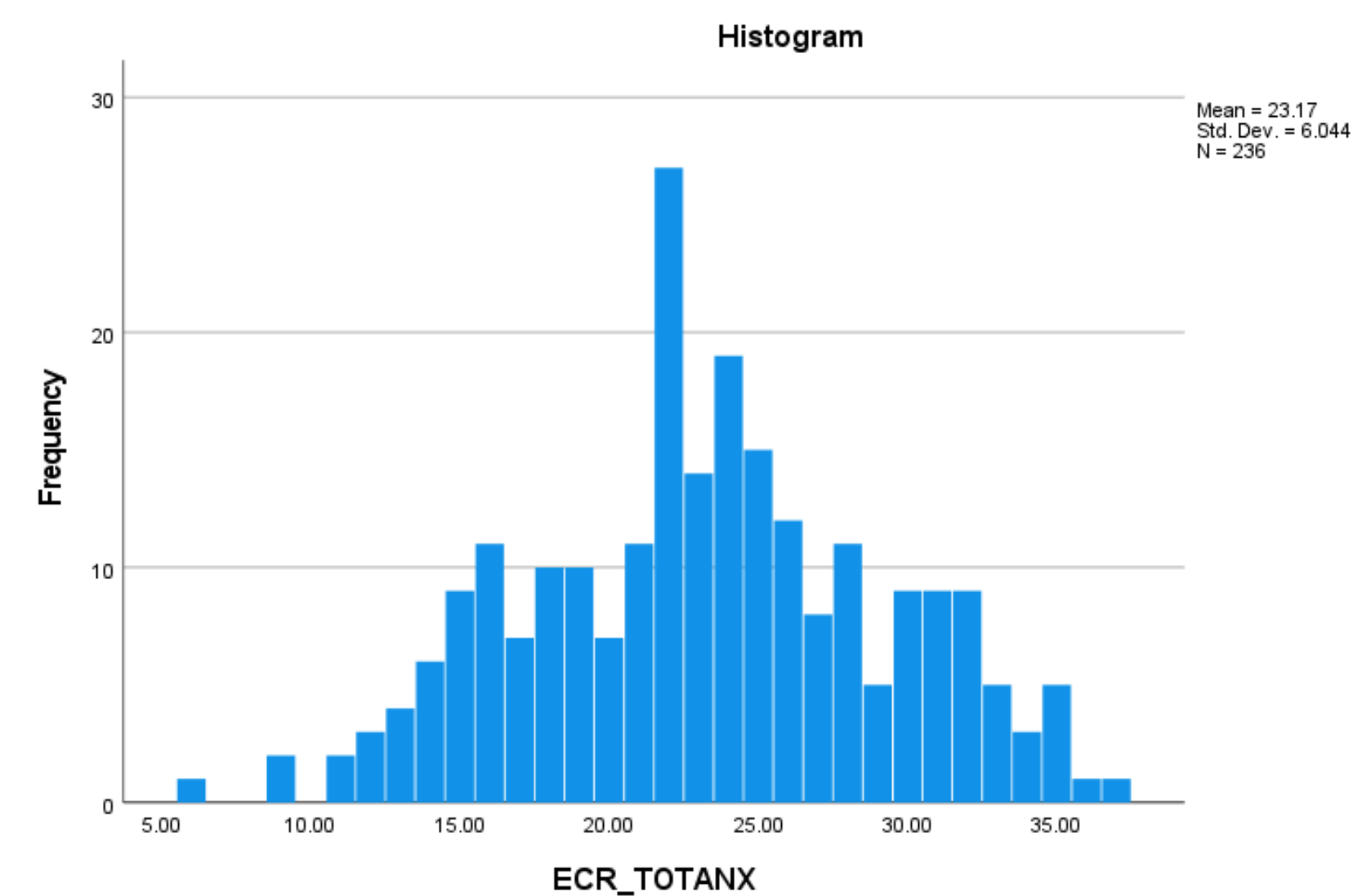
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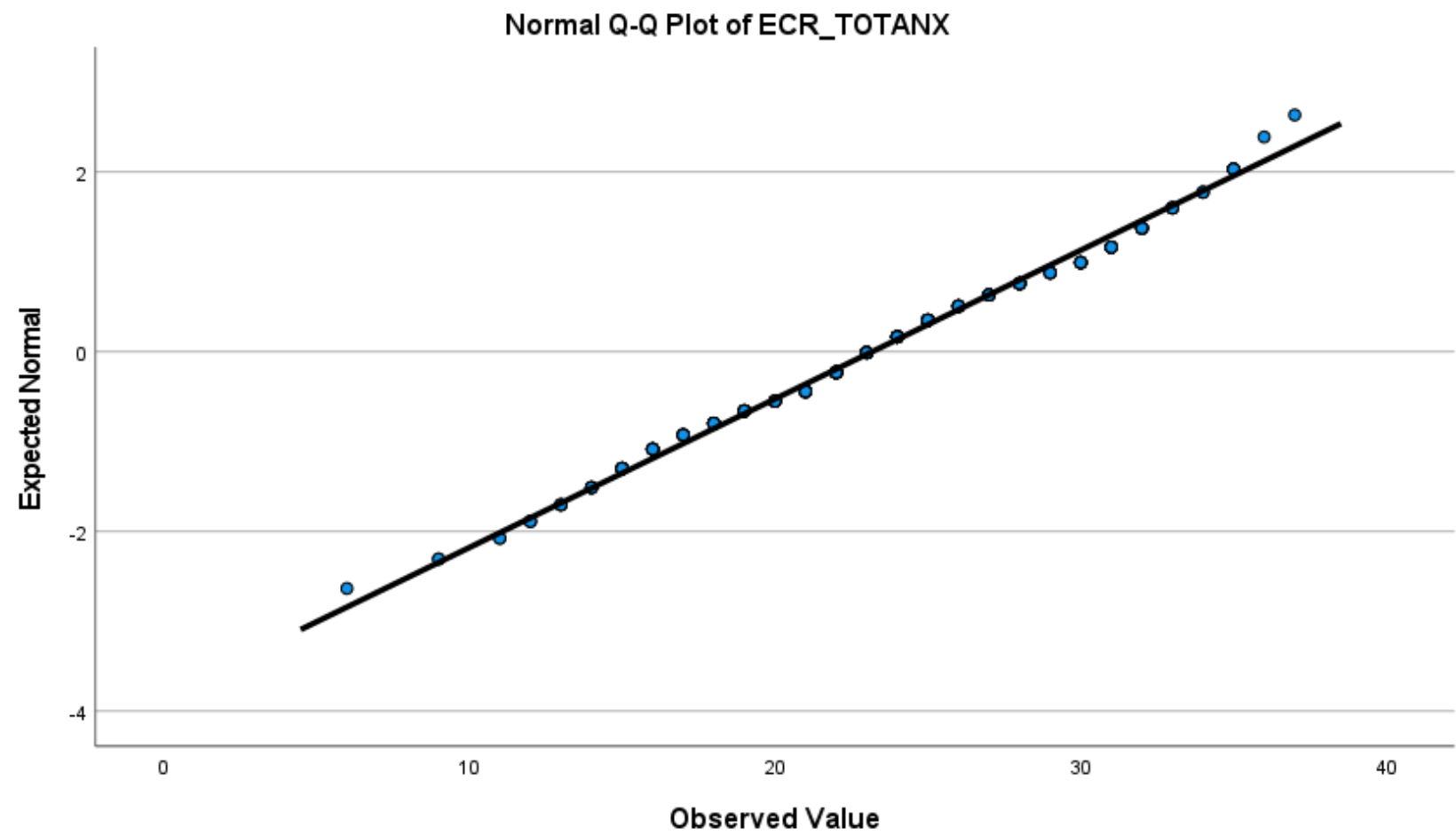
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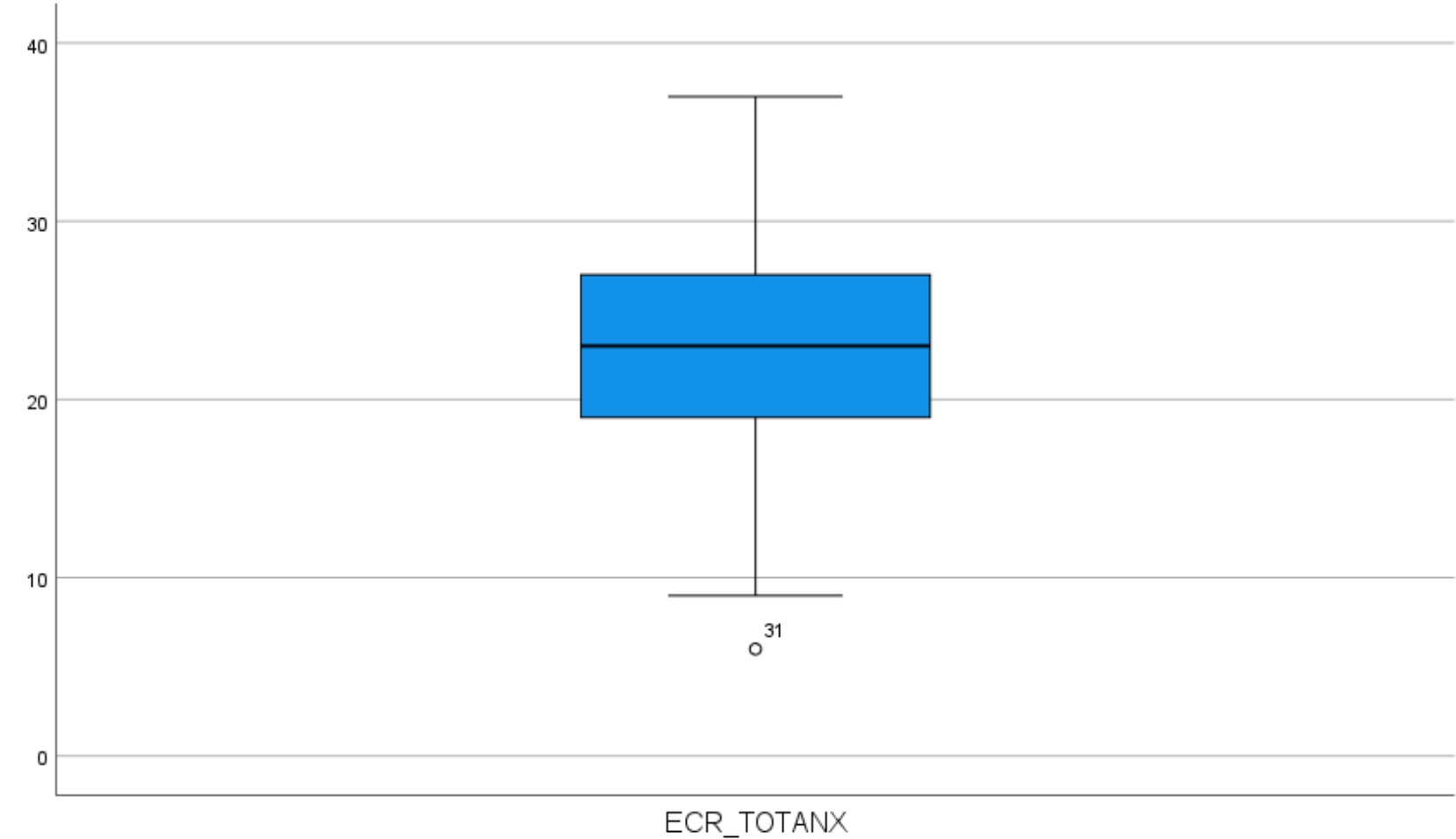
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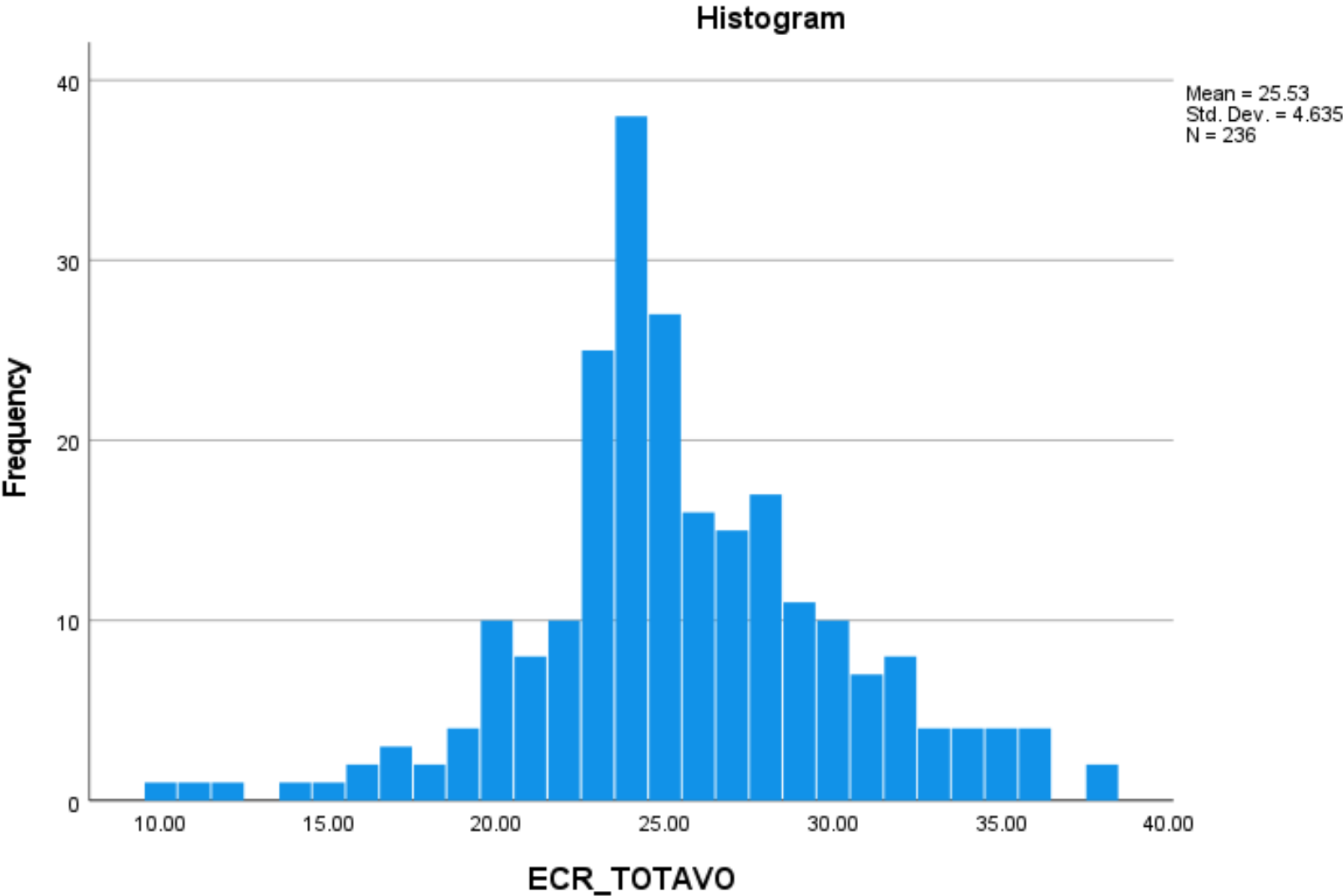
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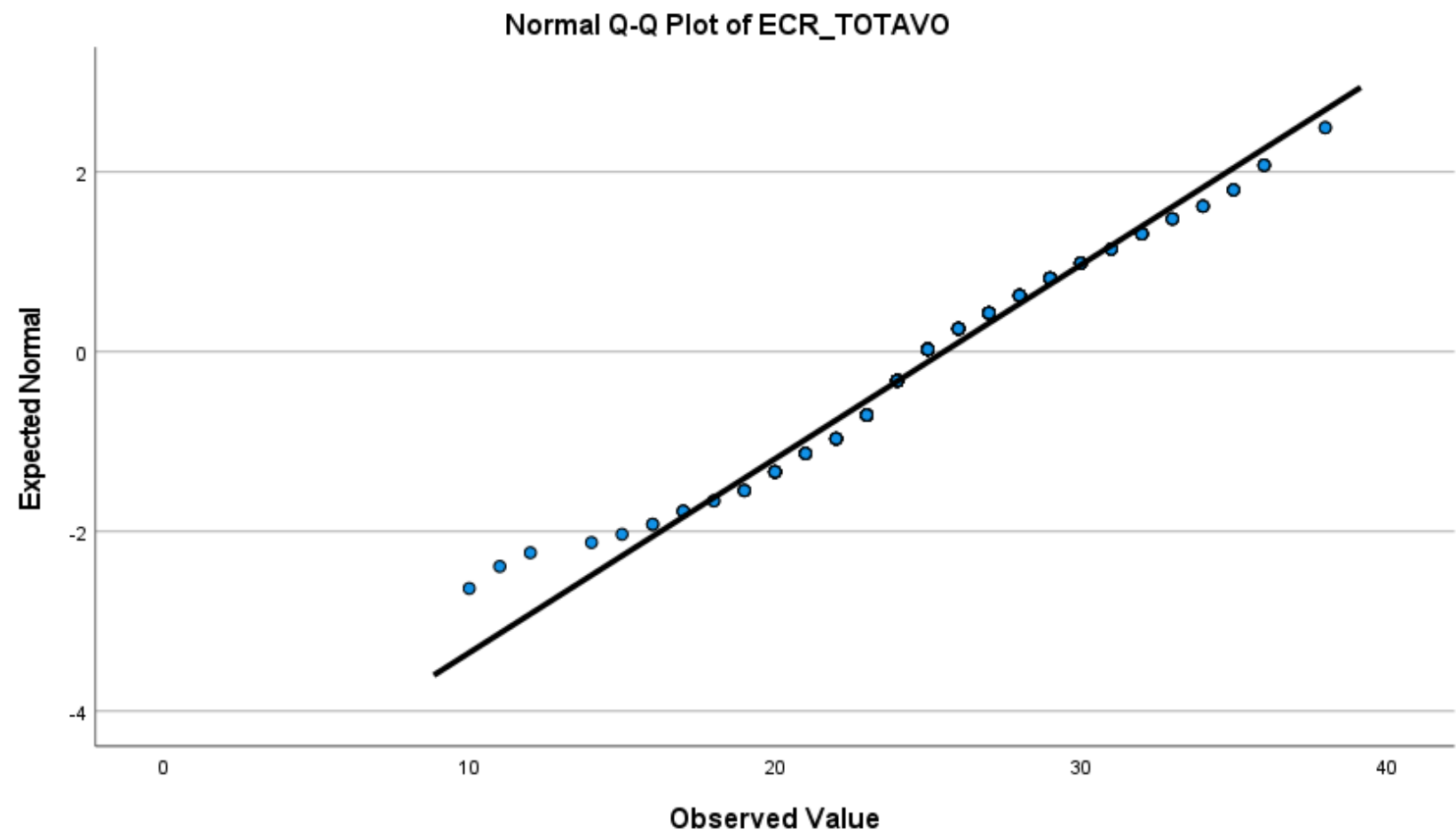
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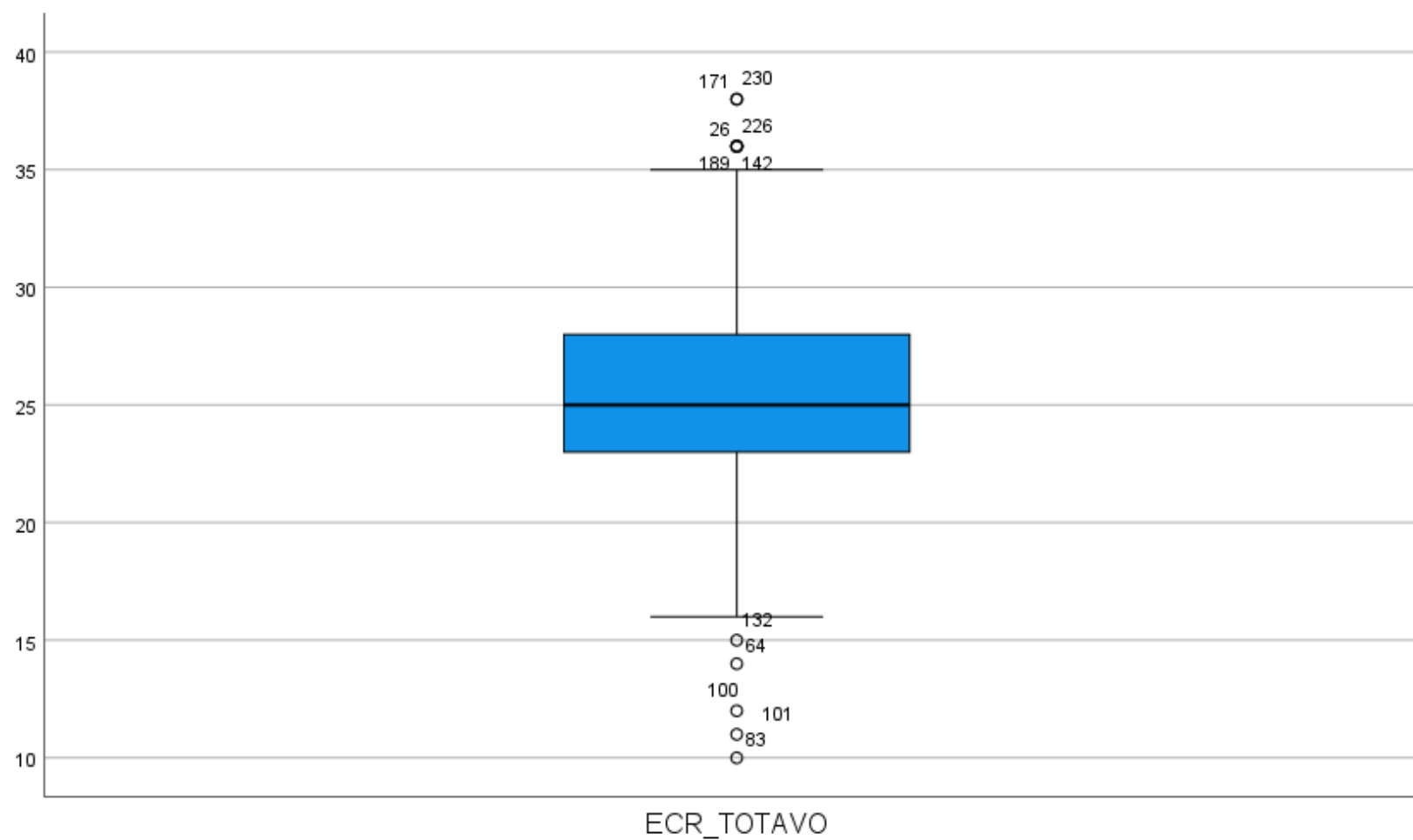
2.15 Cont.



2.15 Cont.



2.15 Cont.



2.16 Normality Tests Following Transformation of Non-Normal Variables

PANAS ‘Negative Affect’ Subscale Transformation

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
LogPANAS1	236	1.00	1.57	1.1456	.13893	1.180	.158	.796	.316
LogPANASAU	236	1.00	1.61	1.1995	.16423	.592	.158	-.722	.316
LogPANASCR	236	1.00	1.68	1.2317	.17838	.434	.158	-.773	.316
LogPANASCO	236	1.00	1.62	1.1272	.14590	1.193	.158	.782	.316
SqrtPANASCO	236	3.16	6.48	3.7164	.69159	1.573	.158	2.306	.316
SqrtPANASCR	236	3.16	6.93	4.2190	.90446	.767	.158	-.236	.316
SqrtPANASAU	236	3.16	6.40	4.0529	.80828	.865	.158	-.204	.316
SqrtPANAS1	236	3.16	6.08	3.7902	.66758	1.530	.158	1.952	.316
RecipPANAS1	236	.03	.10	.0748	.02015	-.591	.158	-.559	.316
RecipPANASAU	236	.02	.10	.0674	.02273	-.109	.158	-1.185	.316
RecipPANASCR	236	.02	.10	.0634	.02379	.139	.158	-1.141	.316
RecipPANASCO	236	.02	.10	.0784	.02187	-.658	.158	-.765	.316
PANAS1_TOT	236	10.00	37.00	14.8093	5.76358	1.908	.158	3.491	.316
PANASAU_TOT	236	10.00	41.00	17.0763	7.14310	1.161	.158	.584	.316
PANASCRVT_TOT	236	10.00	48.00	18.6144	8.30071	1.124	.158	.637	.316
PANASCOVT_TOT	236	10.00	42.00	14.2881	5.92090	2.041	.158	4.622	.316
Valid N (listwise)	236								

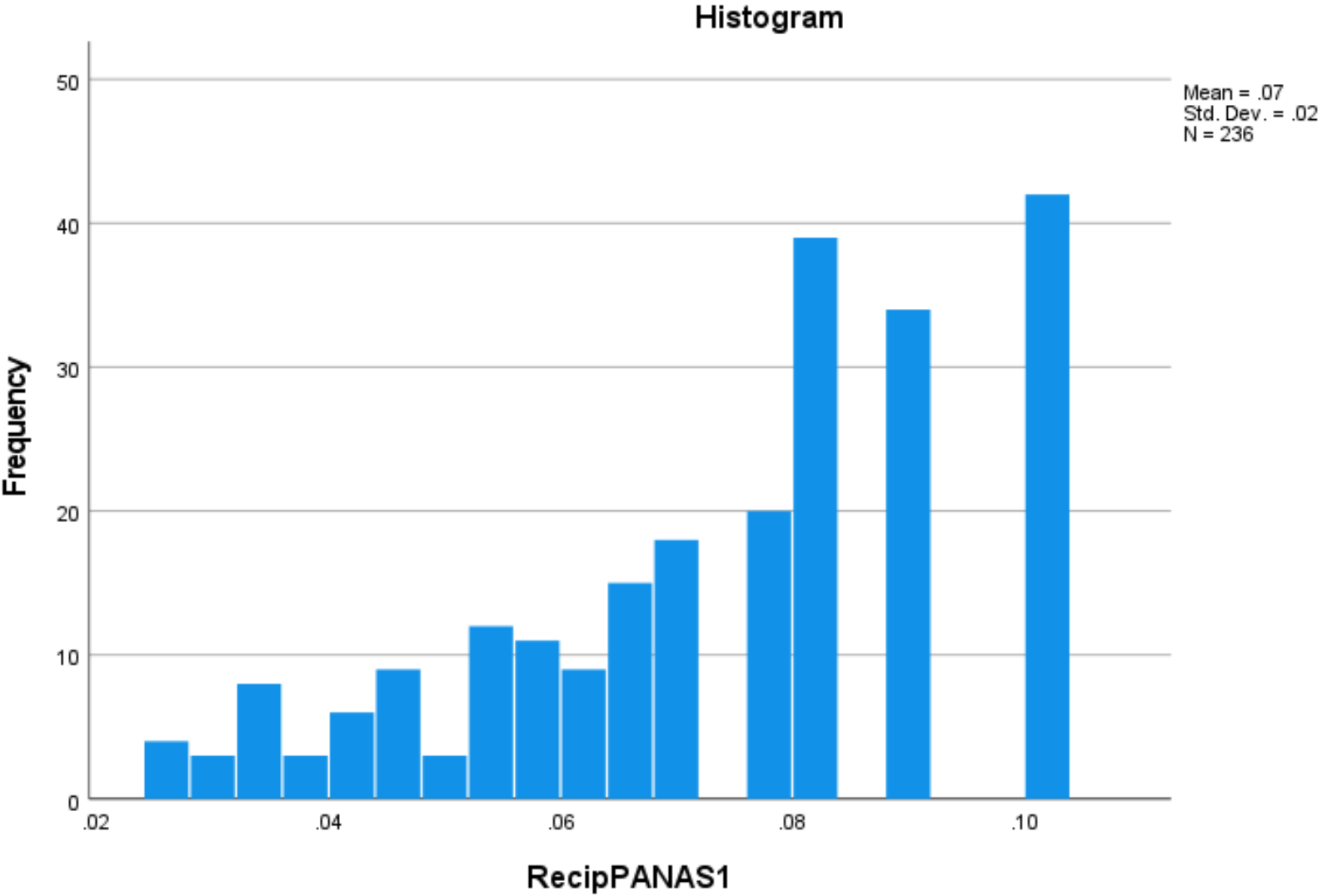
2.16 Cont.

Tests of Normality

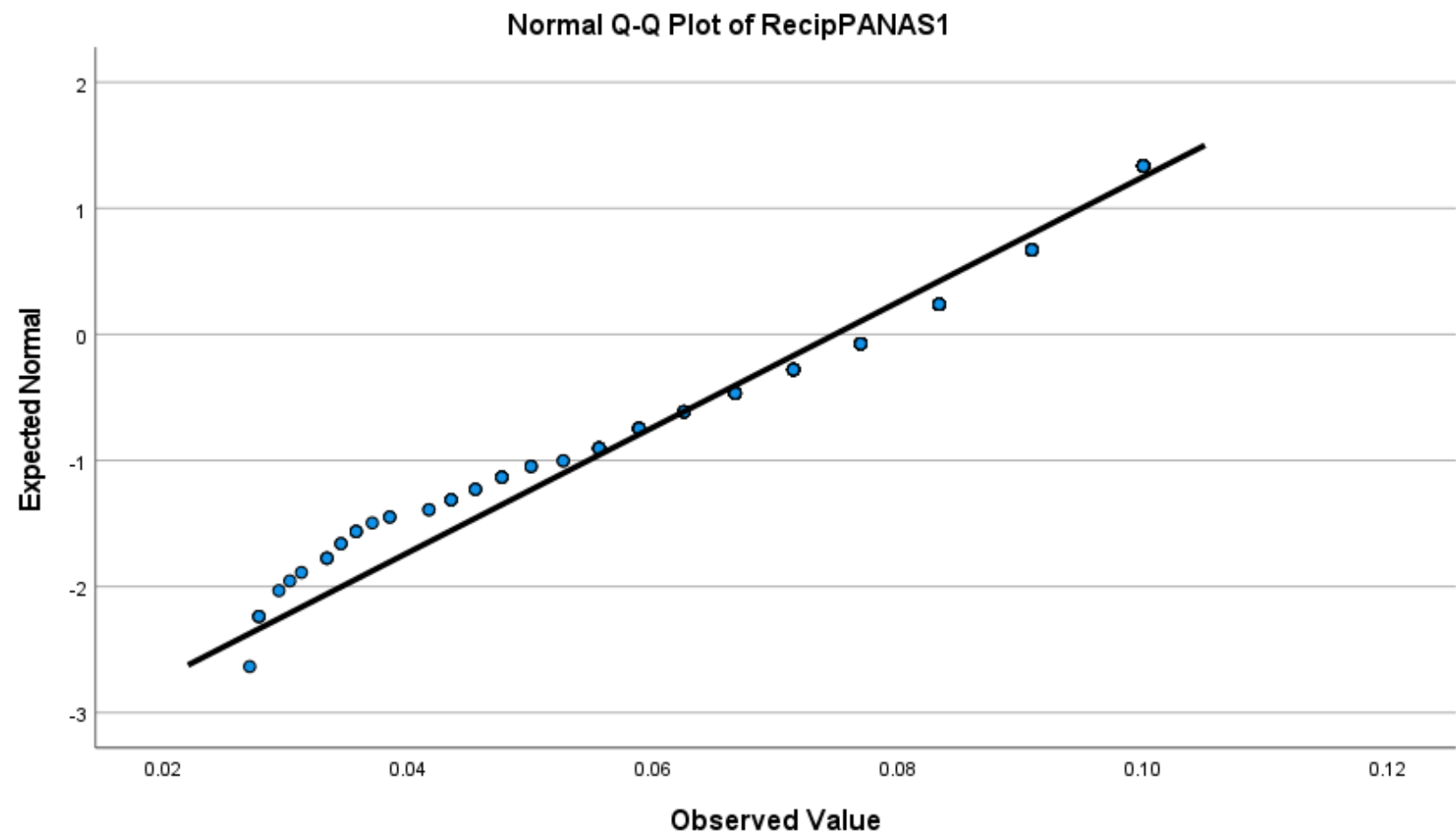
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LogPANAS1	.171	236	.000	.870	236	.000
LogPANASAU	.127	236	.000	.922	236	.000
LogPANASCR	.097	236	.000	.941	236	.000
LogPANASCO	.192	236	.000	.833	236	.000
SqrtPANASCO	.211	236	.000	.795	236	.000
SqrtPANASCR	.121	236	.000	.918	236	.000
SqrtPANASAU	.150	236	.000	.897	236	.000
SqrtPANAS1	.181	236	.000	.823	236	.000
RecipPANAS1	.151	236	.000	.927	236	.000
RecipPANASAU	.101	236	.000	.939	236	.000
RecipPANASCR	.105	236	.000	.938	236	.000
RecipPANASCO	.190	236	.000	.869	236	.000
PANAS1_TOT	.204	236	.000	.765	236	.000
PANASAU_TOT	.174	236	.000	.860	236	.000
PANASCRVT_TOT	.150	236	.000	.878	236	.000
PANASCOVT_TOT	.234	236	.000	.741	236	.000

a. Lilliefors Significance Correction

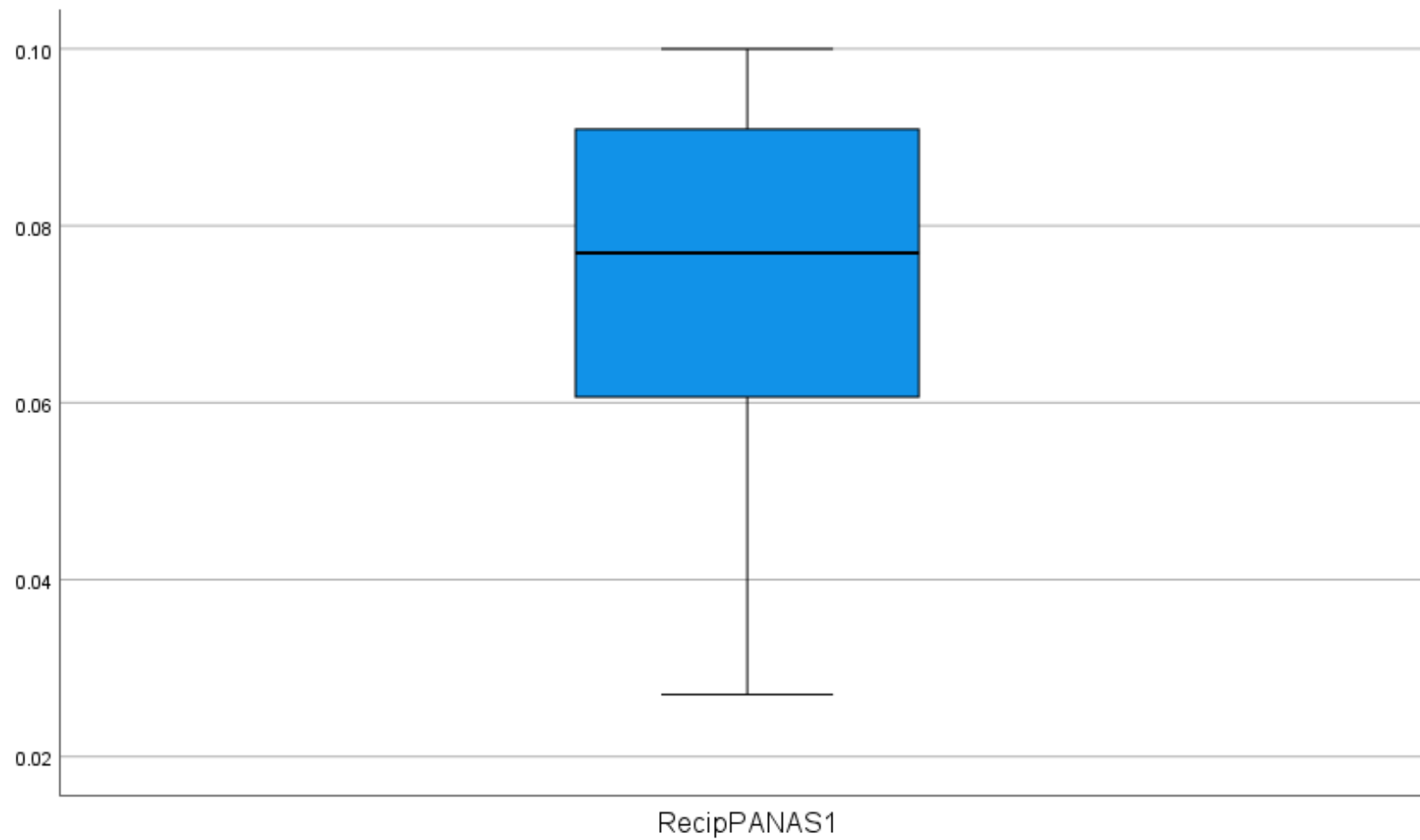
2.16 Cont.



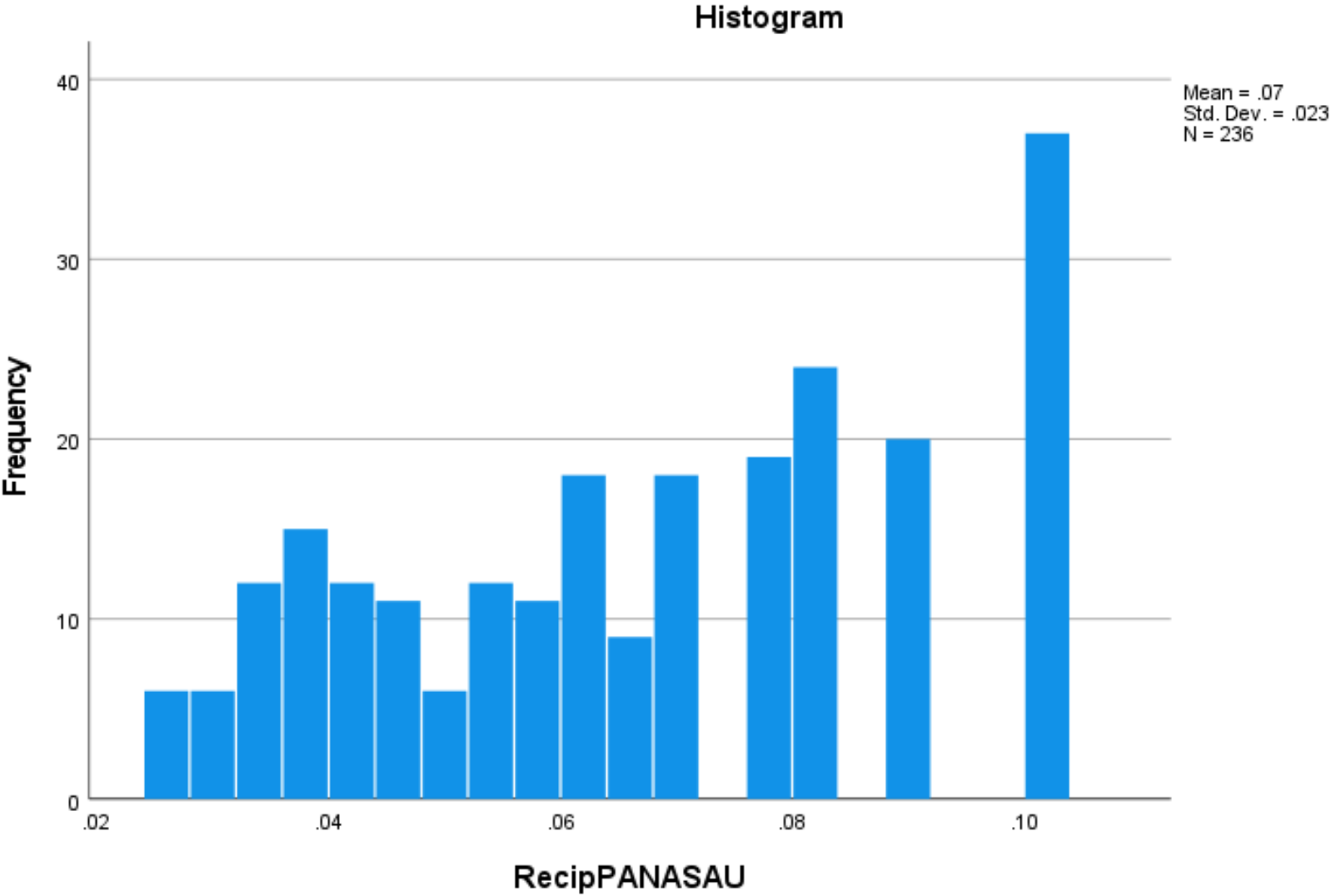
2.16 Cont.



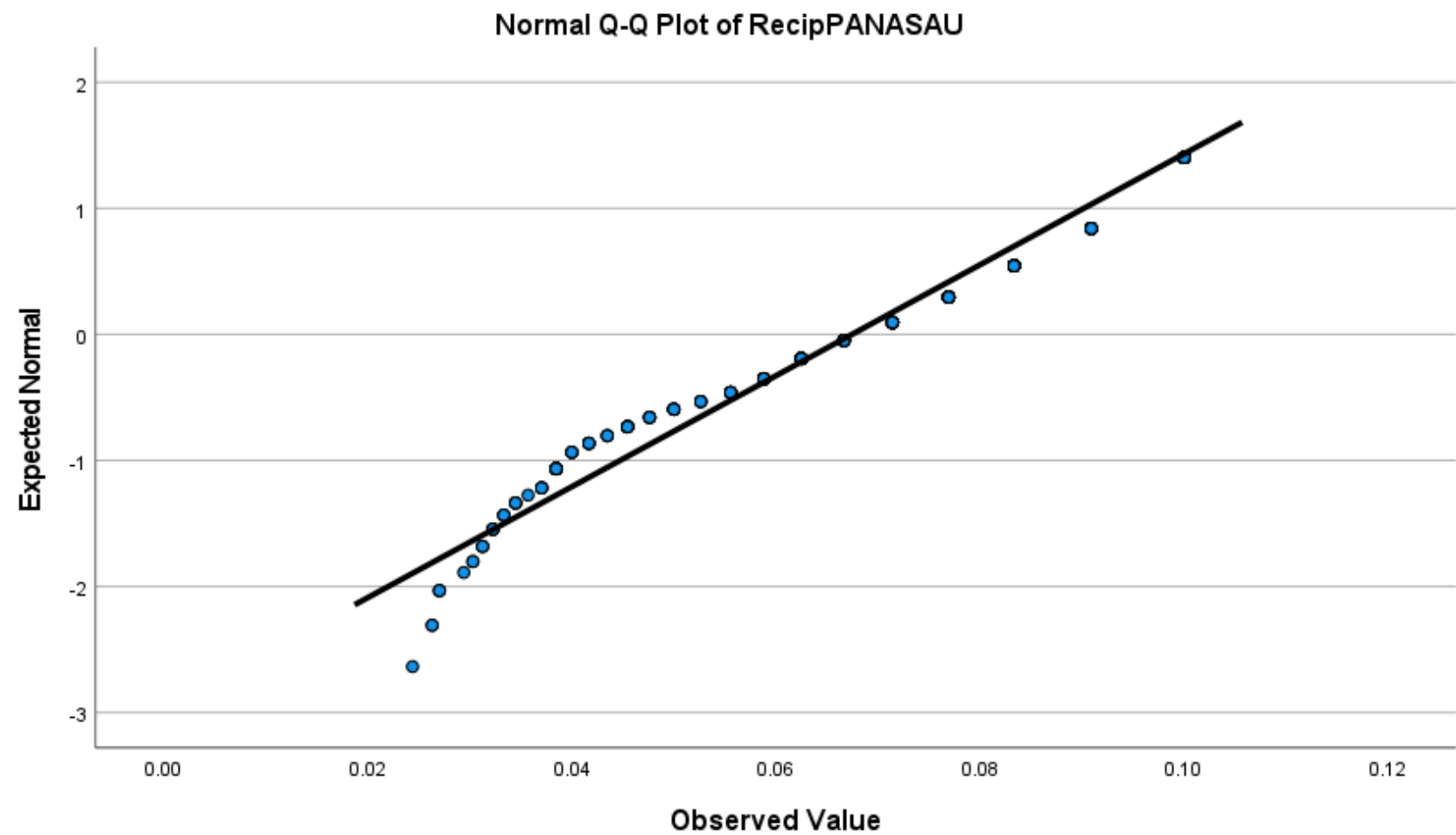
2.16 Cont.



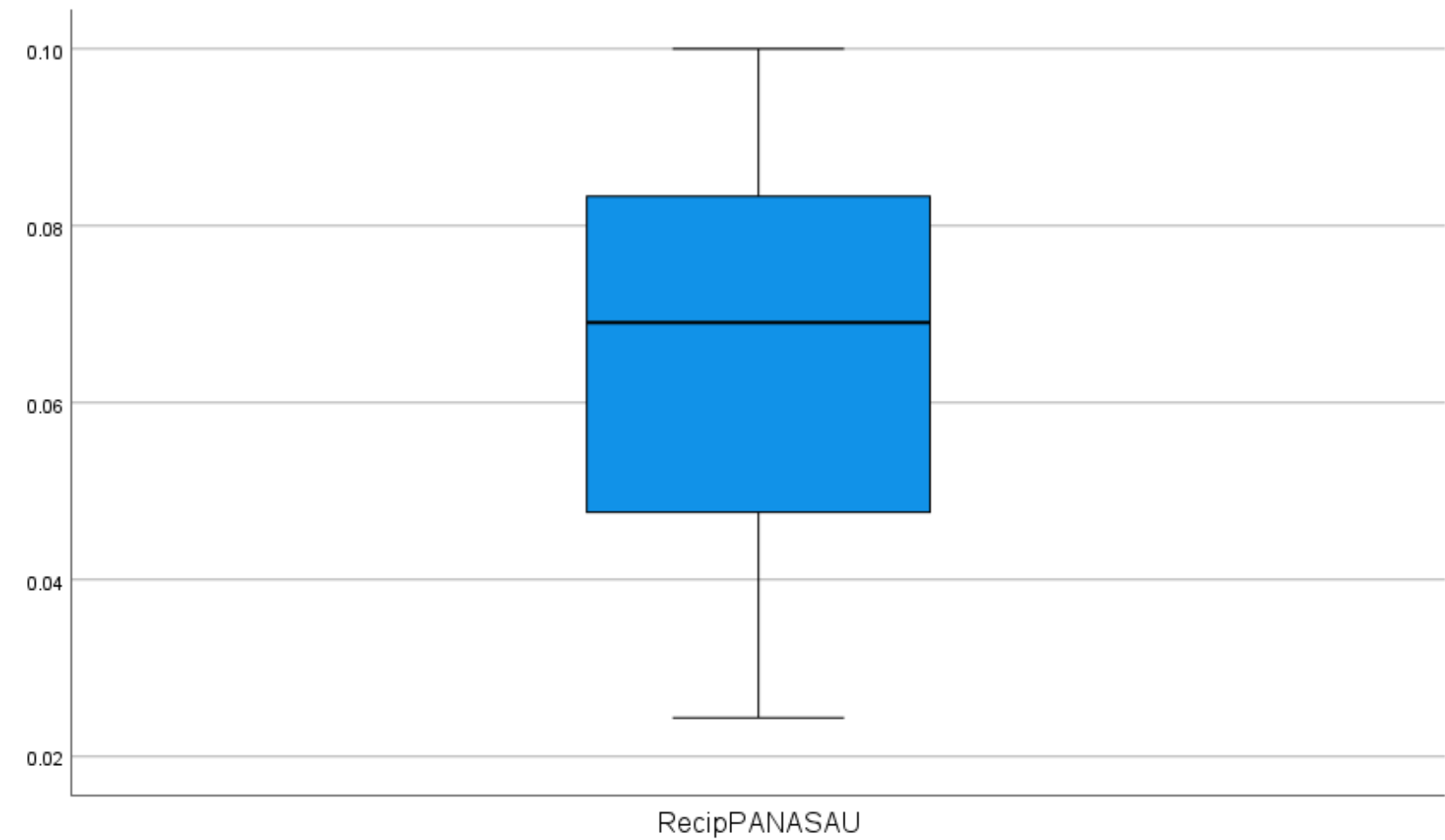
2.16 Cont.



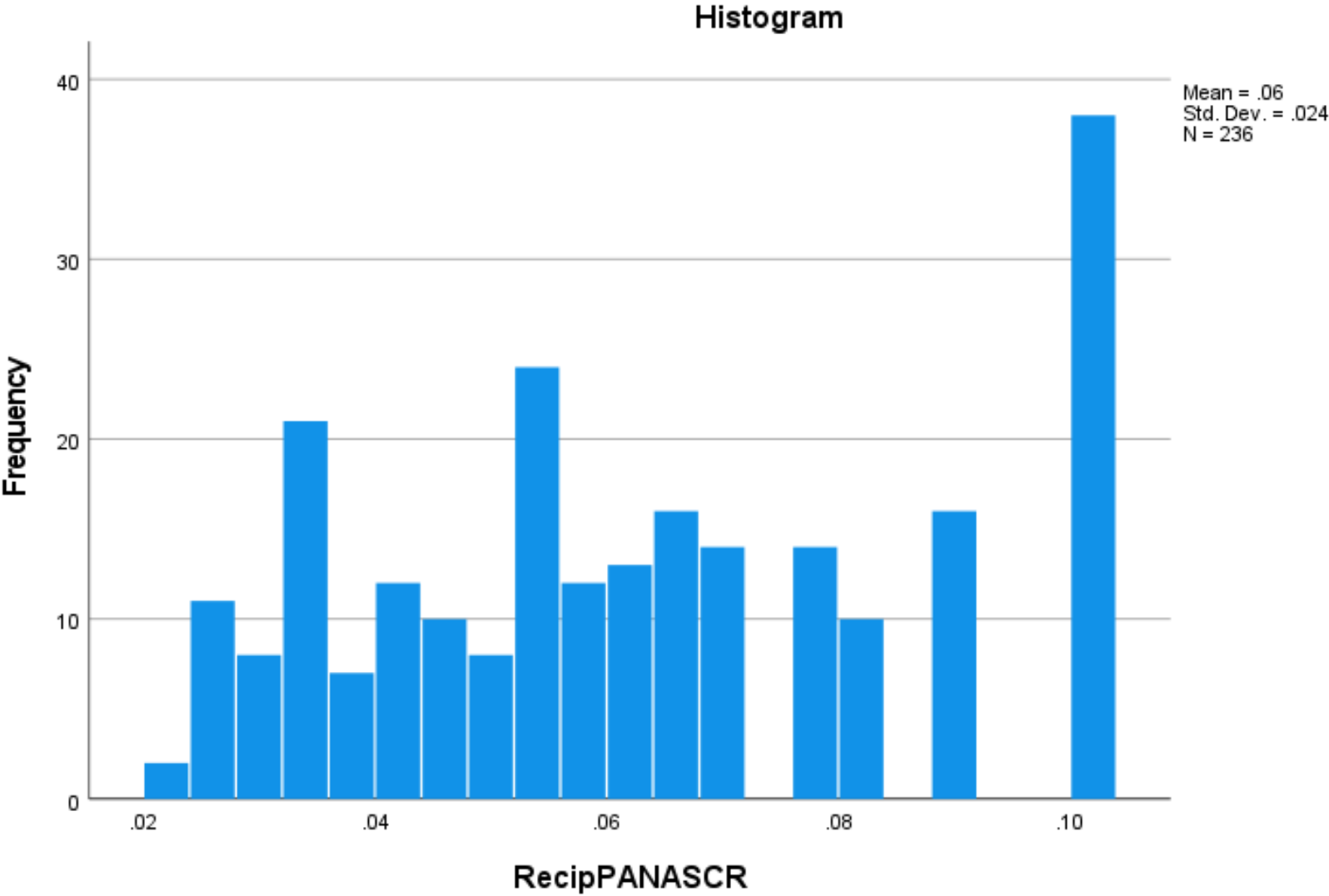
2.16 Cont.



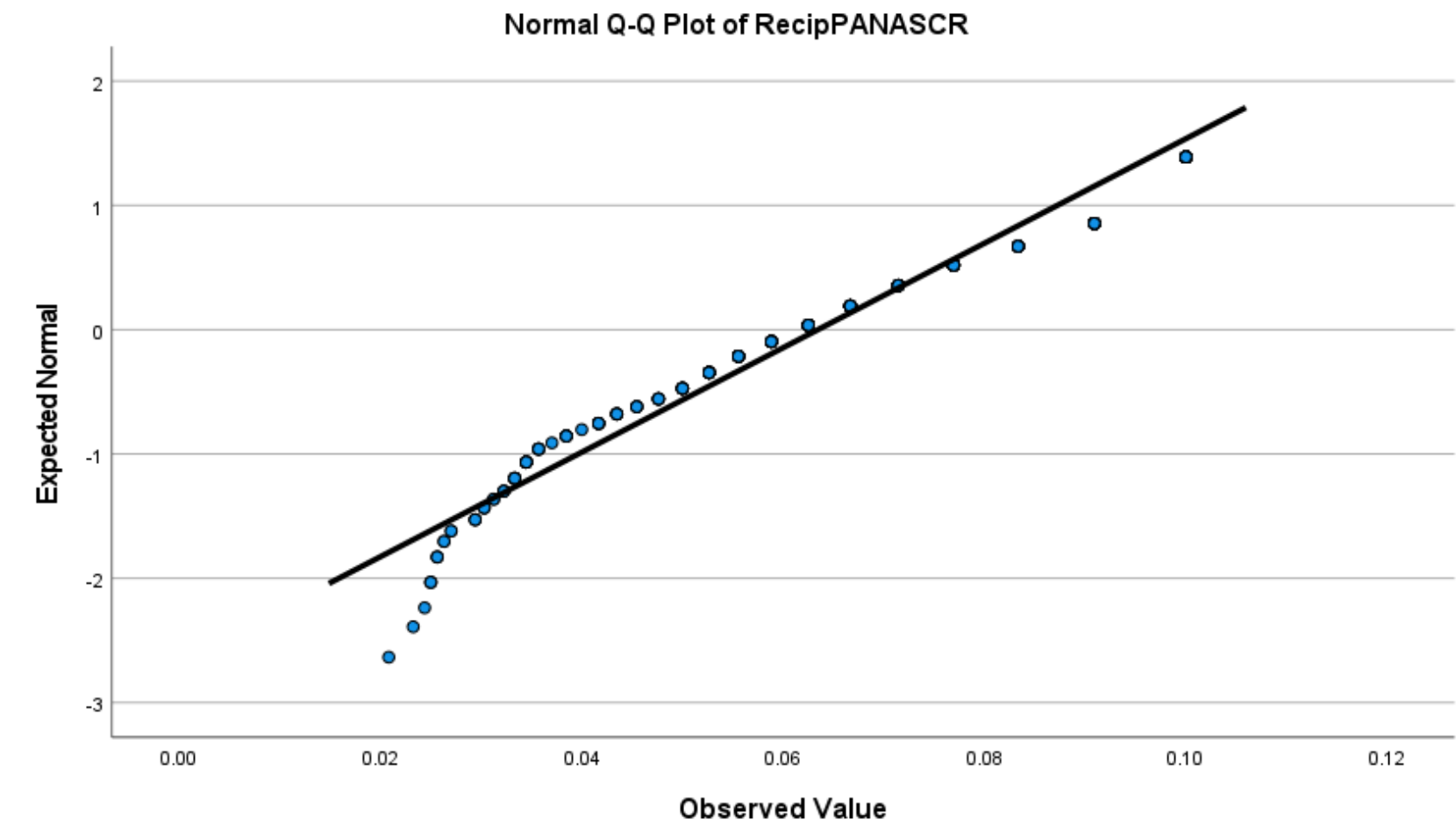
2.16 Cont.



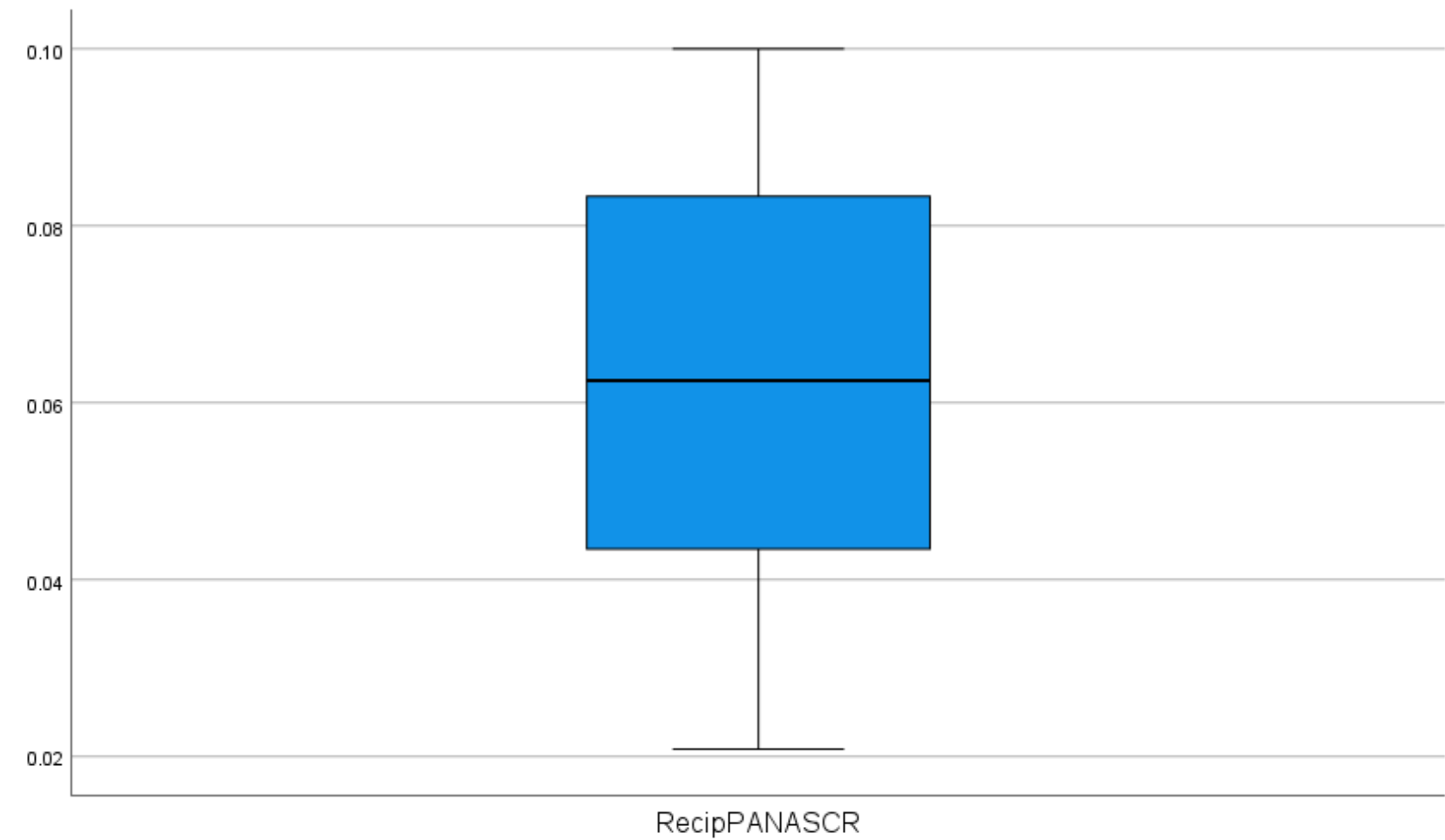
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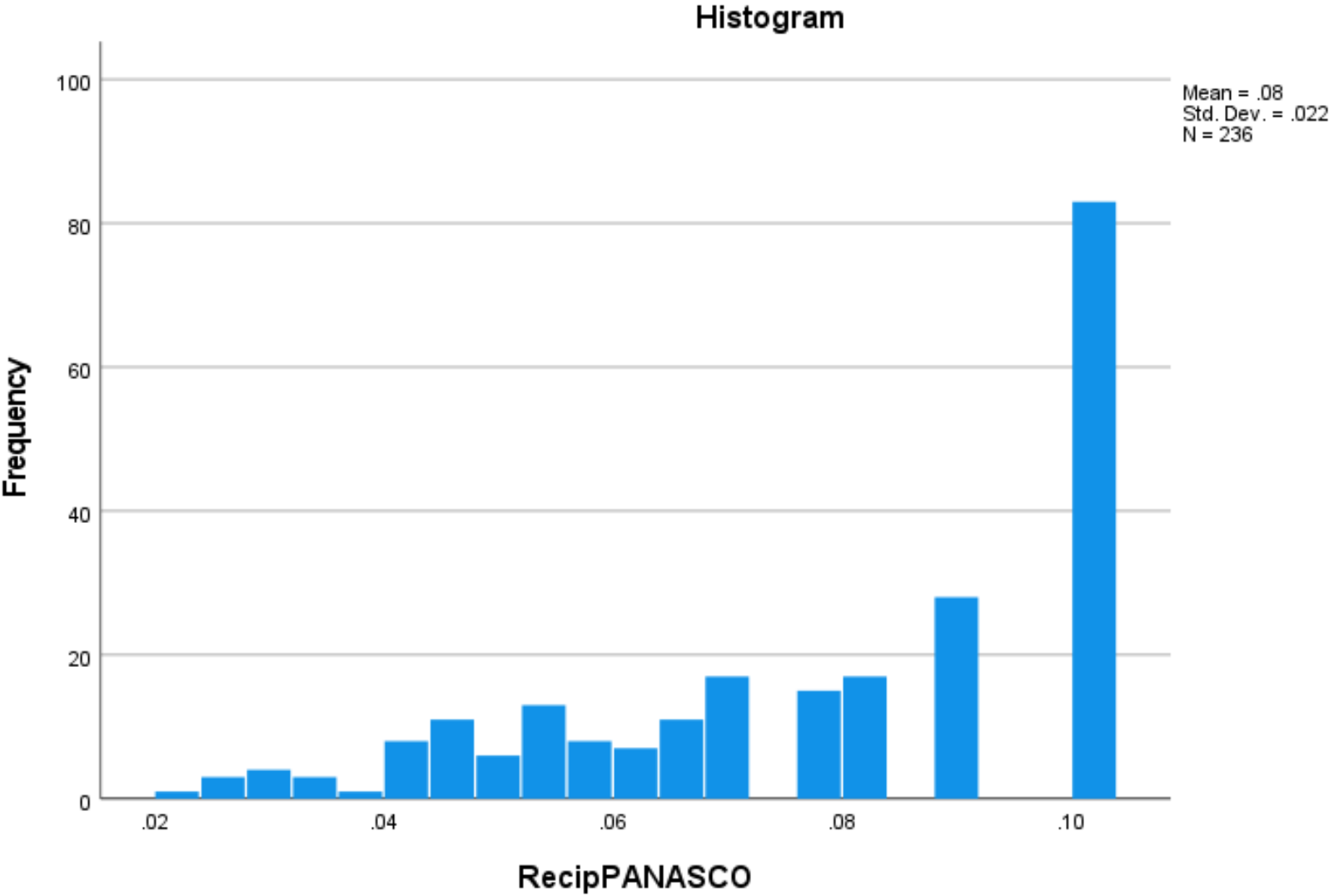
2.16 Cont.



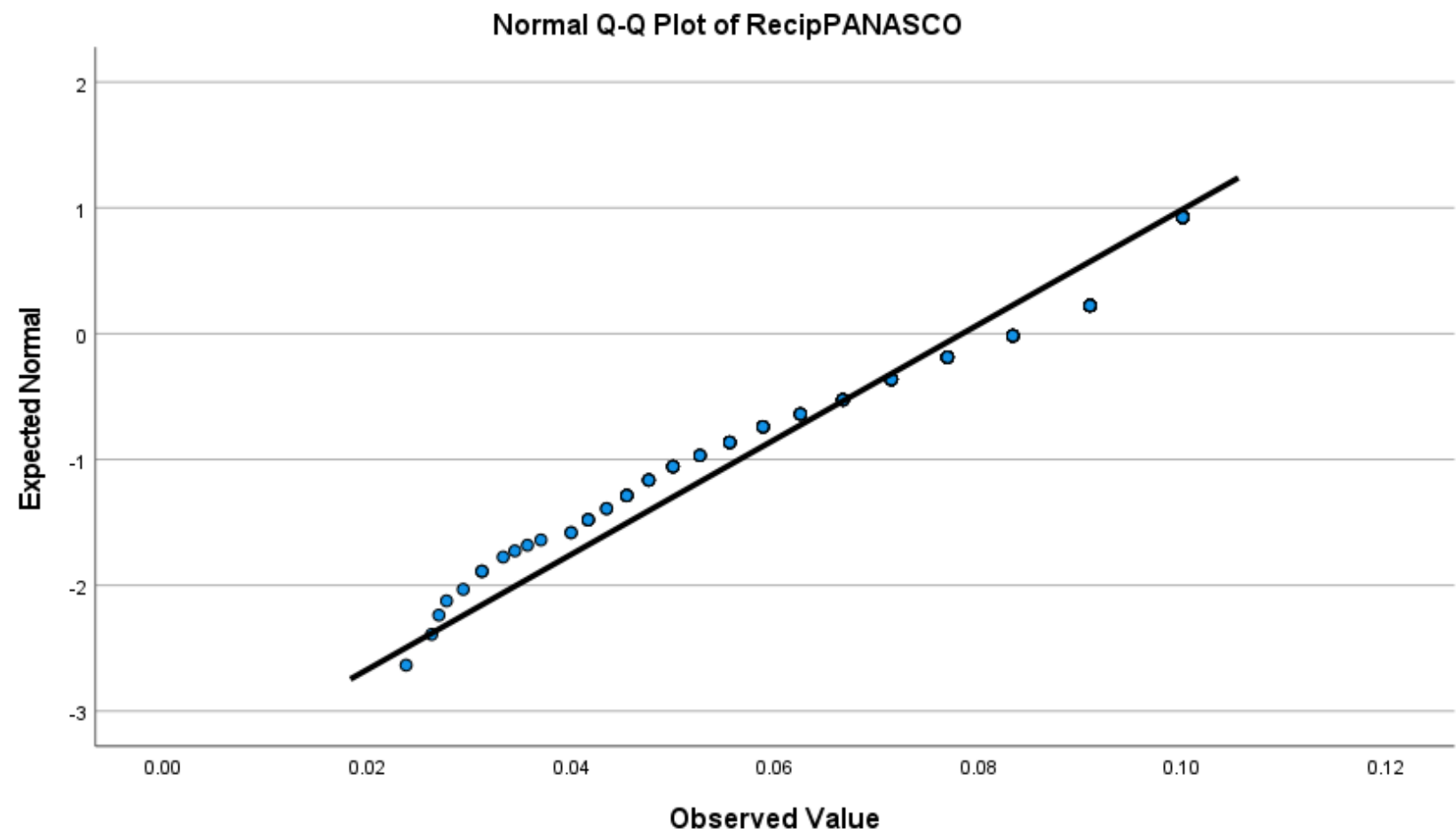
2.16 Cont.



2.16 Cont.



2.16 Cont.



2.16 Cont.

