## Original Paper

# The German Translation and Validation of the Scale for the Assessment of Thought, Language and Communication: A Factor Analytic Study

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**Abstract**
The Scale for the Assessment of Thought, Language and Communication (TLC) represents an instrument for the assessment of formal thought disorder (FTD). The factorial dimensionality of the TLC has yielded ambiguous results for a distinction between positive (e.g. circumstantiality) and negative (e.g. poverty of speech) FTD. The purpose of the current study was to first translate and validate the TLC scale in German. Second, the internal structure was explored in order to identify different FTD dimensions. Two hundred and ten participants (146 patients with ICD-10 diagnoses: depression n = 63, schizophrenia n = 63, mania n = 20; 64 healthy subjects) were interviewed and FTD was rated with the TLC. The principal component analysis of the German TLC version revealed a 3-factor solution, reflecting a disorga-
nized factor, an emptiness factor and a linguistic control factor. The current investigation yielded similar results to those originally reported for the TLC. Thus, a distinction between a positive disorganized, a negative and a semantic word level factor can be supported for the German translation.

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## Introduction

From a historical perspective, formal thought disorders (FTD) are described as a core symptom of schizophrenia [1–3]. FTD is a syndrome present in many conditions such as schizophrenia, mood disorders as well as in organic and personality disorders (for a detailed overview, see McKenna and Oh [4]). Moreover, mild aberrations of thought and language are also present in healthy individuals suggesting a continuum of severity of disorganized thought in the population [5, 6].

Different interview-based clinical rating scales for FTD have been introduced [5, 7–10]. The Scale for the Assessment of Thought, Language and Communication (TLC) [10] was the first to operationalize a stock of

common terms and definitions [10] as well as a number of practical examples for each item (see online suppl. material, www.karger.com/doi/10.1159/000345359). Moreover, the TLC covers a wide range of different FTD symptoms, allowing for a detailed rating according to their individual severity. Apart from this, the scale was not only validated for patients with schizophrenia, but also for other psychiatric disorders such as mania and depression. These elaborated descriptions and definitions helped to improve interrater reliability and test-retest reliability of FTD assessments [11]. Subsequent to the introduction of the TLC, a factor analytic study based on the assessment of different psychiatric patient groups and healthy controls suggested the separation of 3 different FTD subtypes, referred to as 'fluent disorganization', 'emptiness' and 'linguistic control' [6]. The latter factor, referred to as the 'linguistic control' syndrome, was mainly characterized by stilted speech and self-reference phenomena.

Peralta et al. [12] further performed a factor analysis on the TLC in 115 patients with schizophrenia recruited from an acute inpatient unit. The authors isolated 7 factors with eigenvalues greater than 1, which they referred to as 'disorganization factor', 'negative factor', 'idiosyncratic factor', 'semantic factor', 'attentional factor', 'referential factor' and 'verbosity factor'. However, the first 2 factors, explaining 34.5% of the total variance, can be regarded as most important. In a similar study, Harvey et al. [11] interviewed 142 inpatients with schizophrenia using the TLC. Their results revealed a 2-factorial solution resulting in a distinction between a 'verbal productivity' and a 'disconnection' model of FTD. Altogether, the majority of factor analytic approaches of the TLC revealed two main clusters explaining most of the TLC variance – one is referred to as 'positive thought disorder' or 'disorganization' factor and the other factor can be conceptualized as a 'negative thought disorder' dimension [13].

Taken together, the practicability and psychometrical reliability and validity [6], the operationalized descriptions and common definitions of clinically relevant FTD symptoms as well as their individual severity ratings [10] made the TLC a valuable instrument in psychiatric research [6, 8, 11, 12, 14–18]. For these reasons, the scale was translated into French [19] and Greek [14]. However, no German translation and validation of the scale was available so far. Thus, the purpose of the current study was to first validate and introduce a German version of Andreasen's TLC scale. Second, a factor analysis of the TLC items was performed to further elucidate the internal structure of the scale. Since FTD is a common symptom not only observed in schizophrenia but also in the majority of other psychiatric disorders, patients with different diagnoses were included.

## Methods

### TLC Instrument

The TLC encompasses 20 different FTD phenomena, which are mostly rated according to their quantitative occurrences during a 50-minute interview. The range of graduation differs between 0 (= absent), 1 (= mild), 2 (= moderate), 3 (= severe) and 4 (= extreme) for the TLC items *poverty of speech, poverty of content of speech, pressure of speech, distractable speech, tangentiality, derailment, incoherence, illogicality, semantic paraphasia* and *clanging*. The items *neologisms, word approximations, circumstantiality, loss of goal, perseveration, echolalia, blocking, stilted speech, self-reference* and *phonemic paraphasia* are rated according to absent (= 0), mild (= 1), moderate (= 2) and severe (= 3) symptom severities.

### Translation and Assessment Procedure

With permission of Nancy Andreasen, a clinical linguist translated the TLC into the German language. The presence of FTD was assessed in the context of a free psychiatric interview (for detailed information, see Andreasen [10]). In the course of the interview, the participant is asked a number of general questions, e.g. topics of everyday life and hobbies. In order to obtain a natural speech pattern, participants were permitted to talk and answer as long as possible. Occasionally, the participant was interrupted to elicit a reaction or verbal response. The duration of the interviews was about 45–60 min, depending on the severity of illness. Further psychopathological symptoms were assessed during the interview using the Scale for the Assessment of Positive Symptoms [20], the Scale for the Assessment of Negative Symptoms [21], the Hamilton Rating Scale for Depression [22] and the Young Rating Scale for Mania [23] in all groups. Subsequent to the interview, the assessor immediately rated the TLC items and all other psychopathological symptoms. All conversations were audiotaped in order to allow for a rejudgment of critical phenomena such as *neologisms* or *paraphasias* subsequent to the interview. All participants gave written informed consent and were paid EUR 10 for the participation in the study. The study was approved by the Local Ethics Committee.

### Raters

All raters (M.S., S.G., C.S., M.F., T.H., M.K.) were clinically trained psychiatrists, familiar with the German translation of the TLC as well as with the general assessment of psychopathological symptoms. In order to achieve a good interrater reliability between the assessors, rater training sessions have been performed prior to the FTD assessments. Therefore, all raters were asked to independently score the TLC items shortly after different patients were jointly interviewed. The raters achieved a good interrater reliability of 0.79 (intraclass correlation coefficient).

### Participants

Patients were recruited and interviewed at the in- and outpatient units of the Department of Psychiatry and Psychotherapy, Philipp University Marburg, at the Department of Forensic Psychiatry, Vitos Hospital Haina, a unit with chronic, long-term pa-

**Table 1.** Sample characteristics

|  | Healthy (n = 64) | Depression (n = 63) | Schizophrenia (n = 63) | Mania (n = 20) |
|---|---|---|---|---|
| Age, years | 39.03±12.79 | 45.84±14.74 | 36.10±12.52 | 45.60±17.26 |
| Education, years | 11.35±1.48 | 10.79±1.65 | 10.19±1.71 | 10.90±1.71 |
| TLC | 0.62±1.21 | 2.70±4.01 | 10.51±10.95 | 15.35±9.20 |
| SAPS | 0.75±1.60 | 5.43±6.51 | 28.16±23.74 | 29.65±15.86 |
| SANS | 2.42±3.32 | 32.22±21.95 | 32.24±18.43 | 9.75±8.88 |
| HAM-D | 1.45±2.49 | 16.29±7.07 | 11.29±7.27 | 5.30±3.05 |
| YMRS | 0.45±0.96 | 2.37±3.18 | 6.41±5.85 | 16.25±5.41 |

Figures are means ± SD. SAPS = Scale for the Assessment of Positive Symptoms; SANS = Scale for the Assessment of Negative Symptoms; HAM-D = Hamilton Rating Scale for Depression; YMRS = Young Rating Scale for Mania.

tients, and at the outpatient unit of the Department of Psychiatry and Psychosomatics, University of Freiburg. The different raters conducted interviews across all diagnoses and including healthy subjects in order to countervail rater-diagnosis effects.

All patients met ICD-10 criteria for depression (n = 63, female = 29/male = 34), schizophrenia (n = 63, female = 18/male = 45) or mania (n = 20, female = 6/male = 14) (table 1). Patients were diagnosed independently by 2 psychiatrists based on a patient and proxy interview. A review of previous in- and outpatient records and a follow-up of the patients' stay on the ward were additionally employed. All patients had been inpatients at some point in time during the course of their illness. Healthy subjects (n = 64, female = 36/male = 28) were recruited via postings in the local newspaper. All patients received antipsychotic medication, antidepressants or mood stabilizers.

*Factor Analysis*
The Statistical Package for Social Sciences (SPSS) Software was applied to perform a principal component analysis with varimax rotation. According to the number of participants (n >200), factor loadings <0.37 are not presented [24], since smaller values cannot be considered significant and should therefore not be selected to define subscales.

**Results**

The items *clanging* and *echolalia* were discarded from the principal component analyses due to the low prevalence (1%). The severity of TLC items was highest for *derailment* (mean = 0.63, SD = 1.01) and *circumstantiality* (mean = 0.61, SD = 0.92), whereas *word approximations* (mean = 0.12, SD = 0.43) and *stilted speech* (mean = 0.09, SD = 0.31) revealed low severity values.

*Factor Analysis*
The principal component analysis was performed for the 18 TLC items (*clanging* and *echolalia* excluded). The inspection of Cattell's scree test yielded a factor solution of 3 components. A Kaiser-Meyer-Olkin test of sphericity revealed a score of 0.921 for sampling adequacy, which indicates distinct and reliable factors.

The eigenvalue for factor 1 was 6.01, for factor 2, it was 4.30 and for factor 3, it was 1.94, respectively. After rotation, the 3 factors explained 68.05% of variance: the first factor explained 33.38%, the second factor 23.87% and the third factor 10.80% (table 2).

Factor 1, the 'disorganization component', comprised *pressure of speech, distractable speech, tangentiality, derailment, incoherence, circumstantiality, loss of goal* and *perseveration* items, whereas the highest factor loadings were found for *derailment*.

The second factor comprised the items *illogicality, neologisms, word approximations* as well as *semantic* and *phonemic paraphasia*. Thus, this factor 2 might be termed 'linguistic control', since changes on the word basis were most characteristic.

The last, 'emptiness factor', consisted of *poverty of speech, poverty of content* and *blocking* phenomena. Here, the highest factor loading was found for the *poverty of speech* item.

*Internal Consistency*
The internal consistency (Cronbach's α) of the 3 subscales yielded acceptable results. The subscale internal consistency ranged between 0.926 for the first factor and 0.607 for the third factor.

The mean sum scores for each group and each factor were compared (ANOVA, table 3). The first factor revealed significant differences between the patient groups; however, the difference found between the healthy subjects and the depression group was not significant.

**Table 2.** Factor structure and internal consistency for the German TLC

| Factor | Factor analysis and internal consistency | | | | |
|---|---|---|---|---|---|
| | items | loading | eigenvalue | variance | Cronbach's α |
| Disorganization | Derailment | 0.879 (0.775) | 6.01 | 33.38% (25.5%) | 0.926 |
| | Loss of goal | 0.856 (0.740) | | | |
| | Circumstantiality | 0.814 (0.501) | | | |
| | Pressure of speech | 0.757 (0.648) | | | |
| | Tangentiality | 0.750 (0.251) | | | |
| | Distractable speech | 0.693 (0.428) | | | |
| | Self-reference | 0.624 (0.269) | | | |
| | Perseveration | 0.612 (0.746) | | | |
| | Incoherence | 0.590 (0.632) | | | |
| | Stilted speech | 0.460 (0.531) | | | |
| Linguistic control | Phonemic paraphasia | 0.882 (n.a.) | 4.30 | 23.87% (8.9%) | 0.842 |
| | Semantic paraphasia | 0.796 (n.a.) | | | |
| | Word approximations | 0.718 (0.358) | | | |
| | Neologisms | 0.707 (−0.353) | | | |
| | Illogicality | 0.552 (0.265) | | | |
| Emptiness | Poverty of speech | 0.711 (0.416) | 1.94 | 10.80% (9.7%) | 0.607 |
| | Blocking | 0.564 (0.102) | | | |
| | Poverty of content | 0.543 (0.609) | | | |

*Clanging* and *echolalia* were not included in the analyses, since these items had a low prevalence (<1%). Items with loadings >37 are presented for the German sample; factor loadings as well as variance data for the English sample of Andreasen and Grove [6] are reported in parentheses. All factor items and their loadings are available upon request.

**Table 3.** Diagnostic distribution of the obtained factor scores

| | Group | | | | F | p |
|---|---|---|---|---|---|---|
| | healthy (n = 64) | depression (n = 63) | schizophrenia (n = 63) | mania (n = 20) | | |
| Factor 1 | 0.37±0.96 | 1.55±3.14 | 7.24±7.63 | 13.25±6.57 | 47.81 | <0.001[a] |
| Factor 2 | 0.08±0.28 | 0.20±0.74 | 1.71±2.80 | 1.95±2.70 | 13.81 | <0.001[b] |
| Factor 3 | 0.16±0.41 | 0.97±1.48 | 1.95±1.98 | 0.50±0.83 | 17.88 | <0.001[c] |

[a] Except for the post hoc comparison between the healthy and depression group; all other group comparisons were significant (p < 0.001).

[b] Except for the post hoc comparison between the healthy and depression group and for the schizophrenia and mania group; all other groups comparisons were significant (p < 0.001).

[c] Patients with depression or schizophrenia had more negative FTD than healthy controls (p = 0.008 and p < 0.001, respectively); patients with schizophrenia had more FTD than patients with depression (p = 0.001); patients with schizophrenia had more FTD than patients with mania (p < 0.001).

With regard to the second factor, post hoc comparisons again revealed no significant differences between the healthy and the depression group. In addition, no significant difference was found between the schizophrenia and the mania group. All other groups significantly differed with respect to factor 2 scores.

The third factor dimension revealed significantly higher scores for patients with depression and schizophrenia as compared to the healthy group. Patients with schizophrenia as opposed to patients with depression also differed significantly. Moreover, patients with schizophrenia revealed significantly higher scores than patients with mania.

## Discussion

The TLC was previously translated and validated for French [19] and Greek [14]. So far, a German version of the scale was not available. For this purpose, a representative validation sample of psychiatric patients with depression, mania and schizophrenia as well as a group of healthy subjects was interviewed using the German translation of the TLC. As found in previous studies, the clinical prevalence of *clanging* and *echolalia* is comparatively low [6, 14], which led to an exclusion of these 2 items from the current principal component analysis.

In general, the factor analysis of the German validation sample revealed high correspondences to previously reported factor solutions. Thus, similar to our study, a 'disorganized syndrome' (factor 1) encompassing *tangentiality, derailment, incoherence, circumstantiality* and *loss of goal* phenomena had previously been found [6, 11, 12, 14]. This dimension of a 'disorganized syndrome' explained a third of the total variance and was best represented by *derailment* and *loss of goal*. The importance of this syndrome refers to the traditional European, phenomenological view represented by Emil Kraepelin [3] and Eugen Bleuler [1]. Although Kraepelin did not explicitly refer to a disorganized syndrome as such, he integrated the 'loosening of thought and the total loss of internal and external connections' (*vollständiger Verlust des inneren und äusseren Zusammenhangs)* (p. 155) in his well-known concept of *Zerfahrenheit* [3]. Similar to this view, Bleuler described 'loosening of associations' *(Assoziationszerreissungen)* (p. 184) as prominent phenomenon [1].

The second factor best resembles what was previously referred to as the 'linguistic control' dimension [6]. Here, the highest factor loadings were found for both items *phonemic* and *semantic paraphasias*. Due to the low prevalence, the majority of studies have not attempted to include these items as originally proposed by Andreasen

[10] in their data analysis. However, the current data revealed moderately frequent *paraphasia* occurrences (*phonemic paraphasia,* 11% of ratings >0; *semantic paraphasia,* 10.5% of ratings >0), which together with *word approximations, neologisms* and *illogicality* phenomena best explained the second factor. Similar to the current results, Andreou et al. [14] reported a pattern consisting of *illogicality, neologisms* and *word approximations*.

The third factor in our sample reflects what might be called the 'emptiness' dimension, since highest factor loadings were found for the TLC item *poverty of speech* as well as for *blocking* phenomena. Together with *poverty of content,* these items can be attributed to the previously discussed dimension of negative thought disorder [13].

In conclusion, a trisyndromic factor solution best explained the variance in the current data set, which supports the view of a multidimensional construct of FTD [5, 6, 12, 16, 17]. However, previous studies investigating the internal structure of the TLC found varying numbers of factors ranging from 2 [11, 18], 3 [6, 14, 15] to 6 [12, 17] factor solutions. These differences may derive from the inclusion of different patient groups and sample sizes, and not from different methodological approaches chosen for the factor analysis. In the current study, a large sample encompassing differences with regard to diagnosis and FTD severity was tested. In healthy subjects, slight psychopathological symptoms, including FTD, were also found.

The German version of the TLC yielded good psychometric results, which makes it a practicable and well-suited instrument for the detailed assessment of FTD across diagnoses. Longitudinal studies are needed to identify the relationship between FTD subsyndromes and prognosis over time [12] and the correlation with neuropsychological dimensions. Further, there is yet no scale to rate subjective symptoms of FTD, which are frequently reported by patients with schizophrenia, in prodromal state, depression and mania.

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