Evaluating Depression, Anxiety, and Stress Assessment Before and During the COVID-19 Pandemic Using Generalisability Theory

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Scott James Lightburn

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Abstract

The evaluation of depression, anxiety, and stress requires distinguishing between state and trait changes. Otherwise, the accuracy of evaluating the effectiveness of interventions and the reliability and validity of research can be compromised. The COVID-19 pandemic has introduced extraneous variables that have the potential to significantly impact the measurement of affective conditions and the distinction between state or trait symptoms. The Depression Anxiety and Stress Scales (DASS-21) is the only psychometric scale that measures depression, anxiety, and stress, and the overall psychological distress simultaneously. It is widely used and applicable to both clinical and non-clinical populations. However, no study has assessed its ability to distinguish state from trait changes or investigated the impact of the COVID-19 pandemic on its temporal reliability. In this study, Generalisability Theory (G-Theory) was applied to evaluate the DASS-21 under normal and COVID-19 pandemic conditions. Data was collected from two independent samples. The first sample was collected in the United States (n = 115) before the pandemic and the second sample was collected in New Zealand (n = 114) during the pandemic. In both samples the data were collected on three occasions with 2 to 4-week intervals. The total DASS-21 scale showed excellent reliability in measuring enduring symptoms of psychological distress (G = 0.94 to 0.96), and while all DASS-21 subscales demonstrated good reliability in the pre-pandemic US sample, they showed lower temporal reliability in the NZ sample during the pandemic. These findings suggest that the overall DASS-21 reliably measures psychological distress as a trait and its scores can be generalised across different populations and occasions. However, the DASS-21 subscales are not as reliable during emergencies and uncertainty as seen in the COVID-19 pandemic. The overall psychological distress remains stable across individuals and can be reliably measured by the DASS-21, but shifts in depression, anxiety, and stress levels are likely during emergencies and uncertainty.

Introduction

According to the World Health Organization (2020), the coronavirus pandemic has impacted mental health services worldwide and will likely continue to do so over the next few years. Factors such as financial insecurity, restriction of daily routines, and disruption to mental health services, along with many other environmental and social challenges, are expected to further exacerbate already existing mental health issues (Alzueta et al., 2021; Maital & Barzani 2020; Torales et al., 2020; World Health Organization 2020). Although research on COVID-19 varies from country to country, there is a growing consensus that as stress, loneliness, and COVID-19 related challenges increase, so too will the prevalence and severity of mental health problems such as depression and anxiety (Fassett-Carman et al., 2020; Kwong et al., 2021; Lei et al., 2020; Liu, 2020; Torales et al., 2020).

An expected increase in negative psychological issues highlights the need for robust and accurate screening to identify potentially vulnerable individuals and provide targeted interventions (Alzueta et al., 2021; O'Connor et al., 2021; Zhang et al., 2020). Additionally, levels of depression, anxiety, and stress are likely to shift over time, as stress is often related to the development of anxiety and depression, and anxiety often precedes depression (Goldberg & Fawcett, 2012; Hranov et al., 2007; Zhang et al., 2020). Therefore, it is emphasised that mental health services use appropriate psychometric tools that accurately distinguish between dynamic (state) and enduring (trait) symptoms to prevent potential misdiagnoses, overdiagnoses, and inaccurate evaluation of associated risk factors. These potential risks further highlight the importance of reliable and valid assessment of distress symptoms in the general population by using assessment instruments specifically designed for this purpose (Kircanski et al., 2017; Medvedev et al., 2017; O'Connor et al., 2021).

Accurate measurement of depression and the distinction between dynamic and enduring symptoms is important for both general and clinical populations as it can lead to a more precise

diagnosis, allowing for appropriate treatment to be given (Angst, 2009; Cuijpers et al., 2014; Eaton et al., 2008; Kuyken et al., 2011; Souery, et al., 2012). Additionally, accurate measurement of depression allows for better differentiation of depression from other mental health conditions that may present with similar symptoms (Angst, 2009; Eaton et al., 2008; Hranov et al., 2007; Malhi & Mann, 2018; Souery, et al., 2012).

More specifically, the ability to measure aspects of depression reliably and accurately over time can inform treatment plans (Demyttenaere et al., 2004; Zhang et al., 2020). For instance, recognising enduring symptoms is essential when choosing the right treatment for major depressive disorder. Research has shown that around 35% to 85% of people who have experienced one episode of major depression are likely to have another episode in the future highlighting the need for long-lasting and targeted treatments for depression (Angst, 2009; Eaton et al., 2008; Souery et al., 2012). By identifying long-term and short-term symptoms of depression, interventions can be implemented promptly, and appropriately to prevent reoccurrence, persistence, and severity of symptoms (Hollon et al., 2005; Segal et al., 2002; Segal et al., 2010).

Similarly, accurate measurement of anxiety is arguably of equal importance for both general and clinical populations. Anxiety is usually considered normal unless it persists over long periods and negatively impacts daily life, work, and social functioning (American Psychiatric Association, 2013; Angst, 2009; Craske & Stein 2016; Mohlman, 2017; Wolitzky-Taylor, et al., 2016). In clinical populations, accurate measurement is crucial for the effective diagnosis and treatment of anxiety disorders, such as social anxiety disorder, generalized anxiety disorder, and separation anxiety disorder (American Psychiatric Association, 2013; Bandelow et al., 2022; Craske & Stein 2016). In the general population, it can provide insight into the prevalence and distribution of anxiety and be useful for evaluating potential risk can

inform public health policies aimed at reducing anxiety's burden (Angst, 2009; Demyttenaere et al., 2004; Lim et al. 2018; Craske & Stein, 2016; Bandelow et al., 2012).

The World Health Organization has recognised anxiety disorders as a leading concern in the coming decades (Demyttenaere et al., 2004). Moreover, symptoms of mood disorders often co-occur or co-exist with other mental disorders such as anxiety, depression, and stress. For instance, researchers have associated the severity of depressive symptoms with preceding increases in anxiety-related symptoms, and in turn as levels of anxiety-related symptoms increase so too does the likelihood of depressive symptoms (Angst, 2009; Kessler et al., 2005; Hirschfeld, 1999; Hranov et al., 2007; Zhang et al., 2020).

Accurate measurement of both state and trait anxiety is important for understanding the onset, duration, and severity of anxiety symptoms, which can be used to inform the selection of a treatment strategy (Cuijpers et al., 2014; Bandelow et al., 2012; Bandelow et al., 2022; Mohlman, 2017; Wolitzky-Taylor, 2010). State anxiety is usually identified as a temporary situation-specific response to stimuli (e.g., taking a test, job interview & unexpected fright), while trait anxiety is a tendency to experience anxiety in various situations over extended periods of time (e.g., ongoing financial problems, work stress & legal problems). One example of a scale that did not accurately differentiate between state and trait is the State-Trait Anxiety Inventory (STAI; Spielberger, 1983). Although it was thought that the STAI measured both state and trait anxiety, Forrest et al.'s (2021) investigation of the STAI using two independent samples, found that all subscales measured trait anxiety, highlighting how some measures have the potential to be misleading and should be more thoroughly examined.

Much like depression and anxiety, the accurate assessment of stress, including the differentiation between long-term and short-term symptoms, is crucial for providing insight into the characteristics and associated potential risks (Connolly et al., 2010; Fassett-Carman et al., 2020; Kendler et al., 1999; Martin & Brantly, 2002; Miller et al., 2021). However, not all

forms of stress are negative and can be divided into two distinct categories, namely adaptive stress and maladaptive stress, each possessing different characteristics and outcomes. For example, adaptive stress is a positive form of stress that can motivate individuals to achieve their own goals and can arise from challenging activities (e.g., sporting competitions), learning a new skill and improving performance, leading to personal growth and better resilience. While maladaptive stress is a negative form of stress that can lead to emotional and physical health problems. Maladaptive stress is said to occur when individuals are unable to cope with stressors, which can range from daily hassles to major life events, such as job loss or divorce (Connolly et al., 2010; Larzelere & Jones, 2008; Mitchell et al., 2008).

The distinction between long-term and short-term maladaptive stress can provide insight about a person's symptoms, and potential overlap with other psychological symptoms, as stress often co-exist with other psychological disorders such as depression and stress (Connolly et al., 2010Larzelere & Jones, 2008; Fassett-Carman et al., 2020; Zhang et al., 2020). Long-term stress is characterised by exposure to real or perceived stressors over an extended period, whereas short-term stress, such as acute stress, is characterised by brief and intense stressful events (Connolly et al., 2010; Fassett-Carman et al., 2020; Kendler et al., 1999). While opinions on what stress is and how it is measured vary, it is clear that high levels of stress can have negative health and quality-of-life outcomes (Larzelere & Jones, 2008; Mitchell et al., 2008).

In summary, the COVID-19 pandemic and related issues have had a significant impact on mental health and associated services worldwide and is expected to continue to do so. This has further exacerbated already existing mental health issues and highlights the importance of robust and accurate screening to identify vulnerable individuals and provide targeted interventions. Accurate measurement of depression, anxiety, and stress, including the distinction between dynamic and enduring symptoms, state and trait anxiety, is crucial for

effective diagnosis, treatment, and prognosis of these conditions. Accurate assessment not only informs treatment plans, maintenance, and preventive strategies, but also provides insight into the prevalence, distribution, potential risk and protective factors, and nature and course of these conditions. This information can inform public health policies and practitioners aimed at reducing the burden of these mental health issues in the coming years.

Table 1 presents a list of well-established questionnaires for measuring depression, anxiety, and stress, along with the number of citations and basic psychometric properties. The purpose of Table 1 one is to briefly highlight various limitations of popular assessment tools. In addition to being well established over the course of several decades, many of these assessment tools (e.g., DASS-21, CES-D, BDI, HAM-D, PHQ-9, HADS, PSWQ) are recommended for use by well-established organisations, such as the American Psychological Association, the National Institute for Health and Care Excellence in the United Kingdom, and the Society of Clinical Psychology (Care Excellence and Society of Clinical Psychology, 2003; National Collaborating Centre for Mental Health, 2011). To ensure clear comparisons between the presented assessment tools, Table 1 does not include scales that focus on specific demographics, illnesses, or disorders that are outside the general scope of measuring depression, anxiety, or stress.

Table 1. *Psychometric properties of common depression, anxiety, and/or stress assessment tools and number of Google Scholar citations for each scale (9 January 2023)*

Scales	Dimension measured	Original and secondary citations	Subscales /Items	Cronbach's alpha α	Test-retest reliability *r*	Google scholar Citations
DASS-21	Depression, Anxiety & Stress	Lovibond & Lovibond (1995)	3/21	[1]0.87 - 0.91	[2]0.71-0.81	12389
HADS	Depression &Anxiety	Zigmond & Snaith (1983)	2/14	[3]0.68 - 0.93	[3]0.52-0.82	47424
GHQ	Depression & Anxiety	Goldberg (1972, 1988)	1/28	[4]0.69-0.90	[5]0.78-0.90	10326
HSCL	Depression, anxiety, somatisation, obsessive-compulsive, interpersonal and sensitivity.	Parloff et al. (1954), Derogatis et al. (1974)	5/58	0.84-0.87	0.67-0.80	5944
CES-D	Depression	Radloff (1977)	1 /20	0.80	0.45 - 0.70	61493
BDI	Depression	Beck et al. (1961)	1/21	0.84	0.86	48945
HAM-D	Depression	Hamilton (1960, 1986)	1/23	0.79	0.65-0.98	37247
PHQ-9	Depression	Kroenke (2001)	1/9	0.89	0.86	31813
BAI	Anxiety	Beck et al. (1988)	1/21	0.92	0.75	16179
HAM-A	Anxiety	Hamilton (1959)	1/14	[6]0.86	[6]ICC* = 0.92	11253
PSWQ	Anxiety	Meyer (1990)	1/16	0.94	0.92	5990
STAI	Anxiety	Spielberger (1983)	2/40	0.78-0.88	[7]0.73-0.86	3098
PSS	Stress	Cohen et al. (1983)	1/10	0.78	0.70-0.90	32240

Note. * Intraclass correlation coefficient; DASS: Depression Anxiety and Stress Scale; HADS: Hospital Anxiety and Depression Scale; GHQ: General Health Questionnaire; HSCL: Hopkins Symptom Checklist; CES-D: Centre for Epidemiologic Studies Depression Scale; BDI: Becks Depression Inventory; HAM-D: Hamilton Depression Rating Scale; PHQ: Patient Health Questionnaire; BAI: Becks Anxiety Inventory; HAM-A: Hamilton Anxiety Rating Scale; PSWQ: The Penn State Worry Questionnaire; STAI: State-Trait Anxiety Inventory; PSS: Perceived Stress Scale. Citations : [1]Antony et al. 1998 ; [2]Brown et al. 1997 ; [3]Bjelland et al. 2002 ; [4]Shayan et al. 2015 ; [5]Robinson & Price, 1982 ; [6]Clark & Donovan, 1994 ; [7]Bieling et al. 1998.

The above list of assessment tools as measures of depression, anxiety, or stress, all have certain limitations, despite their widespread use and validity. Some scales lack temporal reliability (i.e., HADS, HAM-D & CES-D) and/or have questionable/inconsistent internal reliability. Other assessment tools lack brevity diminishing response rates, as well as not being freely available, restricting their accessibility or applicability (e.g., BDI, CESD-R & HADS) to specific populations.

One example is the CES-D which is one of the most widely used psychometric scales for measuring symptoms of depression (Radloff, 1977; Vilagut et al., 2016). However, due to its original development using Western adult populations and its intention for clinical use, the CES-D has received criticism for its limited applicability as a diagnostic tool across different populations, including children or younger adults as well as reduced cultural sensitivity (Radloff, 1977; Vilagut et al., 2016). Additionally, the CES-D has demonstrated poor to acceptable temporal reliability with test-retest scores ranging from 0.45 - 0.70, and problems with items that have overlapping physical symptoms have made it challenging to differentiate between depression and other physical health issues. These limitations highlight the need for further research to assess its ability to identify ongoing problems (Kimong et al., 2022; McQuaid et al., 2000; Orme et al.,1986, Vispoel et al., 2018).

Another commonly used questionnaire is the HADS, which was designed to measure the severity of anxiety and depression in hospital populations (Lawrie et al., 2004; National Collaborating Centre for Mental Health, 2011). Despite its widespread use in hospitals and other institutions, more recent meta-analyses of prior studies have highlighted ongoing criticisms of the proficiency of the HADS as a screening tool in certain medical settings and as a case-finding instrument (Mitchell et al., 2010; Wu et al., 2021; Brennan et al., 2010). Moreover, the HADS reliability (as seen in Table 1) is inconsistent in some studies, suggesting

poor reliability, further highlighting again why it is important to note the limitations when using the HADS or any other tool as a screening method.

Despite the potential drawbacks of each assessment tool, the DASS-21 appears to be the most appropriate to evaluate for two reasons. The first reason (discussed below) is that the DASS-21 has demonstrated good psychometric properties, even when compared with other scales that measure similar dimensions of depression anxiety and stress. The second reason is because it is the only self-report questionnaire that measures depression, anxiety, and stress simultaneously, for both clinical and general populations (Lovibond & Lovibond, 1995; Lee et al., 2019). It is for these reasons the DASS-21 has been selected for further investigation in this study.

The Depression Anxiety and Stress Scales (DASS) were developed through a series of factor analyses aimed at assessing symptoms of depression and anxiety. However, an exploratory factor analysis revealed a third-dimension resembling "stress," such as irritability, agitation, nervous tension, and low frustration tolerance (Lovibond & Lovibond, 1995). As a result, the scale was reconceptualised to measure depression, anxiety, and stress, resulting in the 42-item scale (DASS-42) and was later reduced to the more commonly used and now freely available 21-item short-form scale (DASS-21; Lovibond & Lovibond, 1995). Each of the DASS-21's subscales comprises of 7 items, measuring clusters of symptoms associated with its given subscale. More specifically, the depression subscale measures aspects such as hopelessness, dysphoria, devaluation of life, anhedonia, inertia, and self-deprecation, while the anxiety subscale measures aspects of physiological arousal, situational anxiety, panic attacks or subjective anxious experiences. The stress subscale focuses on people's ability to relax, level of impatience, nervous arousal, agitation, and irritability. Studies assessing the DASS-21 generally propose that its three subscales have adequate construct validity, and although each of the three factors possess distinct characteristics that differentiate them from one another,

they all share the common aspect of psychological distress (Henry & Crawford, 2005; Lee et al., 2019; Medvedev et al., 2018; Ng et al., 2007).

Initially, the DASS included several items (e.g., fatigue, concentration, sleep disturbances) that were later removed due to a lack of a significant or unique relationship with depression and anxiety and were thought to be more closely related to generalised negative affect or emotional distress (Lovibond & Lovibond, 1995). Although studies that assessed the DASS-21 generally support a three-factor model, a number of studies have found that a one-factor model tends to account for the greatest proportion of variance (Lee et al., 2019). Lee et al. (2019) recently conducted a systematic review of the DASS-21 using methodology guidelines for the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN; Prinsen et al., 2018), where they found sufficient convergent, discriminant, and nomological validity to support a one-factor model with a latent variable tentatively labelled "psychological distress."

Despite growing evidence, a single-factor structure is not currently accepted due to discrepancies between researchers' definitions of the construct and inconsistencies in their choice of variables to measure. For example, Osman et al.'s (2012) bi-factorial analysis of the DASS-21 revealed a single factor relating to what the authors could only describe as a "General factor" or "General distress," which accounted for approximately 62% of variance across the Depression, Anxiety, and Stress subscales, while other studies investigating the DASS-21 have labelled it as a "common factor", "negative affect" or "negative affectivity" (Szabó, 2010; Henry & Crawford, 2005).

Further, studies evaluating the psychometric properties of the DASS-21 generally report good reliability. For example, Cronbach's alpha for the Depression, Anxiety, and Stress subscales ranges from 0.81 to 0.94 (Antony et al., 1998; Osman et al., 2012). Lee et al.'s (2019) systematic review using COSMIN methodology found that the DASS-21 demonstrated high

pooled correlations from the studies testing construct validity with other scales such as the Beck Depression Inventory (BDI; $r = 0.73$), Beck Anxiety Inventory (BAI; $r = 0.75$), and the Hospital Anxiety and Depression Scale (HADS) depression ($r = 0.69$) and anxiety ($r = 0.66$) subscales. The review also found strong evidence to suggest moderate content validity of the DASS-21 with well-supported internal consistency, Pearson's separation index, and Cronbach's alpha values of no less than 0.70 for the Depression and Stress subscales.

Temporal reliability is a key characteristic to consider when evaluating psychological assessment tools like the DASS-21. It helps to determine if the results of the assessment tool are changing over time, or if they remain stable. This distinction is important because it tells us whether the results reflect a temporary change or a more long-lasting characteristic. For instance, if a tool is able to measure a trait accurately and reliably, it can be useful for tracking the effectiveness of a long-term treatment or intervention over time (Cuijpers et al., 2014; Kuyken et al., 2011). This can give researchers a clearer picture of any changes that occur, which can improve the overall quality of their research. On the other hand, a highly stressful event, such as taking exams, experiencing financial problems, or losing a loved one, can temporarily affect the accuracy and reliability of a psychological assessment tool (Kuyken et al., 2011; Zhang et al., 2020). In this case, it can be difficult to determine if the results are reflecting a temporary change or a more permanent characteristic, if a clear distinction between state and trait aspects of the tool is not made, of which could lead to misinterpretation of the results.

Two studies have evaluated the test-retest reliability of the English version of the DASS-21, with the first study conducted by Brown et al. (1997) with 437 participants from a clinical sample of individuals being assessed or treated for phobias and mood disorders. Of these participants, only 20 were randomly selected for testing 2 weeks after the initial administration, and the results indicated that the test-retest scores across all three subscales had

a range of r scores from 0.71 to 0.81. The second, more recent study used a Bayesian structural equation model to assess test-retest invariance over a three-month interval with 269 older adult participants with an average age of 66.45 years (SD = 7.06) and found support for temporal stability (Gomez et al., 2014). However, the author summary of findings was vague at best, highlighting the challenges when using complex statistical methods. Moreover, the authors also recognise that these findings may be unique to the time interval and age range, making generalisation and interpretation of the results difficult. Other studies evaluating translated versions, such as the Persian version, have reported good *r* scores ranging from 0.74 to 0.88 (Kakemam et al., 2022).

Research surrounding the DASS-21 temporal reliability is scarce impeding researchers' ability to generalise their results (Brown et al. 1997; Gomez et al., 2014). Additionally, there are limitations in the methods and rigor of these studies. One such limitation is the dependence on Classical Test Theory (CTT) methods such as test-retest reliability as a means of determining temporal reliability (Arterberry et al., 2014; Brown, 2006; Medvedev et al., 2017; Spielberger, 1970; Vispoel et al., 2018). Test-retest reliability involves correlating the scores from two or more time intervals to assess the consistency of the construct being measured over time (Spielberger, 1970). However, test-retest analyses although widely accepted, does not account for variability across scale items and the contribution associated with each variance component and interaction between person, item, and occasion (Medvedev, 2017; Spielberger, 1970; Vispoel et al., 2018).

Similarly, CTT techniques such as intraclass correlations coefficient (ICC) that assess temporal reliability have limited accuracy and do not control for variability across individual items (Bloch and Norman 2012; Medvedev et al., 2017). This means that CTT methods used to determine temporal reliability may not accurately reflect the variability and complexity of real-world situations, further highlighting the importance of its limitations. Awareness of these

limitations and accounting for them can help to provide a more comprehensive and accurate evaluation of the assessment tool, which in turn, can improve the validity of the results in practical applications. Despite the frequent use of the DASS-21, its psychometric properties were mostly investigated using traditional psychometric methods such as CTT.

Recently, Rasch methodology was used to examine the psychometric properties of the DASS-21 and demonstrated robust reliability and internal structural validity in all subscales and the overall scale as a measure of global psychological distress (Medvedev et al., 2018). The same study developed ordinal to interval conversion tables for the DASS-21 to convert ordinal raw scores in the interval-level data to increase measurement precision. However, there were no investigations into whether the DASS-21 measures more enduring or more dynamic aspects of affective conditions. Moreover, generalisability of the DASS-21 assessment scores across samples and occasions was also not examined using appropriate methodology. Therefore, further research using more appropriate methodology such as Generalisability theory (G-theory; Cronbach et al., 1963; Paterson et al., 2018) is required to clearly distinguish between enduring and dynamic aspects of the DASS-21 and its subscales and to evaluate the overall reliability and generalisability of its assessment scores.

G-theory has been increasingly applied to distinguish between state (dynamic aspect) and trait (enduring aspect) in psychometric measures (Medvedev et al., 2017; Vispoel et al., 2018). Developed by Cronbach et al. (1963) as an extension of CTT, G-Theory provides a more thorough and advanced statistical method for establishing the overall reliability and generalisability of assessment scores by examining sources of measurement error and their unique contributions to the overall assessment scores (Bloch & Norman, 2012). Compared to CTT, which only considers the error of measurement as a single factor, G-theory allows for a more in-depth and comprehensive way of examining both measures and constructs to being measured. The differentiation and separation of individual measurement error, allows for a

more in-depth and comprehensive way of examining both measures and constructs to being measured. Moreover, G-theory has already been used to examine psychometric scales such as childhood depression and perceived stress (Miller et al., 2021; Paterson et al., 2018). For example, by utilising G-theory, Miller et al. (2021), determined that the 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) measured stable characteristics of stress and was, therefore, more suitable for assessing long-term effects of interventions rather than short-term effects.

Although, both G theory and IRT/Rasch models are transcending limitations of CTT in investigating psychometric properties of ordinal scales, they focus on different aspects of measurement. While IRT and Rasch models concerned with unique contributions of individual items to the overall construct (e.g., item difficulty) and functioning of items response categories (Medvedev et al., 2020), G theory examines the overall reliability and generalisability of assessment scores over time and sample population (Miller et al., 2021). Thus, both methods complement each other in establishing reliable and valid assessment instruments.

This study aimed to investigate stable and dynamic aspects of distress captured by the DASS-21 and to establish the reliability and generalisability of its assessment scores under pre-pandemic and pandemic conditions. Using data collected from the United States (pre-pandemic) and New Zealand (pandemic), a generalisability study (G-study) was conducted to investigate the overall reliability of the DASS-21 and its subscales, and to produce generalisability coefficients and indices reflecting state and trait aspects of the measure. Following the G-study, a decision study (D-study) was conducted to optimise reliability and evaluate dynamic and enduring patterns across symptoms reflected by the individual items of the DASS-21. It was hypothesised that challenges associated with the COVID-19 pandemic conditions, would increase variability observed in the DASS-21 scores during pandemic

conditions compared to pre-pandemic and would, therefore, help to identify dynamic aspects of distress.

Method

Participants

Participants (98%) were New Zealand and US university students. A total of 115 responses were collected over three occasions from the US students at approximately one-month intervals. The US sample consisted mainly of people who identified as White Americans (89.7%) and female (70%) students between the age of 18 to 22 years (M = 18.9, SD = 0.87). Unlike the US sample, from which data was collected between February and April 2019, the data from the New Zealand sample was collected between March and June 2020, before, during, and after New Zealand's COVID-19 pandemic lockdown (see Appendix B). The NZ sample contained a total of 114 responses collected on three occasions with approximately 14-day intervals. The NZ sample consisted of people who identified as NZ European (61%), Māori (16%; indigenous people of New Zealand), Asian (16%), Pasifika (3%), and other ethnicities (4%). These participants were predominantly female (85%) students between the age of 18 to 68 years (M = 26.32, SD = 9.92).

Procedure

Ethical approval was granted by the Human Research Ethics Committee at the University of Waikato for both the US and NZ samples (see Appendix A1-A3). Students from both the University of Waikato and the University of Missouri were enrolled in an introductory or first-year psychological course. Students from the University of Missouri partook in the study online as part of their course grade and were informed as to the nature of the study before providing consent to participate. Similarly, students from the University of Waikato were informed of the purpose of the study and provided consent before participating in the questionnaire, where they received course credit for their participation.

Measure

The DASS-21 (Lovibond and Lovibond, 1995) consists of 21 items that assess levels of psychological distress. The self-report measure asks participants to indicate how much each statement applied to them over the past week using a 4-point Likert scale, with responses ranging from 0 ("did not apply to me at all"), to 3 ("Applied to me very much, or most of the time"). The Depression, Anxiety, and Stress subscales of the DASS-21 each contain seven items. The DASS-21's subscales are calculated by summing the relevant items' responses (see Appendix D1 & D2) and are interpreted according to a scoring table to indicate the severity of symptoms (e.g., moderate severity of depression falls between a total subscale score of 14 & 20).

Data Analyses

IBM SPSS v.27 was used throughout in both samples to compute descriptive statistics, ICC, test-retest, and Cronbach's alpha coefficients. Mean imputation was used to replace missing responses (< 0.5%) to items (Huisman, 2000). Following the guidelines of Medvedev et al. (2017) and Cardinet et al. (2011), G-theory analyses were conducted using Edu-G 6.1-e software (see Appendix E1-E80; Swiss Society for Research in Education Working Group, 2006). In this study we used mean imputation to replace missing responses (< 0.5%) on individual items following procedures used in other similar studies (Paterson et al., 2018). Although, there are more advanced imputation methods available, such as FIML or multiple imputations (Baraldi & Enders, 2010), using mean imputation is justified in this case because it was used to replace missing responses on individual scale items only when the responses were available for most scale items that already have high correlations with each other (e.g., α=0.77 to 0.93). Moreover, this imputation was applied at each time point separately while the overall missing data was merely 0.5% and is negligible from statistical perspective, given that the data were normally distributed.

For both the G-study and D-study, a random effects design was implemented, where the interactions between person (P), item (I), and occasion (O) are expressed as P x I x O. Both person and occasion facets were set as infinite to allow generalisability, while the items facet was fixed because the same items were used across all observations. Facets were defined using the trait perspective, where the person (P) facet is the object of measurement, and items and occasions are instrumentation facets (Cardinet et al., 2011). Variance attributed to the model by persons represents a trait component of the scale scores; variance attributed to the model by person and occasion interactions represent state components of the scale scores where dynamic changes over time can be observed.

ANOVA estimates were used to calculate the sum of squares and mean squares as well as the variance components for each facet and their associated interactions. Appendix C presents further information on this process, including the formulae used to calculate the contribution of each facet to the score and the interactions between person, item, and occasion (Shavelson et al., 1989).

Next, relative G-coefficients (G_r) and absolute G-coefficients (G_a) were calculated (Cardinet et al., 2011). G-coefficients reflect the overall reliability or the generalisability of the measure in question (G coefficient = True person variance / True person variance + Error variance). G_r accounts for the relative sources of variance related to person computed as follows (Shavelson et al., 1989):

$$\boldsymbol{G_r} = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_\delta^2} ; \boldsymbol{\sigma_\delta^2} = \frac{\sigma_{pi}^2}{n_i} + \frac{\sigma_{po}^2}{n_o} + \frac{\sigma_{pio}^2}{n_i n_o}$$

Where $\boldsymbol{n_o}$is the number of occasions and $\boldsymbol{n_i}$is the number of items.

G_a is an absolute model of measurement based on the test scores that accounts for all sources of error that may indirectly influence the absolute measure ($\sigma^2\Delta = \frac{\sigma_0^2}{n_o} + \frac{\sigma_i^2}{n_i} + \frac{\sigma_{pi}^2}{n_i} + \frac{\sigma_{po}^2}{n_o} + \frac{\sigma_{io}^2}{n_i n_o} + \frac{\sigma_{pio}^2}{n_i n_o}$ (Cardinet et al., 2011):

$$G_a = \frac{\sigma_p}{\sigma_p^2 + \sigma_\Delta^2}$$

Lastly, a D-study was conducted in which individual items and subscales were examined and modified by iteratively removing items to optimise reliability of the DASS-21 and its subscales as well as distinguish between state and trait components. A state component index (SCI) and trait component index (TCI) were also computed. These component indexes are coefficients that represent the proportion of variance accounted for a state and trait component in a scale respectively. These formulae were developed by Medvedev et al. (2017) and are include below:

$$SCI = \frac{\sigma_{po}^2}{\sigma_{po}^2+\sigma_p^2};\ TCI = \frac{\sigma_p^2}{\sigma_{po}^2+\sigma_p^2}$$

We have also computed variance components for each item, together with SCI values. Items with higher SCI's (e.g., ≥0.70) are considered as measuring a state to a larger extent, while items with higher TCI (e.g., ≥0.70) are predominantly measuring trait aspects.

Results

Descriptive statistics of the DASS-21 and subscales, separated by occasions and samples are presented in Table 2. DASS-21 scores were distributed close to normal, with values for skewness ranging from 0.72 to 1.18 and kurtosis from -0.21 to 0.90 (West et al., 1995). Post-hoc tests of the DASS-21's full scale indicated that occasion two's full scale, in addition to the Anxiety and Stress subscales were significant in the NZ sample and were significantly lower than occasion one. Internal consistency for the full scale and subscales were acceptable, with Cronbach's alpha's of the total DASS-21 scale over three occasions ranging from 0.79 to 0.93 in the NZ sample and 0.77 to 0.93 in the US sample. Test-retest coefficients for the total scale ranged from 0.65 to 0.77, and for subscales values ranged from 0.54 to 0.76 across both samples. ICCs ranged from 0.59 to 0.74 across all subscales and samples. Across three occasions in the US sample, the proportion of participants who scored above the cut-off scores

for severe disturbances ranged from 17% to 22% for depression, 21% to 26% for anxiety, and 27% to 36% for stress, whereas the proportion of participants who met the cut-off score for extremely severe were 18% to 27%, 52% to 64% and 17% to 32%, respectively. Contrastingly, the NZ sample presented with a lower number of participants who met the cut-off scores for severe with proportions ranging from 7% to 11% for depression, 7% to 9% for anxiety, and 10% to 11% for stress. Extremely severe proportions in the NZ sample ranged from 4% to 7% for depression, 7% to 11% for anxiety, and 4% to 0% for stress. Overall, the descriptive statistics from both samples indicate sufficient variability across all three occasions for the application of a G-theory analysis.

Table 2. *Means, Standard Deviation (SD), Cronbach's Alpha, test-retest coefficients, Intraclass Correlation (ICC), 95% Confidence Intervals (CI), with proportions of participants who meet cut-off values for severe and extremely severe for the DASS-21 over three occasions across two samples*

Assessment	Occasion 1		Occasion 2		Occasion 3		ICC (95% CI)	
Scale/Sample	US	NZ	US	NZ	US	NZ	US	NZ
Full Scale							0.68 [0.59,0.76]	0.74 [0.67,0.80]
Mean	16.08	17.35	16.32	15.78*	13.95*	15.97		
SD	10.53	11.41	11.27	10.72	11.55	10.54		
Cronbach's α	0.91	0.93	0.93	0.93	0.93	0.92		
Test-retest (*r*)[a]			0.72	0.77	0.65	0.72		
Depression							0.67 [0.58,0.75]	0.74 [0.67,0.81]
Mean	4.63	5.42	4.24	5.45	4.04	5.25		
SD	4.48	4.84	4.29	4.57	4.79	4.47		
Cronbach's α	0.89	0.91	0.90	0.90	0.93	0.90		
Test-retest (*r*)[a]			0.72	0.76	0.64	0.73		
Severe	17%	7%	21%	6%	22%	11%		
Extremely severe	27%	7%	23%	6%	18%	4%		
Anxiety							0.68 [0.59,0.76]	0.69 [0.61,0.77]
Mean	4.63	4.40	4.89	3.79*	4.09	3.75*		
SD	4.03	3.89	4.20	3.66	4.26	3.39		
Cronbach's α	0.77	0.79	0.82	0.80	0.83	0.80		
Test-retest (*r*)[a]			0.70	0.71	0.66	0.64		
Severe	26%	9%	21%	7%	25%	9%		
Extremely severe	64%	11%	68%	11%	52%	7%		
Stress							0.59 [0.49,0.68]	0.63 [0.54,0.72]
Mean	6.84	7.53	7.17	6.54*	5.93*	6.96		
SD	3.94	4.31	4.08	4.04	4.09	4.43		
Cronbach's α	0.79	0.82	0.80	0.83	0.82	0.86		
Test-retest (*r*)[a]			0.60	0.66	0.54	0.62		
Severe	36%	10%	31%	11%	27%	11%		
Extremely severe	21%	4%	32%	0%	17%	2%		

Note. Asterisk (*) indicated that the mean is significantly different from Occasion 1. [a] Test-retest bivariate correlation between occasion 1, 2 and 3; SD=Standard deviation; CI= Confidence interval.

G-study

Table 3 includes variance components calculated in the G-study analyses. The results show that the DASS-21 total scale has excellent reliability and generalisability of scores across occasions and populations of both samples in measuring the overall psychological distress as

a trait, reflected by over 90% of the true variance in the scores and G-coefficients ranging from 0.92 to 0.96. The overall error variance in the total scale scores was negligible and predominantly explained by person-occasion interaction representing individual state.

In the US sample, all three subscales of the DASS-21 demonstrated acceptable reliability and generalisability of scores with G_rs' ranging from 0.79 to 0.96. However, all three subscales appeared less reliable in the NZ sample during pandemic conditions as evidenced by G scores ranging from 0.61 to 0.71, which failed to meet the threshold for a reliable trait measure (≥ 0.80; Arterberry et al., 2014). These results were in line with the expectation that variability of distress symptoms would be higher in pandemic conditions reflected by the overall lower G coefficients compared to the overall higher G-coefficients in the pre-pandemic sample.

The largest portion of measurement error in all subscales for both samples were the interactions between person and item (P×I) and person, item and occasion (P×I×O) together explaining between 7% and 24% of the total variance. Additionally, when compared to the US sample, the NZ sample had more error variance from the person-item interaction, whereas the US sample had a larger portion of error variance from the person-item-occasion interaction. An interaction between person, item, and occasion suggests that participants' responses to subscale items were influenced by assessment occasion (e.g., assessment environment). SCI coefficients for all scales across both samples ranged from 0.00 to 0.14, suggesting that variance attributed to the state component is relatively negligible compared to the trait variance.

Table 3. *Analysis of variance of the DASS-21's full scale and subscales across two samples*

	DASS-21 total				Depression				Anxiety				Stress			
	US		NZ		US		NZ		US		NZ		US		NZ	
Facets	σ^2	%	σ^2	%	σ^2	%	σ^2	%	σ^2	%	σ^2	%	σ^2	%	σ^2	%
P	0.162	0.95	0.082	92.00	0.149	76.00	0.067	57.00	0.131	79.00	0.091	69.00	0.191	88.00	0.062	60.00
I	0.000	0.00	0.000	0.00	0.001	0.50	0.000	0.00	0.000	0.00	0.000	0.00	0.001	0.56	0.001	0.56
O	0.002	1.06	0.002	2.00	0.006	2.78	0.008	6.92	0.000	0.13	0.000	0.37	0.000	0.00	0.000	0.00
PI	0.000	0.00	0.000	0.00	0.019	9.50	0.022	19.18	0.014	8.51	0.017	12.99	0.008	3.72	0.015	14.40
PO	0.006	3.95	0.006	6.00	0.008	3.96	0.005	3.96	0.004	2.42	0.005	3.50	0.000	0.06	0.010	9.64
IO	0.000	0.00	0.000	0.00	0.001	0.62	0.002	2.06	0.002	1.37	0.002	1.89	0.002	0.94	0.002	1.64
PIO	0.000	0.00	0.000	0.00	0.013	6.65	0.013	10.92	0.014	8.59	0.016	12.28	0.015	6.73	0.014	13.72
Gr	0.96 [0.87,1.05]		0.94 [0.85,1.03]		0.79 [0.55,1.03]		0.63 [0.39,0.87]		0.80 [0.58,1.02]		0.71 [0.48,0.94]		0.89 [0.71,1.07]		0.61 [0.37,0.85]	
Ga	0.95 [0.85,1.05]		0.92 [0.82,1.02]		0.76 [0.50,1.02]		0.57 [0.29,0.85]		0.79 [0.57,1.01]		0.69 [0.45,0.93]		0.88 [0.68,1.08]		0.60 [0.36,0.84]	
SCI	0.04		0.07		0.05		0.07		0.03		0.05		0.00		0.14	
TCI	0.96		0.93		0.95		0.93		0.97		0.95		1.00		0.86	

Note. P = person; I = Item; O = occasion; PI = person-item; PO = person-occasion; IO = item-person; PIO = person-occasion; G_r = G coefficient (relative); G_a = G coefficient (absolute); SCI = state component index; TCI = trait component index.

D-Study

Table 4 presents results from the D-Study's individual item analysis, which includes variance components of person, person-occasion interaction, SCI, and G_r. The most state-sensitive item in the scale was item 8 ("I felt that I was using a lot of nervous energy") from the stress subscale, with an SCI of 0.63 (US) and 0.70 (NZ), and G_r of 0.37 (US) and 0.30 (NZ), indicating that this item meets the threshold to be considered a state item (SCI ≥ 0.60; Cardinet et al., 2011; Medvedev et al., 2017). Contrastingly, most other items in both samples reflected predominantly enduring distress patterns. For instance, items that reflected stable characteristics across both samples with a $G_r \geq 0.60$ are the following: 3 "I couldn't seem to experience any positive feeling at all"; 4 "I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)"; 5 "I found it difficult to work up the initiative to do things"; 6 "I tended to over-react to situations"; 7 "I experienced trembling (e.g., in the hands)"; 10 "I felt that I had nothing to look forward to"; 11 "I found myself getting agitated"; 18 "I felt that I was rather touchy"; 19 "I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a

beat)"; 20 "I felt scared without any good reason". The remaining items had SCI below 0.50 in both samples, indicating that these items predominantly reflect enduring symptoms. Attempts to enhance the reliability of subscales by iteratively removing the most dynamic items for individual subscales and the total scale are included in Table 4. These analyses achieved no noticeable improvement of G-coefficients across both samples, suggesting that the DASS-21 and its subscales have optimal reliability in the current measurement design. There was no or little change when each of the three occasions were excluded from the generalisability analysis, indicating that the results were not affected by any specific occasion.

Table 4. *Decision Study indicating State Component Index for all items in the DASS-21 across both samples with full scale and subscale modifications.*

	P		PxO		SCI		G_r	
Subscale	US	NZ	US	NZ	US	NZ	US	NZ
Depression								
3 I couldn't seem to experience any…	0.460	0.315	0.105	0.130	0.19	0.29	0.81	0.71
5 I found it difficult to work up the…	0.313	0.292	0.134	0.094	0.30	0.24	0.70	0.76
10 I felt that I had nothing to look…	0.439	0.301	0.123	0.114	0.22	0.27	0.78	0.73
13 I felt down-hearted and blue	0.351	0.187	0.078	0.138	0.18	0.42	0.82	0.58
16 I was unable to become enthusiastic…	0.233	0.286	0.161	0.129	0.41	0.31	0.59	0.69
17 I felt I wasn't worth much as a person	0.330	0.288	0.170	0.148	0.34	0.34	0.66	0.66
21 I felt that life was meaningless	0.176	0.299	0.169	0.131	0.49	0.30	0.51	0.70
Anxiety								
2 I was aware of dryness of my mouth	0.194	0.239	0.147	0.134	0.43	0.36	0.57	0.64
4 I experienced breathing difficulty…	0.335	0.238	0.114	0.149	0.25	0.39	0.75	0.61
7 I experienced trembling (e.g., in…	0.294	0.180	0.126	0.147	0.30	0.45	0.70	0.55
9 I was worried about situations in…	0.256	0.185	0.163	0.156	0.39	0.46	0.61	0.54
15 I felt I was close to panic	0.197	0.207	0.195	0.182	0.50	0.47	0.50	0.53
19 I was aware of the action of my…	0.275	0.401	0.137	0.147	0.33	0.27	0.67	0.73
20 I felt scared without any good…	0.325	0.306	0.112	0.176	0.26	0.37	0.74	0.64
Stress								
1 I found it hard to wind down	0.214	0.184	0.163	0.157	0.43	0.46	0.57	0.54
6 I tended to over-react to situations	0.307	0.251	0.100	0.122	0.25	0.33	0.75	0.67
8 I felt that I was using a lot of…	0.118	0.073	0.201	0.171	0.63	0.70	0.37	0.30
11 I found myself getting agitated	0.361	0.216	0.134	0.142	0.27	0.40	0.73	0.60
12 I found it difficult to relax	0.320	0.132	0.121	0.159	0.27	0.55	0.73	0.45
14 I was intolerant of anything…	0.310	0.115	0.124	0.135	0.29	0.54	0.71	0.46
18 I felt that I was rather touchy	0.261	0.463	0.161	0.138	0.38	0.23	0.62	0.77
Full Scale Modification								
Full scale without items 8, 12 and 14	0.160	0.096	0.006	0.006	0.04	0.06	0.95	0.92
Full scale without items 8 and 12	0.161	0.089	0.006	0.006	0.04	0.06	0.96	0.92
Full scale without item 8	0.164	0.084	0.006	0.006	0.04	0.07	0.96	0.93
Depression Subscale Modification								
Depression subscale without items 13, 16 and 21	0.131	0.036	0.010	0.004	0.07	0.10	0.58	0.29
Depression subscale without items 13 and 21	0.122	0.063	0.011	0.007	0.08	0.10	0.63	0.49
Depression subscale without item 21	0.143	0.048	0.008	0.004	0.05	0.08	0.73	0.49
Anxiety Subscale Modification								
Anxiety subscale without items 7, 9 and 15	0.136	0.128	0.006	0.004	0.04	0.03	0.67	0.63
Anxiety subscale without items 9 and 15	0.153	0.125	0.004	0.007	0.03	0.05	0.77	0.69
Anxiety subscale without item 15	0.135	0.081	0.003	0.005	0.02	0.06	0.78	0.63
Stress Subscale Modification								
Stress subscale without items 8, 12 and 14	0.186	0.041	0.005	0.022	0.03	0.35	0.76	0.29
Stress subscale without items 8 and 12	0.182	0.041	0.000	0.013	0.00	0.24	0.82	0.37
Stress subscale without item 8	0.193	0.048	0.002	0.014	0.01	0.23	0.86	0.47

Note. P = person; PO = person-occasion; SCI = state component index; G_r = G coefficient (relative).

Table 5 includes variance components (P, I, O), their interactions, relative (G_r) and

absolute (G_a) coefficients as well as the state component index (SCI) of the DASS-21's full scale, with one of each occasion excluded. Results presented in Table 5 showed little change when one of the three occasions were excluded from the generalisability analysis, indicating that the results from the analyses were not greatly influenced by one single occasion.

Table 5. *Analysis of variance of the DASS-21 full scale with individual occasions excluded*

Excluded Occasion	Occasion 1				Occasion 2				Occasion 3			
	US		NZ		US		NZ		US		NZ	
Facets	σ2	%	σ2	%	σ2	%	σ2	%	σ2	%	σ2	%
P	0.169		0.093		0.158		0.082		0.159		0.078	
I	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
O	0.000	1.9	0.002	23.6	0.003	20.5	0.001	7.2	0.005	35.3	0.006	41.4
PI	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
PO	0.009	98.1	0.006	76.4	0.010	79.5	0.011	92.8	0.008	64.7	0.008	58.6
IO	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
PIO	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
G_r	0.95		0.94		0.94		0.89		0.95		0.91	
G_a	0.95		0.92		0.92		0.88		0.93		0.85	
SCI	0.05		0.06		0.06		0.12		0.05		0.09	

Note. P = person; I = item; O = occasion; PI = person-item; PO = person-Occasion; IO = item-person; PIO = person-occasion; G_r = G coefficient (relative); Ga = G coefficient (absolute); SCI = state component index

Discussion

Using G-theory, this study investigated enduring and dynamic aspects of distress including depression, anxiety and stress symptoms operationalised by the DASS-21 under pre-pandemic and pandemic conditions. We used longitudinal data from two independent samples of approximately equal size, one collected in the US before COVID-19 and the other collected in NZ during the COVID-19 pandemic period. Across both samples, results demonstrated that the DASS-21 full scale was reliable in measuring enduring symptoms of psychological distress, which is reflected by the excellent temporal reliability and generalisability of the total DASS-21 scores across occasions and both samples' populations (G = 0.94 to 0.96). This means that the DASS-21's total score accurately measures true differences between people with merely 4% to 6% of variance attributed to the measurement error, suggesting that the overall psychological distress has characteristics of a trait, which is relatively stable over time. Overall, the total distress scores were remarkably consistent across individuals over time, of which is in

line with the results from a recent validation study conducted by Medvedev et al. (2020) where Rasch analysis demonstrated that the combined score of the DASS-21's subscales had robust reliability and internal validity. Attempts to enhance the reliability of the DASS-21 subscales by modifying item content did not yield any improvement, indirectly supporting the reliability of this studies primary results. Moreover, little change was observed when one of the three occasions was excluded from the generalisability analysis, indicating that these results were not greatly influenced by any specific occasion, and the current measurement design was appropriate.

Although all three DASS-21 subscales showed good reliability and measured relatively enduring characteristics of depression, anxiety and stress, the DASS-21's subscales were found to be less reliable and measured more dynamic characteristics of depression, anxiety and stress under pandemic conditions (NZ sample) compared to pre-pandemic conditions (US sample). Most notably the Stress and Depression subscale in the NZ sample had G coefficients below acceptable levels to be considered as a reliable measure of either state or trait (Arterberry et al., 2014). These findings support the hypothesis that the variability of depression, anxiety and stress symptoms would increase during pandemic conditions. It should be noted that the sample cohorts (I.e., NZ and US samples) analysed in this study are not directly comparable as they were drawn from different populations and under different conditions. However, this study has a quasi-experimental design in nature that allowed for the examination of the DASS-21 assessment of distress under natural conditions associated with both pandemic and everyday life.

The results showed that the individual subscales were mostly affected by measurement error due to person-item interaction. Error variance for person-item interaction ranged from 3.72% to 19.18% across all subscales, with the overall higher values observed in the NZ sample during the pandemic. Measurement error associated with person-item interaction suggests

differential item functioning and/or interpretation, meaning that interpretation of items varied from person to person resulting in less consistent answers. Furthermore, larger proportions of error variance associated with person-item interaction were observed from the NZ sample while the US sample's participants answered questions more consistently, suggesting the NZ participants may be understanding and answering items slightly differently. Additionally, a large portion of measurement error was due to the interaction between person, item, and occasion. Error variance for person-item-occasion interaction ranged from 6.65% to 13.72%, suggesting that subscales' scores were influenced by both the occasion that the questionnaire was administered and the participant's personality, which in turn affected how the questions were interpreted.

It should be noted that differential interpretation and item functioning can be overcome by transforming the ordinal scores into interval level data using the Rasch conversion algorithm, where data associated with the New Zealand population invariance of DASS-21's ordinal scales has already been established by Medvedev et al. (2020) using Rasch analysis. Such findings lead us to tentatively speculate that the increased variances seen in person-item and person-item-occasion interaction were likely due to the fact that the NZ samples assessment was conducted during the COVID-19 pandemic, affecting how people perceived their symptoms. It also should be kept in mind that the US sample had a significantly larger proportion of participants who met the over-cut off scores for severe and extremely severe disturbance across all three subscales. Such observations could be explained by both the differences in lifestyle between countries and the fact that the DASS-21's NZ sample was collected during the COVID-19 lockdown. For instance, a recent study conducted by Hartstone and Medvedev (2021) found a reduction in anxiety and stress levels during New Zealand's COVID-19 lockdown. It is possible that the larger person-item interaction seen in the NZ

sample is associated somewhat with the overall lower anxiety and stress found in Hartstone and Medvedev's (2021) study, which is beyond the scope of this study.

A key finding in this study remains the remarkable stability of the overall scale scores across both conditions and samples, indicating that participants' overall distress levels were likely to remain relatively stable over time. The high stability of the total scales is an interesting finding considering that the depression, anxiety, and stress operationalised by the DASS-21 were subject to change over time to a larger extent, of which was further emphasised in the NZ sample. Moreover, given that symptoms of depression, anxiety and stress share such a close relationship and often co-occur or co-exist together, it is likely that the observed variability represents shifts between the three constructs and is reflective of their strong relationship (Hranov et al., 2007; Zhang et al., 2020). More specifically, an increase or decrease in one of three constructs measured by the DASS-21, may be associated with a proportional increase or decrease of the remaining two constructs. For example, a reduction in levels of stress as measured by the DASS-21 may be associated with a proportional increase of depression and/or anxiety at each individual level.

Limitations and Future Directions

A notable limitation of this study was the homogeneity of samples populations in terms of participants' age and participation in higher education. Additionally, data was collected from different countries (US and NZ) and under different conditions (pre-pandemic and pandemic) which did not allow for direct valid comparison between samples. This allowed us to only speculate as to why the observed increases in variability seen in the NZ sample were due to the differences between samples or conditions. Moreover, it would have been more optimal to collect data from the same location pre-pandemic and during pandemic conditions as some differences observed in the DASS-21 may be also attributed to the location and time of data collection. Nevertheless, this study aimed to test the psychometric properties of the DASS-21

and to determine how the scale was likely to behave under different conditions and sample populations. For this study, the diversity of sample populations and conditions were desirable and served to evaluate the reliability and generalisability of DASS-21 scores as well as to distinguish enduring and dynamic aspects of psychological distress.

Due to the unique nature of the COVID-19 pandemic, various factors that could potentially impact both mental and physical health must be considered. It is expected that the circumstances surrounding the COVID-19 pandemic will continue to evolve including things like distress, uncertainty, and bereavement. In addition, it is likely that further disruption to mental health services may continue to worsen before any improvement is seen. This may be relevant, as the DASS-21 asks participants to indicate how much each statement "applied to them over the past week?", and an improvement or worsening of distress-related factors may contribute to changes in variability already seen in this study and potentially highlights an ongoing challenge regarding the reliability of the subscales of the DASS-21 in specific circumstances. To produce more robust conclusions, replications of the current study with more diverse and larger samples are recommended. However, the diversity of samples and their corresponding conditions was desirable to evaluate the reliability and generalisability of DASS-21 scores and to distinguish enduring and dynamic aspects of psychological distress.

Accurate understanding of a measured construct and how it behaves over time in addition to differentiating sources of measurement error are important for both future research and medical professionals who utilise the scales such as the DASS-21. For example, results from this study indicate that the overall scale is a reliable relative trait that measures across all conditions, while the depression, anxiety and stress subscales are a less reliable trait measure under NZ conditions. More specifically, increases in the variability of the DASS-21's scores were found in the NZ sample indicating that sample population (e.g., location & nationality)

and contextual factors (e.g., COVID-19 related distress) play a role in the overall generalisability the DASS-21 subscales scores.

Such information can inform both researchers and medical professionals in several ways. A researcher for example would benefit from the knowledge that the subscales of the DASS-21 measures more of a trait aspect, of which can be used to better indicate the progress of target population or mode of treatment. They would also benefit from knowing that certain conditions as seen in the NZ sample, that the stability of subscales scores decreases. Moreover, they can identify, and reliably report changes in general distress (overall scale) as measured by the DASS-21 as enduring characteristics regardless of the influential factors like COVID-19 related distress. Alternatively, a medical professional may benefit from the knowledge that the anxiety and general distress measured by the DASS-21 are more stable over time and that high severity scores (especially the overall score of the DASS-21) likely indicates an ongoing problem with distress or symptoms of mood disorders. Conversely, a reduction of severity scores measured by the DASS-21 over time might indicate the efficacy of a targeted long-term intervention and suggest long lasting effects.

Possible directions for future research are to compare the distress symptoms across different populations, such as those in different countries, cultures, age groups, or medical conditions. This will help determine the generalisability of the DASS-21 full scale and if any differences exist in the measurement of enduring and dynamic aspects of distress in these variables. These ideas combined with longitudinal studies can also be conducted to examine the change in distress symptoms over longer time and determine the reliability of the DASS-21 full scale in measuring relevant changes. Finally, the impact of interventions, such as psychological therapies or pharmacological treatments, on distress symptoms can be examined. This will help determine the effectiveness of these interventions in reducing symptoms of psychological distress as measured by the DASS-21.

Conclusion

In conclusion, this study investigated the psychometric properties of the DASS-21 in measuring enduring and dynamic aspects of distress including depression, anxiety and stress under pre-pandemic and pandemic conditions using G-theory. Results showed that the DASS-21 total scale was reliable in measuring overall psychological distress, with temporal reliability and generalisability of the total scores across both samples suggesting that overall psychological distress is a relatively stable trait over time. However, the reliability of the individual subscales varied between the US pre-pandemic sample and the NZ pandemic sample, with the latter showing higher error variance associated with person-item interaction and person-item-occasion interaction. This suggests that the interpretation of items varied from person to person in the NZ sample and was possibly influenced by the COVID-19 pandemic. The high stability of the overall scale scores across both conditions and samples remains an important finding, indicating that participants' overall distress levels are likely to remain relatively stable over time. Nevertheless, these results are not directly comparable due to the differences in samples and conditions and further research is needed to fully understand the psychometric properties of the DASS-21 in measuring distress under pandemic conditions.

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Appendix A1

Division of Arts, Law, Psychology & Social Sciences *|Te Wānanga o Ngā Kete*

The University of Waikato
Private Bag 3105
Hamilton 3240
New Zealand

Te Piringa – Faculty of Law
Dr Nathan John Cooper
Tel: +64 7 838 4463
Email: nathan.cooper@waikato.ac.nz
www.waikato.ac.nz

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Scott Lightburn

Oleg Medvedev

Psychology

2 March 2021

Dear Scott

Re: **FS2021-01: Investigating State and Trait Symptoms of Depression, Anxiety and Stress using Generalisability Theory (G-theory)**

Thank you for submitting the additional information we requested, in relation to your application to the ALPSS Human Research Ethics Committee. The Committee is now pleased to offer formal approval for your research activities, as detailed in your application.

We encourage you to contact the Committee should issues arise during your data collection, or should you wish to add further research activities or make changes to your project as it unfolds. We wish you all the best with your research. Thank you for engaging with the process of ethical review.

Kind regards,

Nathan Cooper, Chair
Division of Arts, Law, Psychology & Social Sciences Human Research Ethics Committee

Appendix A2

Institutional Review Board
University of Missouri-Columbia
FWA Number: 0002876

IRB Registration Numbers: 00000731, 00009014

482 McReynolds Hall
Columbia, MO 65211
573-882-3181
irb@missouri.edu

February 05, 2019

Principal Investigator: Steven Pratscher
Department: Psychological Sciences

Your IRB Application to project entitled Psychological Adjustment: Three-part study was reviewed and approved by the MU Institutional Review Board according to the terms and conditions described below:

IRB Project Number	2013684
IRB Review Number	244649
Initial Application Approval Date	February 04, 2019
IRB Expiration Date	February 04, 2020
Level of Review	Expedited
Application Status	Approved
Project Status	Active - Open to Enrollment
Expedited Categories	45 CFR 46.110.a(f)(7)
Risk Level	Minimal Risk
Type of Consent	Consent with Waiver of Documentation
HIPAA Category	No HIPAA
Approved Documents	IRB Approved Consent Document Updated protocol Updated recruitment ad Depression, anxiety, and stress scale Trait mindfulness scale- attention and awareness scale Interpersonal mindfulness scale

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
2. All unanticipated problems must be reported to the IRB on the Event Report within 5 business days of becoming aware of the problem. Unanticipated problems are defined as events that are unexpected, related or possibly related to the research, and suggests the research places subjects or others at a greater risk of harm than was previously known or recognized. If the unanticipated problem was a death, this is reportable to the IRB within 24 hours on the Death Report.
3. On-site deaths that are not unanticipated problems must be reported within 5 days of

Appendix A3

University of Missouri

Psychological Sciences
210 McAlester Hall
Columbia, MO 65211
PHONE 573-882-6860
FAX 573-882-7710
WEB psychology.missouri.edu

Dear Oleg Medvedev,

I, Steven Pratscher, permit you and your students, including Scott Lightburn, to use the data we collected at the University of Missouri for the project entitled Psychological Adjustment: Three-part study (IRB #2013684). You have my consent to use this data for research.

Sincerely,

Steven Pratscher, Ph.D.

Appendix B

Alert levels by date in New Zealand during the duration of the current study.

Date range	*Alert level*	Conditions
Prior to March 21, 2020	0	Normal conditions
March 21 – March 23, 2020	2	• New Zealanders aged 70 years and over and people with certain medical conditions required to stay at home as much as possible[1] • Essential workers (certain healthcare professionals, supermarket, food production and transport workers) continued to work as usual[1] • Businesses and organizations required to reduce person to person contact and to allow for employees to work from home where possible[1] • Non-essential domestic travel limited[1]
March 24 – March 25, 2020	3	• Non-essential businesses required to close[2] • Businesses and organizations required to implement alternative working arrangements such as allowing employees to work from home wherever possible[2] • Essential services such as emergency services, supermarkets, service stations and pharmacies remained open[2] • Schools only open to children of essential workers[2] • No face-to-face primary healthcare consultations[3] • All gatherings and events cancelled[2] • Public venues closed[3] • Air travel allowed for people to travel home. Social distancing of two meters required during air travel[3] • Public transport only open to essential workers and for transport of freight[2] • Public given 48 hours' notice to prepare for level 4 (lockdown conditions)[2]
March 26 – April 27, 2020	4	• Essential workers continued to work[3] • All other members of the public required to stay home[3] • Exercising in public allowed[3] • Members of the public allowed to leave home for essential items[3] • Essential workers and members of the public leaving home for exercise or essential items instructed to maintain social distancing of two metres[3] • All non-essential businesses closed[3] • All educational facilities closed[3] • All gatherings and events cancelled[3] • Air travel only for essential workers and freight, except for visitors and tourists travelling home internationally[3] • Public transport only for essential workers, the collection of groceries and medical reasons[3]
April 28 – May	3	• Household bubbles recommended to stay the same as they

13, 2020		were in Level 4, but allowed to expand with caution[4] • Businesses re-opened if safe and social distancing was required in workplaces (two meters advised although one meter was adequate in some businesses)[4] • Employees continued to work from home wherever possible[4] • Retail shops and restaurants required to sell products online and by phone order only, with contactless deliveries[4] • Exercising in public allowed, however gyms remained closed[4] • Early childhood centers and schools reopened for students up to Year 10, however, attendance was voluntary[4] • Tertiary institutes mostly conducted lectures and tutorials by distance learning[4] • Travel between the regions of New Zealand was not allowed except for essential workers[4] • Gatherings such as funerals, tangihanga (Māori ceremonies to mourn the dead) and weddings limited to a maximum of 10 people. Social distancing of two meters required and meals not permitted at gatherings[4]
May 14 – June 8, 2020	2	• General public allowed to leave home, but required to follow public health measures and social distancing (two meters in retail outlets and supermarkets, and one meter in other places)[5] • Retail outlets, malls, cafés, restaurants, playgrounds, gyms, cinemas, and most other public spaces reopened from May 14[6] • Schools reopened from May 18[6] • Bars reopened from May 21[6] • Travel to other regions in New Zealand permitted[5] • Border controls and a 14-day mandatory self-isolation period for new arrivals to New Zealand[5] • Gatherings initially continued to be limited to a maximum of 10 people6 but this was later relaxed to a maximum of 100 people[5]
June 9 until the end of study	1	• All restrictions lifted, except for border control[7] • Members of the public asked to track their movements[7]

Adapted from: [1] Ardern, J. (2020). Nation steps up to Covid-19 Alert Level 2. https://www.bopdhb.govt.nz/media-publications/2020-media-releases/march-2020/nation-steps-up-to-covid-19-alert-level-2/. Accessed December 14, 2020. [2]New Zealand Government. (2020a). New Zealand moves to COVID-19 Alert Level 3, then Level 4 in 48 hours. https://www.beehive.govt.nz/release/new-zealand-movescovid-19-alert-level-3-then-level-4-48-hours. Accessed December 14, 2020. [3]Nielson, M. (2020). Covid-19 Coronavirus: What will alert level 4 mean for New Zealand? *The New Zealand Herald.* https://www.nzherald.co.nz/nz/covid-19-coronavirus-what-will-alert-level-4-mean-for-newzealand/7Z4NTSGEPQ6ZMZUU2H7QLR27IM/. Accessed December 15 2020. [4]Covid-19 alert level 3: What you need to know. (2020, April 20). *RNZ.* https://www.rnz.co.nz/news/national/414688/covid-19-alert-level-3-what-you-need-to-know. Accessed December 15 2020. [5]New Zealand Government. (2020b). Alert Level 2. https://covid19.govt.nz/alert-system/alert-level-2/#everyday-life. Accessed December 15 2020. [6]Covid-19: PM Jacinda Ardern reveals staggered move to alert level 2. (2020, May 11). *RNZ.* https://www.rnz.co.nz/news/national/416359/covid-19-pm-jacinda-ardern-reveals-staggered-move-to-alertlevel-2. Accessed December 15 2020. [7]New Zealand Government. (2020c). New Zealand moves to Alert Level1. https://www.beehive.govt.nz/release/new-zealand-moves-alert-level-1. Accessed December 15 2020.

Appendix C

A. Components of observed score in GT of PxOxI design from Shavelson et al. (1989).

μ = grand mean of X (observed score), p = persons, o = occasions, i = items

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$X = \mu + X_p + X_o + X_i + X_{pi} + X_{po} + X_{oi} + X_{residual}$ **where:**

$X_p = \mu_p - \mu$ **(person effect)**

$X_o = \mu_o - \mu$ **(occasion effect)**

$X_i = \mu_i - \mu$ **(item effect)**

$X_{po} = \mu_{po} - \mu_p - \mu_o + \mu$ **(person x occasion effect)**

$X_{pi} = \mu_{pi} - \mu_p - \mu_i + \mu$ **(person x item effect)**

$X_{oi} = \mu_{oi} - \mu_o - \mu_i + \mu$ **(occasion x item effect)**

$X_{residual} = X_{poi} - \mu_{pi} - \mu_{po} - \mu_{oi} + \mu_p + \mu_i + \mu_o - \mu$

B. Variance component estimates for each effect were calculated as below.

MS = mean square of effect, *n* = facet sample size

$\sigma^2_p = (MS_p - MS_{pi} - MS_{po} + MS_{poi})/n_i n_o$**; Person variance component**

$\sigma^2_o = (MS_o - MS_{io} - MS_{po} + MS_{poi})/n_i n_p$**; Occasion variance component**

$\sigma^2_i = (MS_i - MS_{pi} - MS_{io} + MS_{poi})/n_p n_o$**; Item variance component**

$\sigma^2_{po} = (MS_{po} - MS_{poi})/n_i$**; Person x occasion variance component**

$\sigma^2_{pi} = (MS_{pi} - MS_{poi})/n_o$**; Person x item variance component**

$\sigma^2_{io} = (MS_{io} - MS_{poi})/n_p$**; Item x occasion variance component**

$\sigma^2_{pio} = MS_{poi}$**; Residual (person x occasion x item) variance component**

Appendix D1

DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Appendix D2

DASS-21 Scoring Instructions

The DASS-21 should not be used to replace a face to face clinical interview. If you are experiencing significant emotional difficulties you should contact your GP for a referral to a qualified professional.

Depression, Anxiety and Stress Scale - 21 Items (DASS-21)

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items.

The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows:

NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score.

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. (2nd Ed.)Sydney: Psychology Foundation.

Appendix E1

EduG analyses output for the total DASS-21 (US sample), including observation and estimation designs, ANOVA and G-study tables**.**

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	1207.002	114	10.588	0.156	0.162	0.162	20.2	0.022
I	179.782	20	8.989	0.005	0.005	0.005	0.6	0.009
O	24.412	2	12.206	0.002	0.005	0.005	0.6	0.004
PI	1874.598	2280	0.822	0.134	0.134	0.134	16.7	0.009
PO	87.588	228	0.384	0.002	0.018	0.018	2.3	0.002
IO	272.921	40	6.823	0.056	0.056	0.056	7.0	0.013
PIO	1922.412	4560	0.422	0.422	0.422	0.422	52.6	0.009
Total	5568.716	7244					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.162		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.002	21.1
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.006	100.0	0.006	78.9
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.162		0.006	100%	0.008	100%
Standard deviation	0.402		Relative SE:	0.078	Absolute SE:	0.088
Coef_G relative	0.96					
Coef_G absolute	0.95					

Grand mean for levels used: 1.741
Variance error of the mean for levels used: 0.003
Standard error of the grand mean: 0.056

Appendix E2

EduG analyses output for the DASS-21's "Depression" subscale (US sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 14 15 18 19 20
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	448.112	114	3.931	0.140	0.149	0.149	18.0	0.025
I	53.686	6	8.948	0.011	0.011	0.010	1.2	0.014
O	33.432	2	16.716	0.015	0.017	0.017	2.0	0.015
PI	662.219	684	0.968	0.190	0.190	0.190	23.0	0.018
PO	98.378	228	0.431	0.005	0.024	0.024	2.9	0.006
IO	56.284	12	4.690	0.037	0.037	0.037	4.5	0.015
PIO	545.240	1368	0.399	0.399	0.399	0.399	48.3	0.015
Total	1897.350	2414					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.149		.....		.....	
	.....	I	.....		0.001	2.1
	.....	O	.....		0.006	11.6
	.....	PI	0.019	47.3	0.019	39.6
	.....	PO	0.008	19.7	0.008	16.5
	.....	IO	.....		0.001	2.6
	.....	PIO	0.013	33.1	0.013	27.7
Sum of variances	0.149		0.040	100%	0.048	100%
Standard deviation	0.385		Relative SE:	0.200	Absolute SE:	0.219
Coef_G relative	0.79					
Coef_G absolute	0.76					

Grand mean for levels used: 1.729
Variance error of the mean for levels used: 0.009
Standard error of the grand mean: 0.097

Appendix E3

EduG analyses output for the DASS-21's "Anxiety" subscale (US sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 3 5 6 8 10 11 12 13 14 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	389.837	114	3.420	0.124	0.131	0.131	16.6	0.022
I	50.856	6	8.476	0.001	0.001	0.001	0.0	0.015
O	12.428	2	6.214	0.003	0.001	0.001	0.1	0.007
PI	591.334	684	0.865	0.143	0.143	0.143	18.1	0.017
PO	85.572	228	0.375	0.008	0.012	0.012	1.5	0.006
IO	100.418	12	8.368	0.069	0.069	0.069	8.7	0.028
PIO	594.248	1368	0.434	0.434	0.434	0.434	54.9	0.017
Total	1824.694	2414					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.131		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.000	0.6
	.....	PI	0.014	43.6	0.014	40.5
	.....	PO	0.004	12.4	0.004	11.5
	.....	IO	.....		0.002	6.5
	.....	PIO	0.014	44.0	0.014	40.9
Sum of variances	0.131		0.033	100%	0.035	100%
Standard deviation	0.362		Relative SE:	0.181	Absolute SE:	0.188
Coef_G relative	0.80					
Coef_G absolute	0.79					

Grand mean for levels used: 1.740
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.063

Appendix E4

EduG analyses output for the DASS-21's "Stress" subscale (US sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	2 3 4 5 7 9 10 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	510.946	114	4.482	0.187	0.191	0.191	23.9	0.028
I	74.466	6	12.411	0.013	0.013	0.012	1.6	0.020
O	3.138	2	1.569	0.007	0.004	0.004	0.0	0.004
PI	479.153	684	0.701	0.083	0.083	0.083	10.4	0.014
PO	69.243	228	0.304	0.021	0.000	0.000	0.1	0.005
IO	91.633	12	7.636	0.062	0.062	0.062	7.8	0.025
PIO	617.319	1368	0.451	0.451	0.451	0.451	56.4	0.017
Total	1845.898	2414					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.191		.....		.....	
	.....	I	.....		0.001	4.7
	.....	O	.....		(0.000)	0.0
	.....	PI	0.008	35.4	0.008	31.0
	.....	PO	0.000	0.6	0.000	0.5
	.....	IO	.....		0.002	7.8
	.....	PIO	0.015	64.0	0.015	56.1
Sum of variances	0.191		0.023	100%	0.027	100%
Standard deviation	0.437		Relative SE:	0.153	Absolute SE:	0.164
Coef_G relative	0.89					
Coef_G absolute	0.88					

Grand mean for levels used: 1.754
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.072

Appendix E5

EduG analyses output for Item 1 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.214		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.028	14.7
	.....	PI	.....		.....	
	.....	PO	0.163	100.0	0.163	85.3
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.214		0.163	100%	0.191	100%
Standard deviation	0.462		Relative SE:	0.404	Absolute SE:	0.437
Coef_G relative	0.57					
Coef_G absolute	0.53					

Grand mean for levels used: 1.846
Variance error of the mean for levels used: 0.031
Standard error of the grand mean: 0.177

Appendix E6

EduG analyses output for Item 2 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.194		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.047	24.3
	.....	PI	.....		.....	
	.....	PO	0.147	100.0	0.147	75.7
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.194		0.147	100%	0.194	100%
Standard deviation	0.440		Relative SE:	0.384	Absolute SE:	0.441
Coef_G relative	0.57					
Coef_G absolute	0.50					

Grand mean for levels used: 1.864
Variance error of the mean for levels used: 0.050
Standard error of the grand mean: 0.224

Appendix E7

EduG analyses output for Item 3 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.460		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.021	16.3
	.....	PI	.....		.....	
	.....	PO	0.105	100.0	0.105	83.7
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.460		0.105	100%	0.126	100%
Standard deviation	0.678		Relative SE:	0.324	Absolute SE:	0.354
Coef_G relative	0.81					
Coef_G absolute	0.79					

Grand mean for levels used: 1.797
Variance error of the mean for levels used: 0.025
Standard error of the grand mean: 0.159

Appendix E8

EduG analyses output for Item 4 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.335		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.028	19.5
	.....	PI	.....		.....	
	.....	PO	0.114	100.0	0.114	80.5
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.335		0.114	100%	0.142	100%
Standard deviation	0.579		Relative SE:	0.338	Absolute SE:	0.377
Coef_G relative	0.75					
Coef_G absolute	0.70					

Grand mean for levels used: 1.757
Variance error of the mean for levels used: 0.032
Standard error of the grand mean: 0.178

Appendix E9

EduG analyses output for Item 5 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.313		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.002	1.6
	.....	PI	.....		.....	
	.....	PO	0.134	100.0	0.134	98.4
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.313		0.134	100%	0.136	100%
Standard deviation	0.559		Relative SE:	0.366	Absolute SE:	0.369
Coef_G relative	0.70					
Coef_G absolute	0.70					

Grand mean for levels used: 1.725
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.078

Appendix E10

EduG analyses output for Item 6 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.307		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.005	4.7
	.....	PI	.....		.....	
	.....	PO	0.100	100.0	0.100	95.3
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.307		0.100	100%	0.105	100%
Standard deviation	0.554		Relative SE:	0.317	Absolute SE:	0.325
Coef_G relative	0.75					
Coef_G absolute	0.74					

Grand mean for levels used: 1.475
Variance error of the mean for levels used: 0.008
Standard error of the grand mean: 0.092

Appendix E11

EduG analyses output for Item 7 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.294		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.011	8.3
	.....	PI	.....		.....	
	.....	PO	0.126	100.0	0.126	91.7
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.294		0.126	100%	0.137	100%
Standard deviation	0.542		Relative SE:	0.355	Absolute SE:	0.370
Coef_G relative	0.70					
Coef_G absolute	0.68					

Grand mean for levels used: 1.481
Variance error of the mean for levels used: 0.015
Standard error of the grand mean: 0.123

Appendix E12

EduG analyses output for Item 8 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.118		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.038	16.1
	.....	PI	.....		.....	
	.....	PO	0.201	100.0	0.201	83.9
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.118		0.201	100%	0.240	100%
Standard deviation	0.344		Relative SE:	0.448	Absolute SE:	0.490
Coef_G relative	0.37					
Coef_G absolute	0.33					

Grand mean for levels used: 1.864
Variance error of the mean for levels used: 0.041
Standard error of the grand mean: 0.203

Appendix E13

EduG analyses output for Item 9 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.256		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.045	21.8
	.....	PI	.....		.....	
	.....	PO	0.163	100.0	0.163	78.2
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.256		0.163	100%	0.208	100%
Standard deviation	0.506		Relative SE:	0.403	Absolute SE:	0.456
Coef_G relative	0.61					
Coef_G absolute	0.55					

Grand mean for levels used: 1.930
Variance error of the mean for levels used: 0.049
Standard error of the grand mean: 0.221

Appendix E14

EduG analyses output for Item 10 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.439		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.018	12.6
	.....	PI	.....		.....	
	.....	PO	0.123	100.0	0.123	87.4
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.439		0.123	100%	0.140	100%
Standard deviation	0.662		Relative SE:	0.350	Absolute SE:	0.374
Coef_G relative	0.78					
Coef_G absolute	0.76					

Grand mean for levels used: 1.803
Variance error of the mean for levels used: 0.022
Standard error of the grand mean: 0.150

Appendix E15

EduG analyses output for Item 11 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.361		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.032	19.2
	.....	PI	.....		.....	
	.....	PO	0.134	100.0	0.134	80.8
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.361		0.134	100%	0.165	100%
Standard deviation	0.601		Relative SE:	0.365	Absolute SE:	0.406
Coef_G relative	0.73					
Coef_G absolute	0.69					

Grand mean for levels used: 1.954
Variance error of the mean for levels used: 0.036
Standard error of the grand mean: 0.190

Appendix E16

EduG analyses output for Item 12 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.320		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.001	0.5
	.....	PI	.....		.....	
	.....	PO	0.121	100.0	0.121	99.5
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.320		0.121	100%	0.122	100%
Standard deviation	0.566		Relative SE:	0.348	Absolute SE:	0.349
Coef_G relative	0.73					
Coef_G absolute	0.72					

Grand mean for levels used: 1.791
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.067

Appendix E17

EduG analyses output for Item 13 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.351		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.004	4.4
	.....	PI	.....		.....	
	.....	PO	0.078	100.0	0.078	95.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.351		0.078	100%	0.082	100%
Standard deviation	0.593		Relative SE:	0.280	Absolute SE:	0.287
Coef_G relative	0.82					
Coef_G absolute	0.81					

Grand mean for levels used: 1.539
Variance error of the mean for levels used: 0.007
Standard error of the grand mean: 0.086

Appendix E18

EduG analyses output for Item 14 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.310		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.007	5.2
	.....	PI	.....		.....	
	.....	PO	0.124	100.0	0.124	94.8
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.310		0.124	100%	0.130	100%
Standard deviation	0.557		Relative SE:	0.352	Absolute SE:	0.361
Coef_G relative	0.71					
Coef_G absolute	0.70					

Grand mean for levels used: 1.496
Variance error of the mean for levels used: 0.011
Standard error of the grand mean: 0.103

Appendix E19

EduG analyses output for Item 15 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.197		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.013	6.4
	.....	PI	.....		.....	
	.....	PO	0.195	100.0	0.195	93.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.197		0.195	100%	0.209	100%
Standard deviation	0.444		Relative SE:	0.442	Absolute SE:	0.457
Coef_G relative	0.50					
Coef_G absolute	0.49					

Grand mean for levels used: 1.814
Variance error of the mean for levels used: 0.017
Standard error of the grand mean: 0.130

Appendix E20

EduG analyses output for Item 16 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.233		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.046	22.4
	.....	PI	.....		.....	
	.....	PO	0.161	100.0	0.161	77.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.233		0.161	100%	0.208	100%
Standard deviation	0.483		Relative SE:	0.402	Absolute SE:	0.456
Coef_G relative	0.59					
Coef_G absolute	0.53					

Grand mean for levels used: 1.930
Variance error of the mean for levels used: 0.050
Standard error of the grand mean: 0.223

Appendix E21

EduG analyses output for Item 17 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.333		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.027	13.6
	.....	PI	.....		.....	
	.....	PO	0.170	100.0	0.170	86.4
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.333		0.170	100%	0.197	100%
Standard deviation	0.577		Relative SE:	0.413	Absolute SE:	0.444
Coef_G relative	0.66					
Coef_G absolute	0.63					

Grand mean for levels used: 1.823
Variance error of the mean for levels used: 0.031
Standard error of the grand mean: 0.177

Appendix E22

EduG analyses output for Item 18 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.261		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.018	10.1
	.....	PI	.....		.....	
	.....	PO	0.161	100.0	0.161	89.9
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.261		0.161	100%	0.179	100%
Standard deviation	0.511		Relative SE:	0.401	Absolute SE:	0.423
Coef_G relative	0.62					
Coef_G absolute	0.59					

Grand mean for levels used: 1.852
Variance error of the mean for levels used: 0.022
Standard error of the grand mean: 0.147

Appendix E23

EduG analyses output for Item 19 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.275		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.003	2.3
	.....	PI	.....		.....	
	.....	PO	0.137	100.0	0.137	97.7
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.275		0.137	100%	0.140	100%
Standard deviation	0.524		Relative SE:	0.370	Absolute SE:	0.374
Coef_G relative	0.67					
Coef_G absolute	0.66					

Grand mean for levels used: 1.745
Variance error of the mean for levels used: 0.007
Standard error of the grand mean: 0.082

Appendix E24

EduG analyses output for Item 20 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.325		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.007	5.7
	.....	PI	.....		.....	
	.....	PO	0.112	100.0	0.112	94.3
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.325		0.112	100%	0.119	100%
Standard deviation	0.570		Relative SE:	0.335	Absolute SE:	0.345
Coef_G relative	0.74					
Coef_G absolute	0.73					

Grand mean for levels used: 1.588
Variance error of the mean for levels used: 0.011
Standard error of the grand mean: 0.103

Appendix E25

EduG analyses output for Item 21 of the DASS-21 (US sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.176		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.005	2.6
	.....	PI	.....		.....	
	.....	PO	0.169	100.0	0.169	97.4
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.176		0.169	100%	0.174	100%
Standard deviation	0.420		Relative SE:	0.411	Absolute SE:	0.417
Coef_G relative	0.51					
Coef_G absolute	0.50					

Grand mean for levels used: 1.484
Variance error of the mean for levels used: 0.008
Standard error of the grand mean: 0.087

Appendix E26

EduG analyses output for the total DASS-21 (NZ sample), including observation and estimation designs, ANOVA and G-study tables.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	624.329	113	5.525	0.074	0.082	0.082	10.6	0.012
I	136.226	20	6.811	0.006	0.006	0.005	0.0	0.008
O	27.249	2	13.624	0.002	0.006	0.006	0.7	0.004
PI	2141.425	2260	0.948	0.172	0.172	0.172	22.1	0.010
PO	78.878	226	0.349	0.004	0.017	0.017	2.1	0.002
IO	329.628	40	8.241	0.068	0.068	0.068	8.8	0.016
PIO	1954.911	4520	0.433	0.433	0.433	0.433	55.7	0.009
Total	5292.647	7181					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.082		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.002	25.0
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.006	100.0	0.006	75.0
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.082		0.006	100%	0.007	100%
Standard deviation	0.287		Relative SE:	0.074	Absolute SE:	0.086
Coef_G relative	0.94					
Coef_G absolute	0.92					

Grand mean for levels used: 0.779
Variance error of the mean for levels used: 0.003
Standard error of the grand mean: 0.051

Appendix E27

EduG analyses output for the DASS-21's "Depression" subscale (NZ sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 14 15 18 19 20
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	249.974	113	2.212	0.056	0.067	0.067	8.6	0.014
I	32.778	6	5.463	0.011	0.011	0.011	0.0	0.012
O	50.378	2	25.189	0.021	0.024	0.024	3.1	0.023
PI	716.556	678	1.057	0.225	0.225	0.225	28.6	0.020
PO	79.622	226	0.352	0.004	0.014	0.014	1.8	0.005
IO	103.370	12	8.614	0.072	0.072	0.072	9.2	0.029
PIO	519.297	1356	0.383	0.383	0.383	0.383	48.8	0.015
Total	1751.974	2393					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.067		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.008	16.1
	.....	PI	0.022	56.4	0.022	44.6
	.....	PO	0.005	11.6	0.005	9.2
	.....	IO	.....		0.002	4.8
	.....	PIO	0.013	32.0	0.013	25.4
Sum of variances	0.067		0.040	100%	0.050	100%
Standard deviation	0.259		Relative SE:	0.200	Absolute SE:	0.224
Coef_G relative	0.63					
Coef_G absolute	0.57					

Grand mean for levels used: 0.728
Variance error of the mean for levels used: 0.011
Standard error of the grand mean: 0.107

Appendix E28

EduG analyses output for the DASS-21's "Anxiety" subscale (NZ sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 3 5 6 8 10 11 12 13 14 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	299.930	113	2.654	0.083	0.091	0.091	11.0	0.017
I	34.880	6	5.813	0.010	0.010	0.010	0.0	0.013
O	14.286	2	7.143	0.002	0.001	0.001	0.2	0.008
PI	665.596	678	0.982	0.168	0.168	0.168	20.4	0.019
PO	93.333	226	0.413	0.009	0.014	0.014	1.6	0.006
IO	105.662	12	8.805	0.073	0.073	0.073	8.9	0.029
PIO	646.719	1356	0.477	0.477	0.477	0.477	57.9	0.018
Total	1860.406	2393					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.091		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.000	1.2
	.....	PI	0.017	45.2	0.017	41.9
	.....	PO	0.005	12.1	0.005	11.3
	.....	IO	.....		0.002	6.1
	.....	PIO	0.016	42.7	0.016	39.6
Sum of variances	0.091		0.037	100%	0.040	100%
Standard deviation	0.301		Relative SE:	0.193	Absolute SE:	0.200
Coef_G relative	0.71					
Coef_G absolute	0.69					

Grand mean for levels used: 0.840
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.064

Appendix E29

EduG analyses output for the DASS-21's "Stress" subscale (NZ sample), including observation and estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	2 3 4 5 7 9 10 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	236.530	113	2.093	0.054	0.062	0.062	8.5	0.014
I	53.403	6	8.900	0.006	0.006	0.006	0.8	0.015
O	7.228	2	3.614	0.003	0.001	0.001	0.0	0.004
PI	597.169	678	0.881	0.150	0.150	0.150	20.6	0.017
PO	112.486	226	0.498	0.010	0.030	0.030	4.1	0.007
IO	75.953	12	6.329	0.052	0.052	0.052	7.1	0.021
PIO	582.332	1356	0.429	0.429	0.429	0.429	58.9	0.016
Total	1665.102	2393					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.062		.....		.....	
	.....	I	.....		0.001	1.4
	.....	O	.....		(0.000)	0.0
	.....	PI	0.015	38.2	0.015	36.0
	.....	PO	0.010	25.5	0.010	24.1
	.....	IO	.....		0.002	4.1
	.....	PIO	0.014	36.3	0.014	34.3
Sum of variances	0.062		0.039	100%	0.042	100%
Standard deviation	0.248		Relative SE:	0.199	Absolute SE:	0.204
Coef_G relative	0.61					
Coef_G absolute	0.60					

Grand mean for levels used: 0.771
Variance error of the mean for levels used: 0.003
Standard error of the grand mean: 0.057

Appendix E30

EduG analyses output for Item 1 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.184		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.015	8.9
	.....	PI	.....		.....	
	.....	PO	0.157	100.0	0.157	91.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.184		0.157	100%	0.173	100%
Standard deviation	0.429		Relative SE:	0.397	Absolute SE:	0.415
Coef_G relative	0.54					
Coef_G absolute	0.52					

Grand mean for levels used: 0.865
Variance error of the mean for levels used: 0.018
Standard error of the grand mean: 0.135

Appendix E31

EduG analyses output for Item 2 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.239		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.051	27.4
	.....	PI	.....		.....	
	.....	PO	0.134	100.0	0.134	72.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.239		0.134	100%	0.185	100%
Standard deviation	0.489		Relative SE:	0.367	Absolute SE:	0.430
Coef_G relative	0.64					
Coef_G absolute	0.56					

Grand mean for levels used: 0.912
Variance error of the mean for levels used: 0.054
Standard error of the grand mean: 0.232

Appendix E32

EduG analyses output for Item 3 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.315		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.031	19.4
	.....	PI	.....		.....	
	.....	PO	0.130	100.0	0.130	80.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.315		0.130	100%	0.161	100%
Standard deviation	0.561		Relative SE:	0.360	Absolute SE:	0.401
Coef_G relative	0.71					
Coef_G absolute	0.66					

Grand mean for levels used: 0.722
Variance error of the mean for levels used: 0.035
Standard error of the grand mean: 0.187

Appendix E33

EduG analyses output for Item 4 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.238		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.022	12.9
	.....	PI	.....		.....	
	.....	PO	0.149	100.0	0.149	87.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.238		0.149	100%	0.172	100%
Standard deviation	0.488		Relative SE:	0.387	Absolute SE:	0.414
Coef_G relative	0.61					
Coef_G absolute	0.58					

Grand mean for levels used: 1.026
Variance error of the mean for levels used: 0.025
Standard error of the grand mean: 0.160

Appendix E34

EduG analyses output for Item 5 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.292		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.022	18.9
	.....	PI	.....		.....	
	.....	PO	0.094	100.0	0.094	81.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.292		0.094	100%	0.116	100%
Standard deviation	0.540		Relative SE:	0.307	Absolute SE:	0.341
Coef_G relative	0.76					
Coef_G absolute	0.72					

Grand mean for levels used: 0.880
Variance error of the mean for levels used: 0.025
Standard error of the grand mean: 0.159

Appendix E35

EduG analyses output for Item 6 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.251		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.012	8.8
	.....	PI	.....		.....	
	.....	PO	0.122	100.0	0.122	91.2
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.251		0.122	100%	0.134	100%
Standard deviation	0.501		Relative SE:	0.349	Absolute SE:	0.365
Coef_G relative	0.67					
Coef_G absolute	0.65					

Grand mean for levels used: 0.763
Variance error of the mean for levels used: 0.015
Standard error of the grand mean: 0.122

Appendix E36

EduG analyses output for Item 7 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.180		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.009	5.9
	.....	PI	.....		.....	
	.....	PO	0.147	100.0	0.147	94.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.180		0.147	100%	0.156	100%
Standard deviation	0.424		Relative SE:	0.383	Absolute SE:	0.395
Coef_G relative	0.55					
Coef_G absolute	0.54					

Grand mean for levels used: 0.611
Variance error of the mean for levels used: 0.012
Standard error of the grand mean: 0.110

Appendix E37

EduG analyses output for Item 8 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.073		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.031	15.2
	.....	PI	.....		.....	
	.....	PO	0.171	100.0	0.171	84.8
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.073		0.171	100%	0.202	100%
Standard deviation	0.269		Relative SE:	0.414	Absolute SE:	0.449
Coef_G relative	0.30					
Coef_G absolute	0.26					

Grand mean for levels used: 0.722
Variance error of the mean for levels used: 0.033
Standard error of the grand mean: 0.181

Appendix E38

EduG analyses output for Item 9 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.185		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.067	30.1
	.....	PI	.....		.....	
	.....	PO	0.156	100.0	0.156	69.9
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.185		0.156	100%	0.223	100%
Standard deviation	0.430		Relative SE:	0.395	Absolute SE:	0.472
Coef_G relative	0.54					
Coef_G absolute	0.45					

Grand mean for levels used: 0.839
Variance error of the mean for levels used: 0.070
Standard error of the grand mean: 0.265

Appendix E39

EduG analyses output for Item 10 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.301		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.032	22.1
	.....	PI	.....		.....	
	.....	PO	0.114	100.0	0.114	77.9
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.301		0.114	100%	0.146	100%
Standard deviation	0.549		Relative SE:	0.338	Absolute SE:	0.382
Coef_G relative	0.73					
Coef_G absolute	0.67					

Grand mean for levels used: 0.617
Variance error of the mean for levels used: 0.036
Standard error of the grand mean: 0.189

Appendix E40

EduG analyses output for Item 11 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 12 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.216		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.019	11.9
	.....	PI	.....		.....	
	.....	PO	0.142	100.0	0.142	88.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.216		0.142	100%	0.161	100%
Standard deviation	0.465		Relative SE:	0.376	Absolute SE:	0.401
Coef_G relative	0.60					
Coef_G absolute	0.57					

Grand mean for levels used: 0.883
Variance error of the mean for levels used: 0.022
Standard error of the grand mean: 0.149

Appendix E41

EduG analyses output for Item 12 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 13 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.132		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.016	9.2
	.....	PI	.....		.....	
	.....	PO	0.159	100.0	0.159	90.8
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.132		0.159	100%	0.175	100%
Standard deviation	0.364		Relative SE:	0.399	Absolute SE:	0.419
Coef_G relative	0.45					
Coef_G absolute	0.43					

Grand mean for levels used: 0.746
Variance error of the mean for levels used: 0.019
Standard error of the grand mean: 0.137

Appendix E42

EduG analyses output for Item 13 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.187		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.024	15.0
	.....	PI	.....		.....	
	.....	PO	0.138	100.0	0.138	85.0
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.187		0.138	100%	0.162	100%
Standard deviation	0.432		Relative SE:	0.371	Absolute SE:	0.402
Coef_G relative	0.58					
Coef_G absolute	0.54					

Grand mean for levels used: 0.678
Variance error of the mean for levels used: 0.027
Standard error of the grand mean: 0.165

Appendix E43

EduG analyses output for Item 14 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.115		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.008	5.5
	.....	PI	.....		.....	
	.....	PO	0.135	100.0	0.135	94.5
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.115		0.135	100%	0.143	100%
Standard deviation	0.339		Relative SE:	0.368	Absolute SE:	0.379
Coef_G relative	0.46					
Coef_G absolute	0.45					

Grand mean for levels used: 0.459
Variance error of the mean for levels used: 0.010
Standard error of the grand mean: 0.100

Appendix E44

EduG analyses output for Item 15 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 16 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.207		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.013	6.5
	.....	PI	.....		.....	
	.....	PO	0.182	100.0	0.182	93.5
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.207		0.182	100%	0.195	100%
Standard deviation	0.455		Relative SE:	0.427	Absolute SE:	0.442
Coef_G relative	0.53					
Coef_G absolute	0.52					

Grand mean for levels used: 0.816
Variance error of the mean for levels used: 0.016
Standard error of the grand mean: 0.127

Appendix E45

EduG analyses output for Item 16 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.286		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.080	38.3
	.....	PI	.....		.....	
	.....	PO	0.129	100.0	0.129	61.7
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.286		0.129	100%	0.210	100%
Standard deviation	0.535		Relative SE:	0.360	Absolute SE:	0.458
Coef_G relative	0.69					
Coef_G absolute	0.58					

Grand mean for levels used: 0.909
Variance error of the mean for levels used: 0.084
Standard error of the grand mean: 0.290

Appendix E46

EduG analyses output for Item 17 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 18 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.288		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.026	15.2
	.....	PI	.....		.....	
	.....	PO	0.148	100.0	0.148	84.8
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.288		0.148	100%	0.174	100%
Standard deviation	0.536		Relative SE:	0.385	Absolute SE:	0.418
Coef_G relative	0.66					
Coef_G absolute	0.62					

Grand mean for levels used: 0.719
Variance error of the mean for levels used: 0.030
Standard error of the grand mean: 0.174

Appendix E47

EduG analyses output for Item 18 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 19 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.463		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.012	7.9
	.....	PI	.....		.....	
	.....	PO	0.138	100.0	0.138	92.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.463		0.138	100%	0.150	100%
Standard deviation	0.680		Relative SE:	0.372	Absolute SE:	0.387
Coef_G relative	0.77					
Coef_G absolute	0.75					

Grand mean for levels used: 0.956
Variance error of the mean for levels used: 0.017
Standard error of the grand mean: 0.131

Appendix E48

EduG analyses output for Item 19 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.401		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.002	1.4
	.....	PI	.....		.....	
	.....	PO	0.147	100.0	0.147	98.6
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.401		0.147	100%	0.149	100%
Standard deviation	0.633		Relative SE:	0.383	Absolute SE:	0.386
Coef_G relative	0.73					
Coef_G absolute	0.73					

Grand mean for levels used: 0.904
Variance error of the mean for levels used: 0.007
Standard error of the grand mean: 0.083

Appendix E49

EduG analyses output for Item 20 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.306		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.002	0.9
	.....	PI	.....		.....	
	.....	PO	0.176	100.0	0.176	99.1
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.306		0.176	100%	0.177	100%
Standard deviation	0.553		Relative SE:	0.419	Absolute SE:	0.421
Coef_G relative	0.64					
Coef_G absolute	0.63					

Grand mean for levels used: 0.769
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.076

Appendix E50

EduG analyses output for Item 21 of the DASS-21 (NZ sample), including observation and estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Occasion	O	3	INF	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.299		.....		.....	
	.....	I	.....		.....	
	.....	O	.....		0.001	0.6
	.....	PI	.....		.....	
	.....	PO	0.131	100.0	0.131	99.4
	.....	IO	.....		.....	
	.....	PIO	.....		.....	
Sum of variances	0.299		0.131	100%	0.132	100%
Standard deviation	0.547		Relative SE:	0.362	Absolute SE:	0.363
Coef_G relative	0.70					
Coef_G absolute	0.69					

Grand mean for levels used: 0.570
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.067

Appendix E51

EduG analyses output of the total DASS-21 (US sample) excluding the three highest State Component Index items (8, 12 and 14), together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	8 12 14
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	1040.224	114	9.125	0.154	0.160	0.160	19.9	0.022
I	152.846	17	8.991	0.007	0.007	0.006	0.8	0.009
O	50.752	2	25.376	0.009	0.012	0.012	1.4	0.009
PI	1632.894	1938	0.843	0.142	0.142	0.142	17.6	0.010
PO	90.878	228	0.399	0.001	0.019	0.019	2.3	0.002
IO	212.211	34	6.241	0.051	0.051	0.051	6.3	0.013
PIO	1614.160	3876	0.416	0.416	0.416	0.416	51.6	0.009
Total	4793.965	6209					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.160		.....		.....	
	.....	I	.....		0.000	0.4
	.....	O	.....		0.004	30.6
	.....	PI	0.001	13.7	0.001	9.3
	.....	PO	0.006	72.8	0.006	49.4
	.....	IO	.....		0.000	1.1
	.....	PIO	0.001	13.4	0.001	9.1
Sum of variances	0.160		0.009	100%	0.013	100%
Standard deviation	0.401		Relative SE:	0.093	Absolute SE:	0.113
Coef_G relative	0.95					
Coef_G absolute	0.93					

Grand mean for levels used: 1.745
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.075

Appendix E52

EduG analyses output of the total DASS-21 (US sample) excluding the two highest State Component Index items (8 and 12), together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	8 12
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	1097.536	114	9.628	0.155	0.161	0.161	20.1	0.022
I	173.156	18	9.620	0.008	0.008	0.008	1.0	0.010
O	41.670	2	20.835	0.007	0.009	0.009	1.1	0.007
PI	1723.827	2052	0.840	0.142	0.142	0.142	17.6	0.009
PO	88.259	228	0.387	0.001	0.018	0.018	2.3	0.002
IO	226.735	36	6.298	0.051	0.051	0.051	6.4	0.013
PIO	1701.335	4104	0.415	0.415	0.415	0.415	51.5	0.009
Total	5052.518	6554					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.161		.....		.....	
	.....	I	.....		0.000	0.4
	.....	O	.....		0.003	28.3
	.....	PI	0.001	9.9	0.001	7.0
	.....	PO	0.006	80.5	0.006	56.8
	.....	IO	.....		0.000	0.8
	.....	PIO	0.001	9.6	0.001	6.8
Sum of variances	0.161		0.008	100%	0.011	100%
Standard deviation	0.402		Relative SE:	0.087	Absolute SE:	0.104
Coef_G relative	0.96					
Coef_G absolute	0.94					

Grand mean for levels used: 1.732
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.068

Appendix E53

EduG analyses output of the total DASS-21 (US sample) excluding the highest State Component Index item (8), together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	8
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	1168.152	114	10.247	0.157	0.164	0.164	20.5	0.022
I	174.316	19	9.175	0.008	0.008	0.007	0.9	0.009
O	37.623	2	18.812	0.006	0.008	0.008	1.0	0.006
PI	1804.184	2166	0.833	0.141	0.141	0.141	17.6	0.009
PO	93.177	228	0.409	0.000	0.019	0.019	2.4	0.002
IO	231.948	38	6.104	0.050	0.050	0.050	6.2	0.012
PIO	1779.252	4332	0.411	0.411	0.411	0.411	51.4	0.009
Total	5288.652	6899					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.164		.....		.....	
	.....	I	.....		0.000	0.2
	.....	O	.....		0.003	26.6
	.....	PI	0.000	4.9	0.000	3.6
	.....	PO	0.006	90.3	0.006	65.7
	.....	IO	.....		0.000	0.4
	.....	PIO	0.000	4.8	0.000	3.5
Sum of variances	0.164		0.007	100%	0.010	100%
Standard deviation	0.405		Relative SE:	0.085	Absolute SE:	0.099
Coef_G relative	0.96					
Coef_G absolute	0.94					

Grand mean for levels used: 1.735
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.065

Appendix E54

EduG analyses output of the DASS-21's "Depression" subscale (US sample) excluding the three highest State Component Index items (13, 16 and 21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 13 14 15 16 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	302.365	114	2.652	0.118	0.131	0.131	15.1	0.030
I	1.916	3	0.639	0.011	0.011	0.010	0.0	0.005
O	28.387	2	14.193	0.023	0.024	0.024	2.8	0.022
PI	407.751	342	1.192	0.268	0.268	0.268	30.9	0.031
PO	98.613	228	0.433	0.011	0.030	0.030	3.4	0.011
IO	21.132	6	3.522	0.027	0.027	0.027	3.1	0.015
PIO	265.201	684	0.388	0.388	0.388	0.388	44.7	0.021
Total	1125.365	1379					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.131		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.008	7.8
	.....	PI	0.057	60.4	0.057	54.6
	.....	PO	0.010	10.5	0.010	9.5
	.....	IO	.....		0.002	1.8
	.....	PIO	0.027	29.1	0.027	26.3
Sum of variances	0.131		0.094	100%	0.104	100%
Standard deviation	0.362		Relative SE:	0.307	Absolute SE:	0.323
Coef_G relative	0.58					
Coef_G absolute	0.56					

Grand mean for levels used: 1.787
Variance error of the mean for levels used: 0.012
Standard error of the grand mean: 0.110

Appendix E55

EduG analyses output of the DASS-21's "Depression" subscale (US sample) excluding the two highest State Component Index items (13 and 21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 13 14 15 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	326.577	114	2.865	0.111	0.122	0.122	14.0	0.026
I	7.598	4	1.899	0.007	0.007	0.007	0.0	0.006
O	53.805	2	26.903	0.040	0.042	0.042	4.8	0.033
PI	518.536	456	1.137	0.245	0.245	0.245	28.1	0.026
PO	106.995	228	0.469	0.013	0.033	0.033	3.7	0.010
IO	28.757	8	3.595	0.028	0.028	0.028	3.2	0.014
PIO	367.110	912	0.403	0.403	0.403	0.403	46.2	0.019
Total	1409.377	1724					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.122		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.014	16.0
	.....	PI	0.039	54.8	0.039	45.1
	.....	PO	0.011	15.2	0.011	12.5
	.....	IO	.....		0.001	1.7
	.....	PIO	0.021	30.0	0.021	24.7
Sum of variances	0.122		0.071	100%	0.087	100%
Standard deviation	0.350		Relative SE:	0.267	Absolute SE:	0.295
Coef_G relative	0.63					
Coef_G absolute	0.58					

Grand mean for levels used: 1.816
Variance error of the mean for levels used: 0.017
Standard error of the grand mean: 0.131

Appendix E56

EduG analyses output of the DASS-21's "Depression" subscale (US sample) excluding the highest State Component Index item (21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 14 15 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	395.583	114	3.470	0.133	0.143	0.143	17.2	0.026
I	29.581	5	5.916	0.004	0.004	0.004	0.5	0.010
O	48.264	2	24.132	0.030	0.031	0.031	3.7	0.025
PI	596.586	570	1.047	0.222	0.222	0.222	26.7	0.021
PO	95.070	228	0.417	0.006	0.024	0.024	2.9	0.007
IO	37.272	10	3.727	0.029	0.029	0.029	3.5	0.013
PIO	432.728	1140	0.380	0.380	0.380	0.380	45.5	0.016
Total	1635.083	2069					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.143		.....		.....	
	.....	I	.....		0.001	0.8
	.....	O	.....		0.010	16.2
	.....	PI	0.028	53.7	0.028	43.6
	.....	PO	0.008	15.7	0.008	12.7
	.....	IO	.....		0.001	1.9
	.....	PIO	0.016	30.6	0.016	24.8
Sum of variances	0.143		0.052	100%	0.064	100%
Standard deviation	0.378		Relative SE:	0.227	Absolute SE:	0.252
Coef_G relative	0.73					
Coef_G absolute	0.69					

Grand mean for levels used: 1.770
Variance error of the mean for levels used: 0.014
Standard error of the grand mean: 0.117

Appendix E57

EduG analyses output of the DASS-21's "Anxiety" subscale (US sample) excluding the three highest State Component Index items (7, 9 and 15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 3 5 6 7 8 9 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	272.314	114	2.389	0.129	0.136	0.136	17.9	0.027
I	13.312	3	4.437	0.009	0.009	0.008	0.0	0.013
O	19.588	2	9.794	0.006	0.009	0.009	1.2	0.017
PI	288.271	342	0.843	0.154	0.154	0.154	20.3	0.022
PO	87.912	228	0.386	0.001	0.019	0.019	2.5	0.010
IO	42.012	6	7.002	0.058	0.058	0.058	7.6	0.030
PIO	261.155	684	0.382	0.382	0.382	0.382	50.4	0.021
Total	984.564	1379					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.136		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	4.0
	.....	PI	0.033	49.4	0.033	44.7
	.....	PO	0.006	9.6	0.006	8.7
	.....	IO	.....		0.004	5.6
	.....	PIO	0.027	40.9	0.027	37.0
Sum of variances	0.136		0.066	100%	0.073	100%
Standard deviation	0.369		Relative SE:	0.257	Absolute SE:	0.270
Coef_G relative	0.67					
Coef_G absolute	0.65					

Grand mean for levels used: 1.738
Variance error of the mean for levels used: 0.009
Standard error of the grand mean: 0.094

Appendix E58

EduG analyses output of the DASS-21's "Anxiety" subscale (US sample) excluding the two highest State Component Index items (9 and 15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

D-Study_DASS_US Anxiety subscale without items 9 and 15

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 3 5 6 8 9 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	337.490	114	2.960	0.146	0.153	0.153	20.2	0.026
I	31.577	4	7.894	0.001	0.001	0.001	0.0	0.017
O	8.779	2	4.390	0.006	0.003	0.003	0.0	0.008
PI	366.557	456	0.804	0.138	0.138	0.138	18.3	0.019
PO	80.688	228	0.354	0.007	0.012	0.012	1.5	0.008
IO	61.470	8	7.684	0.063	0.063	0.063	8.4	0.030
PIO	354.397	912	0.389	0.389	0.389	0.389	51.5	0.018
Total	1240.957	1724					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.153		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		(0.000)	0.0
	.....	PI	0.022	47.4	0.022	44.2
	.....	PO	0.004	8.2	0.004	7.7
	.....	IO	.....		0.003	6.8
	.....	PIO	0.021	44.4	0.021	41.4
Sum of variances	0.153		0.047	100%	0.050	100%
Standard deviation	0.391		Relative SE:	0.216	Absolute SE:	0.224
Coef_G relative	0.77					
Coef_G absolute	0.75					

Grand mean for levels used: 1.687
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.072

Appendix E59

EduG analyses output of the DASS-21's "Anxiety" subscale (US sample) excluding the highest State Component Index items (15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	1 3 5 6 8 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	352.664	114	3.094	0.127	0.135	0.135	17.2	0.023
I	48.620	5	9.724	0.004	0.004	0.004	0.5	0.018
O	24.843	2	12.422	0.007	0.010	0.010	1.3	0.014
PI	494.380	570	0.867	0.152	0.152	0.152	19.4	0.018
PO	78.490	228	0.344	0.011	0.009	0.009	1.1	0.006
IO	77.562	10	7.756	0.064	0.064	0.064	8.2	0.028
PIO	467.771	1140	0.410	0.410	0.410	0.410	52.4	0.017
Total	1544.330	2069					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.135		.....		.....	
	.....	I	.....		0.001	1.1
	.....	O	.....		0.003	7.3
	.....	PI	0.019	48.8	0.019	41.9
	.....	PO	0.003	7.3	0.003	6.3
	.....	IO	.....		0.003	5.9
	.....	PIO	0.017	43.9	0.017	37.6
Sum of variances	0.135		0.039	100%	0.045	100%
Standard deviation	0.367		Relative SE:	0.197	Absolute SE:	0.213
Coef_G relative	0.78					
Coef_G absolute	0.75					

Grand mean for levels used: 1.728
Variance error of the mean for levels used: 0.008
Standard error of the grand mean: 0.089

Appendix E60

EduG analyses output of the DASS-21's "Stress" subscale (US sample) excluding the three highest State Component Index items (8, 12 and 14) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 12 13 14 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	328.764	114	2.884	0.181	0.186	0.186	22.7	0.032
I	45.730	3	15.243	0.018	0.018	0.017	2.1	0.031
O	8.001	2	4.001	0.010	0.007	0.007	0.0	0.011
PI	252.854	342	0.739	0.105	0.105	0.105	12.8	0.020
PO	91.332	228	0.401	0.006	0.014	0.014	1.7	0.011
IO	52.399	6	8.733	0.072	0.072	0.072	8.8	0.038
PIO	290.268	684	0.424	0.424	0.424	0.424	51.8	0.023
Total	1069.347	1379					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.186		.....		.....	
	.....	I	.....		0.004	5.5
	.....	O	.....		(0.000)	0.0
	.....	PI	0.022	39.1	0.022	33.9
	.....	PO	0.005	8.3	0.005	7.2
	.....	IO	.....		0.005	7.8
	.....	PIO	0.030	52.6	0.030	45.6
Sum of variances	0.186		0.057	100%	0.066	100%
Standard deviation	0.431		Relative SE:	0.239	Absolute SE:	0.257
Coef_G relative	0.76					
Coef_G absolute	0.74					

Grand mean for levels used: 1.782
Variance error of the mean for levels used: 0.011
Standard error of the grand mean: 0.104

Appendix E61

EduG analyses output of the DASS-21's "Stress" subscale (US sample) excluding the two highest State Component Index items (8 and 12) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 12 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	378.470	114	3.320	0.177	0.182	0.182	22.3	0.029
I	68.342	4	17.086	0.026	0.026	0.025	3.0	0.030
O	3.027	2	1.514	0.011	0.008	0.008	0.0	0.006
PI	351.391	456	0.771	0.114	0.114	0.114	14.0	0.018
PO	75.106	228	0.329	0.020	0.001	0.001	0.1	0.007
IO	62.816	8	7.852	0.065	0.065	0.065	7.9	0.031
PIO	391.050	912	0.429	0.429	0.429	0.429	52.7	0.020
Total	1330.203	1724					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.182		.....		.....	
	.....	I	.....		0.004	8.1
	.....	O	.....		(0.000)	0.0
	.....	PI	0.018	44.2	0.018	37.5
	.....	PO	0.000	0.4	0.000	0.4
	.....	IO	.....		0.003	7.1
	.....	PIO	0.023	55.4	0.023	47.0
Sum of variances	0.182		0.041	100%	0.049	100%
Standard deviation	0.427		Relative SE:	0.203	Absolute SE:	0.221
Coef_G relative	0.82					
Coef_G absolute	0.79					

Grand mean for levels used: 1.725
Variance error of the mean for levels used: 0.009
Standard error of the grand mean: 0.096

Appendix E62

EduG analyses output of the DASS-21's "Stress" subscale (US sample) excluding the highest State Component Index items (8) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	459.732	114	4.033	0.188	0.193	0.193	24.3	0.030
I	69.620	5	13.924	0.021	0.021	0.020	2.5	0.023
O	2.276	2	1.138	0.008	0.005	0.005	0.0	0.004
PI	421.102	570	0.739	0.108	0.108	0.108	13.6	0.016
PO	74.946	228	0.329	0.015	0.005	0.005	0.7	0.006
IO	64.732	10	6.473	0.053	0.053	0.053	6.6	0.023
PIO	474.045	1140	0.416	0.416	0.416	0.416	52.4	0.017
Total	1566.455	2069					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.193		.....		.....	
	.....	I	.....		0.002	6.6
	.....	O	.....		(0.000)	0.0
	.....	PI	0.013	41.3	0.013	36.2
	.....	PO	0.002	5.4	0.002	4.7
	.....	IO	.....		0.002	5.9
	.....	PIO	0.017	53.2	0.017	46.6
Sum of variances	0.193		0.033	100%	0.037	100%
Standard deviation	0.439		Relative SE:	0.180	Absolute SE:	0.193
Coef_G relative	0.86					
Coef_G absolute	0.84					

Grand mean for levels used: 1.736
Variance error of the mean for levels used: 0.007
Standard error of the grand mean: 0.081

Appendix E63

EduG analyses output of the total DASS-21 (NZ sample) excluding the three highest State Component Index items (8, 12 and 14), together with observation, estimation designs, ANOVA and G-study table.

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Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	8 12 14
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	639.167	113	5.656	0.088	0.096	0.096	12.1	0.014
I	96.393	17	5.670	0.008	0.008	0.008	0.0	0.008
O	50.347	2	25.174	0.008	0.012	0.012	1.5	0.009
PI	1860.181	1921	0.968	0.181	0.181	0.181	22.7	0.011
PO	85.282	226	0.377	0.003	0.018	0.018	2.2	0.002
IO	266.343	34	7.834	0.065	0.065	0.065	8.2	0.016
PIO	1632.694	3842	0.425	0.425	0.425	0.425	53.3	0.010
Total	4630.407	6155					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.096		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.004	30.6
	.....	PI	0.002	17.6	0.002	12.0
	.....	PO	0.006	68.6	0.006	46.6
	.....	IO	.....		0.000	1.4
	.....	PIO	0.001	13.8	0.001	9.4
Sum of variances	0.096		0.009	100%	0.013	100%
Standard deviation	0.310		Relative SE:	0.092	Absolute SE:	0.112
Coef_G relative	0.92					
Coef_G absolute	0.88					

Grand mean for levels used: 0.802
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.070

Appendix E64

EduG analyses output of the total DASS-21 (NZ sample) excluding the two highest State Component Index items (8 and 12), together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	8 12
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	618.489	113	5.473	0.080	0.089	0.089	11.3	0.013
I	134.565	18	7.476	0.003	0.003	0.003	0.0	0.009
O	40.813	2	20.406	0.006	0.009	0.009	1.1	0.007
PI	1965.786	2034	0.966	0.180	0.180	0.180	23.0	0.011
PO	80.731	226	0.357	0.004	0.017	0.017	2.1	0.002
IO	282.094	36	7.836	0.065	0.065	0.065	8.3	0.016
PIO	1729.029	4068	0.425	0.425	0.425	0.425	54.1	0.009
Total	4851.506	6497					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.089		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	28.8
	.....	PI	0.001	13.1	0.001	9.2
	.....	PO	0.006	76.6	0.006	53.7
	.....	IO	.....		0.000	1.1
	.....	PIO	0.001	10.3	0.001	7.2
Sum of variances	0.089		0.007	100%	0.010	100%
Standard deviation	0.298		Relative SE:	0.085	Absolute SE:	0.102
Coef_G relative	0.92					
Coef_G absolute	0.90					

Grand mean for levels used: 0.784
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.063

Appendix E65

EduG analyses output of the total DASS-21 (NZ sample) excluding the highest State Component Index item (8), together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	8
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	615.543	113	5.447	0.076	0.084	0.084	10.8	0.012
I	135.050	19	7.108	0.004	0.004	0.004	0.0	0.008
O	36.883	2	18.441	0.005	0.008	0.008	1.0	0.006
PI	2067.600	2147	0.963	0.179	0.179	0.179	22.9	0.010
PO	82.584	226	0.365	0.003	0.017	0.017	2.2	0.002
IO	298.024	38	7.843	0.065	0.065	0.065	8.3	0.015
PIO	1835.176	4294	0.427	0.427	0.427	0.427	54.8	0.009
Total	5070.860	6839					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.084		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	28.2
	.....	PI	0.000	6.8	0.000	4.9
	.....	PO	0.006	87.8	0.006	62.5
	.....	IO	.....		0.000	0.6
	.....	PIO	0.000	5.4	0.000	3.9
Sum of variances	0.084		0.007	100%	0.009	100%
Standard deviation	0.290		Relative SE:	0.081	Absolute SE:	0.096
Coef_G relative	0.93					
Coef_G absolute	0.90					

Grand mean for levels used: 0.782
Variance error of the mean for levels used: 0.003
Standard error of the grand mean: 0.059

Appendix E66

EduG analyses output of the DASS-21's "Depression" subscale (NZ sample) excluding the three highest State Component Index items (13, 16 and 21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 13 14 15 16 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	163.428	113	1.446	0.022	0.036	0.036	4.6	0.018
I	12.107	3	4.036	0.005	0.005	0.005	0.0	0.010
O	49.346	2	24.673	0.043	0.045	0.045	5.8	0.039
PI	406.476	339	1.199	0.276	0.276	0.276	35.5	0.031
PO	78.654	226	0.348	0.005	0.012	0.012	1.6	0.010
IO	30.092	6	5.015	0.041	0.041	0.041	5.2	0.022
PIO	250.575	678	0.370	0.370	0.370	0.370	47.4	0.020
Total	990.678	1367					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.036		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.015	14.1
	.....	PI	0.059	66.0	0.059	55.0
	.....	PO	0.004	4.6	0.004	3.8
	.....	IO	.....		0.003	2.7
	.....	PIO	0.026	29.4	0.026	24.5
Sum of variances	0.036		0.089	100%	0.107	100%
Standard deviation	0.189		Relative SE:	0.298	Absolute SE:	0.327
Coef_G relative	0.29					
Coef_G absolute	0.25					

Grand mean for levels used: 0.735
Variance error of the mean for levels used: 0.019
Standard error of the grand mean: 0.138

Appendix E67

EduG analyses output of the DASS-21's "Depression" subscale (NZ sample) excluding the two highest State Component Index items (13 and 21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 13 14 15 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	212.685	113	1.882	0.051	0.063	0.063	7.8	0.017
I	20.458	4	5.115	0.004	0.004	0.004	0.0	0.011
O	88.763	2	44.381	0.068	0.070	0.070	8.6	0.055
PI	498.075	452	1.102	0.245	0.245	0.245	30.2	0.025
PO	85.371	226	0.378	0.002	0.020	0.020	2.4	0.008
IO	46.296	8	5.787	0.048	0.048	0.048	5.9	0.023
PIO	331.571	904	0.367	0.367	0.367	0.367	45.2	0.017
Total	1283.219	1709					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.063		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.023	25.6
	.....	PI	0.039	60.0	0.039	43.0
	.....	PO	0.007	10.0	0.007	7.2
	.....	IO	.....		0.003	2.8
	.....	PIO	0.020	29.9	0.020	21.5
Sum of variances	0.063		0.065	100%	0.091	100%
Standard deviation	0.251		Relative SE:	0.256	Absolute SE:	0.302
Coef_G relative	0.49					
Coef_G absolute	0.41					

Grand mean for levels used: 0.770
Variance error of the mean for levels used: 0.027
Standard error of the grand mean: 0.164

Appendix E68

EduG analyses output of the DASS-21's "Depression" subscale (NZ sample) excluding the highest State Component Index item (21) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 2 4 6 7 8 9 11 12 14 15 18 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	193.433	113	1.712	0.036	0.048	0.048	6.0	0.013
I	22.830	5	4.566	0.015	0.015	0.015	0.0	0.013
O	61.810	2	30.905	0.032	0.036	0.036	4.5	0.032
PI	627.281	565	1.110	0.242	0.242	0.242	30.4	0.023
PO	76.301	226	0.338	0.008	0.011	0.011	1.3	0.006
IO	90.658	10	9.066	0.076	0.076	0.076	9.6	0.032
PIO	433.898	1130	0.384	0.384	0.384	0.384	48.2	0.016
Total	1506.211	2051					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.048		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.012	18.3
	.....	PI	0.030	60.8	0.030	46.7
	.....	PO	0.004	7.1	0.004	5.4
	.....	IO	.....		0.003	4.9
	.....	PIO	0.016	32.1	0.016	24.7
Sum of variances	0.048		0.050	100%	0.065	100%
Standard deviation	0.218		Relative SE:	0.223	Absolute SE:	0.255
Coef_G relative	0.49					
Coef_G absolute	0.42					

Grand mean for levels used: 0.754
Variance error of the mean for levels used: 0.016
Standard error of the grand mean: 0.126

Appendix E69

EduG analyses output of the DASS-21's "Anxiety" subscale (NZ sample) excluding the three highest State Component Index items (7, 9 and 15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 3 5 6 7 8 9 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	270.153	113	2.391	0.119	0.128	0.128	15.2	0.027
I	11.371	3	3.790	0.009	0.009	0.009	0.0	0.012
O	17.379	2	8.689	0.005	0.008	0.008	0.9	0.015
PI	337.213	339	0.995	0.177	0.177	0.177	21.0	0.027
PO	96.788	226	0.428	0.009	0.013	0.013	1.6	0.012
IO	38.627	6	6.438	0.052	0.052	0.052	6.2	0.028
PIO	314.539	678	0.464	0.464	0.464	0.464	55.1	0.025
Total	1086.069	1367					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.128		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	3.1
	.....	PI	0.038	50.2	0.038	46.4
	.....	PO	0.004	5.9	0.004	5.4
	.....	IO	.....		0.004	4.6
	.....	PIO	0.033	43.9	0.033	40.5
Sum of variances	0.128		0.075	100%	0.081	100%
Standard deviation	0.357		Relative SE:	0.274	Absolute SE:	0.285
Coef_G relative	0.63					
Coef_G absolute	0.61					

Grand mean for levels used: 0.903
Variance error of the mean for levels used: 0.008
Standard error of the grand mean: 0.089

Appendix E70

EduG analyses output of the DASS-21's "Anxiety" subscale (NZ sample) excluding the two highest State Component Index items (9 and 15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 3 5 6 8 9 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	302.089	113	2.673	0.117	0.125	0.125	15.3	0.024
I	34.646	4	8.661	0.003	0.003	0.003	0.4	0.017
O	6.612	2	3.306	0.007	0.004	0.004	0.0	0.007
PI	415.888	452	0.920	0.156	0.156	0.156	19.1	0.022
PO	101.122	226	0.447	0.001	0.020	0.020	2.5	0.009
IO	56.575	8	7.072	0.058	0.058	0.058	7.1	0.028
PIO	409.691	904	0.453	0.453	0.453	0.453	55.6	0.021
Total	1326.622	1709					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.125		.....		.....	
	.....	I	.....		0.001	0.8
	.....	O	.....		(0.000)	0.0
	.....	PI	0.025	44.6	0.025	41.9
	.....	PO	0.007	12.2	0.007	11.4
	.....	IO	.....		0.003	5.2
	.....	PIO	0.024	43.3	0.024	40.6
Sum of variances	0.125		0.056	100%	0.059	100%
Standard deviation	0.353		Relative SE:	0.236	Absolute SE:	0.244
Coef_G relative	0.69					
Coef_G absolute	0.68					

Grand mean for levels used: 0.844
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.072

Appendix E71

EduG analyses output of the DASS-21's "Anxiety" subscale (NZ sample) excluding the highest State Component Index items (15) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	1 3 5 6 8 10 11 12 13 14 15 16 17 18 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	257.841	113	2.282	0.072	0.081	0.081	9.8	0.017
I	34.654	5	6.931	0.006	0.006	0.006	0.0	0.015
O	25.670	2	12.835	0.006	0.010	0.010	1.2	0.014
PI	575.624	565	1.019	0.186	0.186	0.186	22.6	0.021
PO	96.108	226	0.425	0.006	0.016	0.016	1.9	0.007
IO	84.471	10	8.447	0.070	0.070	0.070	8.5	0.030
PIO	520.418	1130	0.461	0.461	0.461	0.461	55.9	0.019
Total	1594.785	2051					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.081		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	6.1
	.....	PI	0.023	48.7	0.023	43.1
	.....	PO	0.005	11.2	0.005	9.9
	.....	IO	.....		0.003	5.4
	.....	PIO	0.019	40.1	0.019	35.5
Sum of variances	0.081		0.048	100%	0.054	100%
Standard deviation	0.285		Relative SE:	0.219	Absolute SE:	0.232
Coef_G relative	0.63					
Coef_G absolute	0.60					

Grand mean for levels used: 0.844
Variance error of the mean for levels used: 0.007
Standard error of the grand mean: 0.086

Appendix E72

EduG analyses output of the DASS-21's "Stress" subscale (NZ sample) excluding the three highest State Component Index items (8, 12 and 14) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 12 13 14 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	187.620	113	1.660	0.029	0.041	0.041	5.2	0.020
I	6.494	3	2.165	0.016	0.016	0.015	0.0	0.011
O	2.129	2	1.064	0.013	0.010	0.010	0.0	0.008
PI	379.673	339	1.120	0.249	0.249	0.249	31.8	0.029
PO	127.038	226	0.562	0.048	0.065	0.065	8.3	0.014
IO	40.865	6	6.811	0.056	0.056	0.056	7.2	0.030
PIO	251.968	678	0.372	0.372	0.372	0.372	47.4	0.020
Total	995.787	1367					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.041		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		(0.000)	0.0
	.....	PI	0.053	52.4	0.053	50.4
	.....	PO	0.022	21.5	0.022	20.7
	.....	IO	.....		0.004	3.8
	.....	PIO	0.026	26.0	0.026	25.0
Sum of variances	0.041		0.101	100%	0.105	100%
Standard deviation	0.203		Relative SE:	0.318	Absolute SE:	0.324
Coef_G relative	0.29					
Coef_G absolute	0.28					

Grand mean for levels used: 0.867
Variance error of the mean for levels used: 0.005
Standard error of the grand mean: 0.072

Appendix E73

EduG analyses output of the DASS-21's "Stress" subscale (NZ sample) excluding the two highest State Component Index items (8 and 12) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 12 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	180.901	113	1.601	0.031	0.041	0.041	5.4	0.015
I	52.015	4	13.004	0.018	0.018	0.017	2.3	0.023
O	0.387	2	0.194	0.011	0.008	0.008	0.0	0.005
PI	471.318	452	1.043	0.215	0.215	0.215	28.4	0.024
PO	112.146	226	0.496	0.020	0.039	0.039	5.1	0.010
IO	48.823	8	6.103	0.050	0.050	0.050	6.6	0.024
PIO	358.643	904	0.397	0.397	0.397	0.397	52.3	0.019
Total	1224.235	1709					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.041		.....		.....	
	.....	I	.....		0.003	3.8
	.....	O	.....		(0.000)	0.0
	.....	PI	0.034	50.3	0.034	46.6
	.....	PO	0.013	18.9	0.013	17.5
	.....	IO	.....		0.003	3.6
	.....	PIO	0.021	30.9	0.021	28.6
Sum of variances	0.041		0.069	100%	0.074	100%
Standard deviation	0.202		Relative SE:	0.262	Absolute SE:	0.272
Coef_G relative	0.37					
Coef_G absolute	0.36					

Grand mean for levels used: 0.785
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.080

Appendix E74

EduG analyses output of the DASS-21's "Stress" subscale (NZ sample) excluding the highest State Component Index items (8) within the subscale, together with observation, estimation designs, ANOVA and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	2 3 4 5 7 8 9 10 13 15 16 17 19 20 21
Occasion	O	3	INF	

Analysis of variance

				Components				
Source	SS	df	MS	Random	Mixed	Corrected	%	SE
P	203.442	113	1.800	0.039	0.048	0.048	6.4	0.014
I	52.466	5	10.493	0.011	0.011	0.011	1.5	0.018
O	1.059	2	0.530	0.008	0.006	0.006	0.0	0.004
PI	547.645	565	0.969	0.188	0.188	0.188	25.4	0.020
PO	121.718	226	0.539	0.022	0.042	0.042	5.6	0.009
IO	60.151	10	6.015	0.049	0.049	0.049	6.6	0.022
PIO	457.071	1130	0.404	0.404	0.404	0.404	54.5	0.017
Total	1443.554	2051					100%	

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.048		.....		.....	
	.....	I	.....		0.001	2.4
	.....	O	.....		(0.000)	0.0
	.....	PI	0.024	43.4	0.024	40.8
	.....	PO	0.014	25.6	0.014	24.1
	.....	IO	.....		0.002	3.6
	.....	PIO	0.017	31.1	0.017	29.2
Sum of variances	0.048		0.054	100%	0.058	100%
Standard deviation	0.218		Relative SE:	0.233	Absolute SE:	0.240
Coef_G relative	0.47					
Coef_G absolute	0.45					

Grand mean for levels used: 0.779
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.066

Appendix E75

EduG analyses output of the total DASS-21 (US sample) excluding occasion one, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	
Occasion	O	3	INF	1

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.169		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.000	1.9
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.009	100.0	0.009	98.1
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.169		0.009	100%	0.009	100%
Standard deviation	0.411		Relative SE:	0.094	Absolute SE:	0.095
Coef_G relative	0.95					
Coef_G absolute	0.95					

Grand mean for levels used: 1.781
Variance error of the mean for levels used: 0.002
Standard error of the grand mean: 0.041

Appendix E76

EduG analyses output of the total DASS-21 (US sample) excluding occasion two, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	
Occasion	O	3	INF	2

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.158		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.003	20.5
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.010	100.0	0.010	79.5
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.158		0.010	100%	0.013	100%
Standard deviation	0.397		Relative SE:	0.101	Absolute SE:	0.113
Coef_G relative	0.94					
Coef_G absolute	0.92					

Grand mean for levels used: 1.713
Variance error of the mean for levels used: 0.004
Standard error of the grand mean: 0.064

Appendix E77

EduG analyses output of the total DASS-21 (US sample) excluding occasion three, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	115	INF	
Item	I	21	21	
Occasion	O	3	INF	3

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.159		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.005	35.3
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.008	100.0	0.008	64.7
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.159		0.008	100%	0.013	100%
Standard deviation	0.399		Relative SE:	0.091	Absolute SE:	0.113
Coef_G relative	0.95					
Coef_G absolute	0.93					

Grand mean for levels used: 1.729
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.077

Appendix E78

EduG analyses output of the total DASS-21 (NZ sample) excluding occasion one, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	
Occasion	O	3	INF	1

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.093		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.002	23.6
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.006	100.0	0.006	76.4
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.093		0.006	100%	0.008	100%
Standard deviation	0.306		Relative SE:	0.079	Absolute SE:	0.091
Coef_G relative	0.94					
Coef_G absolute	0.92					

Grand mean for levels used: 0.815
Variance error of the mean for levels used: 0.003
Standard error of the grand mean: 0.053

Appendix E79

EduG analyses output of the total DASS-21 (NZ sample) excluding occasion two, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	
Occasion	O	3	INF	2

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.082		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.001	7.2
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.011	100.0	0.011	92.8
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.082		0.011	100%	0.011	100%
Standard deviation	0.287		Relative SE:	0.103	Absolute SE:	0.107
Coef_G relative	0.89					
Coef_G absolute	0.88					

Grand mean for levels used: 0.740
Variance error of the mean for levels used: 0.002
Standard error of the grand mean: 0.040

Appendix E80

EduG analyses output of the total DASS-21 (NZ sample) excluding occasion three, together with observation, estimation designs and G-study table.

Observation and Estimation Designs

Facet	Label	Levels	Univ.	Reduction (levels to exclude)
Person	P	114	INF	
Item	I	21	21	
Occasion	O	3	INF	3

G Study Table
(Measurement design P/IO)

Source of variance	Differ-entiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
P	0.078		.....		.....	
	.....	I	.....		(0.000)	0.0
	.....	O	.....		0.006	41.4
	.....	PI	(0.000)	0.0	(0.000)	0.0
	.....	PO	0.008	100.0	0.008	58.6
	.....	IO	.....		(0.000)	0.0
	.....	PIO	(0.000)	0.0	(0.000)	0.0
Sum of variances	0.078		0.008	100%	0.013	100%
Standard deviation	0.280		Relative SE:	0.089	Absolute SE:	0.116
Coef_G relative	0.91					
Coef_G absolute	0.85					

Grand mean for levels used: 0.784
Variance error of the mean for levels used: 0.006
Standard error of the grand mean: 0.079