



Measurement invariance between a traditional and a web-based application of the German Anxiety Sensitivity Index-3 and its psychometric quality

Background: Rapid development of IT and the WWW drastically changes research in the social sciences. In the past, personality/psychopathology research and assessment primarily relied on traditional paper-and-pencil questionnaires. Nowadays, more and more of these questionnaires are adapted for application in the WWW. However, one important question is seldom addressed by researchers.

Does my questionnaire really measure the same construct irrespective of the presentation mode of items?

In the work presented here the construct to be measured was Anxiety Sensitivity. Anxiety Sensitivity is an individual difference variable denoting the tendency to fear anxiety-related sensations. Anxiety Sensitivity is believed to amplify states of fear and anxiety (Reiss, 1991) and is currently regarded as one of the most promising cognitive risk factors in any area of psychopathology (Schmidt, 1999). To measure the construct, the English ASI-3 (Taylor et al., 2007) is increasingly used because of its sound psychometric quality. A German translation is going to be published soon with comparable psychometric properties (Kemper, Ziegler, & Taylor, submitted).

Aims

- Establish the psychometric properties of a WWW-based adaptation of the paper-and-pencil version of the German Anxiety Sensitivity Index-3 (Kemper, Ziegler, & Taylor, submitted)
- To determine whether the WWW-version has the same psychometric properties as the paper-and-pencil version by testing invariance of the internal structure and the external relations

Sample Characteristics

	ASI-3 paper-and-pencil	ASI-3 WWW
<i>N</i>	757	2603
Age		
<i>Md (Range)</i>	21 (18 - 60)	23 (16 - 81)
Sex		
female	552 (72.9%)	1785 (68.6%)
Occupation		
student	708 (93.5%)	2294 (88.1%)
employed	40 (5.3%)	193 (7.4%)
other	2 (0.2%)	116 (4.5%)
Nationality		
German	751 (99.2%)	2436 (93.6%)
other	6 (0.8%)	167 (6.4%)

Method:

- ASI-3: 18-item self-report measure; 3-factor hierarchical model
 - Two identical sets of items and instructions
 - Differing modes of presentation: paper-and-pencil vs. WWW

Statistical Analysis

- Test of invariance of the internal structure of the ASI-3 and the relations of subscales to external criteria within a structural equation modeling approach

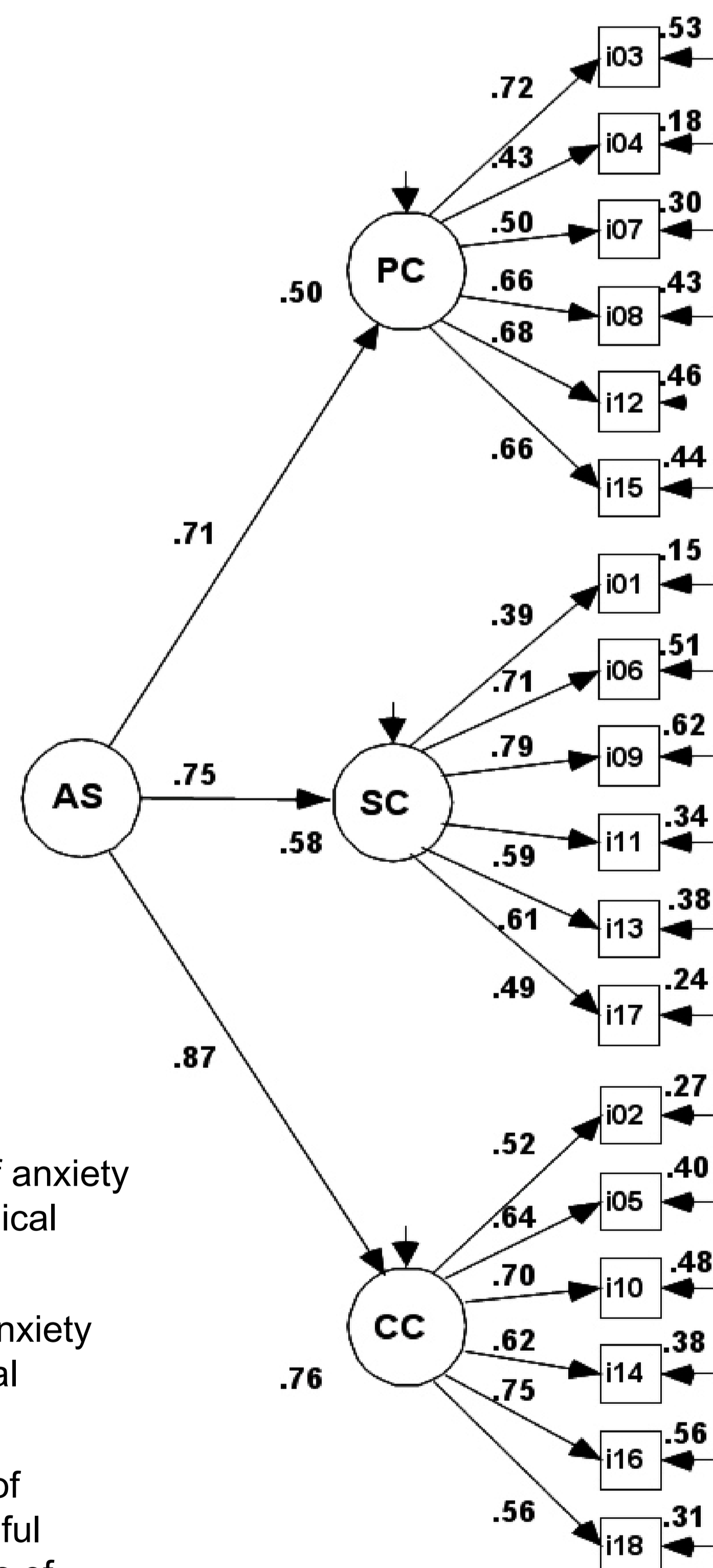
Measures

- ASI-3 (Anxiety Sensitivity Index-3; Kemper, Ziegler, & Taylor, submitted)
- CES-D (Center for Epidemiological Studies-Depression Scale; Hautzinger & Bailer, 1993)
- BSQ (Body Sensations Questionnaire; Ehlers, Margraf, & Chambless, 1993)
- FNE (Fear of Negative Evaluation; Vormbrock & Neuser, 1983)

Results

Testing the Invariance of the Internal Structure – Multigroup Model with Factor Loadings and Residuals Constrained Equal Across Samples

$\chi^2 (df)$: 2058.14 (303)
SRMR: .05
RMSEA: .04
CFI: .91



ASI-3 Subscales

- PC (Physical Concerns):** Fear of anxiety symptoms related to harmful physical consequences (e.g., heart attack)
- SC (Social Concerns):** Fear of anxiety symptoms related to harmful social consequences (e.g., ridicule)
- CC (Cognitive Concerns):** Fear of anxiety symptoms related to harmful cognitive consequences (e.g., loss of control)

Testing the Invariance of the Internal Structure - Goodness-of-fit Statistics for Baseline and Restricted Models

Model	$\chi^2 (df)$	SRMR	RMSEA (90% CI)	CFI
<i>Baseline models</i>				
ASI-3 paper-and-pencil ¹	539.42 (132)	.05	.06 (.058 - .070)	.90
ASI-3 WWW ²	1410.94 (132)	.04	.06 (.058 - .064)	.91
<i>Multigroup models</i>				
unconstrained	1950.45 (264)	.04	.04 (.042 - .045)	.91
equal loadings, manifest	1972.62 (279)	.04	.04 (.041 - .044)	.91
+ equal loadings, latent	1972.97 (281)	.04	.04 (.041 - .044)	.91
+ equal residuals, latent	1986.74 (285)	.05	.04 (.040 - .044)	.91
+ equal residuals, manifest	2058.14 (303)	.05	.04 (.040 - .043)	.91

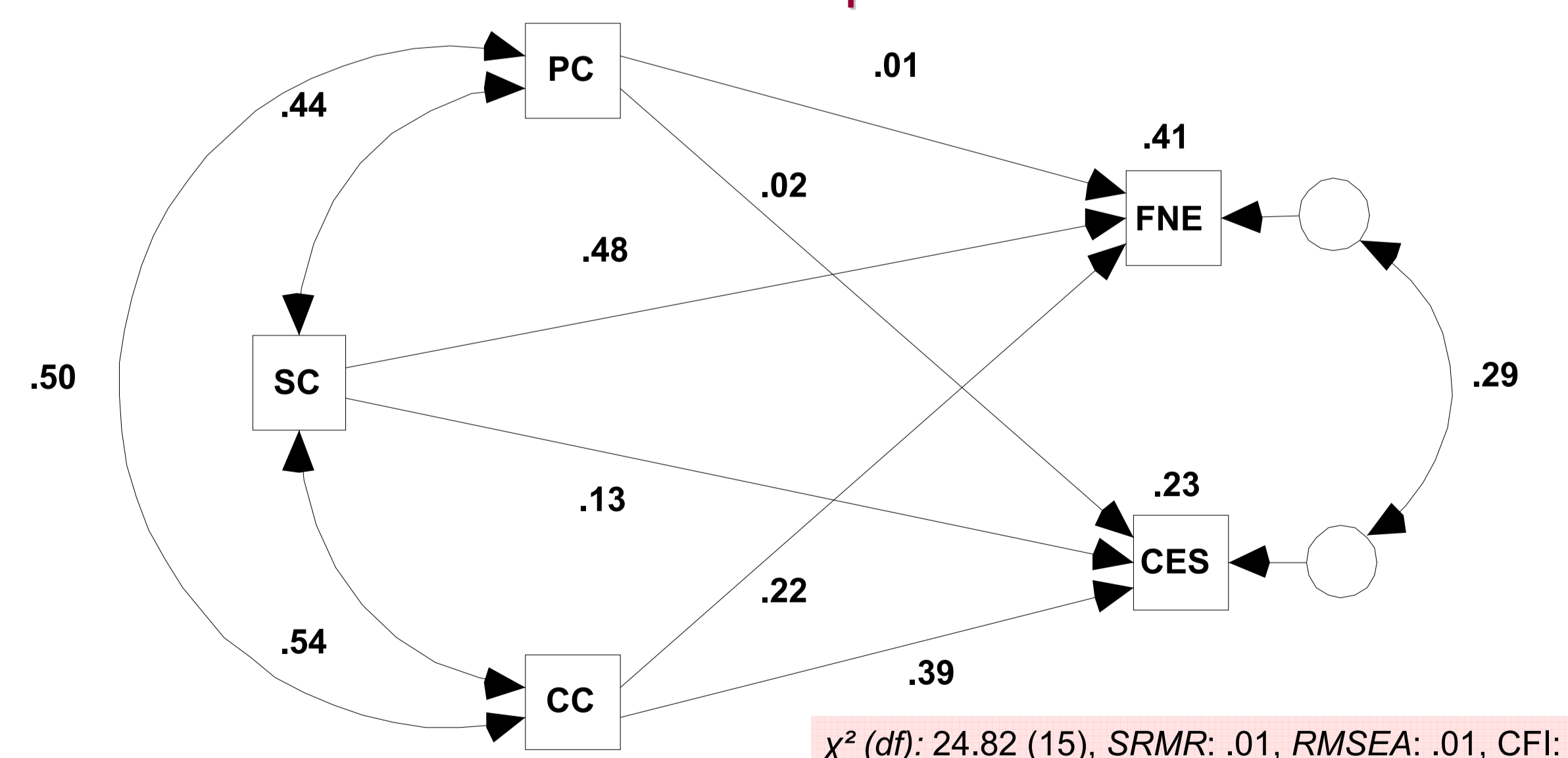
Notes: ¹N = 757, ²N = 2603. All *ps* < .05.

Validity Coefficients and Internal Consistency of ASI-3 Scales

Scale	α	ASI	ASI-PC	ASI-SC	ASI-CC	BSQ	FNE	CES-D
ASI	.87	-.00	.75	.77	.78	.88	.72	.84
ASI-PC	.78	.79	-.00	.39	.48	.51	.24	.15
ASI-SC	.76	.82	.44	-.00	.54	.47	.56	.23
ASI-CC	.79	.83	.50	.54	-.00	.53	.47	.33
BSQ	-.00	-.00	-.00	-.00	-.00	-.00	.40	.16
FNE	.72	.60	.34	.61	.49	-.00	-.00	.38
CES-D	.77	.46	.28	.36	.48	-.00	-.00	-.00

Notes: ¹N = 262 (ASI-3 paper-and-pencil, BSQ, FNE, CES-D). ²N = 2603 (ASI-3 WWW, FNE, CES-D).

Testing the Invariance of External Relations - Multigroup Model with All Parameters Constrained Equal



$\chi^2 (df)$: 24.82 (15), SRMR: .01, RMSEA: .01, CFI: .99

Conclusion: The paper-and-pencil version and the WWW-version of the ASI-3 apparently measure the same construct. Factor loadings and residuals of the 3-factor hierarchical model do not vary by presentation mode. Besides the invariance of the internal structure, external relations of the ASI-3 subscales do not seem to vary either. Convergent and discriminant correlations with measures of depression and social anxiety are invariant across presentation modes. Taken together, these results suggest that group means, reliability and validity coefficients are basically comparable across versions and apply to the ASI-3 irrespective of the mode chosen for the presentation of items. Thus, in future research ASI-3 items may be used either in a traditional paper-and-pencil format or presented via computer (e.g., WWW) to obtain reliable and valid measurements of Anxiety Sensitivity.

References

- Kemper, C. J., Ziegler, M., & Taylor, S. (submitted). Überprüfung der psychometrischen Qualität der deutschen Version des Angstsensitivitätsindex-3.
- Reiss, S. (1991). Expectancy model of fear, anxiety, and panic. *Clinical Psychology Review*, 11, 141-153.
- Schmidt, N. B. (1999). Prospective evaluation of anxiety sensitivity. In S. Taylor (Ed.), *Anxiety sensitivity - Theory, research, and treatment of the fear of anxiety* (pp. 61-82). Mahwah: Erlbaum.
- Taylor, S., et al. (2007). Robust dimensions of anxiety sensitivity: Development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment*, 19(2), 176-188.