Recently, nonlinear dynamic systems (NDS) theories have received increased attention in the mental health field1–5. A NDS account to psychopathology can provide new insights in the dynamic nature of psychopathology and the heterogeneity in patients with similar diagnosis6. Studies on NDS in various research areas including physics7, movement science8 and ecology9 show that certain general principles apply to all NDS, irrespective of form. One such principle is the order transition. While *within* a dynamically stable state the system’s behaviour evolves in a predictable and continuous manner, order transitions *between* two dynamically stable states lead to discontinuous and abrupt change in the systems behaviour10. As an example, consider a walking horse that continuously speeds up (change within state) until it suddenly changes its gait to a trot (change between states)11.

In psychopathology, discontinuous changes such as the onset of pathology, relapse and recovery can be seen as order transitions in a NDS6,12. Additionally, also sudden gains (abrupt changes towards lower symptom severity) and sudden losses (changes towards higher symptom severity), may reflect order transitions in a patient’s psychological state13,14. In studies by different research groups, sudden gains have been found to occur for 17% to 50% of patients receiving psychotherapy for mood and anxiety disorders15–19. Notably, sudden gains also occur for patients with other psychopathologies20 and for patients that are treated with drugs or placebo pills21. Sudden gains are related to better treatment outcome22, sudden losses are related to worse treatment outcome23, suggesting that they might reflect order transitions that can lead to enduring change in symptom severity.

A second principle of NDS is that order transitions are often preceded by a destabilization period in which the stability of the existing state decreases (as a consequence of increasing control parameters)10. During destabilization, the system loses its resilience to external influences leading to increased fluctuations and disorder in the systems behaviour (critical fluctuations) and an increased return time to the existing state after perturbation (critical slowing down)7,10. Destabilization ends when the system makes an order transition towards a new stable state11. Critical fluctuations and critical slowing down can therefore serve as early-warning signals (EWS) for order transitions9,24.

Past research shows that destabilization periods with increased fluctuations and disorder, as coded from observational data of psychotherapeutic processes, are related to more positive treatment outcome in patients with depression2 and aggression problems25. Additionally, indicators for critical fluctuations in experience sampling (ES) data have been linked to more positive treatment outcome in patients with obsessive-compulsive disorder14,26. In a study by van de Leemput and colleagues, indicators for critical slowing in ES data during a baseline period of 5 or 6 days have been related to differences in follow-up course of symptom scores for both patients with mood disorders and the general population12. While these studies support the hypothesis that abrupt clinical change takes place via destabilization and order transitions, there are, except for case studies27–29, no studies that link EWS to specific clinical order transitions in ES data.

Therefore, the present study tests critical fluctuations as an EWS for sudden gains and losses as specific clinical order transitions in patients receiving psychotherapy for mood disorders. Specifically, we hypothesize sudden gains and losses in daily self-ratings of impairment by symptoms and problems to be preceded by a temporal increase in dynamic complexity31, a measure for critical fluctuations, of daily ES data about the therapeutic progress. In order to test a ‘proof of principle’ for the possible real-time predictive value of EWS we 1) measure EWS over the whole time-span of the study repeatedly within individuals30 2) link the EWS to specific future events (sudden gains and losses) within a reasonably small time period11 3) take into account that EWS should only temporarily increase close to the order transition and be at a lower baseline level far from the transition10,11. Since destabilization is characterized by an increased sensitivity to external influences, EWS indicative for destabilization can be useful for clinical practice, as they signal sensitive periods in which treatment efforts are more effective.32,33.