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Predicting transitions between longitudinal classes of post-traumatic stress disorder, adjustment disorder and well-being during the COVID-19 pandemic: protocol of a latent transition model in a general Dutch sample

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ABSTRACT

Background A growing body of literature shows profound effects of the COVID-19 pandemic on mental health, among which increased rates of post-traumatic stress disorder (PTSD) and adjustment disorder (AD). However, current research efforts have largely been unilateral, focusing on psychopathology and not including well-being, and are dominated by examining average psychopathology levels or on disorder absence/presence, thereby ignoring individual differences in mental health. Knowledge on individual differences, as depicted by latent subgroups, in the full spectrum of mental health may provide valuable insights in how individuals transition between health states and factors that predict transitioning from resilient to symptomatic classes. Our aim is to (1) identify longitudinal classes (ie, subgroups of individuals) based on indicators of PTSD, AD and well-being in response to the pandemic and (2) examine predictors of transitioning between these subgroups.

Methods and analysis We will conduct a three-wave longitudinal online survey study of n≥2000 adults from the general Dutch population. The first measurement occasion takes place 6 months after the start of the pandemic, followed by two follow-up measurements with 6 months of intervals. Latent transition analysis will be used for data analysis.

Ethics and dissemination Ethical approval has been obtained from four Dutch universities. Longitudinal study designs are vital to monitor mental health (and predictors thereof) in the pandemic to develop preventive and curative mental health interventions. This study is carried out by researchers who are board members of the Dutch Society for Traumatic Stress Studies and is part of a pan-European study (initiated by the European Society for Traumatic Stress Studies) examining the impact of the pandemic in 11 countries. Results will be published in peer-reviewed journals and disseminated at conferences, via newsletters, and media appearance among (psychotrauma) professionals and the general public.

Strengths and limitations of this study

► This is one of the first studies examining the mental health impact of the COVID-19 pandemic by focusing on negative and positive mental health in the general population.
► A longitudinal research design is used, which enables us to examine the predictors of transitioning between mental health classes over three time points.
► A limitation of this study is that we used self-report measures, instead of clinical interviews, to assess mental health.

INTRODUCTION

The impact of the COVID-19 pandemic on mental health has been profound. In recent reviews, a variety of psychological problems have been identified across studies on COVID-19 pandemic-related mental health effects.[1–4] One of the most commonly reported mental health problems during the pandemic is disturbances in stress reactions, such as post-traumatic stress disorder (PTSD) symptoms and adjustment disorder (AD).[5–7] For instance, a meta-analysis found a pooled prevalence of postpandemic PTSD of 23%[8] and two studies from the UK and Poland reported AD prevalence rates during the COVID-19 pandemic of 16% and 49%, respectively.[5 6] These rates are higher than 1-year prevalence rates of 4%–5% PTSD[9 10] and point prevalence rate of 1% of AD[11] found in the general population before the pandemic.

PTSD and AD are both categorised as disorders specifically related to exposure to trauma and stress in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

(DSM-5)[12] and International Classification of Diseases 11th Revision.[13] People with PTSD experience intense, disturbing thoughts and feelings related to a traumatic event that happened at least 1 month earlier. They may relive this event through flashbacks or nightmares and feel sadness, fear, anger, or feel detached from others.[12] AD has been characterised by 'marked distress that is out of proportion to the severity or intensity of the stressor'.[12] This distress is represented by 'preoccupation with the stressor or its consequences, including excessive worry, recurrent and distressing thoughts about the stressor, or constant rumination about its implications, as well as by failure to adapt to the stressor'.[13] Whereas the PTSD A criterion requires the stressor to be related to death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence, for AD the stressor may be associated with various psychosocial life stressors such as divorce, illness or disability, socioeconomic problems, or conflicts at home or work.[12 13] As both classification systems prescribe that AD typically does not last longer than 6 months and may not be explained better by another mental disorder, AD has been referred to as a subclinical or mild disorder compared with other psychiatric diagnoses.[14] Recent research suggests that AD may be an early marker for more severe disorders, such as PTSD.[15]

So far, most of the research on the psychological impact of the COVID-19 pandemic has been focused on the presence of psychological disorders.[1–4] This approach does not capture the complete picture of mental health for at least two reasons. First, focusing on mental illnesses only provides a limited perspective on mental health. As described by the WHO, mental health is not only defined by the absence of psychopathology, it 'is defined as a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community'.[16] The dual-continua model states that well-being and symptoms of psychopathology are related, but separate continua.[17] Empirical work supports that increases in well-being are related to less psychopathology; however, absence of psychopathology does not indicate a high level of well-being or vice versa.[18–20] Broadening our focus from mental illness to mental health by including psychopathology *and* well-being may therefore yield a more complete picture and better understanding of the psychological impact of the pandemic.

Second, mental disorders have often been investigated as either present or absent by reporting prevalence rates or by examining how people respond on average. These approaches ignore individual differences in psychological responses. An increasing body of research offers support that psychological responses are heterogeneous.[21–25] To illustrate this, there are 636 120 ways to have PTSD.[26] A statistical technique that has often been used to study heterogeneity in responses is latent class analysis (LCA). LCA categorises individuals into classes based on similar response patterns. For instance, LCA has been used to show that mental illness and well-being are separate continua; classes were found of people showing high well-being and low psychopathology symptoms, whereas other classes were characterised by people with elevated symptoms while reporting high well-being.[27]

While LCA might be helpful in identifying latent classes of people that differ in mental health indicators during the pandemic, this has, to the best of our knowledge, not been studied yet. We therefore aim to examine latent classes of AD, PTSD and well-being in order to enhance our knowledge on the impact of the COVID-19 pandemic on mental health. As the pandemic is evolving, people's mental health responses are changing as well. To capture this, longitudinal research is needed. Latent transition analysis (LTA) is a longitudinal extension of an LCA, which is helpful in capturing the fluctuating nature of symptom profiles.[24 25] With LTA, the likelihood of transitioning between classes over time is estimated, so for instance, the likelihood of moving from the high well-being and low psychopathology symptoms class at the first measurement occasion to the high well-being and high psychopathology symptoms class at the second measurement occasion. Furthermore, predictors of transitions can be added to the LTA allowing identification of risk and protective factors for mental health. Examining predictors of transitions of mental health during the pandemic is relevant to identify people at risk for developing worsening of symptoms as well as identifying protective factors that enhance well-being. This knowledge is considered helpful for screening, prevention and treatment of stress reactions and enhancement of well-being related to the global pandemic.

This study aims to examine the longitudinal symptom profiles of PTSD, AD and well-being in a general population sample in the Netherlands during the COVID-19 pandemic using data from three measurement occasions with a 6-month time interval. LCA and LTA will be used to examine longitudinal symptom profiles. Based on previous studies on individual differences in mental health,[22 23 27] we expect to identify at least five classes that differ with respect to symptom profiles. We expect that the modal response would consist of a subgroup representing complete mental health (ie, individuals with low PTSD and AD symptomatology and moderate to high well-being) (class 1), based on prior research of symptom trajectories.[22 23 27] Furthermore, we expect to identify a class with severe symptomatology (high AD and PTSD symptoms) and low well-being (class 2).[21 27] Considering findings on mental health prevalence from cross-sectional studies of COVID-19 pandemic responses,[6] we also expect a class of individuals with difficulties adjusting (moderate to high AD symptoms) and moderate/low well-being, but who do not show traumatic responses (low PTSD symptoms; class 3), and a class for whom PTSD symptoms are at the forefront (high PTSD) and moderate/low well-being, but who experience moderate/low adjustment difficulties (class 4).[28 29] Lastly, in line with the dual-continua model,

we expect a class that shows elevated AD and PTSD symptomatology while maintaining moderate to high well-being levels (class 5).[17 27]

Transitions between classes will be explored by including the following variables related to the participants' (1) sociodemographics, (2) profession, and (3) health, based on prior research examining predictors of distress after adversity.[30–34] Regarding the sociodemographic variables, we expect individuals who are female, belong to an ethnic minority and are exposed to childhood trauma are more likely to belong/transition to classes with more distress and low well-being. Furthermore, with respect to profession, we expect students and people in a healthcare profession to belong/transition to classes with pervasive distress. In addition, we expect that individuals with a history of mental health issues and poor self-reported health are at greater odds to belong to classes with poor mental health. We also expect individuals who report more exposure to pandemic-related stressors (ie, being infected with COVID-19, experiencing a death of a loved one during the pandemic, loss of income due to the pandemic or loss of social network) to be at risk for belonging/transitioning from asymptomatic to symptomatic and from high to low well-being.[35]

METHODS AND ANALYSIS
Study design
This is a longitudinal online cohort study, called CONNECT, carried out among participants from the Dutch general population. This study is part of a pan-European research collaboration under coordination of the European Society for Traumatic Stress Studies (ESTSS) conducted in 11 countries (for more details, see Lotzin et al).[36] Participants will be assessed at three time points (ie, T1, T2, T3), 6 months apart. Data collection for T1 took place from 16 July to 16 November 2020, for T2 from 15 February to 17 June 2021 and for T3 from 2 August to 2 December 2021.

Eligibility
Participants need to be at least 18 years of age, resident in the Netherlands at the time of study participation and able to read Dutch or English. No exclusion criteria will be applied. Participants will be informed about confidentiality and will be asked to provide informed consent before filling out the survey.

Sample size
In line with the pan-European research study, the sample size will be set to n=2000 (ie, n=2000 participants in countries with more than 15 million inhabitants). We expect a 65% response rate per consecutive wave (T2: n=1300, T3: n=845).

Recruitment and procedure
Participants will be recruited via social media platforms (eg, LinkedIn, Facebook, Twitter, Instagram, WhatsApp),

social networks of the authors and mental healthcare clinics and universities whom the authors are affiliated with. Participants will be able to take part in a raffle to win a voucher at every assessment time point (chance of winning 1:100, €25). First year students from Utrecht University, Leiden University, the University of Groningen and Radboud University Nijmegen can participate in exchange for course credits. A marketing agency will be used to recruit 300 individuals from a volunteer panel of the general population who represent specific demographic subgroups that are commonly more difficult to include in scientific research: men, people with low to middle socioeconomic backgrounds and those between 40 and 60 years of age. Eligible participants are provided with a weblink to the survey consisting of questionnaires and asked to complete it, which takes approximately 25 min.

Measures
Detailed information on instruments used in the CONNECT Study can be found at Open Science Framework (https://osf.io/qeba5/). Below we describe the measures that will be used in the current study.

Mental health indicators
PTSD symptoms will be assessed with the Primary Care PTSD screen for DSM-5 (PC-PTSD-5),[37] a 5-item dichotomous (0=no, 1=yes) screening measure assessing symptoms (eg, 'Been constantly on guard, watchful, or easily startled?') experienced over the past month. The PC-PTSD-5 showed good diagnostic accuracy in a sample of 398 US veterans in primary care.[38]

AD symptoms will be assessed with the Adjustment Disorder-New Module 8 Questionnaire,[39] an 8-item self-report measure. Items (eg, 'My thoughts often revolve around anything related to the stressful situation') are rated on a 4-point Likert scale ranging from 1 (never) to 4 (often). Previous research indicated sound construct validity and good internal validity across help-seeking individuals with symptoms of AD.[39]

Well-being is assessed with the WHO-5 Well-Being Index, a derivative of the 28-item and 10-item WHO Well-Being Questionnaires.[40] The WHO-5 measures well-being over the past 2 weeks on a 6-point Likert scale from 0 (at no time) to 5 (all the time). A sample question is 'I have felt cheerful and in good spirits'. The WHO-5 has shown to be validated in a number of studies in various languages.[41]

Predictors of class membership
With respect to sociodemographic characteristics, we will assess participants' gender (ie, female, male, other). Ethnicity will be assessed based on the following question: 'What is your nationality? Select one country from the list'. Ethnicity is dichotomised (Dutch vs non-Dutch) to limit the number of predictors of class membership to avoid computational difficulties. Childhood trauma will be assessed with the Adverse Childhood Experience

(ACE) Questionnaire,[42] relating to emotional, physical and sexual abuse, and emotional and physical neglect. Respondents rate whether the respective childhood trauma was experienced before the age of 19 (no or yes). The ACE has sound construct validity and good internal validity across samples, including clinical and non-clinical samples, and demonstrates convergent validity with the Childhood Trauma Questionnaire.[43]

Related to the participants' profession, we will ask 'What is your current situation regarding education or employment?' We will categorise this as student versus non-student. In case people are employed, we will ask in what field they work in (categorised as healthcare profession vs other).

Questions regarding health will contain history of mental health issues (ie, 'Have you ever been diagnosed with a psychiatric disorder (such as a depressive or anxiety disorder?' yes or no)) and current self-rated health (How would you describe your current health status?) categorised as satisfactory/good versus poor/very poor.

The following stressors related to COVID-19 will be assessed with a set of items developed for the ESTSS COVID-19 Study:[36] being infected with COVID-19 (yes or no), experiencing a death of a loved one during the pandemic (yes or no), loss of income due to the pandemic (yes or no) and perceived burden of loss of social network (categorised as not at all/a bit vs somewhat/severe).

Data analysis
LTA will be used for analysing the data. The LTA will be performed in four consecutive steps. In the first step, LCAs will be conducted for each measurement occasion separately. In line with earlier studies using LTA and LCA,[24 25 44 45] non-binary indicators (ie, symptoms of AD and well-being) will be dichotomised, such that 'symptom absence' is represented by scores of 0 for PTSD, 1 or 2 for AD and 0–2 for well-being, and 'symptom presence' is characterised by scores of 1 on PTSD, 3 or 4 for AD and 3–5 for well-being.

Latent class models up to eight classes will be run. The model with the best fit will be selected. Better model fit is indicated by: (1) lower values for the Bayesian information criterion (BIC) and Akaike information criterion, (2) higher entropy R^2 values, and (3) a significant p value (<0.05) of the Vuong-Lo-Mendell-Rubin test, Lo-Mendell-Rubin likelihood ratio test and the bootstrap likelihood ratio test. We will also take the parsimony and interpretability of the models into account.

In the second step, we will examine measurement invariance between the classes at the separate measurement occasions. This will be tested to examine whether the number of the classes and symptom profiles of the classes are similar across measurement occasions.[46] A non-significant log-likelihood difference test will be used as an indicator for measurement invariance.

In the third step, we will examine transition probabilities by regression class membership of one measurement occasion on the class membership of the preceding measurement occasion. Transition probabilities are the probability of people staying in the same class over time or the probability of people transitioning from one class to another class at a subsequent time point.

In the fourth and final step, predictors will be added to the LTA using multinomial logistic regression analyses. In doing so, we can predict the likelihood of moving out of a class to another class at a subsequent time point compared with staying in the same class over time. Multiple imputations will be used to handle missing data on predictors.[47]

ETHICS AND DISSEMINATION
The study has been approved by the Ethics Committee of Utrecht University (20-360; TM), Leiden University (2020-09-10; JM-V1-2619), the University of Groningen (PSY-1920-S-0517; LL) and Radboud University Nijmegen (ECSW-2020-127; ME). All researchers involved in this study, except for AMF and SS, are board members of the Dutch Society for Traumatic Stress Studies (in Dutch: De Nederlandstalige Vereniging voor Psychotrauma). This study is part of a pan-European research collaboration initiated by the ESTSS including 11 countries (for more details, see Lotzin *et al*).[36] The research findings will be published in a peer-reviewed, open access journal article and disseminated among researchers, clinicians, members of our society and policy makers at conference talks, via news updates on the website of the Dutch Society for Traumatic Stress Studies (www.ntvp.nl), and media appearances. With consent from the participants, data will be deposited, stored and shared at a secure data management service from Utrecht University.

PATIENT AND PUBLIC INVOLVEMENT
Potential participants or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

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covering the costs of the marketing agency that supported us with recruitment and vouchers for participants.

Competing interests None declared.

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