**Measures.**

*Metacognitive Anger Processing scale,* MAP (Moeller, 2016) is a 26-item scale assessing metacognition in relation to anger on a 4-point scale (1 = never true, 2 = sometime true, 3 = often true, 4 = always true). The scale has three subscales: (1) positive beliefs about anger (e.g. ‘anger helps me solve problems’); (2) uncontrollable rumination (e.g. ‘I cannot let go of angry thoughts’); and (3) negative beliefs about anger (e.g. ‘anger could make me go mad’). The MAP has shown satisfactorily psychometric properties regarding factor structure, internal reliability, test-retest reliability and concurrent and convergent validity (Moeller & Bech, 2019).

*Novaco Anger Scale,* NAS (Novaco, 2003): this is a 60-item scale constructed to measure anger disposition. It has a Cognitive, an Arousal, and a Behavioral subscale.

*Stait Trait Anger eXpression Inventory,* STAXI-2 (Spielberger, 1999) is a 57-item scale with six subscales measuring anger Trait Anger (T-Ang), State Anger (S-Ang), Anger Expression: outward expression of anger (AX-O),inward expression of anger (AX-I), and Anger control: Anger Control-In (AC-I) and Anger Control-Out (AC-O),

*Meta Cognitive Questionnaire,* MCQ (Cartwright-Hatton & Wells, 1997) is a 30-item measure used to assess general aspects of metacognition on five subscales: (1) experiences/evaluations of one’s own cognitive function, (2) positive beliefs about worry, (3) experiences/evaluations of one’s own awareness of cognition, (4) beliefs and experiences about danger and uncontrollability, and (5) beliefs about the need to control one’s own cognition.

*Anger Rumination Scale,* ARS (Sukhodolsky, Golub, & Cromwell, 2001) with 19 items measures the tendency to ruminate about anger on four subscales: Angry After-thoughts (6

items); Thoughts of Revenge (4 items); Angry Memories (5 items); and Understanding the Causes (4 items).

*Hospital Anxiety and Depression Scale,* HADS (Zigmond & Snaith, 1983) is a 14-item self-report questionnaire measuring anxiety and depression.

**Statistical analysis.**

Across participants and measures, less than 5% of responses were missing, and no respondent

was missing more than a total of three items. The values for the missing items were replaced

with the series mean for the item.

To test the psychometric validity of the MAP, we used the same approach as in (Moeller & Bech, 2019), comparing the performance of the shortened scale with the full version with 26 items. For scalability, we used the non-parametric Mokken analysis. The Mokken model (Mokken, 2011) is based on the Guttman cumulative rating scale principle (Bech, 2012), stating that scorings on lower prevalence manifest items must be preceded by scorings on high prevalence items. The scalability is evaluated by use of Loevinger’s coefficient of

homogeneity (Bech, 2012). Coefficients of homogeneity from 0.20 to 0.29 belong in a questionable zone as to constitute a cumulative scale, coefficients of 0.30 to 0.39 are acceptable, while a coefficient of 0.40 or higher clearly indicates scalability (Mokken, 2011; Van Schuur, 2011). Regression analyses were used to test concurrent validity.

**Results.**

Table 1 displays the results of the Mokken analysis for the MAP- 26 items original version along with the results for the MAP-SV.

Table 1. Mokken analysis of the MAP and the MAP-SV Total and the subscales of the combined sample, the mixed clinical sample, and the forensic sample.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Scale | Number of items  Original version/short version | *N* | Loevinger  Original version/short version | Alpha |
| Combined samples | | | | |  |
|  | MAP Total | 26/9 | 142 | 0.36/0.29 | 0.792 |
|  | Rum | 9/3 | 142 | 0.57/0.50 | 0.722 |
|  | PB | 8/3 | 142 | 0.57/0.51 | 0.729 |
|  | NB | 9/3 | 142 | 0.44/0.44 | 0.766 |
| Mixed clinical sample | | | | |  |
|  | MAP Total | 26 /9 | 88 | 0.36/0.29 | 0.779 |
|  | Rum | 9/3 | 88 | 0.58/0.51 | 0.662 |
|  | PB | 8/3 | 88 | 0.50/.043 | 0.731 |
|  | NB | 9/3 | 88 | 0.47/0.47 | 0.771 |
| Forensic sample | | | | |  |
|  | MAP Total | 26/9 | 54 | 0.37/0.31 | 0.816 |
|  | Rum | 9/3 | 54 | 0.56/0.51 | 0.794 |
|  | PB | 8/3 | 54 | 0.66/0.59 | 0.721 |
|  | NB | 9/3 | 54 | 0.41/0.40 | 0.751 |

Note. MAP-SV Total = Metacognitive Anger Processing scale, PB = positive beliefs subscale, NB = negative beliefs subscale, Rum = rumination subscale.

Table 2 shows internal consistency correlations and convergent validity.

Table 2. Correlations (Pearson) between the MAP-SV subscales and measures of metacognition and anxiety and depression for male forensic inpatients, N = 54 and mixed clinical patients, N = 88.

|  |  | |  | MAP-SV (*N* = 142) | | | MCQ-30 (*N* = 88) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | |  | Rum | NB | PB | PB | NB | CC | NC | CSC | | MCQ-30  Total |
|  | MAP-SV Total |  | | .839 | .762 | .664 | .092 | .467 | .386 | .376 | .069 | .422 | |
|  |  | Rum | |  |  |  | .070 | .411 | .423 | .231 | .011 | .352 | |
|  |  | NB | | .526 |  |  | .030 | .504 | .324 | .415 | .044 | .397 | |
|  |  | PB | | .382 | .158 |  | .114 | .092 | .102 | .171 | .106 | .178 | |
|  | HADS | Anxiety | | .468 | .327 | .140 |  |  |  |  |  |  | |
|  |  | Depression | | .174 | .169 | -.084 |  |  |  |  |  |  | |

Note. *N* = 142 includes forensic sample and mixed clinical sample. *N* = 88 includes only the mixed clinical sample. MAP = Metacognitive Anger Processing scale. HADS = Hospital Anxiety and Depression Scale, HADS Anxiety = HADS anxiety subscale, HADS Depression = Depression subscale. MCQ-30 = MetaCognitive Questionnaire, PB = positive beliefs subscale, NB = negative beliefs subscale, CC = cognitive confidence subscale, NC = negative beliefs about need to control thoughts CSC = cognitive self-consciousness subscale.

**References**

Bech, P. (2012). *Clinical psychometrics*: John Wiley & Sons.

Cartwright-Hatton, S., & Wells, A. (1997). Beliefs about worry and intrusions: The Meta-Cognitions Questionnaire and its correlates. *Journal of anxiety disorders, 11*(3), 279-296.

Moeller, S. B. (2016). The metacognitive anger processing (MAP) scale: Preliminary testing. *Behavioural and cognitive psychotherapy, 44*(4), 504.

Moeller, S. B., & Bech, P. (2019). The Metacognitive Anger Processing (MAP) Scale–Validation in a Mixed Clinical and a Forensic In-Patient Sample. *Behavioural and cognitive psychotherapy, 47*(1), 67-80.

Mokken, R. J. (2011). *A theory and procedure of scale analysis: With applications in political research* (Vol. 1): Walter de Gruyter.

Novaco, R. W. (2003). *The Novaco anger scale and provocation inventory: NAS-PI*: Western Psychological Services Los Angeles, CA.

Spielberger, C. D. (1999). *Sate-Trait Anger Expression Inventory-2: STAXI-2*: PAR, Psychological Assessment Ressources.

Sukhodolsky, D. G., Golub, A., & Cromwell, E. N. (2001). Development and validation of the anger rumination scale. *Personality and individual differences, 31*(5), 689-700.

Van Schuur, W. H. (2011). *Ordinal item response theory: Mokken scale analysis* (Vol. 169): Sage.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatrica scandinavica, 67*(6), 361-370.