FIVE-FACTOR MODEL OF PERSONALITY AND INTERNALISING PSYCHOPATHOLOGY

NEW CONTRIBUTIONS FOR EVALUATION AND AETIOLOGICAL MODELS

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Five-Factor model of Personality & Internalising Psychopathology: New Contributions for Evaluation and Aetiological Models

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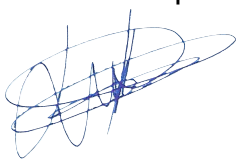

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1. **Vidal-Arenas, V.**, Ortet-Walker, J., Ibáñez, M.I., Ortet, G. y Mezquita, L. (2021). Self-reported Anxiety Severity Measures of DSM-5: evidence of validity and reliability in Spanish youths. *Psicothema*, *33* (2), 312-319. https://doi.org/10.7334/psicothema2020.398
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ABSTRACT

Advances in the study of psychopathology have led to the development of new assessment tools to help in the transition from a categorical to a dimensional-based assessment system. These advances have also allowed the identification of very relevant variables in the understanding of psychopathology, such as normal personality traits. Several mechanisms are described in the scientific literature on how personality influences the manifestation of psychopathology. For example, personality is considered a significant antecedent to other vulnerability factors related to psychopathology (e.g., ruminative thinking style). Thus, taking into account the influence of personality in the study of relationships between different psychological factors (distal and proximal) and psychopathology is extremely valuable.

By considering these issues, the present doctoral thesis has two general objectives: (1) provide new validity and reliability evidence for different psychological assessment tools; (2) offer new evidence for the relation between aetiological variables and vulnerability to psychopathology in young adults. To this end, three studies were carried out to cross-sectionally and longitudinally examine the psychometric properties of the DSM-5 Severity Measures (SMs) for assessing

depressive and anxiety-related symptoms (Study 1 and Study 2), and a scale to assess ruminative cognitions (*Ruminative Thought Style Questionnaire; RSTQ*) (Study 3). To fulfil the second general objective, two studies were conducted to examine the cross-sectional (Study 4) and longitudinal (Study 5) relations between neuroticism, rumination, depressive symptoms and suicidal ideation in young adults. In Study 4, the indirect effect of neuroticism on suicidal ideation through rumination and depression was examined. We also studied whether neuroticism moderated the observed effects of rumination and depressive symptoms on suicidal ideation. Furthermore, to assess the robustness of the obtained results, we tested whether the model was invariant across four countries (USA, Spain, Argentina and the Netherlands) and across sex (female and male). Finally in Study 5, we tested a similar model presented in Study 4 with longitudinal data.

Overall, ***Study 1*** provides evidence for the validity and reliability of the DSM-5 SMs scores for assessing anxiety symptoms (i.e., generalised anxiety, social anxiety, panic, agoraphobia, separation anxiety and specific phobia) in Spanish youths. Specifically, evidence for structure validity is provided and supports the unidimensional nature of the tested DSM-5 SMs, except for specific phobia, which showed evidence for a two-factor structure. The Anxiety SMs also provide evidence for reliability (i.e., internal consistency) and convergent (i.e., with other internalising symptom scales), discriminant (i.e., with scales assessing externalising symptoms) and criterion (i.e., with measures of personality, quality of life and life satisfaction) validity. ***Study 2*** examines the longitudinal measurement invariance of the Anxiety SMs studied in the first paper and the Depression SM. Overall, the three studied measurement invariance levels (i.e., configural, metric, scalar) provide evidence for the stability of the latent structure

of the measures by allowing their use in, for example, studies with longitudinal designs, or in clinical follow-ups. In summary, the first two studies provide initial evidence for the validity and reliability of the Spanish version of the Depression and Anxiety SMs of DMS-5 in Spanish young adults.

Study 3 explores the psychometric properties of the RSTQ and shows evidence for measurement invariance (i.e., at the configural, metric and scalar levels) of the hierarchical structure of the RTSQ across four countries (i.e., United States, Spain, Argentina and the Netherlands) in males and females, and over time (i.e., across three assessment waves conducted every 6 months in Spanish young adults). Furthermore, evidence for reliability of the RTSQ scores is also observed across all study groups and at each wave assessment. On the whole, the third study provides new evidence for the usefulness of the RTSQ which has, in turn, significant practical implications. The RTSQ allows us to obtain, on the one hand a global rumination score and, on the other hand, specific information about the four identified components (i.e., anticipatory, problem-focused, repetitive and counterfactual thoughts), which can be very useful in the design, planning, adaptation or customisation of clinical strategies for each individual.

The results of ***Study 4*** suggest that neuroticism is a significant and direct predictor of rumination and depressive symptoms. In addition, a significant indirect effect of neuroticism on suicidal ideation is seen through rumination and depressive symptoms (i.e., double mediation). It also indicates that, at higher neuroticism levels, the effects of both predictors (i.e., rumination and depression) are stronger (i.e., moderation) and, therefore, more harmful. The described relations are also observed in young people from the four different countries (i.e., United States, Argentina, Spain and the Netherlands), and in both sex groups (i.e.,

male and female). This helps us to conclude that such effects are robust regardless of the study group.

Finally, the main objective of ***Study 5*** is to test the extent to which the direct and indirect effects identified in the fourth study remain significant at the longitudinal level. Overall, it can be highlighted that neuroticism is a direct and significant predictor of rumination and depressive symptoms at all the tested waves, and evidence for its indirect effect on suicidal ideation through depressive symptoms is also observed. In addition, depressive symptoms are a significant direct predictor of suicidal ideation across waves. Finally, and as an unexpected result, the time 2 depressive symptoms predict time 3 rumination. All in all, it should be noted that this effect is isolated (only between two waves) and that the most significant pattern found is the cross-sectional relation between rumination and depressive symptoms. So these findings suggest that rather than being a longitudinal predictor of depressive symptoms (i.e., an aetiological component), rumination is perhaps better conceptualised as a concurrent and/or exacerbating factor of depression, as proposed in initial theories.

In conclusion, it can be stated that the results obtained in the last two studies highlight the role of neuroticism in the study of psychopathology (i.e., depression and suicidal ideation) and related factors (e.g., rumination). Likewise, the findings support the application of evidence-based clinical treatments (e.g., Unified Protocol), where the behaviours and cognitions related to high scores in neuroticism are addressed to reduce maladaptive strategies (such as rumination) and depressive symptomatology which would, in turn, reduce the risk of suicidal thoughts.

RESUMEN

Los avances en el estudio de la psicopatología han dado lugar al desarrollo de nuevas herramientas de evaluación, ayudando en la transición desde un sistema de evaluación basado en un enfoque categorial hacia un enfoque basado en lo dimensional. Además, estos avances también han permitido identificar variables de suma relevancia en la comprensión de la psicopatología, como por ejemplo los rasgos de personalidad normal. Son diversos los mecanismos que se describen dentro de la literatura científica sobre cómo la personalidad influye en la manifestación de la psicopatología. Por ejemplo, la personalidad se considera como un antecedente significativo a otros factores de vulnerabilidad relacionados con la psicopatología (p.ej., estilo de pensamiento rumiativo). De tal forma que tener en cuenta la influencia de la personalidad en el estudio de relaciones entre diferentes factores psicológicos (distales y proximales) y la psicopatología resulta de gran valor.

Así, considerando estas cuestiones, la presente tesis doctoral tiene dos objetivos generales: (1) aportar nuevas evidencias sobre la validez y fiabilidad de nuevos instrumentos de evaluación psicológica, y (2) ofrecer nuevas evidencias sobre la relación entre variables etiológicas y de vulnerabilidad a la psicopatología,

en adultos jóvenes. Para tal fin, se llevaron a cabo tres estudios para examinar de forma transversal y longitudinal, las propiedades psicométricas de las escalas de la gravedad (EG) para evaluar síntomas de depresión y ansiedad del DSM-5 (Estudio 1 y Estudio 2), y una escala para evaluar cogniciones rumiativas (*Ruminative Thought Style Questionnaire; RTSQ*) (Estudio 3). Para la consecución del segundo objetivo general, se llevaron a cabo dos estudios para analizar las relaciones transversales (Estudio 4) y longitudinales (Estudio 5) entre el neuroticismo, rumiación, la depresión y la ideación suicida, en adultos jóvenes. En el Estudio 4, se examinó el efecto indirecto del neuroticismo hacia la ideación suicida a través de la rumiación y los síntomas depresivos. Además, también se estudió si el neuroticismo moderaba los efectos observados de la rumiación y los síntomas depresivos sobre la ideación suicida. Asimismo, para valorar en qué medida los resultados obtenidos eran robustos, testamos si el modelo se mostraba invariante en cuatro países (Estados Unidos, España, Argentina y Países Bajos) y a través del sexo (masculino y femenino). Finalmente, en el Estudio 5, se testó un modelo similar al del Estudio 4 pero con datos longitudinales.

En líneas generales, el ***Estudio 1*** aporta evidencia sobre la validez y fiabilidad de las puntuaciones de las EG del DSM-5 para evaluar síntomas de ansiedad (i.e., ansiedad generalizada, ansiedad social, pánico, agorafobia, ansiedad por separación y fobia específica) en jóvenes españoles. Específicamente, se aportan evidencias sobre la validez de estructura, apoyando la naturaleza unidimensional de las EG del DSM-5 testadas, excepto para fobia específica, que mostró evidencias de una estructura de dos factores. Además, las también mostraron evidencias de fiabilidad (i.e., consistencia interna) y validez convergente (i.e., con otras escalas de síntomas internalizados), discriminante (i.e., con escalas que

evalúan síntomas externalizados), y criterio (i.e., con medidas de personalidad, calidad y satisfacción vital). En el ***Estudio 2***, se examinó la invarianza de medida longitudinal de las escalas de ansiedad estudiadas en el primer trabajo, y la escala de síntomas de depresión. En líneas generales, los tres niveles de invarianza de medida estudiados (i.e., configural, métrico y escalar) aportan evidencia sobre la estabilidad de la estructura latente de las medidas, permitiendo su uso en, por ejemplo, investigaciones que utilicen diseños longitudinales, o en seguimientos clínicos. En resumen, los dos primeros estudios aportan la primera evidencia de validez y fiabilidad de la versión española de las EG de la depresión y ansiedad del DSM-5 en jóvenes españoles.

El ***Estudio 3***, explora las propiedades psicométricas del RTSQ, y muestra evidencias de la invarianza de medida (i.e., a nivel configural, métrico y escalar) de la estructura jerárquica del RTSQ a través de cuatro países (i.e., Estados Unidos, España, Argentina, y Países Bajos), en hombres y mujeres, y lo largo del tiempo (i.e., a través de tres oleadas de evaluación, realizadas cada 6 meses en adultos jóvenes españoles). Además, también se observan evidencias de fiabilidad de las puntuaciones del RTSQ en todos los grupos de estudio, y en cada oleada de evaluación. Así, el tercer estudio aporta nuevas evidencias sobre la utilidad del RTSQ, lo que a su vez presenta implicaciones practicas significativas. Por un lado, el RTSQ permite obtener una puntuación global de rumiación, y por otro obtener información específica sobre los cuatro componentes identificados (i.e., pensamientos anticipatorios, centrados en el problema, repetitivos y contrafácticos), lo cual puede ser de gran utilidad en el diseño, planificación, adaptación o personalización de estrategias clínicas a cada individuo.

Los resultados del ***Estudio 4*** sugieren que el neuroticismo es un predictor significativo y directo de la rumiación y los síntomas depresivos. Además, se observó un efecto indirecto significativo del neuroticismo a la ideación suicida a través de la rumiación y síntomas depresivos (i.e., doble mediación). También se encontró que, a mayores niveles de neuroticismo, los efectos de ambos predictores (i.e., rumiación y depresión) fueron más fuertes (i.e., moderación) y, por ende, más perjudiciales. Las relaciones descritas se observaron de igual forma en jóvenes de cuatro países distintos (i.e., Estados Unidos, Argentina, España y Países Bajos), y en ambos sexos (i.e., masculino y femenino), ayudando a concluir que dichos efectos son robustos independientemente del grupo de estudio.

Finalmente, el ***Estudio 5*** tuvo como principal objetivo testar en qué medida los efectos directos e indirectos identificados en el cuarto estudio se mantenían significativos a nivel longitudinal. En general, se podría destacar que el neuroticismo fue un predictor directo y significativo de la rumiación y los síntomas depresivos en todas las oleadas testadas, y se observaron evidencias de su efecto indirecto sobre la ideación suicida a través de los síntomas depresivos. Además, también se observó que los síntomas depresivos fueron un predictor directo y significativo de la ideación suicida en todas las oleadas testadas. Finalmente, como un resultado inesperado, los síntomas depresivos de tiempo 2 predijeron la rumiación de tiempo 3. Con todo, cabe señalar que este efecto fue aislado (solo entre dos oleadas) y que el patrón más significativo que se encontró fue la relación transversal entre la rumiación y los síntomas depresivos. Así, estos hallazgos sugieren que la rumiación, en vez de ser un factor predictor longitudinal de los síntomas depresivos (i.e., un componente etiológico), quizás esté mejor

conceptualizado como un factor concurrente y/o exacerbador de los síntomas depresivos, como se proponía en las teorías iniciales.

En conclusión, se podría decir que los resultados expuestos en estos dos últimos estudios ensalzan en papel del neuroticismo en el estudio de la psicopatología (i.e., síntomas depresivos e ideación suicida) y los factores relacionados con la misma (p.ej., rumiación). Asimismo, los hallazgos apoyan la aplicación de tratamientos clínicos basados en la evidencia, (p.ej., Protocolo Unificado), donde se trabajan las conductas y cogniciones relacionadas con altas puntuaciones en neuroticismo, para disminuir estrategias desadaptativas (como la rumiación) y la sintomatología depresiva, lo que a su vez disminuiría el riesgo de presentar pensamientos suicidas.

CHAPTER 1

THEORETICAL BACKGROUND

Mental health: a global target

The constitution of the World Health Organization (WHO) defines mental health as a fundamental part of the overall health and well-being of individuals: "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*" (WHO, 1946). However, and as highlighted in the latest WHO mental health strategies reports, mental health remains a neglected part of global efforts to improve health (WHO, 2021b), despite being a factor that causes high mortality and disability in the world's population. Recent global reports underscore that mental health continues to have a high socio-economic (e.g., 66% of total government spending on mental health when only considering global

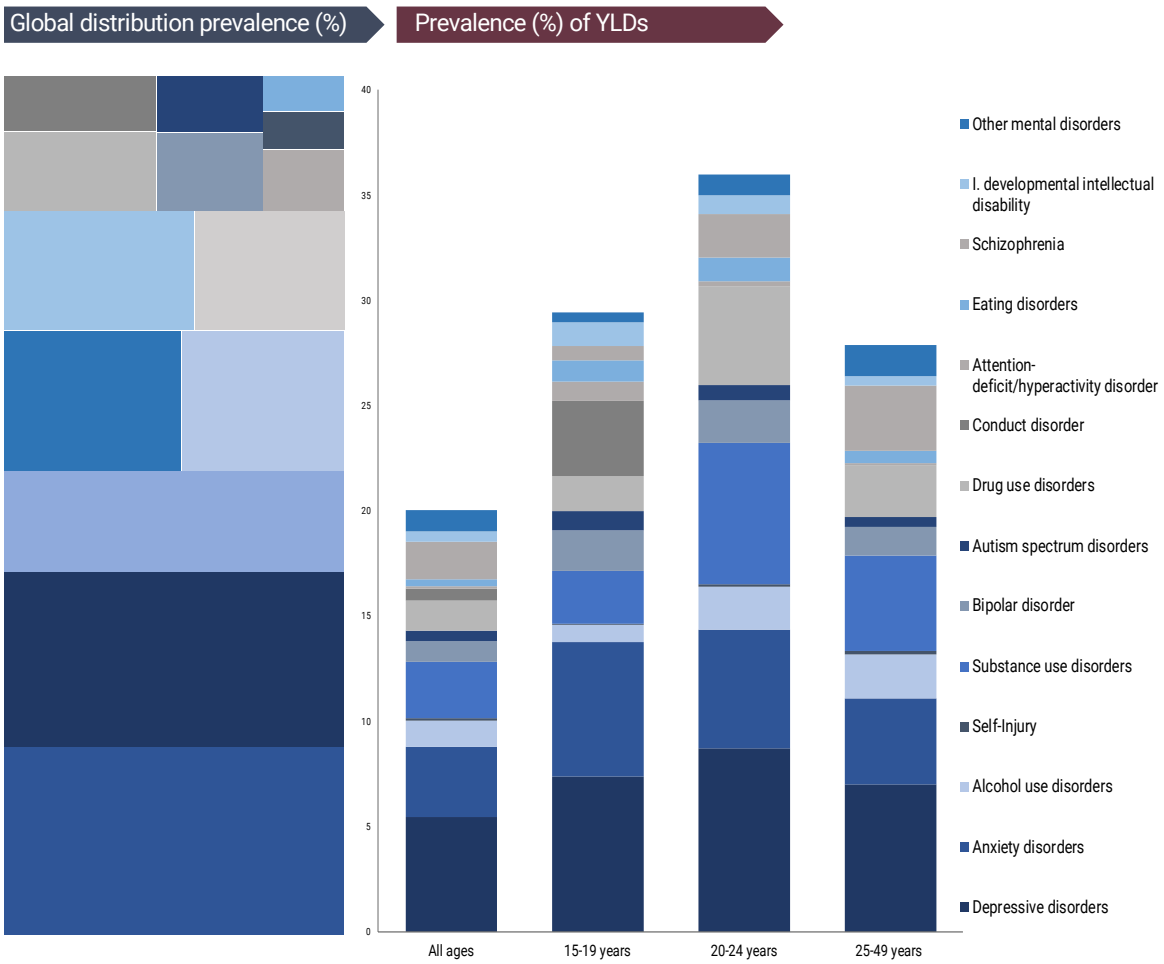
median expenditure on mental hospitals, WHO, 2021a) and personal cost (e.g., people with mental health conditions are more likely to suffer physical health problems, which implies early mortality of 10-20 years, WHO, 2019).

From 1990 to 2019, and according to the latest Global Burden Diseases (GBD) report (GBD 2019 Mental Disorders Collaborators, 2022), the global number of Disability-Adjusted Life-Year (DALYs) due to mental disorders increased from 80.8 million to 123.5 million (proportion from 3.1% to 4.9%) and is the seventh leading cause of DALYs in 2019 (GBD 2019 Mental Disorders Collaborators, 2022). The DALYs rates per 100,000 persons was higher in females than males (1,703.3 and 1,426.5, respectively). In terms of global distribution per country, the highest DALYs rates were observed in the USA, Brazil, New Zealand, and some locations in western Europe, such as Spain (GBD 2019 Mental Disorders Collaborators, 2022).

At a specific disorder level, and as observed in *Figure 1*, depressive disorders (279.6, million people) and anxiety-related disorders (301.4, million people) are the most prevalent mental disorders globally, which are the second and eighth leading causes of Year Lived with Disability (YLDs), respectively (GBD 2019 Mental Disorders Collaborators, 2022). According to countries, the USA, western Europe (e.g., Spain, Portugal, etc.), and a large part of Latin America have the highest prevalence of depressive and anxiety disorders compared to other countries (*Figure 1*). The 15-24 age group presents a higher prevalence of YLDs compared to the other groups, which ranges from 3.09 to 4.16 for depressive symptoms and from 2.66 to 2.70 for anxiety disorders in one million people (see the prevalence distribution in *Figure 1*, left side).

Figure 1

Global disease estimated (%) prevalence of psychopathological conditions



Nonetheless, not only depressive and anxiety-related disorders are of concern, but so is suicidality because nearly 800,000 people die by suicide annually, which makes it the second leading cause of death in populations aged 15-29 years and, therefore, requires special attention (WHO, 2019b). As observed in *Figure 2* (Choropleth maps), the High-income for North America and Central/Eastern Europe locations has obtained a higher percentage of self-injury prevalence compared to other nearby locations, such as the USA and Spain (WHO, 2019a). In spite of these differences, suicidality still constitutes an important problem in these countries. For example, the *Center for Disease Control and Prevention* (CDC)

from the USA States ranked suicide as the 10th cause of death in 2019, where approximately 47,000 individuals died by suicide (Kochanek et al., 2020). Specifically, suicide was the second leading cause of death for the age groups of 10-24 years (19.2%) and 25-44 years (10.9%) (Heron, 2019). Along the same lines, suicide remains the first leading cause of unnatural death in Spain, where 3,539 individuals died by suicide in 2018, with 1,343 deaths between January and May of 2020 (INE, 2021). These data are especially alarming in Spaniards aged 15-29 years for whom suicide accounts for 44.26% of all deaths from external causes and for 16.71% of total deaths (INE, 2021).

Figure 2

Global disease estimated (%) prevalence of psychopathological condition per country

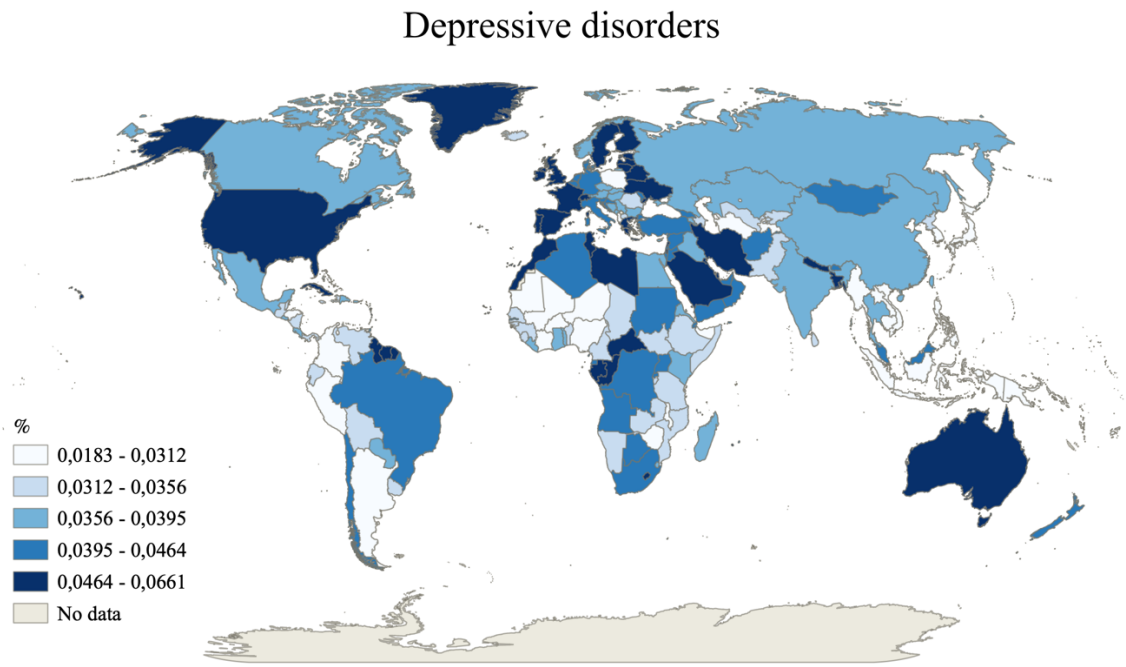


Figure 2

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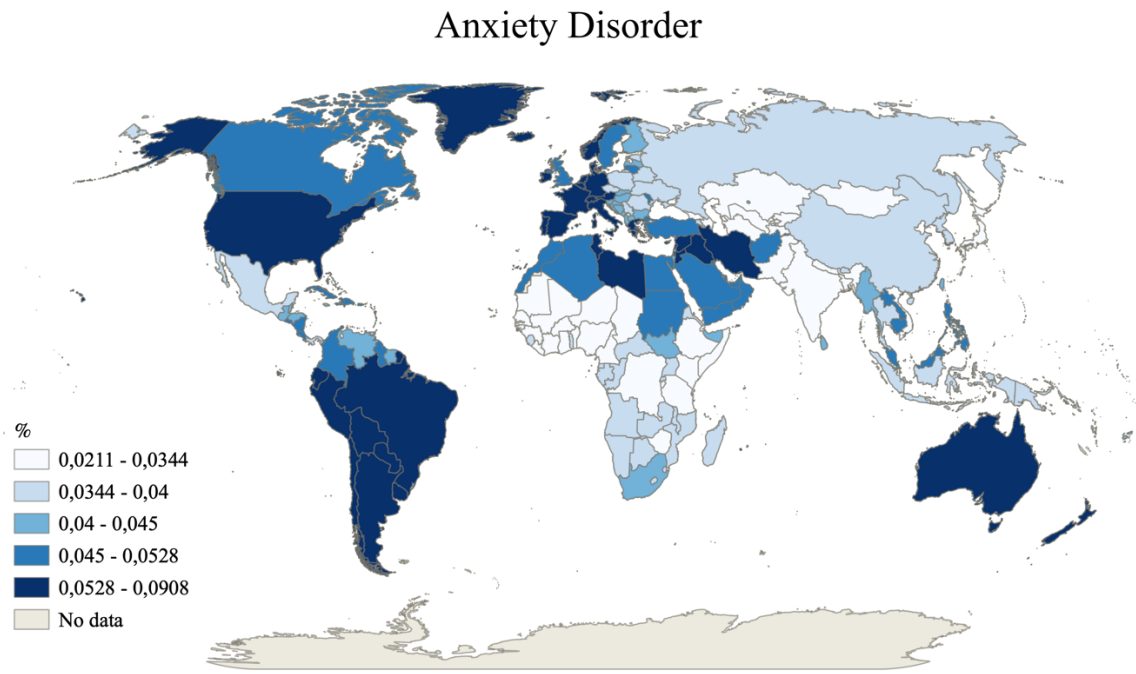
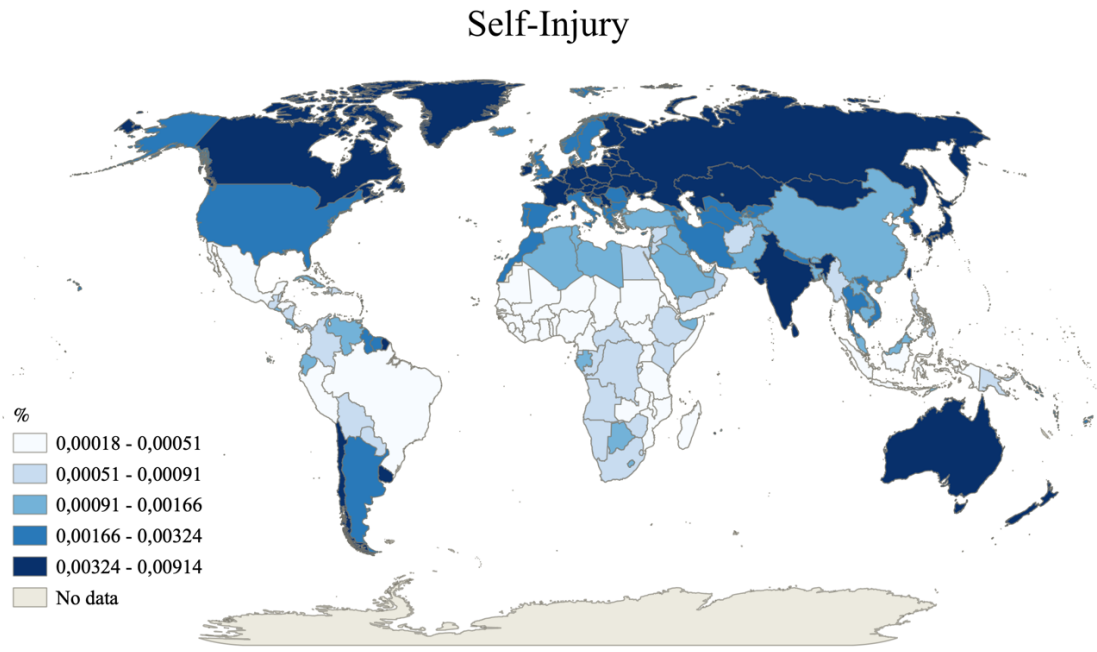




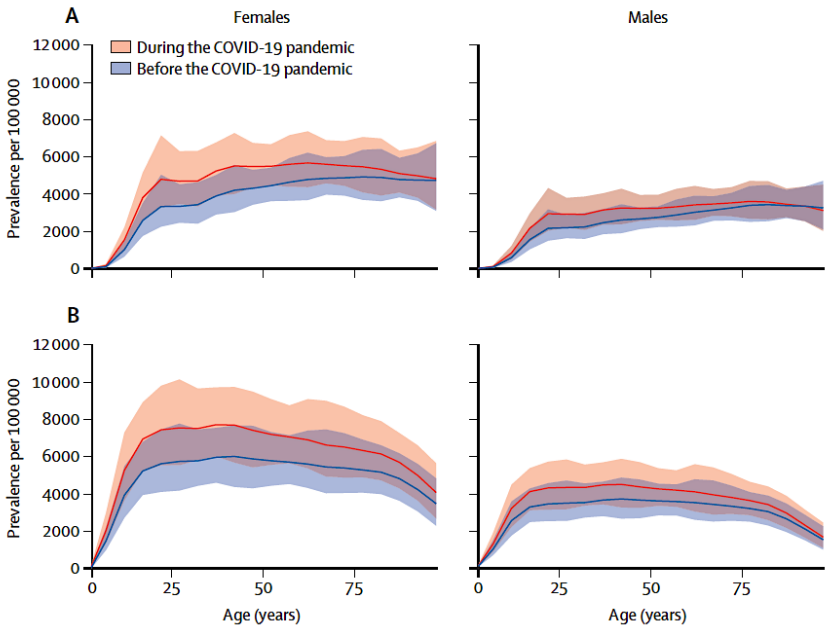
Choropleth map edited by Ortuño-Castillo, J. (2022)

Note: Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME), 2020. Available from http://ghdx.healthdata.org/gbd-results-tool.

In addition, further attention needs to be paid to the mental health problem by considering the negative impact that the COVID-19 epidemic has had on people's mental health, with studies estimating an increase in depressive and anxiety-related symptoms globally. Specifically, a recent systematic review by COVID-19 Mental Disorders Collaborators (Santomauro et al., 2021) has shown that before the adjustments made for the COVID-19 pandemic, depressive and anxiety-related disorders were respectively responsible for 38.7 and 35.5 million DALYs globally. After adjusting for the COVID-19 pandemic, depressive and anxiety-related disorders were respectively responsible for 49.4 and 44.5 DALYs globally. Furthermore, in age range and gender terms, young women aged under 25 years may constitute an at-risk group because a higher prevalence of both disorders was observed (see *Figure* 3; Santomauro et al., 2021).

Figure 3

Prevalence of major depressive (A) and anxiety disorders (B) prevalence before/after the pandemic.



Note: Figure taken from Santomauro et al. (2021).

Estimates of the trends in suicide observed during the COVID-19 pandemic remain unchanged (Farooq et al., 2021). This is an expected result based on other research works in which the number of suicides did not increase during natural disasters or other epidemics (Kõlves et al., 2013; Lester, 2009). Nevertheless, a recent systematic review has shown that the pooled prevalence of suicidal ideation (Farooq et al., 2021), one of the most prevalent components of suicidal behaviours (Castellví et al., 2017; Liu et al., 2020), increased (11.5%) in the general population during the COVID-19 pandemic compared to previous periods (e.g., 9.8%, Nock et al., 2008). Altogether, the data underline global mental health problems associated with depressive and anxiety problems, as well as suicide behaviours, due to their high associated mortality rates, especially for young people.

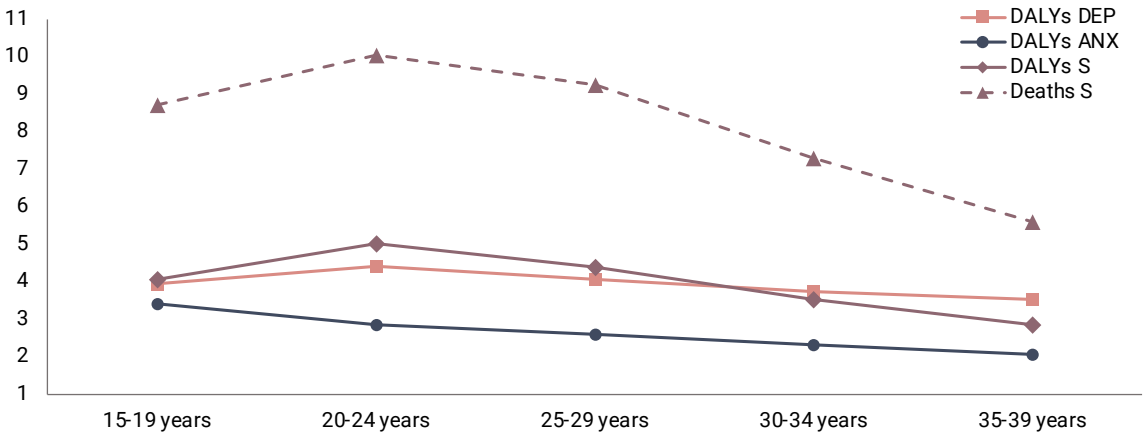
Depression, anxiety and suicidality in young adults

A recent epidemiological meta-analysis has shown that the global onset of the first mental disorders occurs before the age of 25 in 62.5%, with a peak/median age at onset of 14/18 years (Solmi et al., 2021). In relation to depressive disorders, the same study showed that the first diagnosis is made before the age of 25 in almost 40%, with a peak/median age at onset of 19.5/30 years (Solmi et al., 2021). In relation to anxiety-related disorders, a wider variability across types was observed. For example, the study showed onsets at early ages for anxiety/fear-related symptoms, with an occurrence before the age of 18 in half (51.8%) and before the age of 25 in 73.3%, with a peak/median age of 5.5/17 years. In contrast, generalised anxiety symptoms onsets were observed at later ages, such as an occurrence before the age of 18 in 20.4% and before the age of 25 in 33.0%, with a peak/median age of 15.5/32 years. In line with this, the latest available GBD data

have shown that individuals aged approximately 20-24 years have shown higher DALYs for depressive and anxiety disorders, and also for self-harm behaviours and related deaths, compared to other age groups (*Figure 4*). Overall, these data point out that people aged around 25 years are a risk group that requires special attention.

Figure 4

Proportions of DALYs across age groups



Note: DEP= Depressive disorders, ANX= Anxiety disorders, S= Self-Harm (GBD, 2019).

Hence the period covering ages 18-29 is known as "emerging adulthood", which has been defined as a normal developmental period during which feeling depressed and anxious is common (Arnett et al., 2014). The way people experience this period has changed, and the challenges that emerging adults face (e.g., instability and feeling in-between) differ from late adulthood people (Arnett et al., 2014). In this group, a higher psychopathology prevalence was been observed, especially for first-year college students, which might be because the transition from high school to college is a hard time for many students.

Overall, in college students suicidal thoughts and behaviours prevalences range from 17.6-22.3%, 6.1%-9.2% and 1.1-3.2% for suicidal ideation, suicidal plan and

suicidal attempt, respectively (Auerbach et al., 2019; Mortier et al., 2018). Several mental disorders are related to the risk of presenting any type of suicidal behaviour, especially in those who meet the criteria for more than one disorder in the last 12 months (Auerbach et al., 2019). The American College Health Association (American College Health Association-National College Health Assessment, 2019) estimates that around 24.3% and 20% of college students have anxiety and depressive symptoms, respectively, and almost 17% present both.

At a diagnosed disorder level, approximately one third of undergraduate students report a mental disorder diagnostic in the past 12 months (Auerbach et al., 2016, 2018). Broadly, major depressive disorder and generalised anxiety disorders are the two most prevalent disorders in people's lifetime (21.2% and 18.6%, respectively), along with the last 12 months prevalence (18.5% and 16.7%, respectively) when being female and older correlate with both lifetime and last 12-month prevalence (Auerbach et al., 2018). Moreover, almost 30% of college students present anxiety-depression comorbidity (Bitsika & Sharpley, 2012; Jenkins et al., 2020), which is associated with high severity and duration of symptoms, earlier age at onset of the first disorder, childhood trauma and high neuroticism (Lamers et al., 2011). This pattern is also observed in other populations. For instance, in adults recruited from primary care, almost half presented a secondary depressive/anxiety disorder (Hirschfeld, 2001). Thus, college students could be highlighted as a risk group for psychopathology due to their high prevalence for depression, anxiety-related disorders, suicidal behaviours and comorbidity (Auerbach et al., 2019; Mortier et al., 2018).

Psychopathology: hierarchical-dimensional nature

The previous section has shown that depression and anxiety-related symptoms/disorders are the most prevalent forms of psychopathology, and they often appear together. The co-occurrence of psychopathology conditions is not exclusively for depression and anxiety-related disorders, and two main different types of psychological co-occurrences are identified in the literature. One of them, *homotypic comorbidity,* refers to the co-occurrence of many disorders of the same "type", such as depression- and anxiety-related symptoms, as mentioned above, or conduct and oppositional defiant disorder (Maugham et al., 2004; Rowe et al., 2010). The other one, named *heterotypic comorbidity,* refers to the presence of different forms of psychopathology. For instance, the co-occurrence of depression and eating disorder or substance use disorder (Colder et al., 2013; Measelle et al., 2006), or conduct problems with depression (McDonough-Caplan et al., 2018) or anxiety (Linder et al., 2018).

Therefore, it is evident that psychiatric comorbidities occur more commonly than usual (Kessler et al., 2005), and the individuals who meet criteria for one disorder are likely to meet the criteria for another disorder (Krueger & Eaton, 2015). Latent class analyses carried out with 14,348 undergraduate students have evidenced that one of the most considerably prevalent groups of comorbidities to be identified was made up of students who met the criteria for at least one disorder and almost 80% met the criteria for two disorders (Auerbach et al., 2019). This psychiatric co-occurrence phenomenon is observed in early ages, such as child and adolescents (e.g., Colder et al., 2013; Lallukka et al., 2019; McElroy, Shevlin, et al., 2018), and in clinical contexts (Assmann et al., 2018; Hirschfeld, 2001).

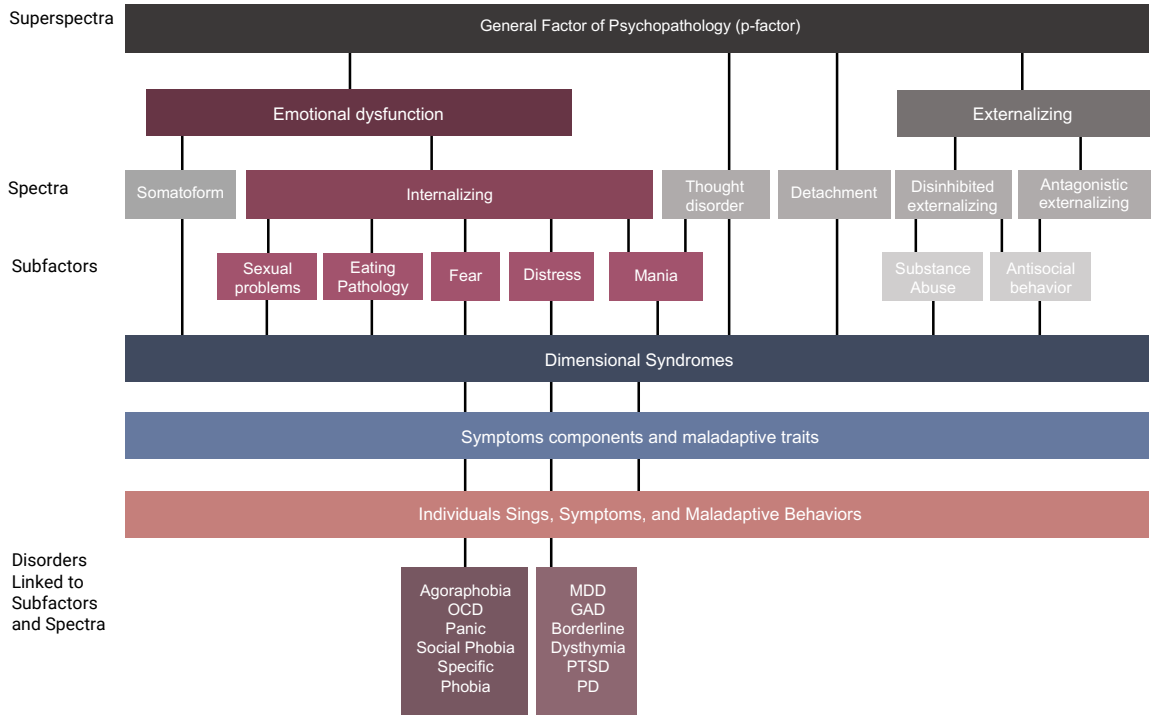
Consequently, all these data question the fundamental assumptions of the distinct nature (i.e., independent phenomena) of psychopathology syndromes considered from a categorical approach, and meta-analytic evidence supports the conclusion that psychopathology conditions are latently continuous (Haslam et al., 2020). Thus, the dimensionality approach is considering the best way to characterise psychopathology and should help to explain the co-occurrence of different syndromes (Krueger et al., 2018). This issue is especially important given that comorbidity is the rule rather than the exception (Krueger & Eaton, 2015). In short, psychiatric comorbidities undermine the notion that psychopathology does not appear in isolation, and evidence suggests the existence of a common structure for psychopathology (Miller et al., 2001). Through the factor analysis framework, studies have evidenced that psychopathological symptoms and disorders tend to group and delineate latent factors that represent the natural covariance of psychopathology (Kotov et al., 2017, 2021). The resulting models by quantitative nosology have been widely accepted in their field, are effective guides for theoretical, research and clinical areas, and also produce very useful instruments (Kotov et al., 2021). These news insights of psychopathology conceptualisation may help to better understand its aetiology and, therefore, help to design more appropriate prevention and treatment programmes, especially in a risk population like college students.

One of the most recent and empirical evidenced models with a strong impact in the psychopathology field and one that integrates these issues is the *Hierarchal Taxonomy of Psychopathology* (HiTOP) model (Kotov et al., 2017; Ringwald et al., 2021). The HiTOP is a model developed by a consortium of experts that mainly aims to address: (1) the dimensional nature of psychopathology; (2) widespread

comorbidity; (3) within-disorder heterogeneity; (4) symptoms overlap by delineating broader dimensions, and also a specific dimension as opposed to a specific category (Kotov et al., 2017, 2021; Krueger et al., 2018; Michelini et al., 2021).

Figure 5

Hierarchal Taxonomy of Psychopathology (HiTOP) model



Note: Adapted from Kotov et al. (2021)

The HiTOP model was designed based on extensive evidence using a latent class/factorial analysis to sort psychopathology according to the natural covariance structure (Kotov et al., 2017, 2021; Krueger et al., 2018; Krueger & Eaton, 2015) by continuing the empirical study of the structure of psychopathology established by previous authors (Achenbach, 1966, 2015; Achenbach & Edelbrock, 2003). Thus, the HiTOP involves the categories underneath, which gradually increase in specificity. General speaking, six levels are defined in this model, from a more specific-basic level comprising observed signs/symptoms, to broader

levels from maladaptive behaviour/traits, syndromes, subfactors and spectra, and finally to a general psychopathology factor (Kotov et al., 2017a, 2021a).

Overall, the HiTOP model allows to account for disorder-specific variance and shared variance (e.g., transdiagnostic spectra and superspectra level). Specifically, the spectra level includes two transdiagnostic factors identified in previous studies (e.g., Carragher et al., 2015; Eaton et al., 2010; Krueger, 1999; Krueger & Markon, 2006), named internalising and externalising symptoms. It also consider others, such as somatoform, thought disorder and detachment. The utility of the operationalidation of transdiagnostic factors is relevant for comorbidity phenomena because many disorders are firstly manifested as transdiagnostic indicators that further develop into more defined mental disorders (McElroy, Belsky, et al., 2018). As regards the relation with suicidality, there is evidence about positive and significant associations between internalising symptoms and suicidal thought and behaviours (Conway et al., 2019; Eaton et al., 2013; Sunderland et al., 2020; Sunderland & Slade, 2015). Suicidality includes distinct components (i.e., suicidal ideation, planning and attempt), which are explained by different factors and result from the complex interplay between many differing biological, psychological and environmental factors (Joiner et al., 2005; O'Connor & Nock, 2014) and, therefore, indicate its distinctive nature (Klonsky et al., 2018). Indeed a recent meta-analysis has noted that suicide attempts are associated mainly with transdiagnostic variance (i.e., internalising factor scores) whereas suicidal ideation and self-harm injury are significantly predicted specifically by major depression disorder (Sunderland et al., 2020). This finding may resemble the close relation between depression and suicidal ideation, and the study of its relations may better account for disorder-specific variance (i.e., specifics effects of

depression) rather than shared common variance (i.e., internalising factor). So these findings reflect the utility of the conceptualised psychopathology hierarchically when we study its associations with complex clinical indicators like suicide.

The composition of internalising spectra, the largest and more complex spectrum from the HiTOP, depends largely on the specific variables included in the analysis (Watson et al., 2022). Although different subfactors have been identified, the two most widespread and best evidenced ones are distress and fear subcomponents (Kotov et al., 2017, 2021). Hierarchical branching into different components reflects the different nature of not only the subfactors, but also of the disorders that underlie them. Specifically, the distress subfactor comprises psychological problems related to pervasive negative emotionality (e.g., MDD, dysthymic disorder, GAD, PSTD), but the fear subfactor consists of disorders that involve more specific forms of distress, which, habitually involve avoidance responses, such as specific phobia, agoraphobia, social phobia, among others (Kotov et al., 2017; Watson et al., 2022). Therefore, depression belongs to the distress subfactor with generalised anxiety, while the other anxiety-related syndromes belong to the fear subfactor (e.g., social anxiety, separation anxiety disorder, among others).

This new dimensional and hierarchical psychopathology conceptualisation has several implications at the conceptual and applied levels. On the one hand, evidence continues to emphasise the need to move away from the biomedical model (i.e., studying/identifying risk factors for each particular psychopathological condition, understood as a clinical syndrome that one either has or does not have),

and encourages adopting a more integrative and empirical perspective where efforts would focus on identifying and studying many of the risk factors (e.g., personality, rumination) underlying a big group of psychological symptoms and disorders. Furthermore, this change in the theoretical-conceptual approach towards a dimensional model also has significant implications to assess psychopathology (i.e., categorical vs. dimensional assessment and diagnostic approaches).

Accordingly, we discuss the role of personality as a significant distal aetiological factor in the following sections to better understand the aetiology of mental health (see p. 48). We also present the possible mechanisms through which personality (see p. 52) and related factors (i.e., rumination, see p. 54) affect the development of frequent and co-occurring psychopathological symptoms, such as depressive symptoms and suicidal ideation. Finally, regarding the dimensional assessment of psychopathology, proposals for improving the DSM-5 are presented, and focus especially on the scales for assessing the severity of the most prevalent symptoms and disorders (depression and anxiety-related symptoms) (see p. 59).

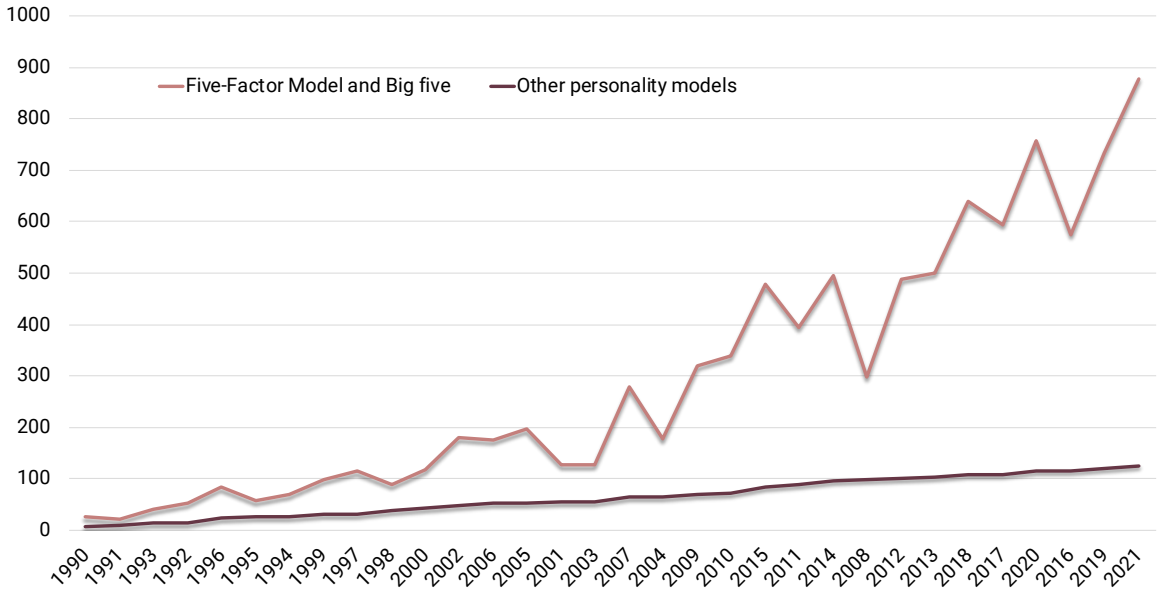
Personality and Mental Health

Personality is defined as the relatively stable and consistent organisation of affective and cognitive dispositions exhibiting behavioral tendencies, which influence adaptation (Eysenck & Eysenck, 1985). There are even different conceptualisations of personality, and the Five-Factor Model of Personality (aka Big Five) is considered the main theoretical framework, which is one of the most accepted by the scientific community (John, 2021) and one of the most widely used in scientific studies (see *Figure 6*). In the Five-Factor Theory (Costa & McCrae, 2010), the basic tendencies (i.e., personality dimensions), characteristics, adaptations and self-concept are considered core components, while biological bases, behaviour (e.g., emotional reactions, mid-career shifts, etc.) and external influences are conceived as related interfacing components of personality (Costa et al., 2019; McCrae & Costa, 1996). From this approach, personality leads to wide range of behaviours (e.g., skills, attitudes, relationships, among others) that, in turn, lead to explain subsequent and more complex behaviours, such as social and emotional responses. The FFM comprises five general personality dimensions, commonly called neuroticism (vs. emotional stability), extraversion (vs. introversion), conscientiousness (vs. disinhibition), agreeableness (vs. antagonism) and openness to experience. Overall, extraversion is conceptualised as individual differences in social skills, activities, excitement seeking and positive emotionality. Conscientiousness reveals the tendency to respect conventional social norms/rules, to be organized, to control impulses, and being a methodical person. Agreeableness reflects individual differences oriented to altruism, empathy, collaboration and compliance. Openness represents differences in

social/political attitudes, fantasy, intellectual curiosity and appreciation of artistic expression. Lastly, neuroticism refers to the propensity to experience negative affect, such as depression, anxiety, hostility and irritability, and to also have low self-worth.

Figure 6

Comparison of the number of publications related to either FFM or other influential theories of personality.



Note: The numbers identified in the figure as "*Other personality models*" refer to the sum of all the studies that used "Eysenk/Cattell personality model", "Hexaco personality model", "Allport personality model", "Cloninger personality model", "Gray personality model" or "Zuckerman personality model" as a key word in the title, abstract or keywords; those identified as "Five-Factor Model and Big Five" are the sum of all the articles whose keywords may have included "Big Five personality model" or "Five-Factor personality model". Data were taken from Scopus (access date 14-06-2022).

Basic personality dimensions have consistently shown their relevance in many life outcomes (Soto, 2019; Ozer & Benet-Martínez, 2006), such as those related to individual life (e.g., happiness, spirituality, virtue, physical health, longevity, self-concept, identity; see Allen et al., 2013; Anglim et al., 2020; Heller et al., 2004; Malouff et al., 2010; Smith et al., 2015; Steel et al., 2008), inter-personal (e.g., peer, family, romantic relationships; see Barańczuk, 2019; Roberts et al., 2007), and

socio-institutional outcomes (e.g., occupational choice and performance, political attitudes, values, volunteerism, community involvement, criminality, citizenship behaviour, academic performance; see Chiaburu et al., 2017; Poropat, 2009; Roberts et al., 2007; Sackett & Walmsley, 2014). The FFM has been also robustly related to psychopathology (Krueger et al., 2020). Several meta-analyses, which have examined cross-sectional associations between personality and psychopathology, have evidenced differentiated associations between personality dimensions and specific clinical disorders. High neuroticism, low extraversion and, to a lesser extent, low conscientiousness show significant and strong effects for major depression, unipolar, dysthymic disorder generalised anxiety, posttraumatic stress disorder, panic, agoraphobia, social anxiety, specific phobia and obsessive-compulsive disorder (i.e., internalising disorders) (Kotov et al., 2010). For substance use disorders and other addictive behaviours like gambling disorder, together antisocial personality disorder and psychopathic traits (i.e., externalising disorders) low conscientiousness, low agreeableness and, to a lesser extent, high neuroticism show significant effects (Decuyper et al., 2009; Kotov et al., 2010; MacLaren at al., 2011; Ruiz, Pincus & Schinka, 2008). Studies about the relation of the FFM and the suprafactors of psychopathology have found similar associations. Despite some minor differences across studies (i.e., samples employed, scales included), it would seem that neuroticism and introversion are related to the internalising factor (Castellanos-Ryan et al. 2016; Etkin et al., 2020, 2022), low agreeableness and low conscientiousness are associated with a disinhibited externalising factor (Caspi et al., 2014), low agreeableness is related to an antagonistic externalising factor (Etkin et al., 2020, 2022), and low conscientiousness and high neuroticism are associated with hyperactivity and

attention problems (Etkin et al., 2020, 2022). High neuroticism, low agreeableness and low conscientiousness would also be related to the general psychopathology factor identified at the top of the HiTOP hierarchy (Caspi et al., 2014; Castellanos-Ryan et al., 2016; Etkin et al., 2020, 2022; Mann et al., 2020).

Thus, the similitude between the FFM of personality and the HiTOP factors is clear, and experts have noted and highlighted in previous works that:

> "*This is because, like normative personality variation, maladaptive dispositions linked to psychopathology are well-organized by domains that are generally well conceptualized as maladaptive extensions of the domains of the FFM*" (p.1, Krueger et al., 2020).

Therefore, this resemblance is not accidental, and transdiagnostic factors of psychopathology have been described as akin to personality domains, such as the FFM, where various personality forms and mental disorders are conceived as manifestations of underlying dimensions (Brandes & Tackett, 2019; Krueger et al., 2020; Rodriguez-Seijas et al., 2015). Negative affect/neuroticism is a fundamental trait domain in research into psychopathology, especially for internalising symptoms like depression and anxiety-related problems. As explained above, studies have largely shown associations between neuroticism and internalising symptoms, such as mood and anxiety-related problems, and in both clinical and general populations (Hakulinen et al., 2015; Jeronimus et al., 2016; Kotov et al., 2010; Malouff et al., 2005), but also with other health indicators, such as suicidality (e.g., Bentley et al., 2021; Handley et al., 2013; Rappaport et al., 2017). In the next section, we focus on describing the role of neuroticism because it is one of the most important psychological factors for understanding internalising mental

disorders (Brandes & Tackett, 2019; Lahey, 2009; Ormel et al., 2013; Widiger & Oltmanns, 2017).

Neuroticism: a critical dispositional factor in mental health

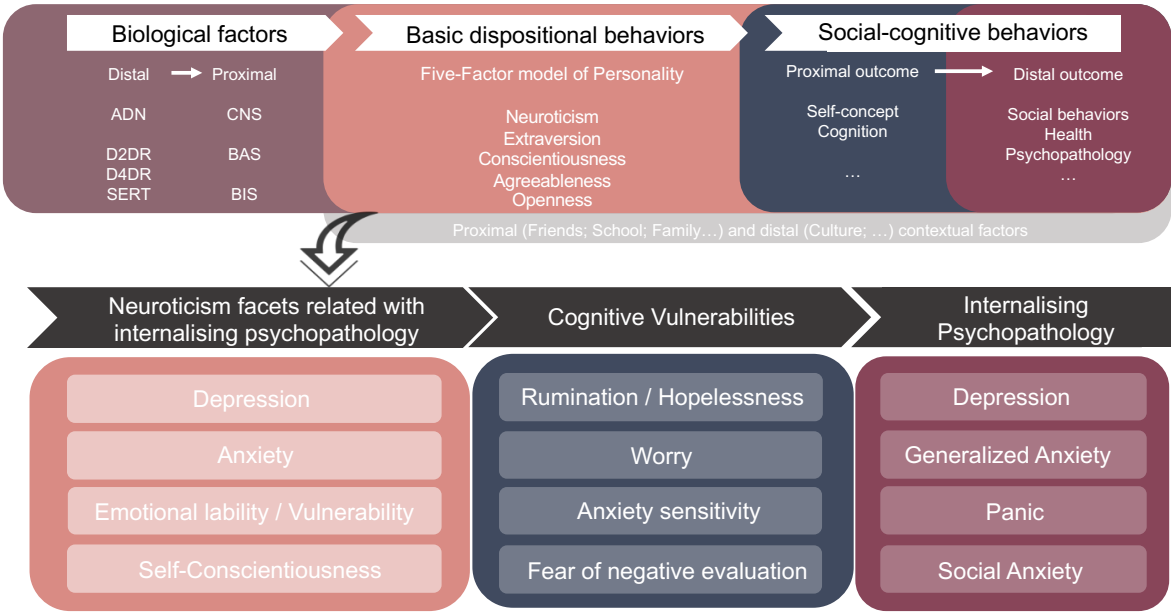
Neuroticism is conceptualised as a basic personality dimension that leads to individual differences in a continuum from a pole of emotional stability to the opposite extreme of negative affect, in which negative emotions like fear, anger, irritability or sadness are experienced at greater intensity and more frequently (Costa & McCrae, 2010; Eysenck & Eysenck, 1985; John & Robins, 2021; Watson & Clark, 1992). This has also been found to be related to almost all psychopathology types (Brandes & Tackett, 2019; Kotov et al., 2010; Malouff et al., 2005; Tackett et al., 2008), and accounts for a significant proportion of current and lifetime comorbidity (Clark, 2005; Khan et al., 2005). Jeronimus et al. (2016) yields the stability of the associations of neuroticism and psychopathology over time. These authors conclude that these data reinforce the idea that neuroticism is an independent and robust indicator of vulnerability in the development of psychopathology (Jeronimus et al., 2016). This falls in the line with a recent Mendelian randomisation study (Howard et al., 2019), which has determined that neuroticism constitutes a causal factor for depression. However, the role of personality in understanding psychopathology is complex, and it is necessary to consider how other socio-cognitive factors interact with personality in the development of psychopathology.

From a biodispositional view (*Figure 7*), effects from distal and proximal biological factors (e.g., genetics and brain systems associated with approach-avoidance behaviours) to distal outcomes like psychopathology can be observed.

This is likely through basic dispositional behaviours (e.g., personality) and their proximal outcomes (e.g., cognitive-related factors).

Figure 7

Biodispositional model for neuroticism and internalising psychopathology



Note: This figure has been designed based on information taken from Costa & McCrae (2010), Ortet & Sanchís (2004), Barlow et al., (2014) and Watson et al., (2022).

Accordingly in this model, the effects of transitional factors in the relation between personality and psychopathology are considered. These social-cognitive vulnerability behaviours may lead to better understand why those with high neuroticism develop one disorder (e.g., depression or generalised anxiety), while otherd develop another disorder (e.g., panic or specific phobia) (Barlow, Ellard, et al., 2014). This perspective falls in line with the triple vulnerability theory in the aetiology of mood and anxiety disorders, where the third component, known as *specific psychological vulnerability,* is described as a mechanism through which a particular emotional disorder may emerge from high neuroticism levels (Barlow, Ellard, et al., 2014).

Regarding internalising psychopathology, social-cognitive vulnerabilities like anxiety sensitivity have been associated mainly with panic or social anxiety (Haeffel et al., 2008; Hong, 2013), while others like rumination have been proposed to explain generalised anxiety and depression (Hong, 2013; McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema et al., 2008), as have other clinical outcomes like suicide (Rogers & Joiner, 2017). In the next section, we focus on describing rumination at the conceptual level, its relations to neuroticism, and some of the most frequent and comorbid symptoms, such as depression and suicidal ideation.

Rumination: a key cognitive factor for internalising psychopathology

Traditionally, rumination has been considered a way of responding to depressive symptoms that involves repetitively and passively self-focusing on one's depressed mood and on the possible causes and consequences of this negative mood (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema, 1991). According to the Response Style Theory (Nolen-Hoeksema, 1991), rumination is one of the main factors involved in the onset, duration and exacerbation of depression via several mechanisms (McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema et al., 2008). In addition, as studies support the notion that rumination can lead to several detrimental psychopathologies beyond depression (e.g., social and general anxiety, substance abuse or eating disorders; Aldao et al., 2010), rumination is proposed as a transdiagnostic pathological process (Nolen-Hoeksema & Watkins, 2011). Indeed, the reference authors in the study of rumination suggest that it can exacerbate psychopathology in at least four ways (Watkins & Roberts, 2020): (a) magnifying and prolonging existing negative mood states; (b) interfering with problem-solving; (c) with active instrumental

behaviours; (d) reducing sensitivity to changing contingencies and context. So the conceptualidation of rumination has evolved from a specific-related factor of depression to a broader risk-factor for psychopathology, and is described as a transdiagnostic factor (Aldao et al., 2010; Watkins & Roberts, 2020).

As previously emphasised, the common core of internalising psychopathology (e.g., depression) is negative affect. As we know that rumination is significantly related to these types of symptoms, it is not surprising that neuroticism presents a significant association with rumination. In fact as an proximal antecedent of rumination, neuroticism/negative affect has been proposed to be aetiologically involved in the development of rumination (Hyde et al., 2008; Mezulis et al., 2011; Sachs-Ericsson et al., 2014; Shaw et al., 2019), and some studies propose that rumination may constitute a significant mediator in the link between neuroticism and depression (Barnhofer et al., 2011; Chen et al., 2020; Hong, 2013; Kuyken et al., 2006; Lyon et al., 2021; Muris, 2006; Roelofs et al., 2008; Verstraeten et al., 2009, 2011). In addition, recent research has found interactive effects between negative affect and rumination on depression, suicidality or non-suicidal self-injury (Nicolai et al., 2016; Zvolensky et al., 2016), which, thus, increases the harmful effects of these variables. Nonetheless, it is important to know that most studies about the associations of rumination and other mental health indicator are based on psychological measures that assess mainly “depressive rumination” rather than rumination as a global thinking style, which is less tied to negative affect. Hence the magnitudes and significances of the observed associations may be biased. This makes the study of rumination assessments a relevant point to improve our understanding of the neuroticism- rumination-depression interrelation.

The rumination assessment

The Ruminative Response Scale (RRS) is one of the most employed rumination scales. It comprises 22 items that assess repetitive thoughts about the causes, consequences, and symptoms of current negative affect (i.e., feeling down, sad or depressed; Nolen-Hoeksema, 1991). One of the most important criticisms of this measure has been the presence of many items that may overlap depressive symptoms. Although the later 10-item version of the RRS excluded items with depressive content (Treynor et al., 2003), some authors still voiced concerns about the RSS because its design still focused on negative mood (i.e., instructions asked participants to rate themselves in terms of "*…when you feel down, sad or depressed*"). Subsequent efforts have resulted in other rumination assessment instruments, such as the Ruminative Thought Style Questionnaire (RTSQ) designed by Brinker and Dozois (2009).

The RTSQ is a unidimensional measure that assesses rumination and is less tied to negative affect. It is composed of 20 items. With the RTSQ, four central characteristics of rumination are assessed: repetitive, recurrent, uncontrollable, intrusive thoughts. Moreover, in the RTSQ, the authors also included different temporal orientations (i.e., past, present and future) and three types of valences (neutral, negative and positive thoughts). Tanner et al. (2013) proposed a short version of the RTSQ (15-items) to assess rumination across four facets: 1) *problem-focused thoughts* (thoughts focused on symptoms, causes and consequences of problems); 2) *counterfactual thinking* (thoughts focused on imagining alternative outcomes or realities); 3) *repetitive thoughts* (intrusiveness, persistence, and automaticity of thoughts); 4) *anticipatory thoughts* (future-

oriented ruminative thoughts). Overall, these four-factors appear to reflect some ideas of traditional rumination conceptualisations, such as: the *problem-focused thoughts* and *repetitive thoughts* subfacets would be congruent with initial rumination conceptualisations (Conway et al., 2000; Nolen-Hoeksema, 1991), whereas *anticipatory thoughts* would be related more to the protective effects of rumination (Tanner et al., 2013). Later studies extended the evidence for this four-correlated factor structure (Bravo, Pearson, et al., 2018; Dzhambov et al., 2019), and others have also provided evidence for the existence of a higher-order factor structure. Considering a global factor and specific subfactors of rumination could be very interesting because rumination is frequently operationalised with a global score (McCarrick et al., 2021; Olatunji et al., 2013), and the differential associations between subfactors and distinct psychological problems have been identified (e.g., counterfactual thinking with PTSD symptom clusters or problem-focused thoughts with alcohol outcomes; see Bravo, Pearson, et al., 2018). All this allows for more global to more specific assessments and, therefore, highlights an important target for interventions.

On the psychometrics properties of the RTSQ, there is evidence for the validity and reliability of its scores across different populations [clinical vs. non-clinical (Helmig et al., 2016a), undergraduates (Bravo, Pearson, et al., 2018; Brinker & Dozois, 2009; Dzhambov et al., 2019; Mihić et al., 2019), the general population (Karatepe et al., 2013) and adolescents (Tanner et al., 2013)]. Is has also been adapted to different languages [Spanish (Bravo, Pearson, et al., 2018), Serbian (Mihić et al., 2019), Bulgarian (Dzhambov et al., 2019), German (Helming & Meyer et al., 2016) and Turkish (Karatepe et al., 2013)]. However, only a few studies have explored the measurement invariance of the RTSQ across countries and gender

groups. Bravo, Pearson, et al. (2018) found by using the 15-item version of the RTSQ, the four-factor correlated model was invariant across males and females, but also among undergraduates from the USA, Argentina and Spain. However, to our knowledge, no previous study has explored the measurement invariance of a hierarchical model of the RSTQ 15-item form across countries, gender groups and over time. This is especially relevant considering that most studies have used a global factor of rumination (e.g., McCarrick et al., 2021; Olatunji et al., 2013), and some studies that have compared rumination across men and women and across countries have applied the total score of the RSTQ 15-item form (e.g., Mezquita et al., 2019).

On the whole, all the evidence described in the present section underscores that: (1) neuroticism is a distal dispositional factor in the aetiology and severity of internalising symptoms, especially for mood disorders and depressive symptoms and is, therefore, a significant key factor to better understand suicidality, especially suicidal ideation; (2) rumination could constitute an intermediated cognitive key factor in understanding the relation of neuroticism and psychopathology; for example, as regards depressive symptoms; (3) advances in the rumination conceptualisation and its subsequent assessment could be useful for more accurately studying the relation between rumination and other distal and proximal factors. For example, it could have a significant impact on the more precise study of how the effects of rumination might mediate the relation between neuroticism and depression, and how this relation can help us to better understand the suicidal ideation phenomenon given their inherent interrelationship, as discussed above.

As set out in a previous section (p. 42, *Psychopathology: hierarchical-dimensional nature*), and as indicated above, new insights into psychopathology conceptualisation and its latent structure (i.e., the HiTOP model, Kotov et al., 2017, 2021) allow us to better understand and identify the relevant aetiological factors involved in the onset and development of psychopathology. Besides conceptual implications, these advances also offer several contributions at an applied level; for instance, in assessment practices. Hence the following section encompasses the main contributions of the shift from a categorical to a dimensional paradigm in assessment proposals, specifically those developed in the latest DSM-5 edition (APA, 2013).

A step towards the dimensional assessment system in DSM-5

Advances in psychopathology conceptualisation have been helpful in making a transition from categorical diagnostic systems [e.g., Diagnostic and Statistical Manual of Mental Disorders (DSM) or International Classification of Diseases (ICD)] to more dimensional and evidence-based approaches. Overall, taking a dimensional approach enables some of most noted categorical approach limitations to be overcome (e.g., high *Not Otherwise Specified* rates, little temporal stability of categorical diagnosis, and reliability; Bromet et al., 2011; Kotov et al., 2021; MacCallum et al., 2002; Markon et al., 2011), because it has an implicit continuous nature, relies on formal models, and is based on systematic observations (Kotov et al., 2021, LeBeau et al., 2015). The present section aims to expose the novelties included in the latest DSM edition regarding the dimensional approach to assess psychopathology by describing its empirical evidence and the issues that require further research.

Kraemer (2007) underscores that "*DSM focus and concern has always been on diagnoses, that is, a clinical expert's opinion as to whether some disorder is present in a particular patient*" (p., S8, Kraemer, 2007), and she also emphasises that "*The word 'diagnostic' in DSM is clearly descriptive of its purpose to provide the best guidance currently available to identify those with a disorder*" (p., S9, Kraemer, 2007). However, a recent study conducted by First et al. (2018) with clinicians, who were members of the *Global Clinical Practice Network* (GCPN), has described that employing categorical diagnoses is often/routinely used to obtain diagnostic codes for administrative or billing purposes (intake, 67.8%; ongoing treatment, 63.1%). Almost half the clinicians reported never/sometimes using criteria to make a diagnosis (intake, 49.8%; ongoing treatment, 50%). However, despite the purposes of the most valued categorical systems by clinicians being to use it to select treatment (Reed et al., 2011), it is one of the least reported uses, along with estimating a likely prognosis (First et al., 2018). The authors conclude that these findings could reflect the weaknesses identified in utilising categorical classification systems, such that the heterogeneity in the diagnostic use of categories, and also lack of a univocal relation between diagnostic categories and treatment options (First et al., 2018).

The *World Psychiatric Association* (WPA) - WHO survey about clinician's attitudes towards mental health (Reed et al., 2011) has evidenced that the majority of the surveyed clinicians favour including a dimensional component in the assessment process. This is specifically because it would make the diagnostic system more detailed and personalised, or because it would be more accurate for describing the underlying psychopathology (Reed et al., 2011). So even from the categorical approach, clinicians' decisions can be considered easier (i.e., the

patient either reaches the diagnostic threshold for a specific disorder or does not), and the information collected with this system is limited to "presence/absence" terms. Therefore, dimensional assessment systems could be extremely interesting for not only research features, but also for clinicians' practices or applied fields related to psychopathology.

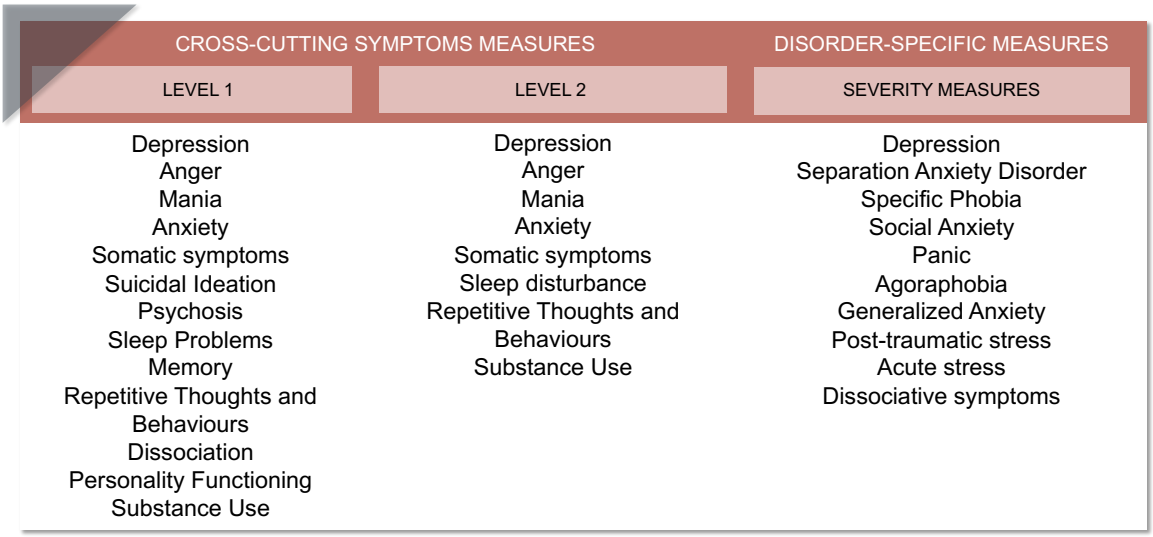
Discussion about the inclusion of a dimensional viewpoint in the DSM is not recent, and its possible consideration has been present since the DSM-III evaluation process, but has been continuously postponed (Kraemer, 2007). Notwithstanding, during the revision process of the fifth edition of DSM-5, the need to consider the dimensional approach in the evaluation system was once again emphasised. So to proceed with the inclusion of dimensional measurements, three aspects were highlighted that have to be met: (1) dimensional tools must correspond to their categorical diagnosis; (2) and must be "transparent" in complexity terms to clinicians and (3) dimensional assessment tools must show evidence for validity and reliability (Kraemer, 2007). Nonetheless, it is important to know that the aforementioned survey also evidences that a minority of clinicians consider that a dimensional system would be too complicated to be used in clinical systems or there is insufficient evidence for the reliability of such an approach (Reed et al., 2011). Nevertheless, in the last edition of DSM, several dimensional tools were included in the third section named "*Emerging Measures and Models*". These measures have been favourably valued by mental health professionals in ease and clarity terms (i.e., 70% of clinicians rated the emerging measures better than the classic categorical system, Moscicki et al., 2013). Likewise, these measures have been highly valued by patients, with about 50% reporting that the new measures would help their clinicians to better understand their symptoms and

would, thus, improve communication in clinical practice, as well as the therapeutic alliance (Moscicki et al., 2013).

Specifically, two types of measures were included (see *Figure 8*): (1) self-rated Cross-Cutting symptom measures; (2) disorder-specific severity measures. One of the main differences is the degree of the specificity of assessments. While the former has a more general measure (i.e., in terms of psychopathology domains), the second is indicated for a specific disorder.

Figure 8

Psychopathology measure from DSM-5, Section III: Emerging measures



From a broader perspective, Levels 1 and 2 self-rate cross-cutting symptoms measures and assess symptoms across diagnostic categories. The *Level 1* measure assesses 13 domains for adults in the last 2 weeks (see *Figure* 8). *Level 2* compromises measures with a higher degree of specificity compared to the former level, but not for all the domains contemplated in *Level 1*, and excludes the memory, personal functioning, suicidal ideation/attempts, dissociation and psychosis domains. Lastly, the *Severity Measures* (SMs) were developed by

specialist work groups as short self-reported measures to assess symptoms related to depression (9 items), anxiety-related disorders (10 items), stress-related disorders (i.e., posttraumatic stress with 8 items, and acute stress with 7 items) and dissociative disorders (8 items) in the last week.

The SMs of DSM-5 are purposed to mainly solve the problem of the categorical diagnosis structure to detect changes in psychopathology over time when patients attend therapy (APA, 2013). SMs were designed as a short self-reported measure to be administered during both an initial intake interview and over time to track the severity of an individual's disorder and response to treatment (p. 733; APA, 2013). Due to its short self-reported design, these scales can also act as a useful and efficient time-cost resource to identify high-risk studenst in their first years in need of help. Not only a high prevalence of mental health problems has been identified (Auerbach et al., 2016, 2018), but so has low treatment-seeking rates (Bruffaerts et al., 2019; Ebert et al., 2019). Indeed its short-design can help to reduce the time spent on assessing individuals (NICE, 2016) and can, therefore, cut waiting lists to access mental health services, which is one of the common barriers identified for college students to participate in treatment (Vidourek et al., 2014). By also considering the high comorbidity rates in this population (Auerbach et al., 2019), especially for depression and anxiety-related symptoms (Bitsika & Sharpley, 2012; Jenkins et al., 2020), SMs could be useful for also covering a wide range of symptoms based on the same conceptual approach, the same response scale, and also within the same time frame. In short, the SMs from DSM-5 could be most interesting at an applied level. However, before using these measures in research and clinical settings, it is necessary to provide evidence for the validity and reliability of the SM scores. In the next section, existing evidence for the

psychometric properties of the depression and anxiety SMs proposed by DSM-5, and also for the Spanish version of these scales, is reviewed.

Depression Severity Measure

The SM proposed in DSM-5 (APA, 2013) to assess depressive symptoms is an adaptation of the *Patient Health Questionnaire* 9-item version (PHQ-9) screening tool, used to assess the presence and severity of depressive symptoms based on a 4-point Likert scale (Löwe et al., 2004). Specifically, the PHQ-9 contains the same symptoms considered in *criteria A* for major depression disorder (MDD) of DSM-5. PHQ-9 is a widely use tool that has been adapted across different countries and populations and provides evidence for validity and reliability. Regarding its structure, some studies point out the unidimensional nature of PHQ-9 (González-Blanch et al., 2018; Kocalevent et al., 2013; Leung et al., 2020), while others have found a two-factor solution (i.e., somatic and cognitive-affective symptoms) for its latent structure (Guo et al., 2017; Petersen et al., 2015). Nonetheless, there are cross-loadings items, and its distribution in factors across different study samples differs. Some studies point out that the cognitive-affective factor and the somatic factor is composed of four (items 1, 2, 6 and 9) and five (items 3, 4, 5, 7 and 8) indicators, respectively (e.g., in the psychiatric sample, Beard et al., 2016), while others note that the two factors are composed of five items (1, 2, 4, 6 and 9) and four items (3, 5, 7 and 8) (e.g., among the patients with persistent major depressive disorder, Guo et al., 2017). A latent structure composed of six (1, 2, 6, 7, 8 and 9) and three (3, 4, and 5) items for the cognitive-affective factor and the somatic factor, respectively, has also been reported (e.g., for palliative patients, Chilcot et al., 2013, and college students, Keum et al., 2018). Thus, the loadings of each item

on the proposed two-factor structure seems inconsistent across studies and, therefore, indicates that the weights of items could vary due to the study sample type. Considering that both factors are highly correlated (from .85 to .97; Beard et al., 2016; González-Blanch et al., 2018; Keum et al., 2018), some researchers suggest that a one-factor solution could better depict the structure of PHQ-9 (Boothroyd et al., 2019). Therefore, the unidimensional structure for PHQ-9 may lead to better assessment practices and allow homogeneous assessments to be made across different individuals, as researchers recommend (e.g., Boothroyd et al., 2019).

Studies have found evidence for large associations with convergent measures, such as distress symptoms (i.e., depressive and anxiety-related symptoms) and rumination (*rs* from .57 to .85; Adewuya et al., 2006; Amtmann et al., 2014; Dadfar et al., 2018; Garabiles et al., 2020; Hammash et al., 2013; Kroenke et al., 2001; Maroufizadeh et al., 2019; Wang, et al., 2014), as well as medium to large associations with discriminant/criterion scales that assess perceived social support, life events, quality of life, well-being, sleep disturbance, and pain interference (*rs* from -.25 to -.80; Amtmann et al., 2014; Arnold, et al., 2019; Dadfar et al., 2018; Garabiles et al., 2020; Kroenke et al., 2001; Maroufizadeh et al., 2019; Martin et al., 2006) in different samples (clinical and non-clinical) and countries (e.g., USA, China, S. Korea, among others). There is even scarce evidence for cross-sectional relations between PHQ-9 scores with the FFM of personality. Some studies have found medium to large associations among PHQ-9 and Neuroticism (*rs* from .44 to .48), Extraversion (*rs* from -.27 to -.36), Conscientiousness (*rs* from -.32 to -.55), Agreeableness (*rs* from -.23 to -.38) and Openness (*rs* from -.17 to -.29) (Nikčević, et al., 2021).

In short, studies about PHQ-9 (i.e., the Depression SM of DSM-5) have provided evidence to take this tool as a suitable assessment for measuring depressive symptoms in a short time. However, some issues need further examination given the scarce evidence for the structure validity of the Spanish version in young adults (e.g., its longitudinal measurement invariance has not yet been tested).

Anxiety Severity Measures

The Anxiety Disorders Subgroup of the DSM-5 Anxiety, OC Spectrum, Posttraumatic, and Dissociative Disorder Work Group has developed initial versions of anxiety-related SMs (Lebeau et al., 2012). A set of 10 items is based on questions related to frequency, intensity, escape and avoidance behaviours that are common in anxiety problems. Specifically, these measures assess symptoms related to generalised anxiety, separation anxiety, social anxiety, specific phobia, panic and agoraphobia (*Figure 8*). Each original item examines specific symptoms in the last week on a 5-point Likert scale. Different pieces of validity and reliability evidence of the scores from the English version, and also from other translated versions of the scales, have been reported (Beesdo-Baum, et al., 2012; DeSousa et al., 2017; Yalin et al., 2017). Studies generally show evidence for the unidimensionality structure of generalised anxiety, social anxiety, panic, agoraphobia and separation anxiety (Beesdo-Baum, et al., 2012; DeSousa et al., 2017). The Specific Phobia Scale has a one-factor solution in clinical populations (e.g., Beesdo-Baum, et al., 2012), but not in general populations (i.e., DeSousa et al., 2017). The Cronbach's alphas of the scales rank from .83 to .98, and the test-retest correlations (11n days later on average) from .71 to .84 reveal good reliability indices of scale scores, except for Specific Phobia as a unidimensional

scale (i.e., with a test-retest correlation of .51) (LeBeau et al., 2012). Finally, the scales scores showed medium to large correlations with other scales that assess similar constructs (i.e., Social Anxiety, *r* = .47 to .62; Panic, *r* = .68 to .82; Agoraphobia, *r* = .36 to .73; General Anxiety, *r* = .68 to .77) (DeSousa et al., 2017).

In a parallel fashion to the evidence found for the depression SM, studies about the psychometric properties of anxiety-related SMs have reported promising evidence and point out the fact that these scales may be useful for assessing different anxiety symptoms. However, as far we know, there is no validity and reliability evidence for the Spanish anxiety SMs scores at either the transverse or longitudinal level.

Conclusions

Although the structure of psychopathology and its assessment have been extensively studied in recent decades, much research remains to be examined, especially in relation to the validity and reliability evidence for the depression and anxiety SMs proposed in DSM-5. For example, further studies are needed to examine the psychometric properties of measures in different languages to provide evidence for their suitability for being used in different populations (e.g., Spanish population) and for studying their stability over time. This last point is especially important because, as far we know, there is limited evidence about the longitudinal measurement invariance structure of DSM-5 scales, even though it was proposed mainly to establish the baseline of treatment, and to perform clinical follow-up (p. 733; APA, 2013). Similarly with the RTSQ, although previous studies have shown suitable psychometric properties, some issues still need to be further researched. First of all, and as we mention above, while the four-correlated factor

has been studied more than the second-order factor, the latter has conceptual and practical advantages because it considers a global factor of rumination in addition to four subfactors. Moreover, as far we know, neither longitudinal measurement invariance nor measurement invariance across the groups of interest (e.g., across countries) of the second-order structure of the RTSQ has been tested. Therefore to bridge these gaps, the present thesis provides new evidence about the psychometric properties of these assessment tools by examining different sources of validity (e.g., structure, convergent/discriminant, criterion) and reliability evidence across distinct groups (e.g., across countries and gender groups) and over time.

Furthermore, and as explained above, extensive evidence indicates close connections between personality and psychopathology forms. Specifically, the close relation between neuroticism and internalised symptoms, especially with specific problems like depression, has been highlighted. Nonetheless from the biodispositional model, socio-cognitive vulnerabilities have been described to better understand the relation between personality and psychopathology. In line with this, rumination has been shown to be a clear risk factor for depression, where neuroticism has also been described as an antecedent factor to rumination. As far as we are aware, there is little evidence for having simultaneously studied the effects of neuroticism and rumination to explain depression. As depressive symptoms and suicidal ideation are closely related, studying the effects of neuroticism, as a known distal-aetiological variable, and rumination, as a known cognitive vulnerability factor of depression, can help us to extend our knowledge and to clarify the relation between these variables. Thus such evidence may help, among other things, to determine which variables might be relevant in prevention

strategies and treatment designs for emotional problems and suicidal behaviours. This is particularly relevant because, despite the large body of evidence available on the need for psychological treatment, there are still many, for example, young adults who, despite reporting psychological problems, do not seek treatment. It is even more relevant to bear in mind that depression and suicidal behaviours are one of the main risk factors for not seeking help and treatment in this population, as highlighted in the previous sections.

CHAPTER 2

RESEARCH AIMS AND HYPHOTHESES

Given the need to extend evidence on different issues related to assessment tools and the aetiology of psychopathology, the **general objectives** of this doctoral thesis are, on the one hand, to provide new evidence for the validity and reliability of the scores of different assessment tools (i.e., SMs of DSM-5, Study 1 and Study 2; RTSQ to assess rumination, Study 3) and, on the other hand, to extend and provide new knowledge on the relation between dispositional variables, socio-cognitive vulnerabilities, psychopathology and suicidality in a cross-national and cross-sectional design (Study 4) and also prospectively (Study 5). Thus the **objectives** and **hypotheses** linked with each study are the following.

Study 1

Self-reported DSM-5 Anxiety Severity Measures: Evidence for Validity and Reliability in Spanish Youths

Specific Objective 1: Examining the psychometric properties of the DSM-5 anxiety SM Spanish version among college students

Hypothesis 1: A unidimensional structure for each self-reported SM will be observed.

Hypothesis 2: Anxiety Severity Measures will show adequate reliability indices (i.e., Cronbach's alphas and ordinal omegas higher than .70).

Hypothesis 3: The anxiety SM will show higher associations with internalising than externalising measures (convergent/discriminant validity evidence).

Hypothesis 4: The total scores of the anxiety SMs will be significantly associated with higher neuroticism and lower satisfaction with life and quality of life scores (criterion validity evidence).

Study 2

Anxiety and Depression Severity Measures of DSM-5: Longitudinal Measurement Invariance, and Psychopathology Trajectories among College Students

Specific Objective 2: Provide additional validity and reliability evidence for the anxiety and depression SMs of DSM-5 in Spanish college students in a longitudinal design (i.e., four assessment waves during an 18-month period)

Hypothesis 5: The unidimensional structure of DSM-5 SMs will be confirmed across waves, and longitudinal measurement invariance of the scales will be found.

Hypothesis 6: Depression and Anxiety SMs will show suitable reliability coefficients (i.e., Cronbach's alphas and ordinal omegas higher than .70) at each assessment wave.

Hypothesis 7: General reduction in depression and anxiety-related symptoms will be observed over time.

Study 3

Examination of the Latent Structure of the Ruminative Thoughts Style Questionnaire across Countries, Gender and Over Time

Specific Objective 3: Provide reliability and validity evidence for the hierarchical structure of the RTSQ scale across four countries, sex groups (i.e., male and female) and longitudinally among college students

Hypothesis 8: Measurement invariance of the second-order factor structure of the RTSQ will be observed cross-nationally (i.e., USA, Argentina, the Netherlands and Spain) and across sex groups (i.e., male and female).

Hypothesis 9: Longitudinal measurement invariance of the second-order factor structure of the RTSQ will be observed across three assessment waves (i.e., every 6 months during a 1-year period).

Study 4

Neuroticism, Rumination, Depression and Suicidal Ideation: A Moderated Serial Mediation Model Across Four Countries

Specific objective 4: Exploring the direct and indirect effects of neuroticism, rumination, and depression in predicting suicidal ideation across four countries and sex groups among college students.

Hypothesis 10: Emotional stability will be indirectly associated with suicidal ideation via rumination and depressive symptoms (i.e., emotional stability → rumination → depressive symptoms → suicidal ideation).

Hypothesis 11: Effects of rumination on depressive symptoms, and of depressive symptoms on suicidal ideation, will be stronger in the students with higher neuroticism levels.

Hypothesis 12: Indirect and moderated effects observed from neuroticism will be invariant across countries and gender groups.

Study 5

A 1- year Longitudinal Study about Suicidal Ideation, Depressive Symptoms, Rumination, and Emotional Stability

Specific objective 5: Studying the direct and indirect effects of neuroticism, rumination and depression in the prediction of suicidal ideation longitudinally (i.e., three assessment waves every 6 months during a 1-year period) among Spanish college students

Hypothesis 13: Neuroticism will show significant direct effects on depression and rumination across assessment waves.

Hypothesis 14: Rumination will show significant direct effects on depression across assessment waves.

Hypothesis 15: Depression will show significant direct effects on suicidal ideation across assessment waves.

Hypothesis 16: Indirect effects from neuroticism to suicidal ideation via rumination and depression will be observed.

Hypothesis 17: Indirect effects from rumination to suicidal ideation via depressive symptoms will be observed.

CHAPTER 3

STUDY 1

Vidal-Arenas, V.[1], Ortet-Walker, J.[1], Ibáñez, M.I.[1, 2], Ortet, G.[1,2] y Mezquita, L.[1,2] (2021). Self-reported Anxiety Severity Measures of DSM-5: evidence of validity and reliability in Spanish youths. *Psicothema*, *33* (2), 312-319. https://doi.org/10.7334/psicothema2020.398

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Abstract

Background: Very few studies about the psychometric properties of the Anxiety Severity Measures (ASMs) proposed in the DSM-5 exist, and none in Spanish-speaking populations. Thus, the aim of the present study was to provide validity and reliability evidence for the Spanish versions of the Agoraphobia, Social Anxiety, Separation Anxiety, Panic, General Anxiety and Specific Phobia Severity measures. **Method**: Participants included 567 Spaniards (mean age = 21.26, *SD* = 3.61; 68.3% females). Exploratory and Confirmatory Factor Analyses tested the structure of the scales, Differential Item Functioning by sex, Cronbach's Alpha and ordinal omega to test its reliability, and the Pearson correlations between the ASMs and different outcomes to provide evidence for its convergent/discriminant (internalizing and externalizing symptoms) and criterion validity (life satisfaction, quality of life and personality). **Results**: Structural analyses supported a one-factor solution for all the ASMs regardless of sex, except for the Specific Phobia scale. Reliability indices ranked from .82 to .93. All six scales showed stronger associations with the internalizing than externalizing measures and were also negative related with satisfaction and quality of life and emotional stability. **Conclusion**: The Spanish version of ASMs, except Specific Phobia Scale, is suitable for assessing DSM-5 anxiety-related symptoms.

Keywords: DSM-5 Severity measures, psychometric properties, anxiety, young adults.

Introduction

From the first edition in 1952 to the present-day, psychiatrists and psychologists frequently employ the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) in research and clinical practice. Nevertheless, the construct validity of the categorical diagnostic classification system has been questioned for more than 10 years based on a large body of evidence, such as: (1) temporal stability of taxometric diagnosis is low; (2) even though the categories make clinical decisions easier, they only do so in presence-absence terms; (3) many threshold problems have been identified, so high rates of *Not Otherwise Specified* diagnoses have been encouraged; (4) there are high comorbidity rates, especially in anxiety and emotional disorders, reported in general and clinical populations; (5) clinical features, and not etiological assumptions, define the criteria evaluation system (Belloch Fuster, 2012; Bjelland et al., 2009; Brown & Barlow, 2005; Krueger et al., 2018). Consequently, the DSM-5 Task Force outlines the need to consider the dimensional approach of psychopathology while revising the new edition of the DSM (Kraemer, 2007).

Therefore, about 160 medical and mental health professionals worked on the fifth DSM edition, through which the new project and its update were published in 2013 (APA, 2013). Although the dichotomous or binary system of classification (*yes-no*) remained as in previous editions, a new section provides several dimensional assessment tools (APA, 2013). DSM-5 Section III includes two types of measures: (1) Self-Rated Cross-Cutting Symptom Measures, which assess symptoms across diagnostic categories; (2) Severity Measures, which assess symptoms associated with specific disorders. Severity Measures were developed by specialist work groups (LeBeau et al., 2012) and comprise six anxiety-specific

problems (social anxiety, agoraphobia, specific phobia, separation anxiety, panic, generalized anxiety disorder), depression, dissociative symptoms, and two measures for problems related to stress (posttraumatic and acute stress symptoms) (APA, 2013).

Moscicki et al. (2013) conducted a study to explore the subjective clinical utility of the new emerging measures in easiness and clarity terms, among other criteria. The findings indicated that about 70% of mental health professionals reported that they highly valued these assessment tools compared to the categorical evaluation system. Likewise, around 50% of patients reported that the emerging measures would help their clinicians to better understand their symptoms and to, thus, improve communication in clinical practice and therapeutic alliance.

As part of mental disorders, anxiety disorders are some of the most prevalent diagnoses worldwide (Bandelow & Michaelis, 2015), and rank sixth place among the mental disorders that contribute to chronic conditions in Europe. Anxiety disorders also account for 4% of all years lived with disability (World Health Organization Regional Office for Europe, 2019). For these reasons, providing brief and self-reported measures that cover and assess the main anxiety disorder-related symptoms, such as those proposed in DSM-5 Section III, could be useful in research and also for clinical objectives.

Each DSM-5 anxiety severity measure comprises 10 items. Participants answer for the last 30 days (from 0 "*never*" to 4 "*all the time*") the frequency with which they have experienced different anxiety-related symptoms, such as avoidance, fear or nervousness, among others (LeBeau et al., 2012). There are reports of different sources of validity and reliability among other adapted scale versions (Beesdo-Baum et al., 2012; DeSousa et al., 2017; Yalin Sapmaz et al., 2017).

Specifically, previous studies with general and clinical populations have found evidence for one-factor structures for the Generalized Anxiety, Agoraphobia, Social Phobia, and Panic scales (DeSousa et al., 2017; Knappe et al., 2014; Yalin et al., 2017). The Specific Phobia scale has shown a one-factor solution in clinical populations (e.g., Beesdo-Baum et al., 2012), but not in general populations (i.e., DeSousa et al., 2017). In addition, the scale scores have shown medium to large correlations with other scales that assess similar constructs (i.e., Social Anxiety, *r* = .47 to .62; Panic, *r* = .68 to .82; Agoraphobia, *r* = .36 to .73; General Anxiety, *r* = .68 to .77) (DeSousa et al., 2017). These studies evidence the structure and convergent validity of Anxiety Severity Measures. Regarding the scales' clinical sensitivity, large effect sizes were found for the Generalized Anxiety, Agoraphobia, Social Phobia, and Panic scales (*d* > .80), with a medium effect size for the Specific Phobia scale (*d* = .72) (LeBeau et al., 2012), which adds evidence for the construct validity of the Anxiety Severity Measures scales. The Cronbach's alphas of the scales rank from .83 to .98, and the test-retest correlations (11 days on average later) from .71 to .84, show good reliability indices of the scale scores, except for the Specific Phobia scale, with a test-retest correlation of .51 (LeBeau et al., 2012).

Taken together, preliminary evidence for the psychometric properties of the Anxiety Severity Measures is promising, at least for the Generalized Anxiety, Agoraphobia, Social Phobia, and Panic scales, while the Social Phobia requires further research due to its weak reliability and validity evidence, and because its latent structure is not clear, as do the Separation Anxiety scales due to lack of research. In addition, although Anxiety Severity Measures are available in Spanish (APA, 2014), as far as we know no previous study provides evidence for the validity and reliability of their scores. For these reasons, and also given the high prevalence

of anxiety problems in emerging adulthood (e.g., American College Health Association-National College Health Assessment, 2019), our main research aim was to provide on evidence for: 1) the structure of the six Spanish language Anxiety Severity Measures; 2) Differential Item Functioning by sex; 3) scales' internal consistency; 4) convergent and discriminant validity (i.e., by relating them to internalizing and externalizing symptoms); 5) scales' criterion validity (i.e., relating them to personality traits, subjective satisfaction and quality of life) in young Spanish adults, following the recommendations (Muñiz & Fonseca-Pedrero, 2019).

Based on previous studies, we hypothesized that one-factor solutions would provide adequate fit indices for five of the six Anxiety Severity Measures. With the Specific Phobia scale and based on the inconsistent results about its structure found in previous studies, we tested its structure in a more exploratory fashion. Scales' internal consistencies were expected to be higher than the standard cut-off of .70. We also expected higher associations of Anxiety Severity Measures with other scales that assess internalizing symptoms (i.e., worry, anxiety, depression) than with externalizing symptom scales (i.e., drug-related problems) (Kotov et al., 2017). Finally, we expected higher Anxiety Severity Measures scores to be negatively related to the emotional stability personality trait (Kotov et al., 2010), satisfaction with life (Proctor et al., 2009) and quality of life (Olatunji et al., 2007).

Method

Participants

A total of 858 college students from a university in eastern Spain participated, but only the data from the cases who completed the Anxiety Severity measures (*n* = 567) were included in the present work. Also, we considered the drug use data only in the participants who reported alcohol use at least once or twice in the last

6 months (*n* = 412), marijuana use in at least the last month (*n* = 115), and who reported currently smoking tobacco (*n* = 114). The participants included 31.7% (*n*=180) males and 68.3% (*n* = 387) females with a mean age of 21.26 (*SD* = 3.61) that ranged from 18 to 51 years. Most of the participants were single (85% [65.97% females]), and 34% were first (64.9% females), 23% second (80.3% females), 18% third (64.4% females), 17% last (fourth or fifth year, 58.5% females) academic year students, and 8% had already finished their studies (79.1% females).

Instruments

For all the measures (unless otherwise specified), we created composite scores by averaging items and reverse-coding items whenever appropriate to indicate that higher scores signify higher construct levels. Supplemental material to see descriptive and reliability indices for validity measures are available in https://osf.io/3wrbg/.

Anxiety Severity Measures

We used the five-point answer scales, from 0 (*never*) to 4 (*always*), freely published (APA, 2014) with modifications. Firstly, we changed the time frame of assessment to report the symptoms experienced "in the last 6 months" instead of the 30 days of initial (LeBeau et al., 2012) and other adapted (e.g., Beesdo-Baum et al., 2012), following the temporal criterion for anxiety disorders (APA, 2013). The free online version published on the APA website uses a 7-day time frame (https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/assessment-measures). Secondly, we adapted the statement for each scale to an online assessment format. The Specific Phobia scale restricted feared situations to only one and was, thus, transformed into multiple-choice, in which each participant could specify more than one option. Furthermore, we included an

"*Others (specify)*" option. The final version used in the present work are available upon request to the first author.

DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure

DSM-5 Self-rated Level 1 (APA, 2013) comprises 23 items which cover 13 psychopathology domains, valid and reliable among colleges (Bravo, Villarosa-Hurlocker et al., 2018). The participants report the symptoms experienced in the last 14 days on a 5-point Likert Scale (from *none* or *not at all*, to *severe* or *nearly every day*). The present study assessed the anxiety, and depression domains.

Penn State Worry Questionnaire (PSWQ)

We administered the PSWQ (Meyer et al., 1990) to evaluate the degree of worry as a core symptom of General Anxiety Disorder. The questionnaire includes 16 items scored on a 5-point response scale from 0 (*none*) to 4 (*much*). The Spanish version of the PSWQ present evidence of validity and reliability (Nuevo et al., 2009).

Alcohol Use Disorder Identification Test (AUDIT)

We assessed alcohol use and misuse with the 10-item AUDIT, valid and reliable among college students (Carretero et al., 2016). The participants answer the first eight items on a 5-point scale, and the last two items on a 3-point scale. It analyses two domains: consumption (three first items) and alcohol-related problems (seven last items).

Brief Marijuana Consequences Questionnaire (BMCQ)

We assessed marijuana-related problems with the BMCQ, valid and reliable among colleges cross nationally (Bravo et al., 2019), composed by 20-item dichotomous (yes-no) scale. It relates consequences to social-interpersonal consequences, impaired control, risky behaviors, academic disturbances deriving

from marijuana use, among others. Only the participants who reported at least one marijuana use in the previous 30 days completed the questionnaire.

Fagerström test for nicotine dependence

We evaluated nicotine dependence with the modified and Fagerström test, which comprises six items (Becoña & Vázquez, 1998), also evidence as a valid and useful among college students (Arias-Gallegos et al., 2018). Only the participants who reported that they were smokers completed the Fagerström test.

Big Five Personality Trait Short Questionnaire (BFPTSQ)

We evaluated the Five-Factor Model (FFM) of personality (aka Big five) with the Spanish version of the BFPTSQ (Ortet et al., 2017), which comprises 50 items answered on a 5-point response scale from 0 (totally disagree) to 4 (totally agree). It assesses the FFM broad domains: openness, extraversion, emotional stability, agreeableness and conscientiousness. The BFPTSQ is evidence as valid, reliable and also invariant across countries and sex (Mezquita et al., 2019).

Satisfaction with Life Scale (SWLS)

We applied the SWLS (Vázquez et al., 2013) to measure subjective quality of life, which comprise five items that score on a 7-point scale from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). The SWLS is evidence as valid and useful across sex and countries (Esnaola et al., 2017).

Quality of Life Index (QL-I)

The Quality-of-Life index (QL-I) comprises 10 items ranging from 0 (bad) to 10 (excellent). It assesses nine specific domains: Physical and psychological/emotional well-being, Self-care and independent functioning, Occupational and interpersonal functioning, Social emotional support, Community and services support, Personal and spiritual fulfillment and a Global perception of

quality of life. The QL-I Spanish version has evidence as a valid and consistent instrument, also over time (Mezzich et al., 2000).

Procedure

Individuals provided informed consent before starting to participate and received an economic compensation of five euros for completing all the assessment tools. Before undertaking the assessment of the participants, the university's ethical committee approved the project in which the study was conducted. The students completed the main part of the assessment instruments with an online survey on the Qualtrics platform, while a few other measures were completed in the paper-and-pencil format (i.e., PSWQ and AUDIT) when they went to the laboratory to receive their compensation.

Data analyses

Firstly, we performed a Confirmatory Factor Analysis (CFA) of a single factor model to test the structural validity of the Agoraphobia, Social Anxiety, Separation Anxiety, Panic and General Anxiety scales using Mplus 8.4 (Model A). Due to the non-normality observed with all the scales (skewness ≥ 1.5; kurtosis ≥ 3.0) and sample size (n ≥ 500), we applied a Diagonally weighted least squares (WLSMV) model estimator (Li, 2016). We evaluated the model's goodness-of-fit using the comparative fit index (CFI), the Tucker–Lewis Index (TLI) and the root mean square error of approximation (RMSEA). Thus, CFI and TLI > .90 and >.95 indicated an acceptable and optimal fit, respectively (Marsh et al., 2004). RMSEA values ≤ .10 indicate an acceptable fit (i.e., Weston & Gore, 2006). To test Differential Item Functioning (DIF) response by sex we followed steps to calculated single covariate MIMIC model; (1) CFA for the total sample, (2) MIMIC model without direct effects, and (3) if the modification indices include significant direct effects, the model is

tested with these suggested direct effects (see Jones, 2006). With the Specific Phobia scale, we carried out an Exploratory Factor Analysis (EFA) using SPSS 25, and we employed principal axis factoring and Oblimin method rotation. In order to select the number of retained factors, we performed a Parallel Analysis based on principal axis factoring. We also applied Cronbach's alpha (Cronbach, 1951) and Ordinal Omega coefficients (McDonald, 1999) to test the reliability of the scores using SPSS v.25 and Mplus 8.4, respectively. Finally, we performed a descriptive analysis of the sample, and Pearson's correlations between the Anxiety Severity Measures and the other scales, to explore the convergent, discriminant and criterion validity of the scales using SPSS 25. According to Cohen (1992), correlation values ≥.10, .30 and .50 are considered a small, medium and large effect size, respectively.

Results

Structural validity

Table 1 shows the fit indices of the one-factor CFA of the Agoraphobia, Social Anxiety, Separation Anxiety, Panic, General Anxiety scales. Among CFA analysis, the CFI and TLI went from .949 to .977 and .934 to .971, respectively, with acceptable to optimal fit indices (Marsh et al., 2004). However, the RMSEA values were higher than the recommended cut-off of .10 (Hu & Bentler, 1999). The factor loadings of each item on their factor were all significant and ranked from .670 to .921. They can be provided by the first author upon request.

When performing the EFA of the Specific Phobia Scale, the KMO (.87) and Bartlett's Test of Sphericity (X^2 =2890.63, *df* = 45, *p*<.001) indicated that the extraction method fitted the data well. The parallel analysis showed the adequacy of retraining two factors. In the first factor, items from 1 to 5 and item 10 showed

the highest factor loadings (see *Table* 2). These items represent an anxiety factor that explained 49.77% of variance. The second factor comprised items 6 to 9 and explained 14.20% of additional variance. This second factor represents the avoidance component of anxiety problems. It is noteworthy that items 8 and 9 also showed cross-loadings in the anxiety factor (see *Table 2*). A close association between anxiety and avoidance factors appeared (r = .59). Therefore, it would seem that the Spanish version of the Specific Phobia scale is composed of two differentiated, but also mutually dependent, facets.

Item validity

Among DIF analysis, not significant effects from sex were observed except for Specific Phobia scale (*Table* 3). Specifically, it was observed DIF by sex for item 10 (i.e., use of drugs and psycopharmac to cope). After considering this direct effect among MIMIC model for Specific Phobia not others significant effects were observed.

Reliability and descriptive statistics

Table 4 shows the descriptive data for males and females, and the reliability coefficients for each scale. Cronbach's alpha and Omega coefficients were all salient (>.70). There were no significant differences in the scale means for gender, except for the Specific Phobia scale, which was higher for females than males (Anxiety factor, t_{565}=2.573, p < .01, d = -.24; Avoidance factor, t_{565} = 2.140, p < .05, d = -.20).

Convergent/discriminant validity

Table 5 shows the correlations between each Anxiety Severity Measure with the other psychopathology measures and personality traits. As expected, the correlations between the Anxiety Severity Measure were higher with the

internalizing than the externalizing measures, except for the tobacco severity index, which showed small/medium correlations with all the Anxiety Severity Measures, apart from specific phobia.

Criterion-related validity

All the Anxiety Severity Measure scales showed the strongest association with the lower emotional stability personality trait, apart from the social phobia severity measure, which was related to mainly introversion, followed by lower emotional stability. All the Anxiety Severity Measures, except for the avoidance factor of the Specific phobia scale, were negatively associated with subjective satisfaction and quality of life, save the Spiritual Fulfillment score (see *Table* 5).

Discussion

The latest edition of the DSM recognizes the need to dimensionally assess psychopathology. Although studies across countries have evidenced both the validity and reliability for the Anxiety Severity Measures (APA, 2013), to our knowledge none of them has been studied in Spanish-speaking populations. Therefore, the aim of this study was to evidence the psychometric properties of the six Anxiety Severity Measures from DSM-5 (i.e., Agoraphobia, Specific Phobia, Social Anxiety, Separation Anxiety, Panic, General Anxiety scales) among young Spanish adults. We tested their structural configuration, and examined their internal consistency coefficients, convergent/discriminant and criterion validity.

The CFA results showed acceptable to adequate fit indices (CFI and TLI) for the one-factor solutions for the Agoraphobia, Social Anxiety, Separation Anxiety, Panic and General Anxiety scales. Also, not DIF by sex were observed, thereby indicating evidence of item validity in both genders. Although the RMSEA coefficients were higher than the recommended cut-off of .10, this was expected given the non-

normality scores distribution (Li, 2016). In accordance with previous studies, all five scales showed evidence for a unidimensional structure, which supports using a single overall score.

With the Specific Phobia scale, two correlated subfactors or facets appeared. The first facet, named Anxiety, comprises items that assess cognitive and physical symptoms, while the second, named Avoidance assesses cognitive and behavioral avoidance. Previous research has found a one-factor solution of this scale to be adequate in a clinical sample (Beesdo-Baum et al., 2012; DeSousa et al., 2017). Conversely, a one-factor solution proved inadequate when testing the scale structure in a community sample (DeSousa et al., 2017). Thus, previous results, along with the present study, suggest that the latent structure of the Specific Phobia construct, as measured by the Anxiety Severity Scale of DSM-5, varies according to sample characteristics (i.e., community *vs*. clinical samples). However, as far as we know, only two studies in a German-clinical sample and a Brazilian-community sample evidence this scale's structure (Beesdo-Baum et al., 2012; DeSousa et al., 2017; Knappe et al., 2013). Therefore, and also considering that it was observed DIF by sex on item 10, more research is needed to answer why other anxiety scales, which are based on similar items, do not show differentiated facets and significant DIF by sex among youths.

Regarding the reliability of scores, the alpha and omega coefficients were over .70 in the overall sample, and also across gender groups. As far as we know, these results provide the first evidence of reliability of the Spanish language DSM-5 Anxiety Severity Measures scores.

To explore the convergent/discriminant validity of Anxiety Severity Measures, we related them to internalizing and externalizing symptoms. In line with the HiTOP

models of psychopathology (Kotov et al., 2017), and as expected, all six scales were significantly and more closely associated with internalizing (e.g., worry, anxiety and depression symptoms) than externalizing measures (drug use measures). However, the nicotine dependence scores were positively associated with all six scales. This finding is consistent with previous results, which indicate that nicotine-dependent patients are at higher risk of presenting severer anxiety symptoms than non-nicotine-dependent individuals (Jamal et al., 2012). So although our results indicated an adequate convergent/discriminant validity of anxiety severity measures, the magnitude of correlations was lower than that found in previous studies (DeSousa et al., 2017; LeBeau et al., 2012). This finding could be due to either the modification to the assessed time frame or the selected measures to test convergent/discriminant validity. Finally, in accordance with the literature (Kotov et al., 2010; Olatunji et al., 2007; Proctor et al., 2009), we found significant and negative associations among all six scales and criterion measures (i.e., emotional stability, satisfaction with life, quality of life domains).

Although we believe that the present study makes an important contribution to the field, it also has several limitations. Firstly, as we used a sample of college students, it is necessary to investigate its generalization to other populations (e.g., clinical populations). Secondly, due to time limitations during the assessment sessions, we included only a few measures to test the convergent and discriminant validity of the scales. Therefore, it would be advisable to include specific measures for all six anxiety problems (e.g., Fear Questionnaire for phobias; Marks & Mathews, 1979), and other scales to assess externalizing symptoms rather than only drug use measures (e.g., antisocial behavior; Loranger et al., 1994) in future studies.

Despite these limitations, the present research provides the first empirical findings on the psychometric properties of Spanish DSM-5 Anxiety Severity Measures. Specifically, we provide evidence for the structure, reliability, convergent/discriminant and criterion validity of the Agoraphobia, Social Anxiety, Separation Anxiety, Panic, General Anxiety and Specific Phobia DSM-5 scales in college students from Spain. Therefore, these scales are suitable assessment tools for measuring the anxiety disorder-related symptoms from DSM-5 in Spanish-speaking individuals in both sexes, except the scale to assess Specific Phobia symptoms.

These issues are very relevant considering that the vast majority of psychological problems are already present for pre-matriculations of college students, which has been related to high odds of attrition, and anxiety problems were the most prevalent cross-national class of disorders (Auerbach et al., 2016). Hence using these short self-reported measures can help to reduce the time spent on assessing individuals (NICE, 2016), and cut long waiting lists for mental health services, as common barriers to participate in treatment (Mowbray et al., 2006; Vidourek et al., 2014). All in all, these scales can help both clinical and research efforts as efficient ways to adopt early screening strategies.

TABLES & FIGURES

Table 1

One-Factor Model Fit Indices

	Confirmatory Factor analysis				
	X^2	df	CFI	TLI	RMSEA (*90% CI*)
Agoraphobia	359.938	35	.966	.956	.128 (*.116 - .140*)
Social Anxiety	312.730	35	.970	.961	.118 (*.106 - .130*)
Separation Anxiety	340.093	35	.956	.944	.123 (*.112 - .135*)
Panic	337.133	35	.977	.971	.123 (*.112 - .136*)
General Anxiety	357.449	35	.949	.934	.127 (*.116 - .140*)

Table 2

Factor Loadings of Each Item on Its Factor for the Specific Phobia Scale

	Factor loadings	
	Anxiety	Avoidance
Item 1	**.75**	-.01
Item 2	**.79**	-.00
Item 3	**.77**	-.04
Item 4	**.74**	.00
Item 5	**.87**	-.06
Item 6	-.01	**.85**
Item 7	-.09	**.91**
Item 8	.32	**.41**
Item 9	.35	**.44**
Item 10	**.50**	.10

Note: To consult the content of each item, access it through this official link: https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/assessment-measures.

Table 3

Model fit indices for DIF analysis by sex

	Models without direct effects					Models with direct effects				
	X^2	df	CFI	TLI	RMSEA (*90% CI*)	X^2	df	CFI	TLI	RMSEA (*90% CI*)
Agoraphobia	380.229	44	.966	.957	.116 (*.105-.127*)				---	
Social Anxiety	315.375	44	.972	.965	.104 (*.093-.115*)				---	
Separation Anxiety	356.447	44	.957	.946	.111 (*.101-.122*)				---	
Panic	367.267	44	.977	.971	.114 (*.103-.125*)				---	
General Anxiety	375.006	44	.950	.937	.115 (*.105-.126*)				---	
Specific Phobia	464.650	53	.940	.920	.133 (*.122-.144*)	447.431	41	.942	.923	.132 (.121-.143)

Table 4

Descriptive for Males and Females and Reliability Coefficients

	Agoraphobia	Social Anxiety Disorder	Separation Anxiety Disorder	Panic Disorder	General Anxiety Disorder	Specific Phobia	
						Anxiety	Avoidance
Cronbach's Alpha (95% CI)	.92 (.91-.93)	.92 (.91-.93)	.90 (.89-.91)	.93 (.92-.94)	.90 (.89-.92)	.88 (.86-.89)	.82 (.80-.84)
Male	.91 (.90-.93)	.91 (.89-.93)	.91 (.88-.91)	.94 (.92-.95)	.90 (.87-.92)	.88 (.85-.90)	.83 (.78-.87)
Female	.91 (.90-.93)	.93 (.92-.94)	.89 (.87-.91)	.93 (.92-.94)	.91 (.89-.92)	.88 (.86-.90)	.82 (.79-.85)
Omega (95% CI)	.92 (.90-.93)	.93 (.91-.94)	.90 (.88-.92)	.93 (.92-.95)	.91 (.88-.92)	.88 (.87-.90)	.82 (.79-.85)
Male	.92 (.90-.94)	.92 (.90-.93)	.91 (.89-.93)	.94 (.92-.96)	.90 (.87-.92)	.88 (.83-.92)	.82 (.77-.87)
Female	.92 (.90-.93)	.93 (.92-.95)	.90 (.87-.92)	.93 (.91-.95)	.91 (.89-.93)	.89 (.86-.91)	.82 (.79-.85)
Mean score *(SD)*	4.16 (5.35)	6.62 (6.61)	4.17 (5.34)	3.45 (5.81)	7.21 (6.12)	4.36 (4.56)	3.93 (3.69)
Male	4.37 (5.44)	6.68 (6.45)	4.50 (5.86)	3.68 (5.99)	6.57 (5.84)	3.64 (4.26) **	3.44 (3.56) *
Female	4.06 (5.31)	6.60 (6.70)	4.03 (5.09)	3.34 (5.73)	7.51 (6.23)	4.69 (4.66) **	4.16 (3.73) *

Note: Statistically significant differences between men and women at $^{*}p < .05$ and $^{**}p < .01$.

Table 5

Pearson Correlations between Anxiety Severity Measures and Outcomes

	Agoraphobia	Social Anxiety	Separation Anxiety	Panic	General Anxiety	Specific phobia	
						Anxiety	Avoidance
Internalizing-related measures							
PSWQ	.28***	.28***	.33***	.29***	.40***	.28***	.14**
DSM-5 L1 - Anxiety	.31***	.36***	.35***	.38***	.44***	.31***	.17***
DSM-5 L1 - Depression	.25***	.29***	.27***	.26***	.36***	.25***	.12**
Externalizing-related measures							
AUDIT- alcohol consumption	-.06	.03	-.09	-.03	-.02	-.03	.01
AUDIT- alcohol-related problems	.11*	.11*	.14**	.13**	.14**	.04	.06
Brief Marijuana Consequences Questionnaire	.19*	.14	.28**	.08	.17	.01	-.07
Fagerström test	.31**	.25**	.29**	.27**	.22*	.07	.03
Personality traits							
Emotional Stability	-.23***	-.31***	-.29***	-.27***	-.38***	-.33***	-.14**
Extraversion	-.16***	-.37***	-.14**	-.08	-.10*	-.12**	-.06
Conscientiousness	-.07	-.17***	-.10*	-.06	-.12**	.11**	-.08
Openness	-.05	-.08	-.09*	.00	-.06	.02	-.01
Agreeableness	-.12**	-.17***	-.16***	-.15***	-.16***	-.13**	-.10*
Satisfaction with Life Scale	-.24***	-.29***	-.25***	-.25***	-.35***	-.20***	-.07
Quality of life:							
Physical Well-being	-.23***	-.22***	-.25***	-.28***	-.35***	-.26***	-.16***
Psychological/Emotional Well-being	-.30***	-.35***	-.34***	-.33***	-.45***	-.31***	-.14**
Self-Care/ Independent Functioning	-.27***	-.27***	-.35***	-.30***	-.33***	-.20***	-.08
Occupational Functioning	-.16***	-.17***	-.28***	-.20***	-.26***	-.15***	-.06
Interpersonal Functioning	-.29***	-.31***	-.33***	-.28***	-.33***	-.21***	-.06
Social Emotional Support	-.24***	-.18***	-.29***	-.23***	-.24***	-.16***	-.03
Community/Services Support	-.20***	-.21***	-.22***	-.29***	-.30***	-.17***	-.05
Personal Fulfillment	-.30***	-.38***	-.35***	-.34***	-.42***	-.24***	-.10*
Spiritual Fulfillment	-.04	-.13**	-.04	-.08	-.13**	-.11**	-.00
Overall Quality of Life	-.29***	-.31***	-.33***	-.33***	-.41***	-.21***	-.08

Note: *p <.05. **p <.01. ***p <.001.

Supplemental Table 1

Descriptive statistics for all validity measures across sex

	Total sample (*n*= 567)		Male [a] (*n*= 180)		Female [b] (*n*=387)		a-b
	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	d
Internalizing-related measures							
PSWQ	34.50 (14.65)	.95	29.58 (12.60)	.93	36.67 (14.98)	.95	.28***
DSM-5 L1 - Anxiety	3.20 (2.44)	.68	3.10 (2.31)	.63	3.25 (2.49)	.71	.03
DSM-5 L1- Depression	3.27 (1.86)	.70	3.19 (2.00)	.75	3.31 (1.80)	.68	.03
Externalizing-related measures							
AUDIT- alcohol consumption	3.34 (2.03)	.69	3.68 (2.29)	.71	3.19 (1.90)	.68	.14*
AUDIT- alcohol-related problems	2.74 (2.87)	.67	3.34 (3.05)	.63	2.47 (2.74)	.67	.18**
Brief Marijuana Consequences Questionnaire	4.23 (3.97)	.86	5.38 (4.18)	.84	3.25 (3.61)	.86	.26**
Fagerström test	1.31 (1.84)	.71	1.55 (2.15)	.77	1.21 (1.70)	.65	.11
Personality traits							
Emotional Stability	20.05 (7.87)	.82	23.01 (6.63)	.76	18.68 (8.02)	.82	.32***
Extraversion	25.21 (7.40)	.84	24.38 (7.33)	.83	25.59 (7.42)	.85	.08
Conscientiousness	23.28 (6.56)	.81	21.67 (6.07)	.76	24.03 (6.66)	.82	.21***
Openness	27.43 (6.80)	.84	26.53 (7.18)	.85	27.85 (6.58)	.83	.09 *
Agreeableness	27.09 (6.18)	.78	26.43 (6.41)	.79	27.40 (6.06)	.78	.07
Satisfaction with Life Scale	23.66 (6.49)	.89	22.90 (6.76)	.88	24.01 (6.35)	.89	.08
Quality of Life Index							
Physical Well-being	6.46 (2.25)		6.67 (2.35)	---	6.36 (2.21)	---	.06
Psychological/Emotional Well-being	6.32 (2.30)		6.37 (2.33)	---	6.30 (2.28)	---	.01
Self-Care & Independent Functioning	7.35 (2.18)		6.93 (2.24)	---	7.55 (2.13)	---	.13***
Occupational Functioning	6.97 (2.09)		6.30 (2.32)	---	7.28 (1.91)	---	.28***
Interpersonal Functioning	7.29 (2.09)		6.87 (2.35)	---	7.49 (1.94)	---	.17***
Social Emotional Support	7.69 (2.27)		7.04 (2.68)	---	7.98 (1.99)	---	.25***
Community & Services Support	6.35 (2.48)		6.25 (2.51)	---	6.35 (2.48)	---	.02
Personal Fulfillment	6.78 (2.38)		6.42 (2.52)	---	6.95 (2.30)	---	.13*
Spiritual Fulfillment	4.64 (3.39)		4.79 (3.58)	---	4.58 (3.31)	---	.04
Overall Quality of Life	6.93 (2.14)		6.64 (2.17)	---	7.06 (2.11)	---	.09*

Note: Cohen's d values of 0.20, 0.50 and 0.80 correspond to small, medium and large effect sizes, respectively (Cohen, 1992). *Indicated *p-values* < .05 for T- test; **Indicated *p-values* < .01 for T- test; *** Indicated *p-values* < .001 for T- test.

CHAPTER 4

STUDY 2

Vidal-Arenas, V.[1], Bravo, A. J.[2], Ortet-Walker, J.[1], Ortet, G.[1,3], Ibáñez, M. I.[1,3] & Mezquita, L.[1,3] (*under review*). Anxiety and Depression Severity Measures of DSM-5: Longitudinal measurement invariance, and psychopathology trajectories among undergraduate students.

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Abstract

The present study examined the longitudinal invariance of the depression, generalized anxiety, social anxiety, panic, separation anxiety, agoraphobia, and specific phobia Severity Measures from the DSM-5 across four waves of assessment in Spanish youths (intake; n=567; mean age= 21.6 years; 67.9% women). We also studied the internal consistency of the scales (i.e., Cronbach's alphas and ordinal omegas). Finally, Latent Growth Curve models were run to explore psychopathology trends over time, specifically initial levels and amount of change over time were analyzed. Findings indicated configural, metric, and scalar longitudinal invariance of all seven Severity Measures from the DSM-5. Reliability indexes ranked from .73 to .96. Psychopathology significantly decreased across time, and significant between and within-individual differences were observed for both initial levels and amount of change over time. The results suggest that the Spanish DSM-5 anxiety and depression Severity Measures are useful assessment tools for longitudinal and follow-up studies.

Keywords: DSM-5 Severity Measures, depression, anxiety, Longitudinal Measurement Invariance, Latent Growth Curve models

Introduction

The categorical diagnostic classification system for mental health disorders has been questioned for more than 10 years due to lack of empirical data supporting the fundamental assumption that psychopathology refers to discrete phenomena (Kotov et al., 2021). For example, studies have consistently found evidence of continuity among psychopathological symptoms and normality (Haslam et al., 2020). Further, clinical features, and not etiological assumptions, tend to define the criteria evaluation system (Brown & Barlow, 2005; Krueger et al., 2018). To this end, even though the categories make clinical decisions easier, they only do so in presence vs absence terms (Krueger et al., 2018), which is problematic given that numerous threshold problems have been identified. For example, high rates of “Not Otherwise Specified” diagnoses have been applied (Kotov et al., 2021). Moreover, the temporal stability of taxometric diagnoses is very low (Bromet et al., 2011), thereby leading to loss of clinical information and reliability (MacCallum et al., 2002; Markon et al., 2011). Consequently, the DSM-5 Task Force outlined the need to consider the dimensional approach of psychopathology while revising the new edition of the DSM (Kraemer, 2007). Although within the latest edition (i.e., DSM-5), despite retaining the categorical system, a new section provides several dimensional assessment tools (APA, 2013).

DSM-5 Section III comprises two distinct groups of measures: (1) Self-Rated Cross-Cutting Symptom Measures, which assess symptoms across diagnostic categories (see Narrow et al., 2013 for further details); and (2) Severity Measures (SMs), which assess disorder-specific symptoms, such anxiety-specific problems (social anxiety, agoraphobia, specific phobia, separation anxiety, panic,

generalized anxiety disorder), depression, dissociative symptoms, and two measures for problems related to stress (posttraumatic and acute stress symptoms). The SMs were designed as short self-reported measures to be administrated both at an initial intake interview and over time to track the severity of the individual's disorder and response to treatment (p. 733; APA, 2013). Furthermore, as specialists pointed out, college students are an at-risk population which need special attention not only due to their high prevalence of distress problems (i.e., major depression and general anxiety), but its associations with, for example, suicidal thoughts and behaviors (Auerbach et al., 2019; Bravo, Villarosa-Hurlocker, et al., 2018). Then, providing short self-reported measures, based on the DSM-5, to cover different psychopathological conditions related to distress (i.e., anxiety-related problems and depression SMs) could be of great help. For example, a short design could help to reduce time spent on assessing individuals (NICE, 2016), thereby reducing the waiting lists of psychological assistance services on university campuses. Long wait lists are a common barrier identified in undergraduate students to participate in psychological treatments (Vidourek et al., 2014).

Previous studies conducted across various countries, have provided reliability and validity evidence of the anxiety SMs scores among samples of non-clinical young adults (U.S., LeBeau et al., 2012; Germany, Knappe et al., 2014; Spain, Vidal-Arenas et al., 2021), non-clinical adults (Brazil, DeSousa et al., 2017; Germany, Knappe et al., 2013; The Netherlands, Möller & Bögels, 2016), and clinical populations (U.S., LeBeau et al., 2012, 2016; Germany, Beesdo-Baum et al., 2012, Knappe et al., 2013). These studies have found evidence to support the unidimensionality for most of the anxiety SMs (DeSousa et al., 2017; Vidal-Arenas

et al., 2021; Yalin et al., 2017). The exception being the Specific Phobia domain, which incorporates an anxiety and avoidance subscale (Vidal-Arenas et al., 2021). All these prior studies provided reliability evidence of its scores (Cronbach's alphas from .82 to .98) (LeBeau et al., 2012; Vidal-Arenas et al., 2021).

As for the SM for assessing depressive symptoms, incorporated in the new section of the DSM-5 (APA, 2013), it is an adaptation from the Patient Health Questionnaire 9-item form (PHQ-9; Löwe et al., 2004). There are some studies that have found a two-factor solution in which a somatic factor and a cognitive-affective factor are differentiated (Beard et al., 2016; Chilcot et al., 2013; Guo et al., 2017; Keum et al., 2018; Petersen et al., 2015). This two-factor solution has been shown to be invariant across gender (Petersen et al., 2015) and time (Guo et al., 2017). However, specific items that load onto each factor differ across the studies (Beard et al., 2016; Chilcot et al., 2013; Guo et al., 2017; Keum et al., 2018). In combination with the fact that both factors are highly correlated (from .85 to .97; Beard et al., 2016; González-Blanch et al., 2018; Keum et al., 2018), some researchers suggest that a one-factor solution could better depict the structure of the PHQ-9 (Boothroyd et al., 2019). To this end, there is evidence of a one factor solution among clinical (González-Blanch et al., 2018) and general population (Kocalevent et al., 2013). This unidimensional structure has also been shown to be invariant across gender and differing age groups among Chinese adolescents (Leung et al., 2020).

Although previous studies have provided some preliminary validity and reliability evidence of the DSM-5 SMs scores, limited research has explored their psychometric properties over time. This is an important gap, as the dimensional measures of the DSM-5 were mainly created to solve the problem of the

categorical diagnosis structure to detect changes in psychopathology across time when patients are attending therapy (APA, 2013), among other purposes.

Purpose of the Present Study

The present study aimed to examine the psychometric properties of the Depression, Generalized Anxiety, Social Anxiety, Panic, Separation Anxiety, Agoraphobia, and Specific Phobia scales from the DSM-5 over time in a sample of undergraduate students from Spain, as they constitute a risk group that requires special attention (Auerbach et al., 2019; Bravo, Villarosa-Hurlocker, et al., 2018). Specifically, we examined the longitudinal measurement invariance (LMI) of each SM across four assessment waves, and we provide reliability evidence (i.e., Cronbach's alphas and ordinal omega coefficients) of its scores at each wave. Once LMI was established, we also studied the longitudinal trend of each psychopathology syndrome over time through Latent Growth Curve Models (LGCMs). We expected that the structure of the SMs would be invariant over time, showing evidence of reliability at each assessment wave. Finally, based on previous studies we also expected to observe a general decrement of depression and anxiety-related symptoms across time, and between and within-individual differences (Levine et al., 2021; Olino et al., 2010; Zimmermann, 2021).

Method

Participants and Procedure

College students participated in an 18-month longitudinal project conducted at a university in Spain in early February 2018. All participants completed informed consent forms before starting their participation. Through online surveys, four waves of data were collected at six-month intervals. Each participant received financial compensation for completing all the assessment tools at the end of each

wave (i.e., 5 euros at Time 1 [T1], 10 euros at Time 2 [T2], and 15 euros at Times 3 [T3] and four [T4]). Given the aim of the present study, only data from participants that completed the depression and anxiety-related Severity Measures of the DSM-5 were analyzed (T1, *n* = 567; T2, *n* = 362; T3, *n* = 301; T4, *n* = 279). Among our analytic sample, participants were primarily females (T1= 67.9%), with a mean age of 21.6 (*SD*= 3.65). Regarding year in school (T1): first year (34.2%), second (23.4%), third (16.8%), fourth (13.8%), fifth (3.3%) and others (8.2%).

Instruments

Depression Severity Measure

Adapted from the Patient Health Questionnaire short version (Löwe et al., 2004), this severity measure from the DSM-5 assesses depressive symptoms on a 4-point response scale (0 = *never*, 3 = *every day*) based on 9 items (APA, 2013). Furthermore, we made some modifications of the Spanish version used (APA, 2014), such that: (1) we changed the time frame of assessment to report the symptoms experienced "in the last 6 months" instead of "the last 7 days" of the free online version published on the APA website (https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/assessment-measures), and we also (2) adapted the statement for each scale to an online assessment format.

Anxiety Severity Measures

The Spanish version of the generalized anxiety, social anxiety, panic, separation anxiety, agoraphobia, and specific phobia SM scales were included in the present study (Vidal-Arenas et al., 2021). Each scale is composed of 10 items, which are rated on a five-point scale from 0 (*never*) to 4 (*always*). A previous study with Spanish youths has showed evidence of its structure, the reliability of the scores

and also convergent/discriminant and criterion validity evidence of the scales (Vidal-Arenas et al., 2021).

Data Analysis

Before running Longitudinal Measurement Invariance (LMI) analyses, we examined the unidimensional structure for each measure at each wave using Confirmatory Factor Analyses (CFA), except for specific phobia, where we tested a two-factor structure. To evaluate overall model fit, we used the following criteria: Comparative Fit Index (CFI) >.90 (acceptable) > .95 (optimal), Tucker-Lewis Index (TLI) >.90 (acceptable) > .95 (optimal), Root Mean Square Error of Approximation (RMSEA) < .06 (Marsh et al., 2004). In addition, to examine the internal consistency of the SMs, we estimated Cronbach's alphas and ordinal omegas with 95% CIs (Dunn et al., 2014) at each assessment wave.

Once the adequacy of the factor structure of the models was confirmed, we next tested the LMI for each measure. In particular, three levels of measurement invariance were tested: (1) *configural* (test whether all items load on the proposed factor), (2) *metric* (test whether item-factor loadings are similar across time), and (3) *scalar* (test whether the unstandardized item thresholds are similar across time). To indicate significant decrement in fit when testing for measurement invariance, we used model comparison criteria of ΔCFI/ΔTFI ≥ .01 (i.e., decrease indicates worse fit; (Cheung & Rensvold, 2002) and ΔRMSEA ≥ .015 (i.e., increase indicates worse fit; Chen, 2007). For CFA and LMI, due to non-normality observed in the data and the sample size (Li, 2016), a diagonally weighted least squares (WLSMV) model estimator was used.

Finally, in a structural equation modeling framework, we examined the trajectories of the total score of each DSM-5 SM in a series of Latent Growth Curve

models (LGCMs), in which a latent intercept and slope are derived from repeated measures of the individual domains. The latent intercept variables reflect the initial level of the growth curve, while the latent slopes were created to represent the rate of change (i.e., growth or decay) in the total SM scores (i.e., depression, generalized anxiety, social anxiety, separation anxiety, panic, agoraphobia, and specific phobia) across 18 months. Prior to conducting LGCMs, we examined the individual slopes for each measure to test the adequacy of a linear approach versus a non-growth model. MLR estimator was use due to a non-normal distribution of the data within LGCMs (Enders & Bandalos, 2001; Schafer & Graham, 2002). Analyses were performed using Mplus 8.4, and SPSS v. 25. All data, analysis code, and research materials are available at https://osf.io/jz4ge/?view_only=34f5e88422e443f8acdbd1187c03865b.

Results

Structure validity evidence and reliability of the SMs scores

Results from the CFAs of all SMs across the different waves of assessment are presented in *Table 6*. Overall, CFA analyses supported a two-factor solution for the specific phobia scale and a one-factor solution for the rest of the SM at baseline models with acceptable to optimal fit indices (CFIs ≧ .927; TLIs ≧ .904; RMSEAs ≦ .177). The mean total score and internal consistency indexes for each DSM-5 severity measure at each time point (and across gender groups) are presented in *Supplemental Table 2.* Cronbach's alphas and ordinal omegas ranged from .73 to .96.

Longitudinal Measurement Invariance of the SMs

Once the structure of the SMs was established at each wave, further examination of LMI was performed. Results from the LMI analyses for all DSM-5

scales are summarized in *Table 6.* We found good fits for all the configural models of the DSM-5 scales (CFIs ≧ .931; TLIs ≧ .926 RMSEAs ≦ .088). When the constraints of the factor loading across waves were added, good fit indexes (CFIs ≧ .940; TLIs ≧ .938, RMSEAs ≦ .082) and an improvement of CFIs, TLIs, and RMSEAs compared with the previous model (i.e., configural) were found, which suggested metric longitudinal invariance. The addition of constraints between the thresholds across the different assessment points of each scale also provided good fit indexes (CFIs ≧ .937; TLIs ≧ .9638, RMSEAs ≦ .081) and negligible differences among CFI/TLI/RMSEA, suggesting scalar invariance across waves.

Trends of psychopathology syndromes over time

As LMI was met for each scale, trends of SM scores across different assessment points were explored. Estimated parameters for each linear LGCM are presented in *Table 7*. Overall, results indicated that intercepts were statistically significant (p < .001) for each syndrome (*Table 7*). Specifically, initial levels of depressive (b = 6.929), generalized anxiety (b = 6.919), and social anxiety (b = 6.484) symptoms were higher than other syndromes (i.e., b ranged from 3.437 for panic, to 4.310, for specific phobia-anxiety factor). Intercept variances were also significant (p < .001), thereby indicating intra-individual differences among undergraduates in initial levels of each syndrome. Moreover, significant negative slopes were observed, suggesting that the trajectory of syndromes declined over time, especially for social anxiety (b = -.780), and less in the case of depression (b = -.266). Also, the linear slope variance of social anxiety, and the anxiety factor from specific phobia symptoms measure were statistically significant (p < .05), indicating intra-individual differences among undergraduates regarding the amount of change in these syndromes over time. Finally, a significant negative

covariance between the estimated intercepts and slopes for social anxiety and the anxiety component of specific phobia were observed, such that, on average, college students with high initial levels were more likely to experience a decline in social anxiety, and in anxiety symptoms from specific phobia over time (i.e., present scores in line with the average trajectory). *Figure 9* provides a visual representation of changes in each psychopathology condition separately based on sample and estimated means.

Discussion

The Severity Measures (SMs) from the DSM-5 to assess symptoms of depressive, generalized anxiety, social anxiety, panic, separation anxiety, agoraphobia, and specific phobia symptoms were created, among other purposes, to solve the problem of the categorical diagnosis and to detect changes in psychopathology across time. However, limited research has studied the measurement invariance of the scales over time, which is a necessary step before using the measures in follow-up assessments. Thus, the aims of the present study were: (1) to test the structure of the SMs across different assessment waves and provide reliability evidence of its scores, (2) examine the Longitudinal Measurement Invariance (LMI) of the SMs by examining three invariance levels (i.e., configural, metric, and scalar) across four waves of assessment; and (3) examine trajectories of each syndrome assessed through SMs across 18 months using Latent Growth Curve Models (LGCMs).

When the structure of the SMs was tested independently at each wave, acceptable-to-optimal fit indexes (i.e., CFI and TLI indices) supported the hypothesized two-factor solution for the specific phobia SM (Vidal-Arenas et al., 2021) and the one-factor solution for the rest of the anxiety SMs (DeSousa et al.,

2017; Vidal-Arenas et al., 2021) and the depression SM (González-Blanch et al., 2018; Kocalevent et al., 2013; Leung et al., 2020). The only fit index that was over the standard cut-offs was the RMSEA (Marsh et al., 2009). However, this result could be expected due to non-normality and sample size of the present study (Li, 2016) and it is also similar to those found in previous studies about the structure of the DSM-5 SM (DeSousa et al., 2017; Vidal-Arenas et al., 2021). For each SM at all waves, adequate reliability coefficients (i.e., Cronbach's Alpha and Omega) were observed (>.73). Altogether, these results provide new (in the case of the depression SM) and additional evidence (in the case of the DSM-5 anxiety SMs; Vidal-Arenas et al., 2021) on the structure and reliability of the scores of the Spanish version of the DSM-5 SMs among Spanish undergraduates.

Once the structure of the scales was confirmed cross-sectionally, LMI was tested. The LMI analyses revealed that the factor solution tested for SMs (i.e., one-factor solution for depressive, generalized anxiety, social anxiety, panic, separation anxiety, and agoraphobia symptoms scales, and two-factor solution for the specific phobia symptoms scale) were invariant across time, such that all items loaded on the proposed factor (i.e., configural invariance), item-factor loadings were similar across time (i.e., metric invariance) and the unstandardized item thresholds were similar across time (i.e., scalar invariance). Then, these findings support the utility of the DSM-5 anxiety and depression SMs for follow-up assessments.

As strong LMI was achieved (i.e., scalar invariance), mean comparisons across time can be examined. Consequently, we examined the developmental trajectories of each assessed syndrome using growth curve models. Overall, findings indicated that college students reported higher initial levels (i.e., more severe) of distress

symptoms (i.e., depressive and generalized anxiety symptoms) and social anxiety symptoms than other symptoms in the line with previous studies (Auerbach et al., 2018; Bravo, Villarosa-Hurlocker et al., 2018). Moreover, as expected, all seven syndromes studied significantly decreased over time (i.e., significant negative linear slopes were observed) (Yang et al., 2020; Zimmermann, 2021). Previous studies with undergraduates showed higher prevalence of depression and anxiety symptoms among first-year students compared to those in the last years of their degree, or non-attenders (Auerbach et al., 2018, 2019; Bruffaerts et al., 2019). Thus, the transition to university might be especially difficult (Levine et al., 2021), and may act as a stressful life event which has been evidenced as a risk-factor for depressive and anxiety-related symptoms among undergraduates (Reyes-Rodríguez et al., 2013). In addition, previous studies about personality development, also report higher levels of neuroticism at the beginning of adulthood and a later decline of this trait over time (John & Robins, 2021). Considering the large body of literature that has ascertained the strong association between neuroticism and the internalizing psychopathology (i.e., depressive and anxiety-related symptoms) (Kotov et al., 2010, 2021), it is also possible that developmental decreasing trends of neuroticism could be responsible for the decrements in the internalizing symptoms reported in the present study. It is important to highlight that our findings also indicated there are between and within-individual differences not only in terms of initial levels but amount of change for specific syndromes. These findings suggest that the study of developmental psychopathology should consider its heterogenous nature, at least among undergraduate students. Thus, our findings emphasize the need to consider individual differences along mental health treatments.

The present study has some limitations that should be considered. The first limitation is that our participants were a small sample of undergraduates from Spain; therefore, future studies among other populations (e.g., clinical samples, college students from other countries), and larger sample sizes are needed to investigate the replicability and generalizability of our findings. Moreover, further longitudinal studies should consider the inclusion of time-invariant and time-varying variables (e.g., SES), due to its effects in between and within-individual change in psychopathology (Wickrama et al., 2016), both psychological (e.g., personality), personal (e.g., clinical antecedents) and socio-contextual (e.g., ethnicity/race).

Despite these limitations, the present study provides evidence for the structure, reliability, and the longitudinal measurement invariance of the Spanish DSM-5 anxiety and depression SMs. These results suggest that the depression, generalized anxiety, social anxiety, panic, separation anxiety, agoraphobia, and specific phobia SMs are a useful tool to dimensionally assess the symptoms related to these DSM-5 disorders cross-sectionally and across-time.

Figure 9

Change in the SMs total score over time

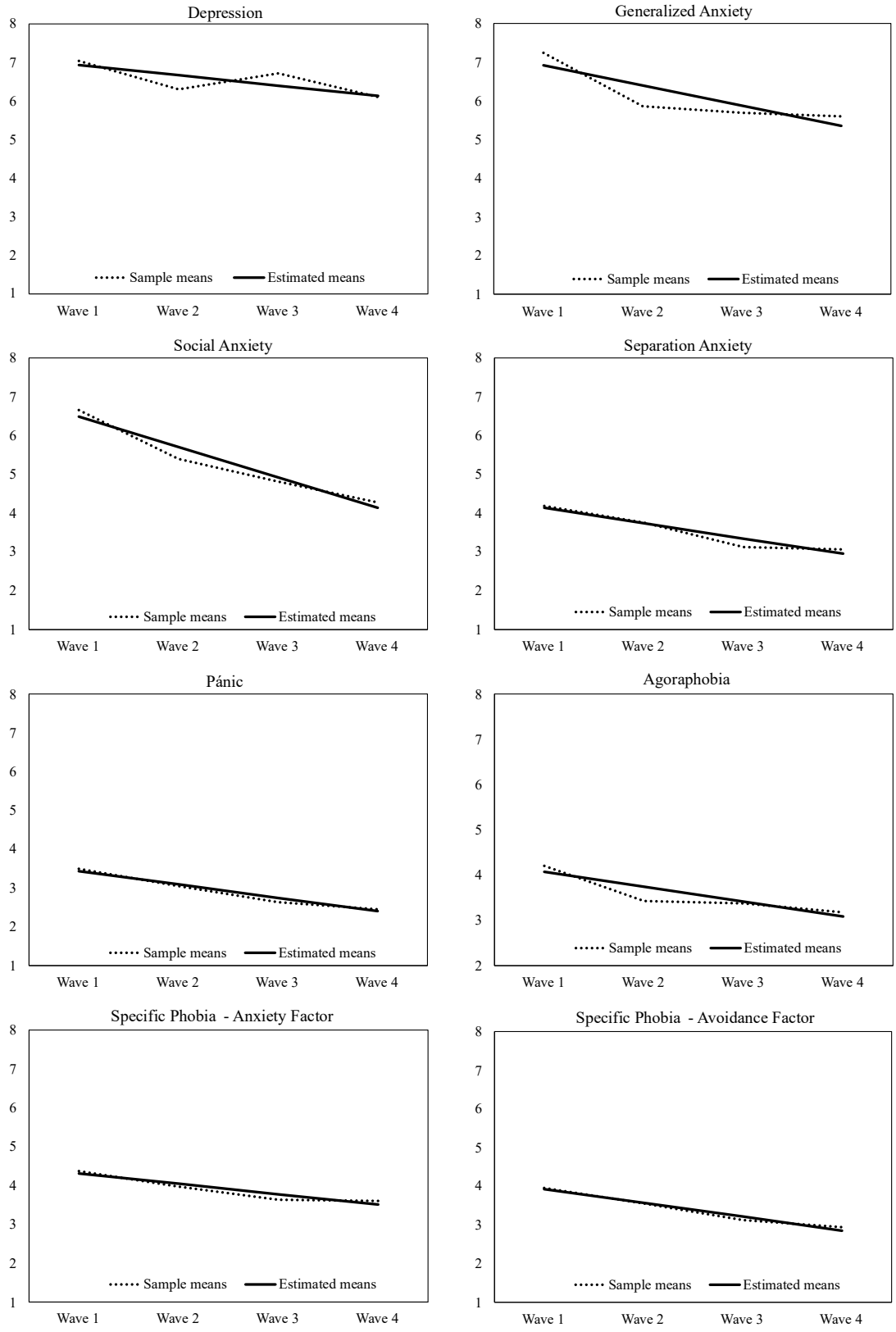

Table 6

CFA fit indexes and longitudinal measure invariance testing of DSM-5 Severity Measures

	Overall Fit Indices					Comparative Fit Indices			
	χ2	df	CFI	TLI	RMSEA [90% CI]		ΔCFI	ΔTLI	ΔRMSEA
Depression									
Based line model									
Wave 1	200.226 *	27	.947	.930	.106 [.092 - .120]				
Wave 2	133.287 *	27	.959	.945	.104 [.087 - .122]				
Wave 3	111.958 *	27	.976	.968	.102 [.083 - .122]				
Wave 4	132.875 *	27	.975	.967	.118 [.099 - .139]				
LMI									
1.Configural	1315.181*	588	.931	.926	.046 [.042, .049]				
2.Metric	1243.639*	612	.940	.938	.042 [.038, .045]	1 vs 2	.009	.012	.004
3.Scalar	1301.904*	639	.937	.938	.042 [.039, .045]	2 vs 3	-.003	.000	.000
Generalized anxiety									
Based line model									
Wave 1	357.449 *	35	.949	.934	.127 [.116 - .140]				
Wave 2	227.751*	35	.964	.953	.123 [.108 - .139]				
Wave 3	193.624*	35	.960	.949	.123 [.106 - .140]				
Wave 4	137.521*	35	.975	.968	.128 [.085 - .121]				
LMI									
1.Configural	1374.751*	734	.958	.955	.039 [.035, .042]				
2.Metric	1322.442*	761	.963	.962	.035 [.032, .039]	1 vs 2	.005	.007	-.004
3.Scalar	1450.056*	791	.957	.957	.038 [.035, .041]	2 vs 3	-.006	-.005	.003
Social Anxiety									
Based line model									
Wave 1	315.375 *	35	.972	.965	.104 [.093 - .115]				
Wave 2	163.514 *	35	.978	.972	.101 [.085 - .117]				
Wave 3	124.359 *	35	.981	.976	.092 [.075 - .110]				
Wave 4	113.419 *	35	.988	.985	.090 [.072 - .108]				
LMI									
1.Configural	1193.164*	734	.977	.975	.033 [.029, .036]				
2.Metric	1170.140*	761	.979	.979	.030 [.027, .034]	1 vs 2	.002	.004	-.003
3.Scalar	1325.170*	791	.973	.973	.034 [.031, .037]	2 vs 3	-.006	-.006	.004
Panic									
Based line model									
Wave 1	337.133 *	35	.977	.971	.123 [.112 - .136]				
Wave 2	251.445 *	35	.980	.974	.131 [.116 - .146]				
Wave 3	118.206*	35	.992	.989	.089 [.072 - .107]				
Wave 4	54.797 *	35	.998	.998	.045 [.019 - .067]				
LMI									
1.Configural	982.017*	734	.992	.991	.024 [.020, .028]				
2.Metric	992.929*	761	.992	.992	.023 [.019, .027]	1 vs 2	.000	.001	-.001
3.Scalar	1055.281*	791	.991	.992	.024 [.020, .028]	2 vs 3	-.001	.000	.001
Separation Anxiety									
Based line model									
Wave 1	340.093 *	35	.956	.944	.123 [.112 - .135]				
Wave 2	204.514 *	35	.968	.959	.116 [.101 - .131]				
Wave 3	152.970*	35	.973	.966	.106 [.089 - .123]				
Wave 4	82.945 *	35	.992	.990	.070 [.051 - .090]				
LMI									
1.Configural	1207.989*	734	.967	.965	.033 [.030, .036]				
2.Metric	1185.127*	761	.971	.970	.031 [.027, .034]	1 vs 2	.004	.005	-.002
3.Scalar	1255.876*	791	.968	.969	.032 [.028, .035]	2 vs 3	-.003	-.001	.001

Table 6 (continued)

Agoraphobia									
Based line model									
Wave 1	359.938 *	35	.966	.956	.128 [.116 - .140]				
Wave 2	127.459 *	35	.987	.984	.085 [.070 - .102]				
Wave 3	127.042 *	35	.983	.978	.093 [.076 - .111]				
Wave 4	111.439 *	35	.989	.986	.088 [.070 - .107]				
LMI									
1.Configural	1113.982*	734	.981	.980	.030 [.026, .033]				
2.Metric	1101.884*	761	.983	.983	.028 [.024, .031]	1 vs 2	.002	.003	-.002
3.Scalar	1180.037*	791	.981	.981	.029 [.025, .032]	2 vs 3	-.002	-.002	.001
Specific Phobia									
Based line model									
Wave 1	418.761*	35	.943	.925	.141 [*.129, .153*]				
Wave 2	419.701*	35	.927	.904	.177 [*.162, .192*]				
Wave 3	300.750*	35	.943	.925	.161 [*.145, .178*]				
Wave 4	197.243*	35	.966	.955	.131 [*.114, .149*]				
LMI									
1.Configural	1620.401*	712	.935	.929	.047 [.044, .049]				
2.Metric	1560.874*	736	.941	.937	.044 [.041, .047]	1 vs 2	.006	.008	-.003
3.Scalar	1620.571*	766	.939	.938	.043 [.041, .046]	2 vs 3	-.002	.001	-.001

Note: *p <.001

Table 7

Results of linear Latent Growth Curve Models for each SMs

	Intercept (Unstandardized)		Linear Slope (Unstandardized)		Correlations between intercept and slope (Standardized)
	Mean	Variance	Mean	Variance	
Depression	6.929***	11.437***	-.266**	.464	-.122
Generalized Anxiety	6.919***	16.506***	-.520***	.349	.120
Social Anxiety	6.484***	24.784***	-.780***	1.585*	-.435*
Separation Anxiety	4.137***	14.889***	-.395***	.970	-.395
Panic	3.437***	13.888***	-.345***	.412	.198
Agoraphobia	4.071***	13.946***	-.329**	1.258	-.346
Specific Phobia					
Anxiety	4.310***	11.040***	-.268***	.717*	-.413**
Avoidance	3.930***	5.570***	-.358***	.059	-.185

Note: *p <.05, **p <.01, ***p <.001

Supplemental Table 2

Descriptive statistics for the Spanish version of the DSM-5 Severity Measures

	Depression	Generalized Anxiety	Social Anxiety	Separation Anxiety	Panic	Agoraphobia	Specific Phobia	
							Anxiety	Avoidance
Wave 1								
Cronbach's Alpha (CI)	.83 (.809, .851)	.90 (.891, .915)	.92 (.911, .931)	.90 (.885, .910)	.93 (.924, .941)	.92 (.904, .925)	.88 (.861, .892)	.82 (.795, .844)
Ordinal omega (CI)	.84 (.808, .859)	.91 (.887, .921)	.93 (.910, .937)	.90 (.880, .919)	.93 (.914, .948)	.92 (.900, .930)	.88 (.861, .904)	.83 (.794, .856)
Mean (SD)								
Total	7.05 (4.30)	7.22 (6.10)	6.63 (6.56)	4.16 (5.29)	3.45 (5.79)	4.16 (5.31)	4.35 (4.56)	3.93 (3.70)
Male	7.17 (4.34)	6.58 (5.80)	6.62 (6.29)	4.43 (5.69)	3.64 (5.96)	4.34 (5.35)	3.62 (4.28)	3.50 (3.58)
Female	6.99 (4.28)	7.52 (6.22)	6.64 (6.68)	4.03 (5.09)	3.35 (5.72)	4.07 (5.39)	4.70 (4.65)	4.13 (3.74)
Wave 2								
Cronbach' Alpha (CI)	.86 (.835, .879)	.91 (.896, .924)	.92 (.902, .928)	.92 (.909, .933)	.93 (.917, .939)	.93 (.916, .938)	.89 (.867, .904)	.82 (.787, .848)
Ordinal omega (CI)	.86 (.832, .888)	.91 (.893, .930)	.93 (.910, .937)	.92 (.896, .943)	.93 (.911, .948)	.93 (.910, .949)	.89 (.859, .915)	.84 (.780, .870)
Mean (SD)								
Total	6.20 (4.23)	5.81 (5.87)	5.48 (5.95)	3.67 (5.39)	2.91 (5.34)	3.29 (5.14)	3.97 (4.46)	3.54 (3.65)
Male	6.16 (4.32)	4.78 (5.47)	5.25 (5.93)	4.13 (5.79)	2.71 (5.13)	3.28 (5.20)	3.98 (5.08)	3.29 (3.74)
Female	6.22 (4.20)	6.24 (5.99)	5.57 (5.98)	3.47 (5.22)	2.99 (5.44)	3.30 (5.12)	3.96 (4.19)	3.64 (3.62)
Wave 3								
Cronbach' Alpha (CI)	.89 (.868, .906)	.90 (.886, .918)	.92 (.903, .931)	.90 (.886, .919)	.93 (.923, .945)	.92 (.906, .933)	.84 (.810, .867)	.73 (.669, .773)
Ordinal omega (CI)	.89 (.863, .914)	.91 (.881, .926	.92 (.895, 938)	.91 (.874, .928)	.94 (.914, .953)	.92 (.896, .941)	.87 (.829, .903)	.83 (.785, .869)
Mean (SD)								
Total	6.59 (4.80)	5.50 (5.72)	4.82 (5.62)	2.98 (4.40)	2.42 (4.61)	3.14 (4.77)	3.64 (3.95)	3.16 (3.34)
Male	6.56 (5.23)	4.95 (5.68)	5.10 (5.95)	3.89 (5.23)	3.21 (5.67)	4.15 (5.91)	3.23 (4.27)	2.87 (3.09)
Female	6.61 (4.64)	5.71 (5.7)	4.72 (5.51)	2.63 (4.00)	2.12 (4.12)	4.77 (4.22)	3.80 (3.83)	3.27 (3.43)
Wave 4								
Cronbach' Alpha (CI)	.88 (.853, .896)	.92 (.899, .929)	.93 (.922, .945)	.92 (.901, .930)	.95 (.944, .960)	.93 (.913, .939)	.87 (.841, .890)	.88 (.852, .899)
Ordinal omega (CI)	.88 (.855, .904)	.92 (.888, .937)	.94 (.917, .954)	.92 (.894, .937)	.96 (.941, .968)	.93 (.907, .950)	.87 (.829, .905)	88 (.831, .912)
Mean (SD)								
Total	5.83 (4.36)	5.37 (5.77)	4.17 (5.80)	2.86 (4.51)	2.21 (4.92)	2.92 (4.96)	3.55 (3.92)	2.95 (3.53)
Male	5.19 (4.51)	5.16 (6.05)	4.74 (6.44)	2.99 (5.15)	2.48 (5.47)	3.42 (5.70)	3.33 (4.52)	2.58 (3.51)
Female	6.06 (4.29)	5.44 (5.68)	3.97 (5.55)	2.81 (4.27)	2.11 (4.72)	2.75 (4.68)	3.63 (3.70)	3.08 (3.53)

CHAPTER 5

STUDY 3

Vidal-Arenas, V.[1], Ibáñez, M. I.[1,2], Ortet-Walker, J.[1], Ortet, G.[1,2], Mezquita, L.[1,2] & Cross-cultural Addictions Study Team (2022). Examination of the latent structure of the Ruminative Thoughts Style Questionnaire across countries, gender, and over time. *Current Psychology*. https://doi.org/10.1007/s12144-022-03010-4

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Abstract

The present work aimed to extend the evidence of the structure validity of the Ruminative Thought Style Questionnaire (RTSQ) 15-item version testing: (1) the structure of two competing models (i.e., four- factor correlated model vs a second-order factor model); (2) the measurement invariance of the final model across four countries (U.S., Spain, Argentina, and the Netherlands) and gender groups (male and female); and (3) the invariance across three assessment waves in a subsample of Spanish youths. Participants were college students (mean age = 20.87, *SD* = 4.47) from the U.S. (*n* = 1875; 67.1% of females), Spain (T1, *n* = 732, 63.9% females; T2, *n* = 370, 71.6% females: T3, *n* = 307, 60.6% females), Argentina (*n* = 368, 65.6% females) and the Netherlands (n = 295, 74.8% females). Confirmatory Factor Analyses supported both correlated factors and second-order factor structure in the whole sample. Due to similar fit indices being observed for both models, and considering the theoretical and practical advantages, we kept the second-order model to examine its invariance across groups and time. Measurement invariance analyses showed that the second-order model was invariant across countries, gender, and over time. Comparisons of the total mean score and the subfacet mean scores (i.e., Repetitive Thoughts, Counterfactual Thoughts, Problem-focused Thoughts, and Anticipatory Thoughts) reveled only small differences across country and gender groups. The present work extends the structural validity evidence of the RTSQ and provides the first evidence concerning its longitudinal stability across time.

Keywords: measurement invariance, cross-national, gender, longitudinal, rumination, youths.

Introduction

The Response Style Theory of depression (Nolen-Hoeksema, 1991) proposes rumination as one of the main factors associated with the duration and exacerbation of depression. Rumination is considered as a way of responding to depressive symptoms that involves repetitively and passively self-focusing on one's depressed mood and on the possible causes and consequences of this negative mood (Butler & Nolen-Hoeksema, 1994). However, advances in research have yielded some relevant changes in the conceptualization of rumination. Accordingly, there is evidence that rumination is not only involved in the duration of depression, but also in its onset (Nolen-Hoeksema et al., 2008). In addition, rumination can lead to several detrimental health outcomes beyond depression, such as major depression, social and generalized anxiety, substance abuse, or eating disorders, thereby acting as a transdiagnostic psychological factor (Nolen-Hoeksema & Watkins, 2011). In parallel to this conceptual evolution, the assessment of rumination has also evolved from the use of more specific instruments of depressed rumination to incorporating more general questionnaires of a broader ruminative thinking style.

One of the most employed rumination scales is the Ruminative Response Scale (RRS), which included 22 items that assessed repetitive thinking around causes, consequences, and symptoms of current negative affect (i.e., feeling down, sad, or depressed, Nolen-Hoeksema, 1991). An important criticism to this scale was the presence of a great number of items that overlap with depression symptomatology, which led to the refinement of the questionnaire in a shorter version of 10 items without items of depressive content (Treynor et al., 2003). However, and despite the improvements of this short scale, some authors

expressed concerns over the RSS because its content still focused on negative mood. Its instructional set was also considered problematic (i.e., instructions asked participants to rate themselves in terms of "…*when you feel down, sad, or depressed*"), which restricts the assessment of rumination to the current depressed mood, and thus complicates the research of rumination in other situations where negative mood is not necessarily present, or in other psychopathological conditions, such as anxiety (Brinker & Dozois, 2009).

To overcome these issues, Brinker and Dozois (2009) created a new questionnaire to assess rumination, less tied to negative affect (particularly depression), named the Ruminative Thought Style Questionnaire (RTSQ). With 20 items, the authors assessed four central characteristics of rumination: repetitive, recurrent, uncontrollable, and intrusive thoughts within a unidimensional measure. They also included (1) past, present and future temporal orientation, and three types of valence of the thoughts (neutral, negative, and positive). In order to identify more specific subcomponents of rumination, Tanner et al. (2013) selected 15-items of the RTSQ that assessed ruminative thinking across four distinct facets: 1) *problem-focused thoughts* (thoughts focused on symptoms, causes, and consequences of problems), 2) *counterfactual thinking* (thoughts focused on imagining alternative outcomes or realities), 3) *repetitive thoughts* (intrusiveness, persistence, and automaticity of thoughts) and 4) *anticipatory thoughts* (future-oriented ruminative thoughts). Overall, these four-factors appear to reflect some ideas of the traditional conceptualizations of rumination: *problem-focused thoughts* and *repetitive thoughts* subfacets would be congruent with initial conceptualizations of rumination (e.g., Nolen-Hoeksema, 1991; Conway et al.,

2000), whereas *anticipatory thoughts* would be more related to the protective effects of rumination (Tanner et al., 2013).

Despite the general agreement in identifying these four components at the core of the RTSQ, there are some discrepancies in describing the structure of the questionnaire, with some authors opting for a four-factor correlated model (Bravo, Pearson et al., 2018; Dzhambov et al., 2019; Tanner et al., 2013), and others showing that a second-order factor structure, in which a higher-order general factor of rumination overarches the four factors, has better fit to the data (Helming & Meyer, 2016; Tanner et al., 2013). Thus, discrepancies across studies suggest that additional research is needed to better describe the structure of the 15-item version of the RTSQ.

The RTSQ has been employed to assess rumination in different populations [clinical vs non-clinical (Helming & Meyer, 2016); undergraduates (Brinker & Dozois, 2009; Bravo, Pearson et al, 2018; Dzhambov et al., 2019; Mihić et al., 2019), general population (Karatepe et al., 2013), and adolescents (Tanner et al., 2013)]. Furthermore, the RTSQ has been adapted to different languages such as Spanish (Bravo et al., 2018), Serbian (Mihić et al., 2019), Bulgarian (Dzhambov et al., 2019), German (Helming & Meyer et al., 2016), and Turkish (Karatepe et al., 2013). Despite its use in different populations and languages, only a few studies have explored the measurement invariance of the RTSQ across countries and gender groups. In this regard, Bravo, Pearson et al. (2018) found that the four-factor correlated model, using the 15-item version of the RTSQ, was invariant across males and females, but also among undergraduates from the U.S., Argentina, and Spain. However, to our knowledge, no previous study has explored the measurement invariance of a hierarchical model of the RSTQ 15-item form across countries and

gender groups. This is especially relevant, considering that most studies use a global factor of rumination (e.g., McCarrick et al., 2021; Olatunji et al., 2013), and some studies that compare rumination across men and women and across countries use the total score of the RSTQ 15-item form (e.g., Mezquita et al., 2019).

The present study

Overall, although the second-order model presents advantages compared with the four-factor correlated structure (i.e., a general factor of rumination is considered), there is no evidence regarding the invariance of the higher-order model of the 15-item RTSQ across different populations and gender groups. Thus, we tested the structure of the 15-item RSTQ (i.e., four- factor correlated model vs a second-order factor model) and the measurement invariance of the final model across four countries (U.S., Spain, Argentina, and the Netherlands) and gender (male and female). This has relevant implications. Namely, provided the measurement invariance across countries and gender groups of the hierarchical structure is demonstrated, comparison of the total scale and subscale mean scores would be allowed between groups. Providing evidence of the measurement invariance across time is also a necessary step before comparing scores (total scale and subscales) of the 15-item RSTQ in follow-ups or longitudinal studies. Thus, we examined the longitudinal measurement invariance of the resulting model across three assessment waves in a subsample of Spanish youths. Based on previous studies, we expected to find evidence to support the use of a global factor of rumination using the RTSQ in addition to the four distinct factors (i.e., repetitive thoughts, problem-focused thoughts, counterfactual thoughts, and anticipatory thoughts) across countries and gender groups (i.e., multi-group

invariance). We also expected that the RTSQ would show longitudinal measurement invariance in emerging adulthood in Spain.

Method

Participants and Procedure

Participants were college students (total *n* = 3,482) from the U.S., Spain, Argentina, and the Netherlands, who participated in an online cross-national survey study regarding personal mental health, personality traits, and substance use behaviors (see Bravo et al., 2019, for a detailed description of the samples and procedures). In addition, the participants of the Spanish sample also participated in two additional follow-ups, after six (*Time 2*) and 12 months with respect to the first assessment (*Time 3*). Only data from students that completed the Ruminative Thought Style Questionnaire (RTSQ) were included in the analyses (see Table 1). Overall, an over representation of females was observed (U.S. sites, 67.1%; Spain, Time 1= 63.9%, Time 2= 71.6%, Time 3= 60.6%; Argentina 65.6%; the Netherlands 74.8%), with a mean age of 20.87 (*SD*= 4.47). Participants reported a mean age which ranged from 20.05 years (U.S. sites) to 24.26 years (Argentina) across countries (see Table 1).

Measures

Rumination.

Rumination was assessed using the 15-item version of the Ruminative Thought Style Questionnaire (RTSQ; Tanner et al., 2013), measured on a 7-point scale from 1 (*Not at all*) to 7 (*Very Well)*. The RTSQ has shown evidence of its validity across gender and among college students from Spain (Bravo Pearson et al., 2018).

Data Analysis

Confirmatory Factor Analysis (CFAs) of the hierarchical model and the four-

factor correlated model were performed in the whole sample that comprised participants from the four countries (Time 1). We examined the model's goodness-of-fit using the comparative fit index (CFI), the Tucker–Lewis Index (TLI) and the root mean square error of approximation (RMSEA). According to commonly employed cut-off values, CFI and TLI > .90 and > .95 indicate an acceptable and optimal fit, respectively (Marsh et al., 2004). RMSEA values of ≤ .10 (Weston & Gore, 2006) and ≤ .06 (Hu & Bentler, 1999) indicate an acceptable and optimal fit, respectively. Once the final model for the whole sample was selected, Multigroup Measurement Invariance (MMI) analysis of the model that showed better fit than the previous CFAs was performed across countries and gender groups. Previously, separate CFAs for the four countries, men, and women were performed. The MMI of the hierarchical model across groups was tested following the steps suggested by (Rudnev et al., 2018): (1) configural (test whether all items load on the proposed factor), (2) metric first-order factors (test whether item-factor loadings are similar across groups), (3) metric first and second-order factors, (4) scalar first-order factors (test whether the unstandardized item intercepts are similar across groups), and (5) scalar first and second-order factors. A similar procedure was followed to test the Longitudinal Measurement Invariance (LMI) of the measures across 3 waves in the Spanish sample (Times 1, 2, and 3). Before running the LMI analysis of the second-order factor structure, we examined the structures at each wave using CFAs. To test the LMI of the second-order model we examined four distinct levels: (1) configural, (2) metric of the first-order factors and (3) metric of the second-order factor, and (4) scalar of the first-order factors. Note that only scalar invariance was tested for the first-order factors because the second-order latent means of the factors were set to 0 to identify the model (Chen et al., 2005;

Dimitrov, 2010; Meredith, 1993). Thus, to indicate significant decrement in fit when testing for measurement invariance (i.e., MMI, and LMI), we used model comparison criteria of ΔCFI/ΔTLI ≥ .010 (i.e., decrease indicates worse fit; Cheung & Rensvold, 2002) and ΔRMSEA ≥ .015 (i.e., increase indicates worse fit; Chen, 2007). For each model we used a Maximum Likelihood estimator.

Mean comparisons across groups (i.e., countries and gender) and across time were also examined. Specifically, one-way ANCOVA (for rumination global scores) and MANCOVA (for each subfactor score) analyses were performed for country groups (controlling for age and gender effects), and also for gender groups (controlling for the effect of age). To test mean differences across the three waves in the Spanish sample, a repeated measures ANCOVA (for rumination global scores), and MANCOVA (for each subfactor score) were performed, controlling for age and gender effects.

All the structural equation models were performed using Mplus 8.4, while descriptive analyses, Cronbach's alpha (Cronbach, 1951) and mean comparisons were performed using SPSS v.25. Effect sizes were calculated employing Cohen's *d* using the following online calculator: https://www.easycalculation.com/es/statistics/effect-size.php.

Results

Confirmatory Factor Analysis

Optimal fit indices for the baseline model of the four-factor correlated model (CFI= .962; TLI = .952; RMSEA = .061) and the second-order factor model (CFI = .960; TLI = .951; RMSEA = .062) were observed. Factor loadings were all significant (p < .001) and salient (i.e., equal, or higher than .673; see *Figure 10*). Considering the equivalence of both models in terms of fit indices, and also the practical and

theoretical advantages of the second-order factor model over the four-factor correlated model, the subsequent invariance analyses were performed with the second-order factor model as the baseline model.

Measurement invariance across countries and gender groups

Results for multi-group measurement invariance across countries and gender groups analysis are summarized in *Table* 9. Prior to carrying out the multi-group analysis, we confirmed the adequacy of the hierarchical structure in each country and gender group separately. For all countries, acceptable to optimal fit indices were observed, except for the Netherlands. In this subsample, although the CFI was acceptable, the TLI and RMSEA were lower/higher than the standard cut-offs of .90 and .10 respectively. For gender groups, optimal fit indices were observed in both groups (*Table* 9).

When we tested the configural invariance (MG.1) of the hierarchical model across countries, we found acceptable to optimal fit indices (MG.1, *Table* 9). Metric (i.e., of the first-order factors, MG.2; and second order factor, MG.3) and scalar invariance (i.e., of the first-order factors, MG.4; and the second order factor, MG.5) across countries were also found as changes in CFI and TLI, and RMSEA were lower than .010 and .015, respectively (Table 9). Similar results were found when the invariance was tested across gender groups (see Table 9, models MG.1b to MG.5b)

Measurement invariance across time

Results for longitudinal measurement invariance of the hierarchical model in the Spanish sample are summarized in *Table* 10. The CFA of the hierarchical model in each wave separately, and also when they were specified in the same model (i.e., configural invariance; ML.1) showed acceptable to optimal fit indices. When the

item factor loadings (ML.2), the loadings of the first-order factors in the second-order factor (ML.3), and the intercepts of the first-order factors (ML.4) were constrained between waves, changes in the CFI and TLI (i.e., < .01), and RMSEA (i.e., < .06) suggested longitudinal metric and scalar invariance.

Reliability coefficients

The Cronbach's alphas in the whole sample and differentiating by country and by gender groups were adequate (see *Table* 8), less so in the case of the Anticipatory Thoughts subscale in the Netherlands (α = .67) which nevertheless could be considered acceptable, as the subscale is composed of only two items (Loewenthal, 1996). When the internal consistency of the scales was explored in the Spanish subsample across time, we found acceptable to adequate internal consistency indices, less so in the case of the Anticipatory Thoughts subscale in wave 2 and 3.

Mean comparisons

MANCOVA analysis showed statistically significant differences between countries [F (12, 8416) = 16.268, p < .001, Wilks' Λ = .941, partial η^2 = .020], and gender groups [F (4, 3184) = 10.182, p < .001, Wilks' Λ = .987, partial η^2 = .013] on Repetitive Thoughts, Counterfactual Thoughts, Problem-focused Thoughts, and Anticipatory Thoughts. ANCOVA analyses also showed statistically significant differences between countries [F (3, 3184) = 22.289, p < .001, partial η^2 = .021] and gender groups [F (1, 3187) = 21.882, p < .001, partial η^2 = .007] on Global Rumination scores. However, the differences were small, as Cohens' d were all lower than .29 (see *Supplemental Table 3*). Moreover, repeated measures analyses showed non-significant differences across time on Global Rumination scores [F (2, 544) = .306, p = .737, partial η^2 = .001], Repetitive Thoughts [F (2, 544) = .279, p =

.757, partial η^2 = .001], Counterfactual Thoughts [F (2, 544) = .484, p = .617, partial η^2 = .002], Problem-focused Thoughts [F (2, 544) = .124, p = .883, partial η^2 = .000], and Anticipatory Thoughts [F (2, 544) = 1.009, p = .365, partial η^2= .004] in the Spanish sample.

Discussion

The present study aimed to examine and extend the evidence concerning the structural validity of the 15-item Ruminative Thought Style Questionnaire (RTSQ), and provide evidence of the measurement invariance of the resulting model across countries, gender groups, and time. The results of the CFA in the whole sample showed acceptable to optimal fit indices for the 4-factor correlated model (Bravo, Pearson et al., 2018; Dzhambov et al., 2019; Tanner et al., 2013) and the hierarchical model (Helming & Meyer, 2016; Tanner et al., 2013) as in previous studies. Due to fit indices of both models being similar, and also considering the practical and theoretical implications of incorporating a general factor of rumination in addition to the four subfacets (i.e., Repetitive Thoughts, Counterfactual Thoughts, Problem Focus Thoughts, and Anticipatory Thoughts), the hierarchal model was selected as the baseline model for the subsequent invariance measurement testing. This is an important issue, as rumination is usually operationalized with a global score in the literature (e.g., McCarrick et al., 2021; Olatunji et al., 2013). However, recent studies have also pointed out the differential associations between subfactors and distinct psychological problems (for a review see Bravo, Pearson et al., 2018), therefore highlighting an important target for interventions. Thereby, using a second-order factor structure for the RTSQ can incorporate advantages from both models regarding the manner in which they conceptualize rumination (i.e., global and four-correlated factors), from

a broader perspective to a more specific-content assessment of rumination.

Multi-group measurement invariance (MMI) analysis showed that the hierarchical structure was invariant across the four countries (i.e., the U.S., Spain, Argentina, and the Netherlands) and gender groups, thereby conferring validity to the comparison of the scores obtained through the RTSQ in different countries and between men and women. Likewise, we evaluated the temporal invariance of the RTSQ in a Spanish subsample. The results of the Longitudinal Measurement Invariance (LMI) indicated configural, metric, and scalar invariance of the hierarchical structure of the RTSQ across the three assessment waves, suggesting that the RTSQ is a sound measure to assess and follow-up the rumination levels across time, at least among Spanish undergraduates.

The results also provide reliability evidence of the total score and the scores of each RTSQ subscale, as the alpha indices rank from adequate to excellent in each country and gender group. The only low alpha coefficients (i.e., < .60) were found in the second and third assessment of the Anticipatory subscale in the Spanish subsample. Considering that alpha at Time 1 was .78, the decrement may be associated with sample attrition.

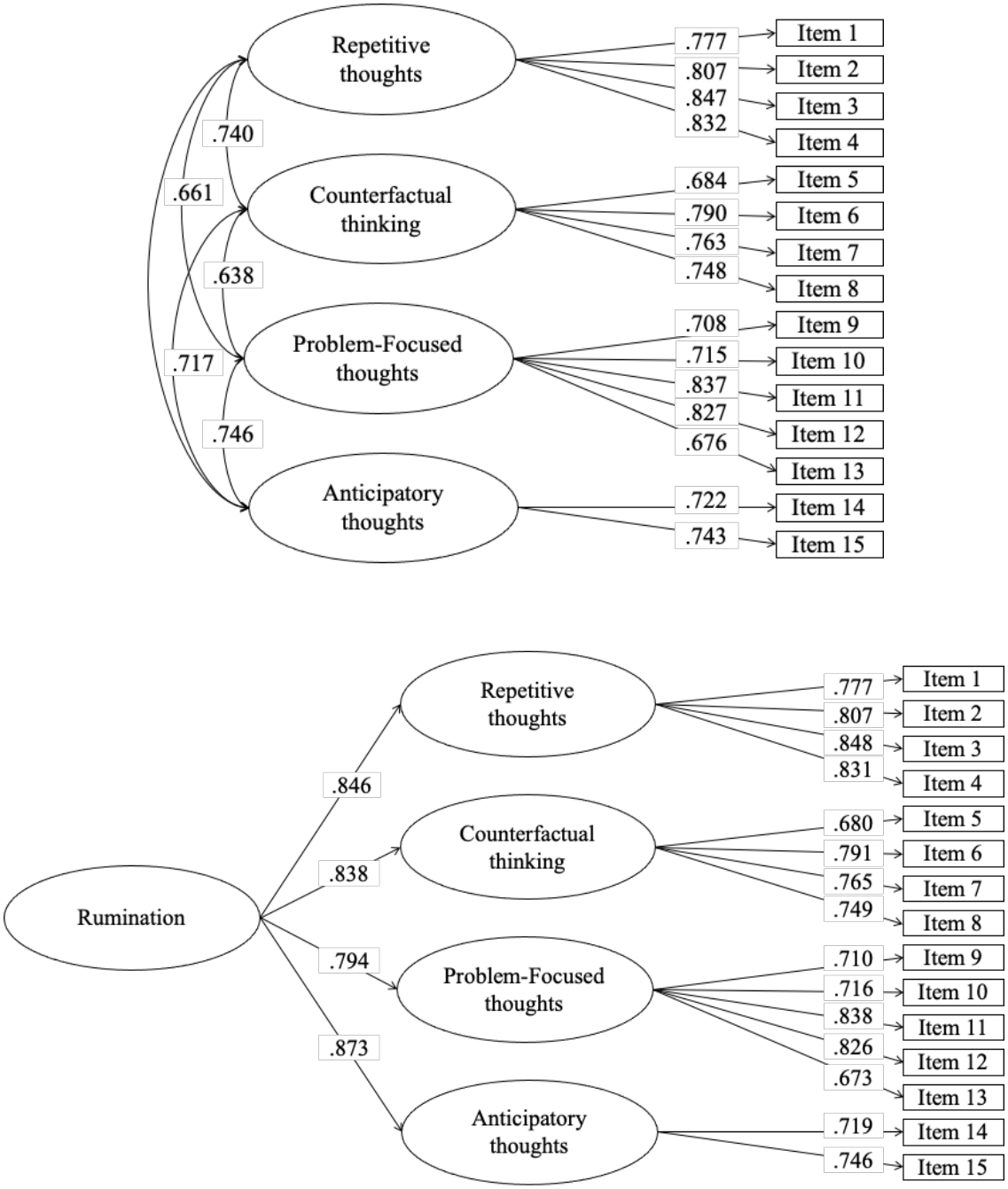
Moreover, the confirmation of the measurement invariances of the hierarchical structure of the RSTQ allowed us to compare the mean scores across groups and time. Although some significant differences were observed between countries (Bravo, Pearson et al., 2018) and gender groups (women scoring higher than men; see (Johnson & Whisman, 2013) as in previous studies, the differences were low in magnitude (as was suggested by the η^2 and Cohen's *d* indices). Moreover, when we tested the mean differences across time, non-significant differences were found, supporting the conceptualization of rumination as stable individual trait

(Nolen-Hoeksema, 1991). Thus, the results of the present study suggest that the RSTQ 15-item form may be a useful assessment tool to assess rumination and its subfacets in youths from different populations, and across time. This is especially important in prevention and clinical settings as rumination has been related to depression (e.g., Olatunji et al., 2013), and other psychological problems (Nolen-Hoeksema & Watkins, 2011). Nonetheless, this research is not exempt of limitations. First, there was an over-representation of women in all four countries. Second, the sample used was composed exclusively of university students from the U.S., Argentina, Spain and the Netherlands, so the findings cannot be extrapolated to other populations (e.g., clinical, elderly, children, or adolescents, among others) or countries. Therefore, future studies are necessary to replicate our findings in other types of populations. Third, the attrition across waves was notable in the Spanish subsample. Therefore, the results obtained by the LMI analyses must be replicated with a larger sample size.

Overall, the present study contributes to the growing literature examining the structural validity of the 15-item version of Ruminative Thought Style Questionnaire (RTSQ). The results have relevant implications in the understanding of the concept of rumination, as they support the existence of four different subcomponents of rumination (i.e., Repetitive Thoughts, Counterfactual Thoughts, Problem-focused Thoughts, and Anticipatory Thoughts) in addition to a general tendency of ruminative thinking. Finally, the measurement invariance results suggest that the RTSQ could be a useful tool to compare the global and specific scores in cross-national and gender-focused research and also in longitudinal and follow-up studies.

Figure 10

Factor structure of the two competing models in the total sample



Note: Single-arrow lines indicate factor loadings, while double-arrow lines indicate correlations.

Table 8

Descriptive statistics across study groups.

	Global Rumination		Repetitive		Counterfactual		Problem-Focus		Anticipatory		Age
	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)
Whole sample (*n*=3252)	60.29 (19.32)	.93	17.58 (6.35)	.89	17.80 (6.06)	.83	16.68 (7.39)	.86	8.26 (3.24)	.70	20.87 (4.43)
Country											
United States (n=1875)	60.45 (19.47)	.95	17.84 (6.42)	.94	17.96 (6.21)	.90	16.44 (7.09)	.90	8.09 (3.13)	.78	19.98 (4.19)
Spain (n=732)	60.27 (19.25)	.94	17.23 (6.52)	.92	17.74 (5.81)	.82	16.52 (7.23)	.89	8.41 (3.14)	.75	21.42 (3.97)
Argentina (n=368)	55.24 (21.19)	.94	16.44 (6.99)	.93	16.41 (6.70)	.84	14.53 (7.49)	.89	7.90 (3.43)	.74	24.26 (5.46)
The Netherlands (n=295)	56.36 (17.56)	.92	16.32 (5.95)	.89	17.34 (5.60)	.83	15.14 (6.53)	.86	7.67 (2.93)	.67	20.76 (2.75)
Gender											
Female (n=2273)	60.18 (19.99)	.95	17.89 (6.48)	.93	17.80 (6.19)	.87	16.33 (7.30)	.90	8.19 (3.17)	.76	20.90 (4.54)
Male (n=1098)	56.36 (17.56)	.94	16.19 (6.34)	.91	17.07 (6.19)	.86	15.31 (6.74)	.88	7.84 (3.13)	.72	21.26 (4.73)
Across time											
Time 2 (n= 370)[†]	64.22 (18.63)	.86	18.21 (6.21)	.73	18.38 (5.88)	.65	18.84 (8.21)	.79	8.78 (3.60)	.56	21.34 (3.71)
Time 3 (n= 307)[†]	64.31 (18.03)	.85	18.39 (5.89)	.70	18.28 (5.97)	.68	18.68 (7.97)	.77	8.96 (3.56)	.52	21.06 (3.69)

Note: [†] Spanish follow-up sample.

Table 9

Goodness-of-fit for the hierarchical structure of the Ruminative Thought Style Questionnaire across countries

	Overall Fit Indices					Comparative Fit Indices			
	χ^2	df	CFI	TLI	RMSEA [90% CI]	Model comparison	ΔCFI	ΔTLI	ΔRMSEA
Across countries									
U.S.	1130.049	86	.954	.944	.081 [.077, .085]				
Spain	374.308	86	.948	.936	.044 [.036, .052]				
Argentina	304.922	86	.943	.931	.083 [.073, .093]				
The Netherlands	337.536	86	.901	.879	.100 [.089, .111]				
1. Configural (MG.1)	1979.519	344	.948	.937	.076 [.073, .080]				
2. Metric- first order (MG.2)	2067.527	377	.946	.940	.074 [.071, .077]	1 vs 2	-.002	-.003	-.002
3. Metric- second order (MG.3)	2100.279	386	.946	.941	.074 [.071, .077]	2 vs 3	.000	.001	.000
4. Scalar- first order (MG.4)	2157.376	389	.944	.939	.075 [.072, .078]	3 vs 4	-.002	-.002	-.001
5. Scalar- second order (MG.5)	2042.719	398	.940	.936	.077 [.074, .080]	4 vs 5	-.004	-.003	.002
Across gender groups									
Women	843.883	86	.959	.950	.063 [.060, .067]				
Men	456.455	86	.953	.943	.064 [.058, .070]				
1. Configural (MG.1b)	1300.337	172	.957	.948	.064 [.060, .067]				
2. Metric - first order (MG.2b)	1313.410	183	.957	.951	.062 [.059, .065]	1 vs 2	.000	.003	-.002
3. Metric- second order (MG.3b)	1316.526	186	.957	.952	.061 [.058, .064]	2 vs 3	.000	.001	-.001
4. Scalar- first order (MG.4b)	1319.864	187	.957	.952	.061 [.058, .064]	3 vs 4	.000	.000	.000
5. Scalar- second order (MG.5b)	1325.043	190	.957	.952	.061 [.058, .064]	4 vs 5	.000	.000	.000

Table 10

Longitudinal Measurement Invariance of the Ruminative Thought Style Questionnaire in Spanish youths

	Overall Fit Indices					Comparative Fit Indices			
Second-order structure	χ^2	df	CFI	TLI	RMSEA [90% CI]	Model comparison	ΔCFI	ΔTLI	ΔRMSEA
Wave 1	207.012	86	948	.936	.044 [.036, .052]				
Wave 2	172.715	86	.940	.927	.052 [.041, .058]				
Wave 3	139.272	86	.951	.941	.045 [.031, .058]				
1.Configural (ML.1)	1284.494	885	.925	.917	.025 [.022, .027]				
2.Metric- first order (ML.2)	1294.050	907	.928	.921	.024 [.021, .027]	1 vs 2	.003	.004	-.001
3.Metric- second order (ML.3)	1301.405	913	.928	.921	.024 [.021, .027]	2 vs 3	.000	.000	.000
4.Scalar (ML.4)	1323.533	935	.927	.923	.024 [.021, .026]	3 vs 4	-.001	.002	.000

Supplemental Table 3

Effects size and corrected means within study groups

	Global Rumination				Repetitive Thoughts				Counterfactual Thoughts				Problem-Focused Thoughts				Anticipatory Thoughts			
Country																				
	U.S.	*SP*	*ARG*	*NTH*	*U.S.*	*SP*	*ARG*	*NTH*	*U.S.*	*SP*	*ARG*	*NTH*	*U.S.*	*SP*	*ARG*	*NTH*	*U.S.*	*SP*	*ARG*	*NTH*
U.S	*60.1 (19.4)*				*17.8 (6.4)*				*17.9 (6.2)*				*16.3 (7.1)*				*8.1 (3.1)*			
SP	.01	*64.6 (19.3)*			.09	*18.1 (6.5)*			.04	*18.3 (5.8)*			-.01	*19.2 (7.2)*			-.10	*9.1 (3.1)*		
ARG	.25	.25	*56.3 (21.2)*		.21	.12	*16.6 (6.9)*		.24	.07	*16.9 (6.7)*		.26	.27	*14.9 (7.5)*		.06	.15	*7.9 (3.4)*	
NTH	.29	.21	-.06	*56.2 (17.6)*	.25	.16	-.02	*16.2 (5.9)*	.10	.21	.15	*17.3 (5.6)*	.19	.20	.08	*15.1 (6.5)*	.14	.24	-.07	*7.6 (2.9)*
Gender																				
	M	*W*			*M*	*W*			*M*	*W*			*M*	*W*			*M*	*W*		
M	*58.0 (19.9)*				*16.6 (6.5)*				*17.3 (6.2)*				*16.1 (7.3)*				*8.0 (3.2)*			
W	.20	*61.4 (17.6)*			.27	*18.1 (6.3)*			.12	*18.0 (6.2)*			.15	*16.9 (6.7)*			.11	*8.4 (3.1)*		
Over time																				
	W1	*W2*	*W3*		*W1*	*W2*	*W3*		*W1*	*W2*	*W3*		*W1*	*W2*	*W3*		*W1*	*W2*	*W3*	
W1	*65.1 (19.3)*				*18.4 (6.5)*				*18.2 (5.8)*				*19.2 (7.2)*				*9.2 (3.1)*			
W2	-.20	*64.8 (18.6)*			-.15	*18.5 (6.2)*			-.11	*18.6 (5.9)*			-.29	*18.9 (8.2)*			-.11	*8.9 (3.6)*		
W3	-.21	-.00	*63.8 (18.0)*		-.19	-.02	*18.3 (5.9)*		-.09	.02	*18.3 (5.9)*		-.28	.02	*18.3 (7.9)*		-.16	-.05	*8.9 (3.6)*	

Note: Corrected means and standard deviations (in brackets) are in italics and shown on the diagonals. The values in the rest of the cells correspond to the effects size value of Cohens' *d* of the comparisons between groups. For example, the *d* value of the comparison means between U.S. and Spain is equal to .01 in Global Rumination, equal to .09 in Repetitive Thoughts, equal to .04 in Counterfactual Thoughts, equal to -.01 in Problem-focused thoughts, and equal to -.10 to Anticipatory Thoughts. U.S= United States; SP= Spain; ARG= Argentina; NTH; The Netherlands; M= Men; W= Women; W1= Wave 1; W2= Wave 2; W3= Wave3.

CHAPTER 6

STUDY 4

Vidal-Arenas, V.[1], Bravo, A. J.[2], Ortet-Walker, J.[1], Ortet, G.[1,3], Mezquita, L.[1,3], Ibáñez, M. I.[1,3] & Cross-cultural Addictions Study Team (2022). Neuroticism, rumination, depression, and suicidal ideation: A moderated serial mediation model across four countries. *International Journal of Clinical and Health Psychology*, *22* (3), 100325. https://doi.org/10.1016/j.ijchp.2022.100325

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Abstract

Background/objectives: Research has highlighted the role of neuroticism, rumination, and depression in predicting suicidal thoughts, but studies on how these variables interplay are scarce. The aims of the present study were to test a model in which emotional stability (i.e., low neuroticism) would act as an antecedent and moderator of rumination and depressed mood in the prediction of suicidal ideation (i.e., moderated serial-mediation), and to explore their replicability across four countries and sex, among college students as an at-risk-group for suicide. **Method:** Participants were 3,482 undergraduates from U.S, Spain, Argentina, and the Netherlands. Path analysis and multi-group analysis were conducted. **Results:** Emotional stability was indirectly linked to suicidal ideation via rumination and depressed mood. Moreover, emotional stability moderated the associations between rumination and depressed mood, and between depressed mood and suicidal ideation. Findings were consistent in males and females, and across countries studied. **Discussion:** Regardless of sex and country, people with low emotional stability reported higher levels of rumination, which in turn was associated with more depressed mood, and these were associated with higher reports of suicidal thoughts. This cascade of psychological risk factors for suicidal ideation seems to be more harmful in people who endorse low levels of emotional stability.

Keywords: Neuroticism, Rumination, Depression, Suicidal Ideation, Cross-national study

Introduction

Globally, nearly 800,000 people die by suicide annually (WHO, 2019a). Death by suicide is the second leading cause of death in youths aged 15-29 years worldwide, so its prevention constitutes a high priority for public health policies (WHO, 2019a). Within this age range, college students are considered an at-risk population due to their high rates of suicidal thoughts and behaviors, with about one out of four of them having experienced some form of suicidal ideation (Mortier et al., 2018). A key component for the development of prevention strategies is greater understanding of the factors involved in suicidality (WHO, 2014), with special attention to the study of suicidal ideation as the most prevalent expression of suicidality (Castellví et al., 2017; Franklin et al., 2017).

The causes of suicidality are presumed to be the result of the complex interplay between many different biological, psychological, and environmental factors (Joiner et al., 2005; O'Connor & Nock, 2014). Among the most studied psychological factors are psychopathology conditions such as depression, cognitive factors such as rumination, and personality traits such as neuroticism. Research has highlighted mood disorders as one of the main risk factors of suicidal behaviors in both young people and adults (e.g., Gili et al., 2019; Too et al., 2019), although meta-analyses of longitudinal studies have reported weaker associations than expected (Franklin et al., 2017; Gili et al., 2019; Ribeiro et al., 2018). Thus, researchers have highlighted the need for the simultaneous consideration of many other factors beyond depression in order to increase the predictive power on suicidality research.

Rumination constitutes another widely studied risk factor for both depression and suicidal ideation. Rumination is defined as a style of thinking that involves

repetitively and passively focusing on symptoms of depression, and the possible causes and consequences of these symptoms (Nolen-Hoeksema, 1991), and is considered a key psychological process for explaining the onset and maintenance of depression (McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema et al., 2008). Accordingly, different meta-analyses have reported moderate to high effects among the association between rumination and depression (Olatunji et al., 2013; Rood et al., 2009). In addition, rumination has shown associations to other conditions beyond depression (Aldao et al., 2010; Watkins & Roberts, 2020), including suicidal thoughts and behaviors (Morrison & O'Connor, 2008; Rogers & Joiner, 2017).

Last, one of the most important factors for understanding common mental disorders is neuroticism (Lahey, 2009; Ormel et al., 2013; Widiger & Oltmanns, 2017). Neuroticism is conceptualized as a basic dimension of personality that leads to individual differences on a continuum from emotional stability to high negative affect (Eysenck & Eysenck, 1985; Tackett & Lahey, 2017). Research has confirmed the strong associations of neuroticism with internalising psychopathology, such as mood and anxiety disorders (Hakulinen et al., 2015; Jeronimus et al., 2016; Kotov et al., 2010) and to a lesser extent, with suicidal thoughts (Brandes & Tackett, 2019; Brezo et al., 2006). In addition, neuroticism/negative affect has also been proposed to be aetiologically involved in the development of rumination (Hyde et al., 2008; Sachs-Ericsson et al., 2014; Shaw et al., 2019), so rumination has usually been considered as a mediator between neuroticism and depression (e.g., Barnhofer & Chittka, 2010; Kuyken et al., 2006; Lyon et al., 2021; Roelofs et al., 2008).

Neuroticism has not only been considered as an antecedent but also as a

moderator of several risk factors for psychopathology. Thus, and from a classical model of diathesis-stress, neuroticism has been conceptualized as a vulnerability personality trait that would interact with stressful events, and other adverse factors, by exacerbating its effects on depression and other emotional disorders (Barlow, Ellard, et al., 2014; Vittengl, 2017). This differential reactivity to stressors may be explained, in part, because neuroticism would influence the selection of behavioral and cognitive coping strategies, and also moderated their effectiveness in managing distress and negative emotions (Bolger & Schilling, 1991; Bolger & Zuckerman, 1995). Claridge & Davis (2001) have also highlighted the moderating role of neuroticism but in a broader way, suggesting that it would act as a nonspecific moderator that would potentiate negative features of the individual in general, leading to maladaptive and unhealthy behaviors.

In summary, prior research suggests that: (1) depression is one of the strongest antecedents of suicidal ideation; (2) rumination is a cognitive antecedent for depression, and suicidal ideation; (3) neuroticism is associated with rumination, depression, and suicidal ideation; and (4) neuroticism may moderate the harmful effect of risk factors on depression and other related conditions. While independently examined, the simultaneous role of these psychological risk factors on suicidal ideation has limited research. Thus, the main aim of the present study was to clarify the interplay between these risk factors on suicidal ideation in a single model. Specifically, we hypothesized that emotional stability (i.e., low neuroticism) would be indirectly associated with suicidal ideation via rumination and depressive symptoms (i.e., emotional stability → rumination → depressive symptoms → suicidal ideation). Furthermore, we also hypothesized that the effects of rumination on depressive symptoms, and of depressive symptoms on

suicidal ideation, would be stronger in students with higher levels of neuroticism (i.e., moderation). Finally, to explore the robustness of the hypothesized model, we tested its invariance in four countries (United States, Spain, Argentina and the Netherlands) and across gender groups.

Materials & Methods

Participants and Procedure

College students (*n* = 3,482) from the U.S., Spain, Argentina, Uruguay, and the Netherlands participated in an online cross-sectional survey study exploring risk and protective factors of marijuana use and mental health outcomes, for more information on the study, see (Bravo et al., 2019). Study procedures were approved by the institutional review boards (or their international equivalent) at the participating universities. Due to low sample size, students from Uruguay were excluded from the present analyses. Only data from students that completed measures about depressive symptoms, rumination, suicidal ideation, and neuroticism were included in the final analysis (U.S., *n* = 1,774; Spain, *n* = 688; Argentina, *n* = 352; the Netherlands, *n* = 286). An over-representation of female students was observed in the final samples (U.S., 67.1%; Spain, 66.1%; Argentina, 65.6%; the Netherlands, 74.8%). Participants' mean age ranged from 20.05 to 24.26 years across countries.

Instruments

Suicidal ideation and depressed mood. We used the scales of suicidal ideation and depressed mood (assessed by one and two items, respectively) of the DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure (APA, 2013; Spanish version, APA, 2014), measured on a 5-point response scale (0, *none or not at all;* 4, *severe or nearly every day*) during the last two weeks. This scale has been validated

among college-student populations (Bravo, Villarosa-Hurlocker et al., 2018).

Rumination. Rumination was assessed using the 15-item version of the Ruminative Thought Style Questionnaire (RTSQ; Tanner et al., 2013; Spanish version, Bravo, Pearson et al., 2018), in which participants respond to what extent the items described them on the basis of a 7-point scale (1, *Not at all*; *7*, *Very Well*). The RTSQ has shown evidence of reliability and validity among undergraduate students and over time, both in English and Spanish speakers (Bravo, Pearson et al., 2018; Vidal-Arenas, Ibáñez et al., 2022).

Emotional Stability. The dimension of Emotional Stability-Neuroticism was measured with the *Big Five Personality Trait Short Questionnaire* (BFPTSQ; Morizot, 2014; Spanish version, Ortet et al., 2017) which is comprised of 10 items in which participants respond to what extent the items described them on the basis of a 5-point response scale (0, *disagree strongly*; 4, *agree strongly*). The BFPTSQ has shown evidence of reliability and validity among undergraduate students, both in English and Spanish speakers (Mezquita et al., 2019).

Data Analysis

To test the proposed model (see *Figure 11*) a path analysis was carried out using M*plus* 8.4, and age and sex were entered as covariates. Overall model fit was evaluated following criteria proposed by Marsh et al. (2004), including the Tucker-Lewis Index (TLI; > .90 [acceptable], > .95 [optimal]), Comparative Fit Index (CFI; > .90 [acceptable], > .95 [optimal]), and the Root Mean Square Error of Approximation (RMSEA; < .06). Also, multi-group analyses were run to test the model invariance across countries and sex groups. We used model comparison criteria of ΔCFI/ΔTFI ≥ .01 (i.e., decrease indicates worse fit; Cheung & Rensvold, 2002) and ΔRMSEA ≥ .015 (i.e., increase indicates worse fit; Chen, 2007) to consider the

tested model as invariant. We also examined the total, indirect and direct effects of each predictor on suicidal ideation using bias-corrected bootstrapped estimates (Efron & Tibshirani, 1993) based on 10,000 bootstrapped samples. To determine statistical significance, 99% bias-corrected bootstrapped confidence intervals not containing zero were evaluated.

Results

Bivariate and descriptive statistics are summarized in *Supplemental Table 4* and *Supplemental Table 5*.

Hypothesized model

The hypothesized model with the whole sample showed optimal fit indices (see *Table 11*). The indirect and total effects are presented in *Table 12*, and direct effects are presented in *Figure 12*. Within our model, there was a significant serial mediation effect from emotional stability to suicidal ideation via rumination and depressed mood. Specifically, low emotional stability was significantly associated with higher rumination, which in turn was associated with higher depressed mood, which in turn related to higher endorsement of suicidal ideation. Also, the effect from emotional stability to suicidal ideation was mediated by depressed mood, as well as the effects from rumination to suicidal ideation were mediated via depressed mood. Finally, the associations between rumination and depressed mood, and also between depressive symptoms and suicidal ideation, were significantly moderated by emotional stability. Specifically, the effects from rumination to depressive symptoms, and from depressive symptoms to suicidal ideation, were stronger among those who reported lower levels of emotional stability.

Model invariance across countries

The fit indices for multi-group analysis were adequate (see *Table 11*, MG1). However, the initial comparative fit indices with the fully constrained model suggested differences across countries (MG2; i.e., ΔCFI/ΔTFI ≥ .01, ΔRMSEA ≥ .015). In order to find an invariant model, we iteratively identified freely estimated paths with the highest contribution to non-invariance of the model, until we obtained an adequate fit (see *Table 11*, MG8). As a result, six paths were freely estimated (i.e., not constrained across countries), but only three of them were related to the hypothesized model (i.e., depressed mood → suicidal ideation; emotional stability → suicidal ideation; emotional stability → depressed mood). When we examined these three paths for each country (see *Figure 2*, and *Supplemental Table 3*), two of them remained significant (i.e., 99% bias-corrected bootstrapped confidence intervals not containing zero) in all the four countries, although we observed some differences regarding the size of the magnitude between countries (i.e., depressed mood →suicidal ideation; emotional stability→ depressed mood; see *Figure 12*). The only relevant difference between countries was observed in the direct path from emotional stability to suicidal ideation, which was significant in Spain (β = -.119) and Argentina (β = -.220), but not in the United States (β = -.045) or the Netherlands (β = -.019).

Model invariance across sex groups

Finally, the invariance of the hypothesized model across sex was tested. The multi-group analysis showed adequate fit indices (see *Table 11*, MG1B). When we constrained the paths of the two groups (MG2B), this resulted in a ΔCFI/ΔTFI ≤ .01, ΔRMSEA ≤ .015. Therefore, the model can be considered invariant across sex.

Discussion

The aim of the present study was to examine how important psychological risk-factors (i.e., emotional stability, rumination, and depressed mood) interplay in the etiology of suicidal ideation. Specifically, we proposed a path model in which we tested (1) the indirect effects from emotional stability to suicidal ideation via rumination and depressed mood; and (2) the moderating effects of emotional stability on associations between rumination, depression, and suicidal ideation. Our findings supported a serial mediation model in which low levels of emotional stability were associated with high levels of rumination, which in turn were related to more depressed mood, and these were associated with the presence of more suicidal thoughts. Moreover, the findings also showed that these serial effects were more harmful (i.e., stronger) at lower levels of emotional stability, such that individuals with low levels of emotional stability are highly sensitive to the negative effects of rumination and depressed mood compared to those with high levels of emotional stability. Importantly, the proposed model was invariant across gender groups, and despite the observed slight differences in the magnitude of three paths between countries, the moderated serial-mediation model was virtually replicated across the four countries examined, supporting the robustness of our findings regardless of gender and sociocultural context.

Regarding mediation effects, depression has been considered an antecedent to suicidal ideation (O'Connor & Nock, 2014), but also a consequence of rumination (McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema et al., 2008), which suggests that depression could act as a mediator between rumination and suicidal thoughts. Accordingly, our findings indicated that depressed mood fully mediated the association between rumination and suicidal ideation (i.e., no direct effects

between rumination and suicidal ideation remained), a full mediation effect was replicated in the four countries studied, and across sex. The scarce research on this topic has reported similar indirect effects from rumination to suicidal ideation through depression (Chan et al., 2009; Miranda & Nolen-Hoeksema, 2007; Polanco-Roman et al., 2016), supporting the notion that rumination is linked to suicidal ideation through its effect on depressive symptoms.

Regarding the mediational role of rumination in the association between neuroticism and depression, our findings have shown a robust partial mediation effect from emotional stability to depressed mood through rumination in the four countries studied and across sex groups, in line with previous studies (e.g., (Barnhofer & Chittka, 2010; Kuyken et al., 2006; Lyon et al., 2021; Roelofs et al., 2008; E. M. Smith et al., 2018; Whisman et al., 2020). Thus, neuroticism would influence depressed mood indirectly through rumination, but also directly, as a recent genetically informative study demonstrated, showing common but also specific influences of both neuroticism and rumination on depression symptoms (Du Pont et al., 2019).

In addition, our serial mediation model showed that emotional stability indirectly predicted suicidal ideation through rumination and depressed mood, but also presented a significant direct path to suicidal ideation. This effect, however, was small and it was not fully replicated across countries. In this regard, some previous studies have reported findings that may suggest a “complete” mediational effect of depression in the association between neuroticism/negative affect and suicidal ideation (Morales-Vives & Dueñas, 2018; Naragon-Gainey & Watson, 2011), whereas others suggest “partial” mediation effects (Rappaport et al., 2017; Statham et al., 1998). Thus, the inconsistencies found in the present, and past

studies, advocate for further research in order to determine the conditions in which neuroticism could influence suicidal thoughts beyond rumination and depression.

Finally, we found that the personality dimension of emotional stability not only may act as an antecedent of rumination and depressed mood, but also moderated the effects from rumination to depressed mood and from depressed mood to suicidal ideation. Although the effect sizes of these interactions were small, they were replicated across the four countries studied, and across sex. Similar interactive effects have been previously described between negative affect and rumination in predicting depression symptoms and suicidal ideation (Zvolensky et al., 2016), and non-suicidal self-injury (Nicolai et al., 2016). In addition, research has also documented interactive effects of neuroticism with other psychological variables, such as cognitive strategies (Ng & Diener, 2009), mindfulness (Drake et al., 2017; Feltman et al., 2009), or ideal-self discrepancy (Hong, 2013; Wasylkiw et al., 2010) when predicting depression, psychological distress, and low well-being. Taken together, these findings would support that neuroticism may act as a moderator variable that would exacerbate the negative effect of other risk factors on depressed mood and related psychopathological conditions, in line with previous theoretical proposals (Barlow, Ellard et al., 2014; Bolger & Zuckerman, 1995; Claridge & Davis, 2001).

It is important to mention the limitations of the present study. First, the Self-Rated Level-1 Cross-cutting measure from the DSM-5 uses two and one items to assess depressed mood and suicidal ideation, respectively. Despite this, these scales have shown good test-retest reliability, strong convergent validity with longer analogue measures (Bravo, Villarosa-Hurlocker, et al., 2018), and association magnitudes found in present study are very similar to those obtained

in other studies that used longer scales (e.g., Morales-Vives & Dueñas, 2018). Second, this study utilized a cross-sectional design, therefore longitudinal studies are needed to more properly assess directional/temporal relations. A third limitation involves the extent to which the results found in undergraduate students can be generalized to other populations. (e.g., clinical populations). The depressed mood variable used does not necessarily equate to a major depressive episode, so the generalizability of present results to clinical depression should be made with caution. Finally, given that suicidality includes distinct components (i.e., suicidal thoughts, planning, and attempt), our findings circumscribe to suicidal ideation and cannot be extrapolated to other types of suicidal behaviors (Klonsky et al., 2018).

Conclusion

Bearing in mind these limitations, we posit our findings may be relevant at a theoretical and at an applied level. At a conceptual level, the proposed moderated serial mediation model may help to clarify the complex interplay between neuroticism, rumination, and depressed mood in the prediction of one of the most prevalent components of suicidal behavior (i.e., suicidal ideation). Specifically, our findings highlight the importance of the neuroticism, since (1) it is a key antecedent of rumination and depressed mood that, in turn, predicts suicidal ideation, and (2) it exacerbates the negative effects of risk factors on mental health, such as rumination on depressed mood, and depressed mood on suicidal ideation. Importantly, these findings were replicated in the four countries studied, increasing confidence about the robustness of the described effects. At an applied level, the present work highlights the importance of neuroticism and rumination for preventive actions and targeted interventions. Thus, a screening of neuroticism and rumination may help to identify those persons that are potentially at a high risk

for depressed mood and suicidality and would be informative of those persons who would require specific, higher treatment dosages (Ormel et al., 2013; Tackett & Lahey, 2017). In addition, our results would support the notion that the combination of targeted interventions for neuroticism (Barlow, Sauer-Zavala, et al., 2014; Sauer-Zavala et al., 2017; Sauer-Zavala & Barlow, 2021) and rumination (Watkins & Roberts, 2020) could be beneficial in preventing depression and suicidal thoughts.

Figure 11

Diagram of the hypothesized model

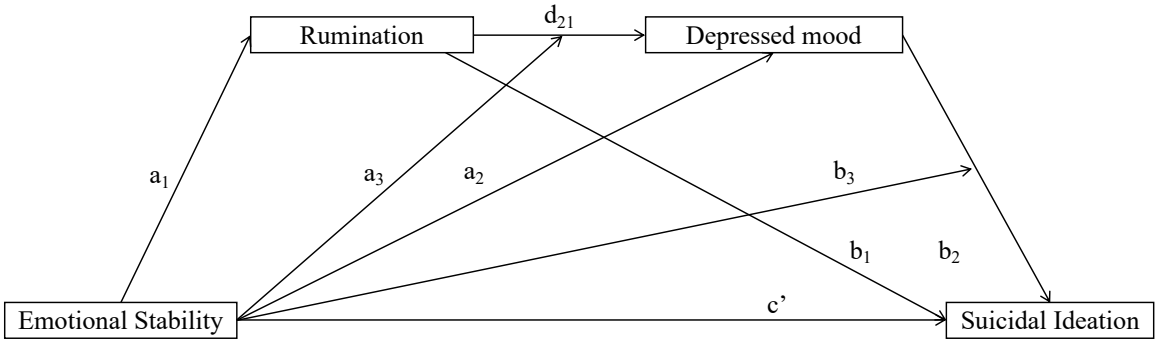
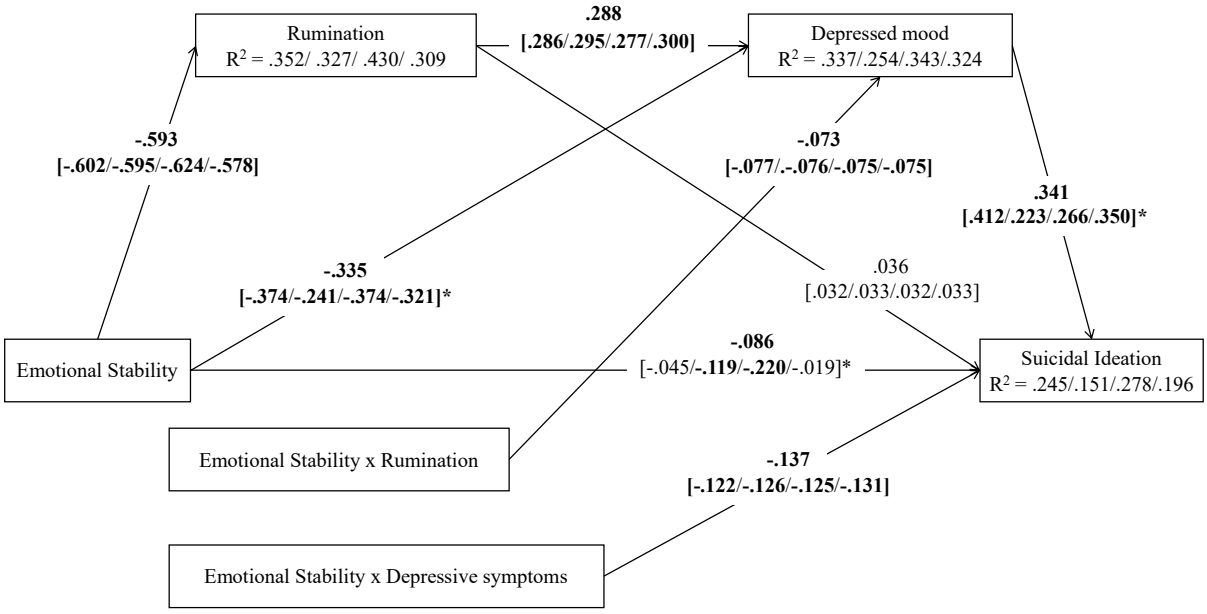


Figure 12

Depicts estimates of tested model within the total sample (M.1) and by countries *(MG8)*



Note: The values divided by a forward slash indicate the coefficients of the United States, Spain, Argentina, and the Netherlands, respectively. Bold type indicates significant effects (i.e., 99% bias-corrected bootstrapped confidence intervals not containing zero). * unconstrained paths from the partially invariant model (MG8) across countries.

Table 11

Invariance testing results of the path analysis across countries and sex

		Moderated serial mediation model									
		Overall Fit Indices									
		X^2	*df*	CFI	TLI	RMSEA (90% C.I)					
M.1	Hypothesized Model	7.000*	2	.999	.986	.029 (.008, .053)					
		Moderated serial mediation model across countries									
		Overall Fit Indices					Comparison Fit Indices				
		X^2	*df*	CFI	TLI	RMSEA (90% C.I)	Model comparison	ΔX^2	ΔCFI	ΔTLI	ΔRMSEA
MG1	Unconstrained Model	18.355*	8	.998	.973	.041 (.016, .066)	---	---	---	---	---
MG2	Full Constrained Model	197.388**	83	.978	.971	.042 (.035, .050)	MG2 vs MG1	179.033**	-.020	-.002	.001
MG3	Full Constrained Model less Constraint 5	183.282**	80	.980	.973	.041 (.033, .049)	MG3 vs MG1	164.927**	-.018	.000	.000
MG4	Full Constrained Model less Constraint 5/11	167.372**	77	.983	.976	.039 (.031, .047)	MG4 vs MG1	149.017**	-.015	.003	-.002
MG5	Full Constrained Model less Constraint 5/11/1	153.745**	74	.985	.978	.037 (.029, .046)	MG5 vs MG1	135.390**	-.013	.005	-.004
MG6	Full Constrained Model less Constraint 5/11/1/9	141.396**	71	.986	.979	.036 (.027, .044)	MG6 vs MG1	123.041**	-.012	.006	-.005
MG7	Full Constrained Model less Constraint 5/11/1/9/14	129.895**	68	.988	.981	.034 (.025, .043)	MG7 vs MG1	111.540**	-.010	.008	-.007
MG8	Full Constrained Model less Constraint 5/ 11/1/9/14/3	120.025**	65	.989	.982	.033 (.024, .042)	MG8 vs MG1	101.670**	-.009	.009	-.008
		Moderated serial mediation model across sex									
		Overall Fit Indices					Comparison Fit Indices				
		X^2	*df*	CFI	TLI	RMSEA (90% C.I)	Model comparison	ΔX^2	ΔCFI	ΔTLI	ΔRMSEA
MG1B	Unconstrained Model	8.900	4	.999	.989	.028 (.000, .053)					
MG2B	Full Constrained Model	44.727*	23	.995	.992	.025 (.014, .035)	MG2B vs MG1B	35.827*	-.004	.003	-.003

Note: * p < .05; ** p < .001

Table 12

Summary of indirect and total effects (M.1)

Specific Indirect effects	*ß*	*99% CI*
Emotional Stability → Rumination → Depressed mood → Suicidal Ideation	**-.058**	-.072, -.045
Emotional Stability → Rumination → Suicidal Ideation	-.021	-.051, .008
Emotional Stability → Depressed mood → Suicidal Ideation	**-.114**	-.138, -.091
Emotional Stability x Rumination → Depressed mood → Suicidal Ideation	**-.025**	-.038, -.012
Rumination → Depressed mood → Suicidal Ideation	**.098**	.077, .120
Emotional Stability → Rumination → Depressed mood	**-.171**	-.202, -.140

Total Indirect effects	*ß*	*99% CI*
Emotional Stability → Suicidal Ideation	**-.194**	-.229, -.159

Total effects (direct + indirect effects)	*ß*	*99% CI*
Depressed mood	**.341**	.294, .389
Rumination	**.134**	.084, .185
Emotional Stability	**-.280**	-.318, -.242
Emotional Stability x Rumination	**-.025**	-.038, -.012
Emotional Stability x Depressed mood	**-.137**	-.196, -.078

Note: Bold type indicates significant effects (i.e., 99% bias-corrected bootstrapped confidence intervals not containing zero).

Supplemental Table 4

Descriptive analysis across study samples and differences between countries and sex

	U.S. sites [a] n = 1774		Spain [b] n = 688		Argentina [c] n = 352		Netherlands [d] n = 286		Males [e] n = 1005		Females [f] n = 2095		a-b	a-c	a-d	b-c	b-d	c-d	e-f
	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	Mean (SD)	α	*d*	*d*	*d*	*d*	*d*	*d*	*d*
Age	19.98 (4.19)	--	21.42 (3.97)	--	24.26 (5.46)	--	20.76 (2.75)	--	21.15 (4.63)	--	20.71 (4.29)	–	-.35***	-.88***	-.22*	-.59***	.19	.81***	.09
Depressed mood	4.56 (2.10)	.81	5.21 (1.83)	.67	5.19 (2.04)	.77	4.55 (1.86)	.80	4.55 (2.03)	.78	4.89 (2.03)	.78	-.33***	-.30***	.001	.010	.36***	.33***	.17
Rumination	60.45 (19.47)	.95	60.27 (19.25)	.94	55.24 (21.19)	.94	56.36 (17.56)	.92	56.79 (18.86)	.94	60.71 (19.74)	.95	.01	.25***	.29**	.25***	.21*	-.06	.20
Suicidal ideation	.39 (.88)	--	.32 (.79)	--	.37 (.89)	--	.31 (.79)	--	.37 (.83)	--	.36 (.87)	–	.08	-.02	.01	-.06	.01	.07	.01
Emotional Stability	19.49 (7.59)	.85	20.27 (7.79)	.85	18.83 (8.40)	.88	19.48 (8.16)	.87	22.60 (7.36)	.83	18.14 (7.58)	.85	-.10	.08	.001	.18*	.10	-.08	.59

Note: Cohen's *d* values of.20,.50 and.80 correspond to small, medium and large effect sizes, respectively (Cohen, 1992).

* Indicated *p-values* < .05; ** Indicated *p-values* < .01; *** Indicated *p-values* < .001.

Supplemental Table 5

Bivariate correlations among study variables

	U.S. sites			Spain			Argentina			The Netherlands		
	1	2	3	1	2	3	1	2	3	1	2	3
1. Suicidal ideation	---			---			---			---		
2. Depressed mood	.49***	---		.31***	---		.42***	---		.43***	---	
3. Rumination	.25***	.49***	---	.27***	.47***	---	.31***	.51***	---	.26***	.52***	---
4. Emotional stability	-.28***	-.53***	-.59***	-.23***	-.40***	-.56***	-.36***	-.55***	-.65***	-.20***	-.46***	-.55***

*** $p < .001$.

Supplemental Table 6

Summary of indirect effects across countries of the partially invariant model (MG8)

	U.S. sites		Spain		Argentina		The Netherlands	
Specific Indirect effects	*ß*	*99% CI*	*ß*	*99% CI*	*ß*	*99% CI*	*ß*	*99% CI*
Emotional Stability → Rumination → Depressed mood → Suicidal Ideation	**-.071**	-.088, -.054	**-.039**	-.057, -.021	**-.046**	-.075, -.017	**-.061**	-.090, -.032
Emotional Stability → Rumination → Suicidal Ideation	-.019	-.048, .010	-.019	-.049, .011	-.020	-.050, .011	-.019	-.049, .011
Emotional Stability → Depressed mood → Suicidal Ideation	**-.154**	-.188, -.119	**-.054**	-.084, -.024	**-.100**	-.165, -.034	**-.113**	-.180, -.046
Emotional Stability x Rumination → Depressed mood → Suicidal Ideation	**-.032**	-.047, -.016	**-.017**	-.028, -.006	**-.032**	-.047, -.016	**-.026**	-.044, -.008
Rumination → Depressed mood → Suicidal Ideation	**.118**	.090, .145	**.066**	.036, .096	**.074**	.028, .120	**.105**	.054, .156
Emotional Stability → Rumination → Depressed mood	**-.172**	-.203, -.141	**-.175**	-.209, -.141	**-.173**	-.208, -.138	**-.173**	-.209, -.137
Total Indirect effects	*ß*	*99% CI*	*ß*	*99% CI*	*ß*	*99% CI*	*ß*	*99% CI*
Emotional Stability → Suicidal Ideation	**-.244**	-.290, -.198	**-.112**	-.160, -.065	**-.165**	-.258, -.073	**-.192**	-.283, -.102

Note: Bold type indicates significant effects (i.e., 99% bias-corrected bootstrapped confidence intervals not containing zero).

CHAPTER 7

STUDY 5

Vidal-Arenas, V.[1], Mezquita, L.[1,2], Ortet, G.[1,2], Ibáñez, M. I.[1,2] (*to be submitted*).
A 1- year longitudinal study about Suicidal Ideation, Depressive symptoms, Rumination, and Emotional Stability.

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Abstract

Background/objectives: Previous cross-sectional studies indicated that, regardless of gender and country, neuroticism is a significant direct predictor of rumination and depressive symptoms, and also an indirect predictor of suicidal ideation, through its effects on rumination and depressive symptoms. However, the cross-sectional nature of the data precluded drawing causal conclusions. To address this limitation, the present paper aims to study the direct and indirect effects among neuroticism (i.e., low emotional stability), rumination, depressive symptoms and suicidal ideation across assessment three waves. **Method:** Participants were college students from Spain (T1, *n* = 569; T2, *n* = 350; T3, *n* = 287). A cross-lagged panel model was carried out and gender was entered as a covariate in the tested model. **Results:** Neuroticism was a significant direct predictor of rumination and depressive symptoms across waves. Non-significant direct effects from rumination to depressive symptoms were observed. Depressive symptoms were a significant direct predictor of suicidal ideation across waves. Finally, neuroticism was a significant indirect predictor of suicidal ideation via depressive symptoms. **Discussion:** The overall findings highlight the significant role of neuroticism in predicting rumination, depressive symptoms and suicidal ideation longitudinally.

Keywords: Neuroticism, Rumination, Depression, Suicidal Ideation, Cross-lagged panel model

Introduction

The study of relevant risk-related factors for self-injurious, thoughts and behaviours (SITBs) is a key component to development prevention actions (WHO, 2014). Emotional disorders are particular common in those people who experience any form of SITBs, especially depression, because it is considered one of the most important diagnoses for determining the suicide risk (Bentley et al., 2021). Bentley et al. (2021) suggest that suicidal thoughts and behaviours and emotional disorders may share a common functional mechanism. Specifically in line with the conceptualisation of emotional disorders proposed by Barlow, Sauer-Zavala et al., (2014), the common components are: (1) the frequent/intense experience of negative emotions; (2) high aversive reactivity; (3) efforts to escape or avoid these negative emotions. The first feature refers to temperamental tendencies to experience negative affect, such as neuroticism, which is commonly understood as a basic personality dimension that leads to individual differences on a continuum from a pole of emotional stability to the opposite extreme of negative affect. Those reporting high neuroticism tend to experience negative emotions (e.g., fear, anger, irritability, sadness, among others) with higher intensity and frequency (Costa & McCrae, 2010; Eysenck & Eysenck, 1985; John & Robins, 2021; Watson & Clark, 1992). Neuroticism is one of the most studied associated factors of psychopathology (e.g., Kotov et al., 2010), especially for mood and anxiety disorders (Hakulinen et al., 2015; Jeronimus et al., 2016; Kotov et al., 2010; Malouff et al., 2005), and has also proven relevant in the development of suicidal thoughts (Rappaport et al., 2017), attempts (Orme et al., 2020) and deaths (Peters et al., 2018; Tanji et al., 2015).

Regarding the second and third characteristics proposed to define emotional disorders, Barlow, Sauer-Zavala et al. (2014) also highlight that people with anxiety/depression disorders show more negative appraisals. This, in turn, means that individuals are less tolerant about their negative emotions which, in turn, leads them to show more avoidance behaviours and cognitions (e.g., thought suppression, rumination) by increasing the intensity and frequency of negative emotions in the long term. For instance, ruminative thinking style involves repetitively and passively focusing on symptoms of depression, and the possible causes and consequences of these symptoms (Nolen-Hoeksema, 1991). People who ruminate remain fixed on problems and negative feelings/thoughts without attempting to change which, therefore, intensifies and prolongs negative emotions (Nolen-Hoeksema et al., 2008). Accordingly, rumination constitutes another studied risk factor for emotional disorders, such as depression (Olatunji et al., 2013; Rood et al., 2009) and suicidal thoughts and behaviors (Rogers & Joiner, 2017). Although specific studies are found among some of these variables (e.g., rumination, depression, suicidal ideation, Miranda & Nolen-Hoeksema, 2007), the simultaneous consideration of neuroticism, rumination, depressive symptoms and suicidal ideation has been very scarcely examined.

Recently, our research group examined the relations of neuroticism, rumination, depressive symptoms and suicidal ideation across four countries (i.e., USA, Spain, Argentina and the Netherlands). This study tested a moderated serial-mediation model in a large cross-sectional sample of young adults to test its invariance across countries and gender groups (Vidal-Arenas, Bravo et al., 2022). Overall, the study found neuroticism to be directly associated with rumination, depressive symptoms and suicidal ideation. Neuroticism was also indirectly linked with

suicidal ideation through its effects on rumination and depressive symptoms. Specifically, a doble-mediation model was observed, such as those reporting low emotional stability (i.e., high neuroticism) tend to ruminate which, in turn, was associated with more depressive symptoms which, in turn, were related to endorsing suicidal ideation more. Besides, rumination was directly associated with depression, but not with suicidal ideation. In contrast, indirect effects from rumination to suicidal ideation through depressive symptoms were observed. Finally, and as expected, depressive symptoms were directly associated with suicidal ideation.

Nevertheless, the above-described study presented some limitations and inconsistencies, which would require further research. Most of the above-described direct and indirect effects were invariant across countries and gender groups, but the direct effect from neuroticism to suicidal ideation was not significant in two of the four studied countries, which indicates the need to further investigate this relation. Moreover, although we proposed causal links among neuroticism, rumination, depressive symptoms and suicidal ideation, they were cross-sectionally examined. Thus longitudinal studies are recommended to confirm these causal inferences. In the same vein, the observed mediation effects require follow-up samples to longitudinally test their feasibility (Cole & Maxwell, 2003). Lastly, the measure applied to the assessed depressive symptoms comprised only three items. Therefore the present study aims to overcome some of these flaws by studying the described relations in a longitudinal sample of young adults evaluated over a 1-year period. Specifically, and based on the aforementioned evidence and the antecedent study (Vidal-Arenas, Bravo, et al., 2022), we expect; (1) neuroticism to show significant direct effects on depression

and rumination, and indirect effects on suicidal ideation over time; (2) rumination to show significant direct effects on depression, and indirect effects on suicidal ideation over time; (3) depression to show significant direct effects on suicidal ideation across assessment waves. For that purpose, a cross-lagged panel model was carried out.

Method

Participants and procedure

Undergraduate students from Spain participated in a 12-month longitudinal project. All the participants completed informed consent forms before participating. Through online surveys, three waves of data were collected at 6-month intervals (T1, *n* = 569; T2, *n* = 350; T3, *n* = 287). Each participant received economical compensation for completing all the assessment tools at the end of each wave (i.e., 5 euros at T1, 10 euros at T2, 15 euros at T3). Given the objective of the present study, only the data from the participants who completed the study variables (i.e., suicidal ideation, depressive symptoms, rumination, and emotional stability) in at least two assessments (*n* = 366) were analysed. In our analytic sample, females were overrepresented (T1 = 68.0%, T2 = 72.3%, T3 = 72.1%). The mean age was 21.30 years (*SD* = 3.63).

Measures

Suicidal ideation. The DSM-5 Self-rated Level 1 Cross-Cutting Symptom Measure (APA, 2014) is composed of 23 items that cover 13 psychopathology domains, which includes suicidal ideation (assessed by one item, *Thoughts of actually hurting yourself?*). The respondents indicate how much/often they have been bothered by each symptom in the previous 2 weeks on a five-point response scale (0, *none or not at all,* 4, *severe or nearly every day*). This measure has been

validated among college student populations (Bravo, Villarosa-Hurlocker, et al., 2018).

Depression Severity Measure. This severity measures the assess criterion from DSM-5 for major depression (9 items) on a 4-point response scale from 0 (*never*) to 3 (*everyday*) (APA, 2014). Evidence for the validity and reliability of its scores has been provided in college students from Spain cross-sectionally and longitudinally (Vidal-Arenas et al., under review; Study 2). Considering the purpose of the present work, item 9 "*Thoughts that you would be better off dead or of hurting yourself in some way*" was deleted to avoid content overlap with the suicidal ideation item.

Rumination. Rumination was assessed using the 15-item version of the RTSQ (Tanner et al., 2013), measured on a 7-point scale from 1 *Not at all* to 7 *Very Well*. The RTSQ scores have evidenced validity and reliability among Spanish college students (Bravo, Pearson, et al., 2018; Vidal-Arenas, Ibáñez et al., 2022).

Emotional Stability. The emotional stability was measured with the Spanish version of the *Big Five Personality Trait Short Questionnaire* (BFPTSQ; Ortet et al., 2017), which contains 50 items that are answered on a 5-point response scale from 0 (*strongly disagree*) to 4 (*strongly agree*). The BFPTSQ scores have shown evidence for reliability and validity among undergraduate students from Spain (Mezquita et al., 2019).

Data analysis

In order to study the direct and indirect longitudinal associations among the study variables (i.e., suicidal ideation, depressive symptoms, rumination, emotional stability), and by focusing on between-person effects, a Cross-Lagged Panel Model (CLPM) was performed (Orth et al., 2020). Before conducting the

CLPM, analyses of longitudinal measurement invariance and reliability coefficients (i.e., Cronbach's alpha) at each wave and each measure included in the model were tested. Specifically, three measurement invariance levels were examined for the depression and emotional stability measures (i.e., one-factor structures) using the WLSMV estimator: (1) configural (test whether all the items load on the proposed factor); (2) metric (test whether the item-factor loadings are similar across time); (3) scalar (test whether the unstandardised item thresholds are similar across time). For the rumination scale (MLR estimator), which is based on a second-order model, four distinct measurement invariance levels were examined: (1) configural; (2) metric of the first-order factors; (3) metric of the second-order factor; (4) scalar of the first-order factors. Note that only the scalar invariance was tested for the first-order factors because the second-order latent means of the factors were set at 0 to identify the model (Chen et al., 2005; Dimitrov, 2010; Meredith, 1993). Thus to indicate a significant decrement in fit when testing for longitudinal measurement invariance, we used the model comparison criteria of ΔCFI/ΔTLI $\geq$ .010 (i.e., decrease indicates a worse fit; Cheung & Rensvold, 2002) and ΔRMSEA $\geq$ .015 (i.e., increase indicates a worse fit; Chen, 2007). After testing the longitudinal invariance of the measurements, we carried out the CLPM analysis.

Overall, in the proposed model, several effects were analysed: (1) effects on a previous measurement wave (e.g., depression T2 on depression T1, and depression t2 on rumination t1); (2) higher-order lag effects (e.g., depression time 3 on depression time 1); covariates effects between each measure at each assessment wave (e.g., depression T1 with rumination T1). The ML estimator was used, and we also examined the total, indirect and direct effects of each predictor on suicidal ideation using bias-corrected bootstrapped estimates (Efron &

Tibshirani, 1993) based on 10,000 bootstrapped samples. Following recent recommendations, the standardised regression coefficients from cross-lagged vias of .03, .07 and .12 were interpreted as a small, medium and large effect, respectively (Orth et al., 2022). All the structural equation models were performed using Mplus 8.4, while descriptive analyses and Cronbach's alpha (Cronbach, 1951) were done employing SPSS v.25 at each assessment wave.

Results

Confirmatory factor analyses and reliability coefficients

The results from the CFAs of all the study measures across the different assessment waves are presented in *Table 13*. The findings showed that the factor structure model examined for each measure fitted the data well at each assessment wave, with acceptable to optimal fit indices (CFIs ≧ .940; TLIs ≧ .927; RMSEAs ≦ .106). The mean score and internal consistency coefficients presented in the reliability coefficients of each measure are summarised in *Supplemental Table 7* Cronbach's alpha indices were above of .828 across waves.

Longitudinal measurement invariance

The results from the LMI analyses are summarised in *Table 13*. Overall, we found good fits for all the tested configural models (CFIs ≧ .922; TLIs ≧ .913 RMSEAs ≦ .055). When the constraints of the factor loading across waves were added, good fit indices (CFIs ≧ .924; TLIs ≧ .917, RMSEAs ≦ .051) and an improvement in CFIs, TLIs and RMSEAs compared to the previous model (i.e., configural) were found and, therefore, suggest metric longitudinal invariance for each tested measure. The addition of constraints between the thresholds across the different assessment points of each scale also provided good fit indices (CFIs

≧ .923; TLIs ≧ .919, RMSEAs ≦ .050) and negligible differences among CFI/TLI/RMSEA, which suggest scalar invariance across waves.

Cross-lagged panel model

Optimal fit indices were observed for the examined the CLPM [CFI= 1.000; TLI=.997; RMSEA (90% C.I) = .012 (.000, .056)]. Regarding direct effects (see *Figure 13*), depressive symptoms and rumination were significantly predicted by low emotional stability at wave 2 and wave 3. Suicidal ideation was significantly predicted by depression at wave 2 and wave 3. Rumination was significantly predicted by depressive symptoms at wave 3. Furthermore, a significant indirect effect from low emotional stability via depression to suicidal ideation (β = -.027; 95% C.I = -.067, -.005) and rumination (β = -.023; 95% C.I = -.055, -.005) was observed, and in such a way that those individuals with low emotional stability tended to report more depressive symptoms which were, in turn, associated with a good endorsement of suicidal thoughts and rumination.

Discussion

The present study aimed to test whether emotional stability (i.e., neuroticism), rumination, depressive symptoms and suicidal ideation interplayed longitudinally. For this general purpose, we conducted a CLPM analysis to test both the direct and indirect longitudinal associations between variables. As hypothesised, depressive symptoms were a significant longitudinal direct predictor of suicidal ideation across assessment waves for showing the robustness of depressive symptoms as a close factor in the prediction of suicidality. This coincides with what previous authors have highlighted (e.g., Gili et al., 2019). In addition, and as hypothesised, low emotional stability predicted later depressive symptoms according to previous neuroticism conceptualisations as a liability factor for affective disorders

(Hakulinen et al., 2015; Jeronimus et al., 2016). Emotional stability also predicted later rumination, which supports some proposals that consider neuroticism as be an aetiological antecedent of this cognitive style (Shaw et al., 2019). Furthermore, a significant and longitudinal minor indirect effect from low emotional stability to suicidal ideation was observed via depressive symptoms, and a similar finding was observed cross-sectionally (Vidal-Arenas, Bravo et al., 2022). As no direct effects were found from rumination to depression, it was not possible to test the double-mediation effect from low emotional stability to suicidal ideation via rumination and depressive symptoms. The findings provide evidence to support, in part, the serial mediation model cross-sectionally tested in the previous study (Vidal-Arenas, Bravo et al., 2022).

Rumination presented a less clear pattern of the results. Conversely to our hypothesis, rumination did not predict later depressive symptoms at any wave. Indeed, and unexpectedly, rumination at wave 3 was prospectively predicted by depressive symptoms from wave 2. It is important to note that this effect was not found at the other waves, which questions the robustness of these results. Similar inconsistencies have been previously reported. For instance, some studies have found longitudinal predictive effects from rumination to depression (Kuster et al., 2012), other studies have reported bidirectional longitudinal effects (Bastin et al., 2021; Calvete et al., 2015; Jury & Jose, 2019; Krause et al., 2017; Whisman et al., 2020), and some have found no longitudinal effects (Royuela-Colomer et al., 2021).

One possible explanation for the discrepancies across studies could be attributed to differences in the covariables included in each study (e.g., self-steam, dispositional mindfulness, stressful events, anxiety, neuroticism, impulsivity, among others), or to differences in the measures employed to assess rumination.

In line with this last issue, most studies that have explored the relation between rumination and mood/anxiety problems have used the Ruminative Scale Questionnaire (RSQ; Nolen-Hoeksema, 1991) or its short version, *Rumination Response Scale* (RSS; Treynor et al., 2003) (Kovács et al., 2020; Olatunji et al., 2013). However, these instruments have been questioned for their high degree of overlap with depression-specific content (Brinker & Dozois, 2009). So some authors use "depressive rumination" instead of "rumination" to refer to what is assessed with RSQ/RSS (e.g., Kovács et al., 2020). Hence employing these scales may lead to inflated associations between rumination and depression, which might explain some of the differences found across studies.

Despite present and past studies not clarifying the predictive link between rumination and depression, it is important to highlight that the present study showed robust cross-sectional associations between rumination and depressive symptoms at the three assessed waves, thus better understanding depressive symptoms is still a significant factor. Similarly, cross-sectional associations were observed between rumination and suicidal ideation. So rather than taking rumination as an aetiological factor involved in the onset of depression and suicidality, it can be better understood as a maintainer or exacerbator of depressive symptomatology and suicidal thoughts. This falls more in line with the original rumination conceptualisation (Nolen-Hoeksema, 1991).

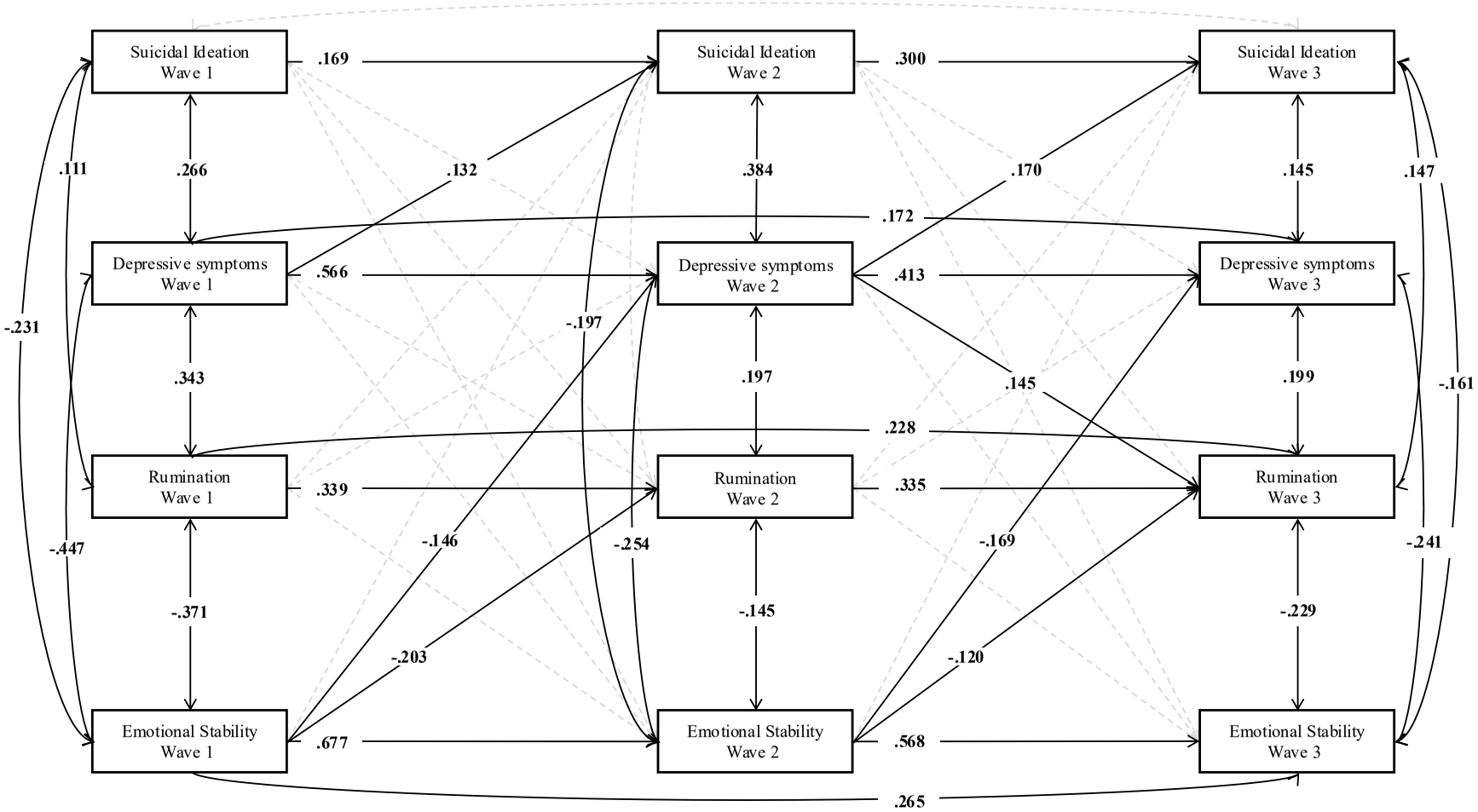
It is important to consider several limitations in the present study that may help to improve further research. The first limitation involves the extent to which the results found in the undergraduate students can be generalised to other populations. (e.g., clinical populations). Moreover, as suicidality includes distinct components (i.e., suicidal thoughts, planning and attempt; Klonsky et al., 2018),

our findings are restricted to suicidal ideation and cannot be extrapolated to other types of suicidal behaviours. Finally, our participants formed a small sample of young adults, and the attrition across waves was notable. Therefore, future longitudinal studies with larger sample sizes are needed.

Our findings generally fall in the line with the previous literature, which has underscored that suicidality and emotional stability may share a common mechanism (Bentley et al., 2021), and suggests that the risk factors for depression may also play a significant role in the aetiology and expression of suicidal ideation. Accordingly, our findings point out that neuroticism is not only a significant distal predictor of depressive symptoms, but also a significant indirect predictor for suicidal ideation. Rumination has also been found as a co-occurrent risk factor for both depressive symptoms and suicidal ideation, which supports the notion of rumination being a transdiagnostic factor of internalising disorders rather than a specific risk factor for depression (McLaughlin & Nolen-Hoeksema, 2011; Shaw et al., 2021). Considering that neuroticism also comes over as a direct longitudinal predictor of rumination, treatments that focus on decreasing behaviours related to low emotional stability could also lead to a reduction in ruminative tendencies. This may favour an indirect decrease in depressive symptoms in the short term and, therefore, reduce the suicidal ideation risk. Hence the evidence found in the present work mainly emphasises the likely usefulness of transdiagnostic treatment for emotional disorders (Barlow, Sauer-Zavala et al., 2014) for the prevention and management of SITBs (Bentley et al., 2017, 2021), in which tendencies related to high neuroticism are addressed, such as working on emotional avoidance responses (i.e., emotion-driven behaviours) or automatic appraisals (e.g., catastrophising) (Barlow et al., 2018).

Figure 13

Direct effects for CLPM estimated



Note: Dashed, gray, lines indicate non-significant vias. Bold type indicates significant effects (i.e., 95% bias-corrected bootstrapped confidence intervals not containing zero).

Table 13

Goodness-of-fit for the confirmatory factor analysis and longitudinal measurement invariance of the study measures

	Overall Fit Indices					Comparative Fit Indices			
	χ^2	df	CFI	TLI	RMSEA [90% CI]	Model comparison	ΔCFI	ΔTLI	ΔRMSEA
Depressive symptoms									
Wave 1	200.075	27	.947	.929	.106 [.093, .120]				
Wave 2	130.884	27	.959	.946	.104 [.086, .122]				
Wave 3	107.930	27	.977	.970	.102 [.082, .122]				
1.Configural	877.220	321	.931	.925	.055 [.051, .059]				
2.Metric	833.435	337	.939	.936	.051 [.046, .055]	1 vs 2	.008	.011	-.004
3.Scalar	871.392	355	.936	.937	.050 [.046, .055]	2 vs 3	-.003	.001	-.001
Rumination									
Wave 1	182.907	86	.947	.935	.044 [.035, .053]				
Wave 2	169.777	86	.947	.936	.052 [.040, .063]				
Wave 3	159.477	86	.940	.927	.054 [.041, .067]				
1.Configural	1291.642	885	.922	.913	.028 [.025, .032]				
2.Metric-first order	1301.809	907	.924	.917	.028 [.024, .031]	1 vs 2	.002	.004	.000
3.Metric-second order	1309.066	913	.924	.918	.028 [.024, .031]	2 vs 3	.000	.001	.000
4.Scalar	1335.113	935	.923	.919	.027 [.024, .031]	3 vs 4	-.001	.001	-.001
Emotional Stability									
Wave 1	215.820	30	.958	.938	.104 [.091, .117]				
Wave 2	151.463	30	.950	.925	.105 [.089, .122]				
Wave 3	71.539	30	.980	.969	.069 [.048, .090]				
1.Configural	790.396	357	.956	.946	.046 [.042, .050]				
2.Metric	756.413	385	.962	.957	.041 [.037, .045]	1 vs 2	.006	.011	-.005
3.Scalar	771.231	405	.962	.960	.040 [.036, .044]	2 vs 3	.000	.003	.000

Supplemental Table 7

Descriptive analysis across study samples and differences between countries

	Wave 1		Wave 2		Wave 3	
	Mean (SD)	α (CI 95%)	Mean (SD)	α (CI 95%)	Mean (SD)	α (CI 95%)
Suicidal ideation	1.31 (.75)	---	1.32 (.75)	---	1.26 (.66)	---
Depressive symptoms	6.78 (3.89)	.829 (.808, .850)	6.05 (3.96)	.858 (.834, .879)	6.40 (4.60)	.891 (.871, .909)
Rumination	65.88 (16.05)	.828 (.806, .848)	64.46 (18.50)	.869 (.849, .888)	64.04 (18.19)	.865 (.841, .886)
Emotional Stability	19.66 (7.63)	.861 (.844, .878)	20.19 (7.24)	.844 (.819, .867)	19.65 (7.43)	.850 (.823, .874)

CHAPTER 8

GENERAL DISCUSSION

The current thesis sought to extend previous knowledge on assessment tools to measure psychopathology and related variables, such as rumination (*General objective 1*), and to provide new evidence about the interplay between distal (i.e., neuroticism) and proximal (i.e., rumination) vulnerability factors of psychopathology (i.e., depressive symptoms) to better understand suicidal thoughts (*General objective 2*).

General objective 1 was addressed by examining the psychometrics properties of the Depression and Anxiety Severity Measures of DMS-5 (Study 1 and Study 2) and the RTSQ (Study 3). After finding evidence for the validity and reliability of these assessment tools, we continued with *General objective 2*. This last general aim was to explore the direct and indirect relations among neuroticism, rumination, depressive symptoms and suicidal ideation in a large cross-sectional sample of young adults across four countries and two gender groups (Study 4) and during a 1-year follow-up sample of Spanish young adults (Study 5).

In order to fulfill these objectives, five studies were carried out with college students. In **Study 1**, a series of factor analyses was performed to test the factorial structure of each Anxiety SMs (i.e., Generalised Anxiety, Social Anxiety, Specific Phobia, Agoraphobia, Panic, Separation Anxiety) cross-sectionally. Next reliability evidence was provided by estimating the Cronbach's Alphas and Omega coefficients of each scale. Finally, convergent/discriminant and criterion validity evidence was obtained through Pearson's correlations with personality and other psychological measures. The **Study 1** results supported a unidimensional structure for each self-reported SM (*Hypothesis 1*) similarly to previous studies (Beesdo-Baum et al., 2012; DeSousa et al., 2017; Yalin et al., 2017), except for the Specific Phobia scale, which showed a two-correlated factor structure. The first identified factor was named *Anxiety* and comprised indicators to assess cognitive/physical anxiety-related symptoms. The second identified factor was called *Avoidance* and assessed cognitive/behavioural avoidance symptoms. In addition, all six anxiety SMs obtained Cronbach's alphas and omegas higher than .70 (*Hypothesis 2*) in the line with previous studies (Beesdo-Baum et al., 2012; DeSousa et al., 2017; Knappe et al., 2014; LeBeau et al., 2012; Möller & Bögels, 2016; Yalin et al., 2017), which provided the reliability evidence of its scores in the whole sample and across gender groups. The findings also evidenced support of higher associations of the Anxiety SMs with internalising (i.e., anxiety, depression and worry) than externalising (i.e., drug use measures) measures (*Hypothesis 3*), and provided convergent/discriminant validity evidence for the Anxiety SMs. Finally, significant and negative associations were also found among all six examined Anxiety SMs with low emotional stability (i.e., high neuroticism), low satisfaction and quality of life (*Hypothesis 4*), which was as expected based on

previous studies (e.g., Kotov et al., 2010; Olatunji et al., 2013; Proctor et al., 2009). Therefore, criterion validity evidence was provided.

In **Study 2**, longitudinal measurement invariance was tested for both the Depression and Anxiety SMs across four assessment waves after testing the adequacy of the structure of each SM at each assessment point. We also reported reliability evidence (i.e., Cronbach's Alpha and Omega coefficients) at each assessment wave. Once longitudinal measurement invariance was observed for each measure, a series of Laten Growth Curve Models (LGCMs) was performed to examine the evolution of each syndrome over time. The results from the second study supported the unidimensional structure of the Depression (González-Blanch et al., 2018; Kocalevent et al., 2013; Leung et al., 2020) and Anxiety SMs, which was less for the specific phobia SM (Vidal-Arenas, et al., 2021) (*Hypothesis 5*). In addition, longitudinal measurement invariance was accomplished for each tested structure (i.e., one-factor structure for each scale, except for Specific Phobia, in which a two-factor correlated structure was tested). Moreover, the Depression and Anxiety SMs showed suitable reliability coefficients at each assessment wave (*Hypothesis 6*), which falls in line with previous studies (Vidal-Arenas et al., 2021). Finally, the findings evidenced that all the internalising symptoms significantly decreased over time, which provided evidence to support that depression and anxiety-related symptoms decreased during the college years (*Hypothesis 7*; Levine et al., 2021; Oline et al., 2010; Zimmermann, 2021).

Study 3 was carried out to examine two competing models regarding the factorial structure of the RTSQ (i.e., a four-correlated factor model vs. a second-order factor structure model) across countries and gender groups and cross-sectionally. The results from the structural equation models provided optimal fit

indices for a second-order factor structure cross-sectionally, and acceptable/optimal fit indices when multigroup measurement invariance was tested across countries and gender. All this supports the measurement invariance of a second-order factor across groups (*Hypothesis 8*). Additionally, the longitudinal measurement invariance of the second-order factor structure through three assessment waves was examined in a Spanish subsample. The findings provide evidence for the longitudinal measurement invariance of the hierarchical structure of the RTSQ (*Hypothesis 9*).

In **Study 4**, we examined several cross-sectional relations between vulnerability factors and psychopathology. We specifically focused on examining the indirect effects from neuroticism (i.e., emotional stability) to suicidal ideation through its effects on rumination and depressive symptoms. We also estimated whether different neuroticism levels may play a significant role in exacerbating the effects of rumination and depressive symptoms in the tested model (i.e., moderated serial-mediation model). Finally, to evaluate the robustness of the proposed model, we also conducted multigroup analyses to test whether the observed effects were invariant across countries (i.e., USA, Spain, Argentina, the Netherlands) and sex groups (i.e., male and female) in a large sample of college students. Overall, the findings supported serial mediation, such as those with high neuroticism, who also reported higher rumination levels which was, in turn, associated with more depressive symptoms, which were also related to more reports of suicidal ideation (*Hypothesis 10*). Moreover, the nalyses also underscored that the effects of rumination and depressive symptoms were more harmful for those with higher scores for neuroticism (*Hypothesis 11*). Finally, all the observed effects described

above were invariant across countries and sex groups (*Hypothesis 12*), which evidence the robustness of the findings.

In **Study 5,** to overcome some of the main limitations of the previous cross-sectional study (e.g., difficulty of ascertain directional relations), a CLPM was used across three assessment waves to longitudinally test the direct/indirect effects among neuroticism, rumination, depressive symptoms and suicidal ideation. The findings indicated that neuroticism was a significant direct factor of rumination and depressive symptoms (*Hypothesis 13*). As for the direct effects from rumination to depressive symptoms (*Hypothesis 14*), none such effects were found, which may suggest that rumination is a significant cross-sectional related factor of depressive symptoms rather than a longitudinal predictor. Furthermore, the results indicated that depressive symptoms were a significant direct predictor of suicidal ideation across the assessment waves (*Hypothesis 15*). Finally, a significant indirect link between neuroticism to suicidal ideation via depression was found (*Hypothesis 16*). This partly supports the serial mediation model presented in Study 4 because no direct effects were found between rumination and depression at the longitudinal level, and no indirect effects could be tested with this relation (i.e., neuroticism→ rumination → depressive symptoms→ suicidal ideation; *Hypothesis 17*).

Overall, the psychometric-related studies (Study 1 to Study 3) provide new evidence for the assessment of various internalising problems and related variables, such as rumination. We specifically provide the first psychometric evidence for the Spanish version of the Severity Measures of DSM-5. We extend not only evidence about the validity and reliability of that scale both cross-sectionally and longitudinally among college students, but also knowledge about

the latent structure of a rumination scale (i.e., the RTSQ), which underscores the existence of a global component underlying four distinct rumination components to allow different degrees of specificity for rumination when we wish to study its relations to other variables.

Apart from providing new psychometric evidence for some instruments of interest (i.e., SMs from DMS-5 or the RTSQ) with Spanish colleges students, the present thesis also focuses on exploring the effects of dispositional (i.e., neuroticism) and cognitive (i.e., rumination) vulnerabilities on depressive symptoms and suicidal ideation. The findings from Study 4 and Study 5 support the notion that neuroticism may play an important role in predicting psychopathology (i.e., depressive symptoms and suicidal ideation) as a significant distal aetiological factor and a proximal aetiological factor to explain cognitive vulnerabilities for depression and ruminative thoughts. The results also point out that those who report more characteristic behaviours of high neuroticism levels will present severer symptoms of depression and suicidal ideation. As some studies have indicated (Newton-Howes et al., 2014; Wardenaar et al., 2014), this has a marked implication for treatment designs. For example, those individuals with high neuroticism levels may require more specific or longer duration interventions compared to those with higher levels emotional stability or those with a more resilient profile (Wardenaar et al., 2014).

Clinical implications

Considering that both SMs from DSM-5 and the tested rumination scale (i.e., RTSQ) were short psychological measures, they may help to reduce the time needed for assessments and, therefore reducing the time spent waiting to access services, which is a major barrier for accessing psychological treatment (Reardon

et al., 2017; Vidourek et al., 2014). Moreover, the proposed structure for the RTSQ scale (i.e., second-order factor structure) allows an assessment of not only a general rumination factor, but also specific components rumination in relation to certain psychological problems (e.g., counterfactual thinking with PTSD symptom clusters or problem-focused thoughts with alcohol outcomes; see Bravo, Pearson, et al., 2018). This makes it a potential aid to design more specific and personalised psychological treatments to help to distinguish which forms of rumination are more present than others in patients.

Regarding the last two studies, and following the notion that psychological interventions are able to bring about certain changes in personality domains (Roberts et al., 2017), our results seem to support the idea that developing targeted interventions for neuroticism could be useful for preventing emotional disorders, such as depression (e.g., Barlow, Sauer-Zavala et al., 2014), but also suicidal thoughts (Bentley et al., 2021, 2017). The present findings also suggest that the combination of personality-targeted interventions and rumination-targeted treatments (e.g., Watkins & Roberts, 2020) may produce synergistic beneficial effects on depression symptoms and suicidal thoughts.

Limitations and future directions

Although we consider that these findings are extremely interesting, there are also issues that should be addressed in future studies. First of al, although the results of Studies 1 and 2 are novel and provide preliminary evidence about the structure, internal consistency and measurement invariance of DSM-5 SM, the sample employed was a convenience sample. Thus future studies are needed to provide evidence for the validity of DSM-5 scales in general and clinical Spanish samples in particular. Secondly, as suicidal ideation was assessed by only one

indicator, it would be interesting to replicate the findings using more extensive measures by including other components of suicidality (e.g., plan or attempts). In relation to this, it would be most interesting to study whether the observed effects are the equivalent in younger samples, such as adolescents, to constitute an emergent group-risk for suicidal thought and behaviours (Fonseca-Pedrero et al., 2022). Thirdly, while the CLPM analysis allowed us to analyse longitudinal mediation effects simply, these models are not without their limitations (Hamaker et al., 2015). Therefore, using other methodological approaches (i.e., Random-Intercept Cross-Lagged Panel Model; Hammaker et al., 2015) can help to assess the consistency of our results, and also allow us to analyse intraindividual differences over time. Finally, other variables may allow a more in-depth study of the relation between the tested variables (i.e., social support) or to help to define the study sample more specifically (i.e., exclusion/inclusion variables), such as assessing in more detail the previous history of suicidal behaviours, the presence of major mental health problems (i.e., schizophrenia or personality disorders that are borderline), or being on treatment for mental health problems, e.g., both psychopharmacological and psychological treatments.

General conclusion

The current thesis was carried out to provide new evidence for the psychological assessment tools and aetiological models of psychopathology. The main findings evidence the validity and reliability of the DSM-5 Depression and Anxiety SMs scores in Spanish young adult samples. Our results also evidence the adequacy of a hierarchical structure of the RTSQ, which consisted in a general factor and four-correlated subfactors (i.e., problem-focused thoughts, anticipatory thoughts, counterfactual thoughts, repetitive thoughts). The present thesis findings also

suggest that the Depression and Anxiety SMs of DMS-5 and the RTSQ could be very useful for carryingout follow ups in young adults.

Furthermore, the results underline the relevance of considering personality traits, specifically neuroticism, to be a vulnerability factor that cross-sectionally and longitudinally predisposes to psychopathology, but also to specific social-cognitive process related to internalising symptoms (i.e., rumination). Specifically, neuroticism is evidenced as a significant direct predictor of depressive symptoms and rumination, and a significant indirect predictor of suicidal ideation. More research is needed to clarify whether rumination constitutes a longitudinal risk factor for depression, or perhaps rumination is better conceptualised as a conoccurrent risk factor that plays a significant role in the maintenance or exacerbation of depressive symptoms. The findings of the present thesis generally support new psychological treatment lines, while therapeutic components are based on evidence for the close relation between personality and psychopathology.

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