Efficacy of Acceptance and Commitment Therapy in Daily Life (ACT-DL) in early psychosis:

Results from the multi-center INTERACT randomized controlled trial

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Key Points

Question

Can Acceptance and Commitment Therapy (ACT) in Daily Life, a combined face-to-face ACT intervention with a digital daily life Ecological Momentary Intervention, reduce psychotic distress in the early stages of psychosis?

Findings

This randomized clinical trial of 148 individuals in the early stages of psychosis (UHR or FEP) found no evidence that ACT-DL improved psychotic distress at post-intervention, 6 or 12-month follow-up over and above treatment as usual. However, significant effects were found for momentary psychotic distress, negative symptoms and functioning.

Meaning

Whereas the blended care approach of face-to-face ACT with the ACT-DL EMI did not improve psychotic distress over and above treatment as usual, it provided a promising avenue for the treatment of momentary psychotic distress as well as for negative symptoms and improving functioning, some of the hardest to treat problems in individuals with UHR and FEP.

Abstract

Importance

Treatment in the early stages of psychosis is crucial to prevent poor clinical and social outcomes.

Currently, no preventive interventions are available that reduce psychotic distress, or affective and negative symptoms as well as functioning, calling for more and dedicated treatments for these.

Objective

To investigate the efficacy of Acceptance and Commitment Therapy in Daily Life (ACT-DL), combining face-to-face therapy with an Ecological Momentary Intervention (EMI), in addition to treatment as usual for psychotic distress, in comparison to treatment as usual only.

Design

This single-blinded randomized clinical INTERACT trial investigated participants post-intervention and at 6 and 12-month follow-up. Participants were recruited between June 1, 2015 and December 31, 2018. Assessors were blinded to treatment allocation.

Setting

INTERACT is a multi-center trial recruiting participants from secondary mental health services in 5 regions in Belgium and The Netherlands.

Participants

The sample was a referral sample of individuals aged 15-65 years with a clinically established UHR or FEP status.

Interventions

Individuals were randomly assigned (1:1) to ACT-DL, consisting of 8 ACT sessions augmented with an EMI app in addition to treatment as usual, or to treatment as usual only.

Main outcomes and measures

The primary outcome was a reduction in psychotic distress as assessed with CAARMS at post-intervention, 6- and 12-month follow-up. Secondary outcomes included symptom severity (measured with BPRS and BNNS), functioning (measured with SOFAS and SFS) and momentary psychotic distress (measured with the Experience Sampling Method, a structured diary technique). All analyses were described in the trial protocol and in a postregistration on the open-science framework, prior to accessing the data.

Results

Of the 196 individuals assessed for eligibility, 148 were randomized to ACT-DL+TAU (n=71) or TAU (n=77) (72 female (49%), average age 25 (SD = 6), 71 FEP (48%)). 115 (78%) provided primary outcome data at least at one follow-up assessment. There was no evidence of a greater reduction in CAARMS distress in ACT-DL+TAU compared to TAU ($\chi^2(3)=2.38$; $p=.50$). However, general psychopathology ($\chi^2(3)=14.44$; $p=.002$); affective ($\chi^2(3)=8.55$; $p=.04$) and negative symptom severity ($\chi^2(3)=19.96$; $p<.001$) as measured with the BPRS was reduced, as well as negative symptoms as assessed with BNNS ($\chi^2(3)=15.96$; $p=.001$) in. Furthermore, global functioning improved ($\chi^2(3)=8.72$; $p=.033$) in ACT-DL+TAU compared to TAU, whereas social functioning failed to reach significance ($\chi^2(3)=7.41$; $p=.060$). Finally, a clear and significant reduction was found in momentary psychotic distress ($\chi^2(3)=21.56$; $p<0.001$), whereas no effects were found for momentary psychotic experiences ($\chi^2(3)=1.02$; $p=.599$), momentary positive ($\chi^2(3)=4.17$; $p=.124$) or negative ($\chi^2(3)=2.78$; $p=.249$) affect. No serious adverse events directly related to the therapy occurred.

Conclusions and relevance

INTERACT did not support a significant effect on psychotic distress as assessed with the CAARMS. However, significant improvements were found for momentary psychotic distress, global functioning and negative symptomatology. These results are promising given that these latter problems are among the hardest to treat.

Trial Registration

Dutch Trial Register: NTR4252

Introduction

Treatment in the early stages of psychosis, including both Ultra-High-Risk (UHR) and First-Episode Psychosis (FEP)¹⁻⁵, is crucial to prevent transition to more severe stages of illness. While most studies have targeted transition to psychotic disorder or reduction of positive symptoms as their main outcome, distress associated with psychotic symptoms has been identified as a major driver of illness⁶. Also, when investigated at a momentary level using Experience Sampling Methodology (ESM), psychotic distress is prominently present in the early stages of psychosis⁷⁻⁹. Furthermore, treatment should target a wider range of symptoms including negative and affective symptoms, while also improving global and social functioning¹⁰.

A comprehensive meta-analysis of preventive interventions for individuals at ultra-high risk for psychosis found no effects of either psychological or pharmacological interventions on psychotic distress, nor on affective symptoms, negative symptoms and functioning¹¹, calling for more and dedicated treatments for these. Acceptance and Commitment Therapy (ACT), a next-generation Cognitive Behavioral Therapy aimed at enhancing individuals' psychological flexibility, may help patients to handle distress¹². While ACT components targeting acceptance are likely to be effective in attenuating distress, ACT components targeting commitment may enhance reward-related motivated action. There is good evidence on the feasibility and acceptability of ACT in people with psychosis^{13,14}. However, meta-analytic evidence on a small number of studies found limited effects in individuals with an established psychotic disorder¹⁵. We therefore developed ACT in Daily Life (ACT-DL) for enhancing the therapeutic effects of ACT under real-world conditions¹⁶⁻¹⁹. ACT-DL builds on the principles of Ecological Momentary Interventions (EMI)^{17,20}, providing treatment in real-time. While pilot studies provided evidence on acceptability and feasibility of ACT-DL in both a clinical sample of patients with mental health disorders²¹, as well as in emerging adults with subthreshold levels of depression and psychosis²², robust, trial-based evidence on its effects in the early stages of psychosis is lacking.

The aim of the current INTERACT study was to test the efficacy of ACT-DL on reducing psychotic distress (primary outcome) as well as on reducing intensity of psychotic symptoms, general psychopathology and negative symptoms and improving global and social functioning (secondary outcomes) and on improving momentary psychotic distress, psychotic experiences and mood (secondary outcomes measured with the ESM) at post-intervention and 6- and 12-month (for non-ESM outcomes only) follow-ups in patients with UHR and FEP. In an a priori planned subgroup analysis, the effects of ACT-DL on the primary outcome in UHR compared with FEP individuals was investigated. In a more exploratory a priori planned sensitivity analysis, we investigated whether the reduction in psychotic distress is greater for TAU including Cognitive Behaviour Therapy for psychosis (CBTp) compared to TAU as well as for ACT-DL+TAU compared to CBTp+TAU.

Methods

Study design

This multi-center single-blind randomized controlled trial (Dutch Trial Register: NTR4252) tested the efficacy of adding ACT-DL to treatment as usual (TAU) compared to TAU in reducing psychotic distress in individuals with UHR or FEP. The trial was conducted at secondary mental health services in five regions in the Netherlands and Belgium. Recruitment took place between June 1, 2015 and December 31, 2018. The study received ethical approval from the MERC at Maastricht University Medical Centre, the Netherlands (reference: NL46439.068.13) and the University Clinic Leuven, Belgium (reference: B322201629214). The trial protocol is published²³ and the study was postregistered on the open science framework¹ (see eMethods 1). Mediation analyses as well as the investigation of acceptability and treatment adherence described in the protocol will be reported separately. This study followed the Consolidated Standards of Reporting Trials ([CONSORT](#)) reporting guideline.

¹ The current study was postregistered, meaning that we registered our analysis plan after we had collected data, however before we had any access to the data. The main postregistration for the INTERACT study is available here https://osf.io/du2bn/?view_only=ec22ed02651441349e1bb1242cfc712c. The postregistration for the current study is embedded as a file within the main registration and can be accessed here https://osf.io/5qfwe/?view_only=4062ccf54b0d4161a0e481aa80e76e78.

Participants

Individuals were referred to the study by their treating clinician. Inclusion criteria were: age 15-65 years; meeting criteria for UHR (without prior use of antipsychotic medication for psychotic symptoms) or FEP (onset within last 3 years) as assessed by the Comprehensive Assessment of At Risk Mental State (CAARMS)² and Nottingham Onset Schedule²⁴; sufficient command of the Dutch language; and ability to provide written informed consent. Exclusion criteria included a primary diagnosis of alcohol/substance abuse or dependence, assessed with the Mini-International Neuropsychiatric Interview²⁵; and severe endocrine, cardiovascular or brain disease.

Randomization and masking

Participants were randomized (1:1) after baseline assessment through a computer-generated sequence. Block randomization was carried out in blocks of six participants, with stratification for the five regions and for group (UHR and FEP, expecting a 50:50 ratio). Trained research assessors were blind to allocation. Any breaks in blinding were documented and another researcher was allocated to complete assessments.

Interventions

Participants allocated to TAU received standard care delivered according to national service guidelines and protocols by their responsible clinician. Standard mental health care included manualized CBTp at some sites. Individuals in the ACT-DL condition received TAU with the exception of manualized CBTp.

ACT-DL consisted of eight manualized ACT sessions (45-60 minutes), administered face-to-face by a trained clinician and an ACT-DL EMI to apply the learned skills in their daily lives. After a psycho-education session, patients received six ACT sessions based on a modified version of ACT for people with psychosis^{12,13,26-28}, in the final session all six components were integrated. The ACT-DL EMI prompted participants at eight semi-random moments per day for three days after each session (starting from session two), with a brief questionnaire on their current mood, psychotic experiences

and activities, as well as providing an exercise or metaphor of the ACT component covered in the previous session. In addition, participants could do ACT exercises at moments when they were most needed. After completion of the intervention period, participants did no longer have access to the app (see our study protocol²³ and Vaessen et al., 2019¹⁶ for more information). Treatment fidelity was rated based on a random selection of audiotapes of three training sessions per participant (range 0-12.6)²³.

Measurements

Assessments were conducted before randomization ('baseline'), after the 8-week intervention period ('post-intervention'), and after 6-month (all outcomes) and 12-month (all non-ESM outcomes) follow-up.

Outcomes

The primary outcome was psychotic distress assessed with the sum distress score of the CAARMS positive symptom subscales (range 0-100)². Secondary outcomes included global and social functioning assessed with the SOFAS²⁹ and SFS³⁰, and symptom severity assessed with the BPRS³¹ and BNSS³² (see eMethods 2 for reliability measures and additional information on the measures). Other secondary outcomes were measured with the ESM, a structured, time-sampling diary technique^{33,34}, and included momentary psychotic distress, momentary intensity of psychotic experiences, and momentary positive affect and negative affect (see eTable 1). Any serious adverse events were recorded throughout the entire study period.

Statistical analysis

Power simulation in R indicated that a sample size of 150 participants (75 per arm) would have 92% power to detect a medium effect size of $d=0.5$ at (at least) one of the post-intervention and follow-up time points when testing our primary hypothesis at $\alpha=0.05$, while allowing for an expected attrition rate of 31% to follow-up.

Statistical analyses were conducted using Stata (version 14.2) and data were analyzed according to intention-to-treat principles. Multivariate multi-level regression models were fitted for primary and secondary outcomes separately with scores at post-intervention, 6-month and 12-month follow-up as the dependent variable. The independent variables included condition, time, group status (UHR or FEP), region, baseline score (grand-mean centered), a baseline score $\times$ time interaction, and a condition $\times$ time interaction. An omnibus test of no difference between the two conditions was performed at all three time points (Wald-type test with $df=3$ and $\alpha=0.05$). Only if statistically significant, the three time-specific contrasts were examined (each tested at $\alpha=0.05$), precluding the need for adjusting for multiple testing at the level of time-specific contrasts.

In the models with ESM outcomes, momentary psychotic experiences, positive and negative affect were included as dependent variables with the same independent variables as previously described. In the analysis of momentary psychotic distress (defined as the association between momentary psychotic experience and negative affect), negative affect was the dependent variable and momentary psychotic experiences (person-mean centered), a momentary psychotic experiences $\times$ time interaction, a momentary psychotic experiences $\times$ condition interaction, and a momentary psychotic experiences $\times$ time $\times$ condition interaction were added as additional independent variables to the model. For these models, an additional level of nesting was added with multiple ESM observations (level 1) being nested within time points (post-intervention, 6-month follow-up) (level 2) nested within subjects (level 3). We added level-3 random intercepts and slopes for the time points and set the variance-covariance matrix of these effects to unstructured. All models were fitted using restricted maximum likelihood (REML) estimation, allowing for the use of all available data under the assumption that data is missing at random and that all variables associated with missing values (see eTable 2) are included in the model^{35,36}. For the subgroup analyses, see eMethods 3.

Results

Of the 196 individuals assessed for eligibility (fig 1), 148 participants were randomized to ACT-DL+TAU ($n=71$) or to TAU ($n=77$ with $n=27$ receiving CBTp+TAU). Attrition rates for the primary

outcome at post-intervention assessment were 21 (30%) participants in ACT-DL+TAU and 17 (22%) in TAU. Attrition rate was higher than expected at 6-month and 12-month follow-up (see Figure 1).

[Insert Figure 1]

The sample included 77 individuals with UHR and 71 with FEP (see Table 1). The sample was nearly equally divided between men and women, with a slightly larger proportion of women in ACT-DL+TAU compared to TAU. The majority of participants lived with others, were employed or student, and did not obtain higher education. Almost 40% of participants in each condition were from an ethnic minority group.

[Insert Table 1]

The mean fidelity score was 10.7 (SD=1.5; range [6.5-12.5]), demonstrating excellent adherence to the ACT-DL manual. Patients participated on average in 6 (SD 3) out of 8 sessions. Unblinding occurred in 21 (14%) of the participants, 16 in ACT-DL+TAU and 5 in TAU.

Table 2 shows descriptive statistics, adjusted mean differences and standardized β -coefficients indicating magnitude of effects for primary and secondary outcomes. There was no evidence of a greater reduction in CAARMS distress in ACT-DL+TAU compared to TAU. However, ACT-DL+TAU showed greater improvement in global functioning (SOFAS) at post-intervention, 6-month, and 12-month follow-up, but failed to reach statistical significance in social functioning (SFS). Moreover, greater reductions in BPRS symptom scores were found in ACT-DL+TAU for the total and affective symptom scale at 6-month follow-up as well as for the negative symptom scale at 6-month and 12-month follow-up (figure 2). In addition, compared with TAU, ACT-DL+TAU was associated with greater reductions in BNNS negative symptoms at 6-month and 12-month follow-up. There were no significant effects on momentary positive affect, negative affect and psychotic experiences. However, there was strong evidence of greater reductions in momentary distress associated with

psychotic experiences in ACT-DL+TAU compared to TAU. Specifically, this showed that the reduction in the *association* between momentary psychotic experiences and momentary negative affect was greater in ACT-DL+TAU than TAU at both post-intervention and 6-month follow-up.

[Insert Table 2 / Figure 2]

The planned subgroup analysis comparing the between-condition effect in UHR versus FEP individuals yielded no significant results (eTable 3 and Figure 3). Likewise, our exploratory analysis comparing ACT-DL+TAU versus TAU with ACT-DL+TAU versus CBTp+TAU did not reach significance (eTable 4). Finally, serious adverse events did not occur as a result of the therapy.

[Figure 3 here]

Discussion

No effect was found of ACT-DL+TAU compared to TAU on the primary outcome measure of psychotic distress in individuals at the early stages of psychosis. However, substantial improvements in the experimental condition were found for the secondary outcome measures, that is, for momentary psychotic distress, negative symptoms at 6- and 12-month follow-up, evident in two separate measures, as well as for global functioning at post-intervention, 6- and 12-month follow-up.

The lack of significant findings on psychotic distress seems mainly due to the fact that TAU was equally successful as ACT-DL+TAU in reducing psychotic distress over time. This is in line with a recent study showing that distress in UHR individuals tended to sharply decline in the first three months after inclusion in an intervention trial³⁷, irrespective of the intervention arm, indicating that distress in these early phases of illness may be ameliorated by just monitoring and having someone to talk to. This seems supported by the literature, as a recent comprehensive meta-analysis, indeed, found no differential effect of any psychological nor pharmacological intervention on psychotic distress in the early phases of psychosis¹⁰. However, ACT-DL+TAU is associated with larger improvements in

self-reported psychotic distress in daily life compared to TAU, indicating that more fine-grained and self-reported real-life measures may capture more subtle changes in psychotic distress as it unfolds in daily life.

In contrast to the null-finding on the primary outcome, we found a consistently stronger effect of ACT-DL+TAU compared to TAU in the models of negative symptoms and global functioning, particularly after 6 and 12 months. This is an important finding as both negative symptoms and social functioning are considered the hardest to treat. Although some recent meta-analytic evidence showed small effects of cognitive behaviorally informed interventions on negative symptoms^{38,39} and functioning³⁸ in individuals with psychosis, two meta-analyses specifically focusing on youth at clinical high risk for psychosis concluded that, currently, no effective treatments are available for either improving functioning⁴⁰ or ameliorating negative symptoms⁴¹ in the early stages of psychosis. Yet, negative symptoms are considered the most disabling symptoms^{42,43}, being closely associated with lower levels of functioning and higher risk for a more disabling course of illness. Improving both negative symptoms and functioning in these early phases of psychosis is thus very promising for prevention of further deterioration towards severe and recurrent symptoms in later stages of illness.

The finding that ACT-DL+TAU is particularly relevant for improving negative symptoms and global functioning is unexpected, given the current state-of-the-art of ACT therapy in psychosis. One meta-analysis found no effect of acceptance-based interventions on either negative symptoms or functioning⁹ and another study did not find a significant difference between second- (CBT) and third- (ACT) wave interventions on negative symptoms or functioning³⁸. However, there are a number of reasons that may explain this discrepancy. First, this is the largest trial examining ACT for psychosis. Previous studies may have been underpowered to detect significant effects. Second, this study used a 12-month follow-up to examine both the immediate and longer-term effects. In contrast, most previous ACT studies used no or a short-term follow-up¹⁵. Third, this is the first RCT focusing on the early stages of psychosis. Acceptance of distress in these early stages may have contributed to patients being less experientially avoidant in dealing with overwhelming symptoms, which may explain the effects

on negative symptoms, while ‘committed action’ may have been particularly instrumental in improving functioning. Fourth, the current study used a blended care intervention, combining face-to-face ACT therapy with the ACT-DL EMI. Although the current study did not evaluate added benefit of ACT-DL over ACT only, the findings of continuous improvement of both functioning and negative symptoms over time may indicate the added value of the EMI component. Indeed, whereas long-term effects of psychological interventions tend to either stay the same⁴⁴ or decline over time⁴⁵, a previous EMI in individuals with depression showed a similar pattern of continuous increase in effect up to 24 weeks post-intervention⁴⁶. This might be explained by the fact that EMIs are particularly tuned to applying skills in everyday situations and, thus, towards developing new habits that will increasingly have an effect over time¹⁷. Further research is needed to demonstrate and disentangle the effects of ACT versus ACT-DL in this population, as well as to identify the contributing components to the long-term effectiveness on negative symptoms and functioning.

The strengths of the current study are the sample size, the use of an active control condition in a subset of participants (including both TAU and structured CBTp), the rigorous trial approach and open science practices (with the study protocol published and the detailed postregistration of the analysis plan), the use of a blended care intervention and the wide scope of primary and secondary outcomes, measured, in part, using ESM. The results of this study also need to be interpreted in light of a number of limitations. First, the control condition consists of both non-manualized TAU and TAU including manualized CBTp. Therefore, we did not control for the effect of receiving structured psychotherapy *per se* in all participants allocated to TAU. However, TAU in the different centers usually included some form of psychotherapy. Second, the sample included both FEP and UHR individuals. Although both groups represent the early stages of psychosis and are considered temporally and phenomenologically continuous, they do present different stages of illness according to the staging model of psychosis. Indeed, most early intervention studies focus particularly on the UHR group. We randomized the groups stratified by UHR versus FEP, making sure that both groups were equally distributed over treatment conditions. Furthermore, the planned subgroup analysis showed no differences between UHR and FEP. Third, whereas use of antipsychotic medication was an exclusion

criterion for UHR, most of the FEP were prescribed antipsychotics. We documented this in the sample characteristics. Furthermore, over the course of treatment (including the 6- and 12-month follow-up) individuals could naturally be prescribed antipsychotic medication if clinically indicated, but given the randomization this factor was, as other potential confounders, balanced across conditions. Fourth, ACT-DL included both a face-to-face and an EMI intervention. However, based on this trial, we cannot disentangle the working components.

To conclude, the blended care approach of face-to-face ACT with the ACT-DL EMI provides a promising avenue for the treatment of momentary psychotic distress and negative symptoms while also improving functioning, in individuals with UHR and FEP. This is an important finding as effective treatment at the early stages of both of these problems, may prevent deterioration to more severe stages of illness.

Contributors

Inez Myin-Germeys: Conceptualization, Methodology, Writing – Original Draft (introduction and discussion), Writing – Review & Editing, Visualization, Supervision, Project administration, Funding acquisition. **Evelyne van Aubel:** Conceptualization, Methodology, Software, Formal analysis, Investigation (recruitment and assessment), Data curation, Writing – Original draft (method section and results), Writing – Review & Editing, Visualization. **Ginette Lafit:** Software, Formal analysis, Writing – Review & Editing. **Wolfgang Viechtbauer:** Methodology, Software, Writing – Review & Editing. **Thomas Vaessen:** Conceptualization, Methodology, Investigation (recruitment and assessment), Writing – Review & Editing. **Henrietta Steinhart:** Conceptualization, Methodology, Investigation (recruitment and assessment), Writing – Review & Editing. **Annelie Klippel:** Conceptualization, Methodology, Investigation (recruitment and assessment), Writing – Review & Editing. **Tim Batink:** Resources (supervision to trial therapists). **Ruud van Winkel:** Investigation (recruitment), Writing – Review & Editing. **Mark van der Gaag:** Conceptualization, Investigation (recruitment), Writing – Review & Editing. **Therese van Amelsvoort:** Investigation (recruitment), Writing – Review & Editing. **Machteld Marcelis:** Investigation (recruitment), Writing – Review &

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Declaration of interest

We declare no competing interests.

Data sharing

Deidentified data are available upon request through a data access system, ‘Data cuRation for Open Science’ (DROPS), administered via REDCap at the Center for Contextual Psychiatry, KU Leuven. Interested researchers can submit an abstract, which is subject to review by the research team to ensure there is no overlap with existing projects. Following abstract approval, a variable access request is submitted and researchers are required to postregister their analysis plan. A dataset containing only variables required for the proposed analysis is then released to the researchers by a data manager, along with a time- and date-stamped receipt of data access.

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References

1. Fusar-Poli P, Borgwardt S, Bechdolf A, et al. The psychosis high-risk state: a comprehensive state-of-the-art review. *JAMA psychiatry*. 2013;70(1):107-120.
doi:10.1001/jamapsychiatry.2013.269
2. Yung AR, Yuen HP, McGorry PD, et al. Mapping the onset of psychosis: The comprehensive assessment of at-risk mental states. *Aust N Z J Psychiatry*. 2005;39:964-971.
doi:10.1080/j.1440-1614.2005.01714.x
3. Linscott RJ, Van Os J. An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: on the pathway from proneness to persistence to dimensional expression across mental disorders. *Psychol Med*. 2013;43:1133-1149. doi:10.1017/S0033291712001626
4. Van Os J, Linscott RJ. Introduction: The extended psychosis phenotype - Relationship with schizophrenia and with ultrahigh risk status for psychosis. *Schizophr Bull*. 2012;38(2):227-230.
doi:10.1093/schbul/sbr188
5. Van Os J, Reininghaus U. Psychosis as a transdiagnostic and extended phenotype in the general population. *World Psychiatry*. 2016;15(2):118-124. doi:10.1002/wps.20310
6. Baumeister D, Sedgwick O, Howes O, Peters E. Auditory verbal hallucinations and continuum models of psychosis: A systematic review of the healthy voice-hearer literature. *Clin Psychol Rev*. 2017;51:125-141. doi:10.1016/j.cpr.2016.10.010
7. van der Steen Y, Gimpel-Drees J, Lataster T, et al. Clinical high risk for psychosis: the

- association between momentary stress, affective and psychotic symptoms. *Acta Psychiatr Scand.* 2017;136(1):63-73. doi:10.1111/acps.12714
8. Reininghaus U, Kempton MJ, Valmaggia L, et al. Stress sensitivity, aberrant salience, and threat anticipation in early psychosis: An experience sampling study. *Schizophr Bull.* 2016;42(3):712-722. doi:10.1093/schbul/sbv190
9. Klippel A, Myin-Germeys I, Chavez-Baldini UY, et al. Modeling the Interplay Between Psychological Processes and Adverse, Stressful Contexts and Experiences in Pathways to Psychosis: An Experience Sampling Study. *Schizophr Bull.* 2017;43(2):302-315. doi:10.1093/schbul/sbw185
10. van der Gaag M, van den Berg D, Ising H. CBT in the prevention of psychosis and other severe mental disorders in patients with an at risk mental state: A review and proposed next steps. *Schizophr Res.* 2019;203:88-93. doi:10.1016/j.schres.2017.08.018
11. Mei C, van der Gaag M, Nelson B, et al. Preventive interventions for individuals at ultra high risk for psychosis: An updated and extended meta-analysis. *Clin Psychol Rev.* 2021. doi:10.1016/j.cpr.2021.102005
12. Hayes SC, Strosahl K, Wilson KG. *Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change.* New York: Guilford Press; 1999.
13. Gaudiano BA, Herbert JD. Acute treatment of inpatients with psychotic symptoms using acceptance and commitment therapy: Pilot results. *Behav Res Ther.* 2006;44:415-437. doi:10.1016/j.brat.2005.02.007
14. Johns LC, Oliver JE, Khondoker M, et al. The feasibility and acceptability of a brief acceptance and commitment therapy (ACT) group intervention for people with psychosis: The ‘ACT for life’ study. *J Behav Ther Exp Psychiatry.* 2016;50:257-263. doi:10.1016/j.jbtep.2015.10.001
15. Jansen JE, Gleeson J, Bendall S, Rice S, Alvarez-Jimenez M. Acceptance- and mindfulness-based interventions for persons with psychosis: A systematic review and meta-analysis. *Schizophr Res.* 2020;215:25-37. doi:10.1016/j.schres.2019.11.016
16. Vaessen T, Steinhart H, Batink T, et al. ACT in daily life in early psychosis: An ecological

- momentary intervention approach. *Psychosis*. 2019;11(2):93-104.
doi:10.1080/17522439.2019.1578401
17. Myin-Germeys I, Klippel A, Steinhart H, Reininghaus U. Ecological momentary interventions in psychiatry. *Curr Opin Psychiatry*. 2016;29(4):258-263.
doi:10.1097/YCO.0000000000000255
18. Reininghaus U, Depp CA, Myin-Germeys I. Ecological interventionist causal models in psychosis: Targeting psychological mechanisms in daily life. *Schizophr Bull*. 2016;42(2):264-269. doi:10.1093/schbul/sbv193
19. Steinhart H, Myin-Germeys I, Reininghaus U. The development of ecological momentary interventions. In: Palmier-Claus JE, Haddock G, Varese F, eds. *Experience Sampling in Mental Health Research*. London: Routledge; 2019:81-106.
20. Heron KE, Smyth JM. Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *Br J Health Psychol*. 2010;15(1):1-39.
doi:10.1348/135910709X466063
21. Batink T, Bakker J, Vaessen T, et al. Acceptance and commitment therapy in daily life training: A feasibility study of an mhealth intervention. *JMIR mHealth uHealth*. 2016;4(3):e103. doi:10.2196/mhealth.5437
22. van Aubel E, Bakker JM, Batink T, et al. Blended care in the treatment of subthreshold symptoms of depression and psychosis in emerging adults: A randomised controlled trial of Acceptance and Commitment Therapy in Daily-Life (ACT-DL). *Behav Res Ther*. 2020;128:103592. doi:10.1016/j.brat.2020.103592
23. Reininghaus U, Klippel A, Steinhart H, et al. Efficacy of Acceptance and Commitment Therapy in Daily Life (ACT-DL) in early psychosis: Study protocol for a multi-centre randomized controlled trial. *Trials*. 2019;20(769):1-12. doi:10.1186/s13063-019-3912-4
24. Singh SP, Cooper JE, Fisher HL, et al. Determining the chronology and components of psychosis onset: The Nottingham Onset Schedule (NOS). *Schizophr Res*. 2005;80(1):117-130.
doi:10.1016/j.schres.2005.04.018
25. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric

- Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J Clin Psychiatry*. 1998;59(suppl 20):22-33.
26. Bach P. ACT with the seriously mentally ill. In: Hayes SC, Strosahl K, eds. *A Practical Guide to Acceptance and Commitment Therapy*. New York: Springer; 2005:185-208.
 27. Bach P, Hayes SC. The use of acceptance and commitment therapy to prevent the rehospitalization of psychotic patients: A randomized controlled trial. *J Consult Clin Psychol*. 2002;70(5):1129-1139. doi:10.1037/0022-006X.70.5.1129
 28. Jansen G, Batink T. *Time to ACT!: Het Basisboek Voor Professionals*. 1st ed. Zaltbommel: Thema; 2014.
 29. Goldman HH, Skodol AE, Lave TR. Revising axis V for DSM-IV: A review of measures of social functioning. *Am J Psychiatry*. 1992;149(9):1148-1156. doi:10.1176/ajp.149.9.1148
 30. Birchwood M, Smith J, Cochrane R, Wetton S, Copestake S. The Social Functioning Scale. The development and validation of a new scale of social adjustment for use in family intervention programmes with schizophrenic patients. *Br J Psychiatry*. 1990;157(DEC.):853-859. doi:10.1192/bjp.157.6.853
 31. Ventura J, Lukoff D, Nuechterlein KH. Brief Psychiatric Rating Scale (BPRS) Expanded Version (4.0): scales, anchor points and administration manual. *Int J Methods Psychiatr Res*. 1993;3:227-244.
 32. Kirkpatrick B, Strauss GP, Nguyen L, et al. The brief negative symptom scale: Psychometric properties. *Schizophr Bull*. 2011;37(2):300-305. doi:10.1093/schbul/sbq059
 33. Csikszentmihalyi M, Larson R. Validity and reliability of the experience-sampling method. *J Nerv Ment Dis*. 1987;175(9):526-536.
 34. Myin-Germeys I, Kasanova Z, Vaessen T, et al. Experience sampling methodology in mental health research: New insights and technical developments. *World Psychiatry*. 2018;17(2):123-132. doi:10.1002/wps.20513
 35. Little RJ, Rubin DB. *Statistical Analysis with Missing Data (Vol. 793)*. John Wiley & Sons, Ltd; 2019.
 36. Mallinckrodt CH, Clark WS, David SR. Accounting for dropout bias using mixed-effects

- models. *J Biopharm Stat.* 2001;11(1-2):9-21. doi:10.1081/BIP-100104194
37. Wilson RS, Shryane N, Yung AR, Morrison AP. Distress related to psychotic symptoms in individuals at high risk of psychosis. *Schizophr Res.* 2020;215:66-73. doi:10.1016/j.schres.2019.11.027
38. Wood L, Williams C, Billings J, Johnson S. A systematic review and meta-analysis of cognitive behavioural informed psychological interventions for psychiatric inpatients with psychosis. *Schizophr Res.* 2020;222:133-144. doi:10.1016/j.schres.2020.03.041
39. Sitko K, Bewick BM, Owens D, Masterson C. Meta-analysis and meta-regression of Cognitive Behavioural Therapy for Psychosis (CBTp) across time: The effectiveness of CBTp has improved for delusions. 2020. doi:<https://doi.org/10.1080/00498254.2020.1737890>
40. Devoe DJ, Farris MS, Townes P, Addington J. Attenuated psychotic symptom interventions in youth at risk of psychosis: A systematic review and meta-analysis. *Early Interv Psychiatry.* 2019;13:3-17. doi:10.1111/eip.12677
41. Devoe DJ, Braun A, Seredynski T, Addington J. Negative symptoms and functioning in youth at risk of psychosis: A systematic review and meta-analysis. *Harv Rev Psychiatry.* 2020;28(6):341-355. doi:10.1097/HRP.0000000000000273
42. Correll CU, Schooler NR. Negative symptoms in schizophrenia: A review and clinical guide for recognition, assessment, and treatment. *Neuropsychiatr Dis Treat.* 2020;16:519-534. doi:10.2147/NDT.S225643
43. Veerman SRT, Schulte PFJ, de Haan L. Treatment for Negative Symptoms in Schizophrenia: A Comprehensive Review. *Drugs.* 2017;77(13):1423-1459. doi:10.1007/s40265-017-0789-y
44. Peters E, Crombie T, Agbedjro D, et al. The long-term effectiveness of cognitive behavior therapy for psychosis within a routine psychological therapies service. *Front Psychol.* 2015;6:Article 1658. doi:10.3389/fpsyg.2015.01658
45. van der Gaag M, Nieman DH, Rietdijk J, et al. Cognitive behavioral therapy for subjects at ultrahigh risk for developing psychosis: A randomized controlled clinical trial. *Schizophr Bull.* 2012;38(6):1180-1188. doi:10.1093/schbul/sbs105
46. Kramer I, Simons CJP, Hartmann JA, et al. A therapeutic application of the experience

sampling method in the treatment of depression: A randomized controlled trial. *World*

Psychiatry. 2014;13(1):68-77. doi:10.1002/wps.20090

Tables

Table 1: Baseline demographic and clinical characteristics of the intention-to-treat population.

Characteristic	Total (n=148)			TAU only (n=77)			ACT-DL + TAU (n=71)		
Age, mean (SD), range	25 (6) 15-47			24 (6) 15-43			26 (6) 16-47		
Female, No. (%)	72 (49%)			30 (39%)			42% (59%)		
Living alone, No. (%)	25 (17%)			12 (16%)			13 (18%)		
Employment status, No. (%)									
Employed (full-time or part-time)	36 (25%)			18 (24%)			18 (26%)		
Unemployed ((non-)structured)	62 (42%)			36 (47%)			26 (37%)		
Student	36 (25%)			17 (22%)			19 (27%)		
Other	12 (8%)			5 (7%)			7 (10%)		
Higher education	50 (34%)			23 (30%)			27 (39%)		
Ethnic minority	56 (38%)			30 (39%)			26 (37%)		
Medication use ^a , No. (%) ^b									
Antidepressants	29 (20%)	20 (26%)	9 (13%)	18 (23%)	15 (36%)	3 (9%)	11 (16%)	5 (15%)	6 (17%)
Sleep medication	15 (10%)	4 (5%)	11 (15%)	7 (9%)	2 (5%)	5 (14%)	8 (11%)	2 (6%)	6 (17%)
Anxiolytics	28 (19%)	6 (8%)	22 (31%)	10 (13%)	3 (7%)	7 (20%)	18 (26%)	3 (9%)	15 (42%)
Antipsychotics ^c	66 (45%)	3 (4%)	63 (89%)	34 (44%)	3 (7%)	31 (89%)	32 (46%)	0 (0%)	32 (89%)
Other psychotropic medication	7 (5%)	3 (4%)	4 (6%)	4 (5%)	2 (5%)	2 (6%)	3 (4%)	1 (3%)	2 (6%)
FEP ^d , No. (%)	71 (48%)			35 (45%)			36 (51%)		

Abbreviations: FEP = First Episode of Psychosis.

^a Data for all participants, UHR and FEP participants separately.

^b Individuals could be prescribed multiple psychotropic medications.

^c Antipsychotics for UHR individuals were prescribed at dosages too low to function as an antipsychotic agent.

^d FEP versus Ultra High Risk for psychosis (UHR).

Table 2: Primary and secondary outcomes at baseline, post-intervention, 6-month and 12-month follow-up.

		TAU only ^a	ACT-DL + TAU ^a	Adjusted mean differences at follow-up time points ^b					Omnibus test ^c		
Outcome	Time	Mean (SD), N	Mean (SD), N	Mean (SE)	95% CI	Stand. Mean (SE) ^d	95% CI	P value	$\chi^2(3)$	P value	N
CAARMS	Base	201.25 (83.92), 75	205.57 (82.84), 70								
	Post	89 (86.51), 58	76.08 (79.51), 50	-6.45 (14.09)	-34.06 to 21.16	-0.08 (0.18)	-0.42 to 0.26	.65	2.38	.45	115
	FU6	68.95 (81.14), 42	77.68 (76.23), 41	9.74 (15.98)	-21.58 to 41.07	0.12 (0.20)	-0.27 to 0.51	.54			
	FU12	76.59 (80.06), 41	64.34 (78.57), 41	-11.41 (17.84)	-46.37 to 23.55	-0.14 (0.22)	-0.58 to 0.30	.52			
SFS	Base	107.99 (9.45), 74	109.21 (8.05), 68								
	Post	109.33 (8.40), 56	112.08 (8.08), 48	2.79 (1.19)	0.46 to 5.12	0.31 (0.13)	0.05 to 0.57	.02	7.41	.06	112
	FU6	109.63 (9.09), 38	112.66 (9.37), 36	3.61 (1.54)	0.59 to 6.63	0.40 (0.17)	0.07 to 0.73	.02			
	FU12	110.58 (9.27), 36	114.88 (9.85), 39	2.07 (1.73)	-1.32 to 5.47;	0.23 (0.19)	-0.15 to 0.60	.23			
SOFAS	Base	39.70 (10.56), 77	38.44 (10.20), 71								
	Post	50.92 (12.75), 60	53.88 (10.84), 50	4.92 (2.15)	0.69 to 9.14	0.40 (0.17)	0.06 to 0.73	.02	8.72	.03	118
	FU6	52.17 (14.15), 42	58.15 (10.33), 41	5.88 (2.40)	1.17 to 10.60	0.47 (0.19)	0.09 to 0.85	.01			
	FU12	53.45 (13.79), 42	59.63 (10.32), 41	5.94 (2.38)	1.28 to 10.61	0.48 (0.19)	0.10 to 0.85	.01			
BPRS total	Base	42.01 (8.92), 77	39.47 (7.73), 71								
	Post	37.62 (8.95), 61	36.97 (9.06), 50	0.53 (1.42)	-2.25 to 3.31	0.06 (0.16)	-0.25 to 0.36	.71	14.44	.002	119
	FU6	39.23 (8.07), 42	33.80 (7.28), 40	-5.40 (1.61)	-8.55 to -2.25	-0.59 (0.18)	-0.94 to -0.25	.001			
	FU12	37.84 (11.15), 41	34.92 (9.13), 42	-3.06 (2.22)	-7.41 to 1.28	-0.34 (0.24)	-0.81 to 0.14	.17			
BPRS affective	Base	13.30 (4.71), 77	12.55 (4.44), 71								
	Post	11.26 (4.86), 61	10.41 (4.57), 50	-0.67 (0.78)	-2.19 to 0.86	-0.15 (0.17)	-0.49 to 0.19	.39	8.55	.04	119
	FU6	11.52 (4.98), 42	9.55 (3.59), 40	-2.35 (0.82)	-3.95 to -0.75	-0.53 (0.18)	-0.89 to -0.17	.004			
	FU12	10.80 (4.65), 41	9.60 (3.31), 42	-1.28 (0.89)	-3.02 to 0.46	-0.29 (0.20)	-0.68 to 0.10	.15			
BPRS activation	Base	9.85 (3.30), 77	9.13 (2.19), 71								
	Post	8.75 (2.72), 61	9.14 (2.52), 49	0.84 (0.44)	-0.03 to 1.70	0.29 (0.15)	-0.01 to 0.59	.06	4.90	.18	118
	FU6	9.43 (3.29), 42	8.62 (1.84), 39	-0.48 (0.53)	-1.53 to 0.56	-0.17 (0.18)	-0.53 to 0.19	.36			
	FU12	10.00 (3.83), 41	9.85 (2.89), 39	-0.10 (0.79)	-1.65 to 1.45	-0.04 (0.27)	-0.57 to 0.50	.90			
BPRS positive	Base	10.2 (3.49), 77	9.34 (3.32), 71								
	Post	9.29 (2.93), 60	9.18 (4.02), 50	0.26 (0.56)	-0.84 to 1.37	0.07 (0.16)	-0.23 to 0.38	.64	0.81	.85	118
	FU6	8.81 (3.66), 42	8.33 (3.40), 40	-0.19 (0.64)	-1.44 to 1.07	-0.05 (0.18)	-0.40 to 0.30	.77			
	FU12	9.24 (3.67), 41	9.12 (4.14), 42	0.03 (0.78)	-1.49 to 1.55	0.01 (0.22)	-0.41 to 0.43	.97			

Table 2 (continued): Primary and secondary outcomes at baseline, post-intervention, 6-month and 12-month follow-up.

Outcome	Time	TAU only ^a	ACT-DL + TAU ^a	Adjusted mean differences at follow-up time points ^b					Omnibus test ^c		
		Mean (SD), N	Mean (SD), N	Mean (SE)	95% CI	Stand. Mean (SE) ^d	95% CI	P value	$\chi^2(3)$	P value	N
BPRS negative	Base	8.65 (3.00), 77	8.45 (2.68), 71								
	Post	8.46 (3.31), 61	8.42 (2.89), 50	-0.05 (0.44)	-0.91 to 0.81	-0.02 (0.15)	-0.30 to 0.27	.91	19.96	<.001	119
	FU6	9.48 (2.87), 42	7.72 (2.48), 39	-1.67 (0.57)	-2.76 to -0.58	-0.56 (0.19)	-0.92 to -0.19	.003			
	FU12	9.47 (3.66), 39	7.22 (1.72), 41	-2.46 (0.62)	-3.67 to -1.25	-0.82 (0.21)	-1.22 to -0.42	.000			
BNSS	Base	22.21 (12.96), 76	17.30 (11.93), 71								
	Post	17.14 (14.37), 61	15.68 (13.65), 50	0.12 (1.86)	-3.42 to 3.75	0.01 (0.14)	-0.26 to 0.28	.95	15.96	0.001	118
	FU6	20.10 (15.43), 42	11.00 (9.11), 41	-8.00 (2.39)	-12.68 to -3.32	-0.59 (0.18)	-0.93 to -0.24	.001			
	FU12	17.05 (14.14), 41	9.56 (11.74), 42	-5.70 (2.50)	-10.60 to -0.79	-0.42 (0.18)	-0.78 to -0.06	.02			
ESM ^e momentary NA~PE ^f	Base	0.66 (0.03), 76	0.76 (0.04), 71								
	Post	0.65 (0.04), 52	0.55 (0.05), 44	-0.13 (0.06)	-0.25 to -0.01	-0.05 (0.02)	-0.09 to -0.00	.03	21.56	<0.001	103
	FU6	0.90 (0.05), 39	0.40 (0.08), 30	-0.33 (0.08)	-0.49 to -0.17	-0.12 (0.03)	-0.18 to -0.06	<.001			
ESM momentary PE	Base	2.18 (0.92), 76	2.11 (0.97), 71								
	Post	1.96 (0.92), 52	1.99 (0.99), 44	0.09 (0.15)	-0.20 to 0.37	0.09 (0.15)	-0.21 to 0.38	0.56	1.02	0.60	103
	FU6	2.08 (0.96), 39	1.64 (1.05), 30	-0.01 (0.20)	-0.40 to 0.37	0.01 (0.20)	-0.41 to 0.38	0.94			
ESM momentary PA	Base	3.80 (0.90), 76	3.93 (1.07), 71								
	Post	4.10 (1.18), 52	4.32 (1.19), 44	0.16 (0.18)	-0.20 to 0.52	0.12 (0.14)	-0.15 to 0.39	0.40	4.17	0.12	103
	FU6	4.05 (0.98), 39	4.40 (1.39), 30	-0.17 (0.18)	-0.52 to 0.19	-0.12 (0.14)	-0.39 to 0.14	0.36			
ESM momentary NA	Base	2.64 (1.14), 76	2.46 (1.05), 71								
	Post	2.38 (1.21), 52	2.35 (1.18), 44	0.10 (0.18)	-0.25 to 0.45	0.08 (0.13)	-0.19 to 0.34	0.57	2.78	0.25	103
	FU6	2.58 (1.11), 39	1.83 (1.41), 30	-0.11 (0.20)	-0.51 to 0.29	-0.08 (0.15)	-0.38 to 0.22	0.59			

Abbreviations: CAARMS = Comprehensive Assessment of At Risk Mental State; SFS = Social Functioning Scale; SOFAS = Social and Occupational Functioning Scale;

BPRS = Brief Psychiatric Rating Scale; BNSS = Brief Negative Symptom Scale; ESM = Experience Sampling Method; SD = standard deviation; Stand. = standardized; No. = number; CI = confidence interval.

^a Data are sample mean scores (between-subject SD), number of observations. Number of observations differs from the maximum when participants did not complete the measure.

^b Adjusted mean differences are based on a complete-case ITT analysis.

^c Omnibus test of no differences at all three time points ($\chi^2(df)$ with 3 degrees of freedom, $\alpha=0.05$, number of observations in the analysis).

^d Standardized β -coefficients are based on analyses with standardized outcomes and baseline control variables, indicating the magnitude of effects.

^e Analyses with ESM outcomes were adjusted for SOFAS score at baseline.

^f For momentary psychotic distress, data represent slope coefficients (standard error) expressing the strength of association between momentary negative affect and momentary person-mean centred psychotic experiences.

Figures

Figure 1. Study flowchart

Abbreviations: ACT-DL, Acceptance and Commitment Therapy in Daily Life; TAU, treatment as usual; CBTp, Cognitive Behavioural Therapy for psychosis.

Figure 2. Differences in treatment effects on BPRS negative symptoms (top) and BNSS negative symptoms (bottom) at post-intervention, 6-month and 12-month follow-up.

Figure 3. Differences in treatment effects on CAARMS distress scores in UHR versus FEP individuals at post-intervention, 6-month and 12-month follow-up.