The Scale “Openness for Information” (SOFI) – A new assessment tool for research on information behavior

Anne-Kathrin Mayer & Günter Krampen
ZPID – Leibniz Institute for Psychology Information
Trier/Germany

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“information behavior”: “activities a person may engage in when identifying their own need for information, searching for information and using or transferring that information.” (Wilson, 1999, p. 249)

→ Important for learning and achievement, particularly in self-regulated learning activities
Prediction of Information Behaviors

- **Context-oriented approach**: situational demands, available information resources, scholarly discipline, stage of the research process etc. (e.g. Wilson, 1981)

- **Competence-oriented approach**: information literacy (knowledge / skills relevant for effective/efficient information behavior; e.g. Kwong & Son, 2011), prior knowledge/level of expertise, general cognitive abilities (e.g. Ingwersen, 1996)

- **Personality-oriented approach**: personal dispositions (personality dimensions, self-efficacy, personal interests, cognitive styles, learning styles etc., e.g. Halder, Roy, & Chakraborty, 2010; Heinström, 2003, 2005; Kim, Sin & Tsai, 2014; Kwon & Song, 2011)
Openness for Information (OI)

• situational trait influencing behaviors in the context of information searching; dispositional “need for information”

• individual preference for broad and comprehensive, as well as deep and differentiated, well-reflected information behaviors → individuals with high “openness for information” are generally inclined to:
  • approach information searching in an intellectually curious, open-minded manner,
  • invest much time and effort in information searching
  • try to identify multiple perspectives on a topic,
  • strive to test assumptions by consulting multiple information sources,
  • apply well-founded evaluation criteria
(1) **Scale construction**: structure, psychometrics (reliability, item-total correlations), and **stability**

(2) Associations with **information behaviors**:
   - metacognitive activities (planning, monitoring, reflecting) ➔
   - number/varieties of information sources used ➔
   - application of sophisticated (scientific) evaluation criteria ➔

(3) Associations with **personality measures**:
   - Need for Cognitive Closure ➔
   - “Big 5”: Openness for Experiences ➔, Conscientiousness ➔
   - Epistemic curiosity ➔
(4) Associations with cognitive abilities and competence measures:
   • Verbal intelligence ?
   • Nonverbal intelligence ?
   • Scholarly information literacy (knowledge about searching and accessing information) ?

(5) Relevance for learning: Prediction of information literacy acquisition
Scale „Openness for Information“ (SOFI)

• **Pilot version:** \( k = 17 \) items referring to information search and evaluation, e.g.,
  • „I try to find out whether contradictory information on my search topic/my question exists.“
  • „I invest a lot of time to find the best source of information.“
  • I use a variety of information sources to get an impression of the spectrum of opinions on the topic / possible answers on my question“

• **Instruction:** „Please indicate how you usually behave when searching and evaluating information.“

• **Ratings:** 5-point Likert scales („very atypical for me“ – „very typical for me“)
Empirical Studies

• **Study 1: Construction and first validation**
  - $N = 112$ law students (all semesters)
  - 18 - 33 years ($M = 21.88$, $SD = 2.80$), 60.7 % female

• **Study 2: Stability and validity**
  - $N = 116$ (Study 2a)/$N = 115$ (Study 2b) psychology students (2nd year BSc; 3rd and 4th wave of a longitudinal study; $N = 137$ at t1),
  - 18 to 31 years ($M = 20.33$, $SD = 2.29$), 81.8 % female

• **Study 3: Associations with cognitive abilities**
  - $N = 99$ students of educational sciences (all semesters)
  - 17 to 32 years ($M = 21.96$, $SD = 2.87$), 82.0 % female

• **Study 4: Applicability in non-student samples**
  - $N = 86$ adults (opportunity sample; online study)
  - 18-74 years ($M = 44.35$, $SD = 13.22$), 52.3 % female
Construction: EFA / CFA

- **Exploratory Factor Analysis**
  - Study 1 \((N = 112\) law students) \(\rightarrow\) Principal Components Analysis
  - Scree-Test / parallel analysis (Horn, 1965): 1 factor (29.32 percent of variance) \(\rightarrow\) Final version: \(k = 9\) items

- **Confirmatory Factor Analysis**
  - Study 1, 2a, 3, 4 \((N = 413)\) \(\rightarrow\) CFA with Mplus-Version 7.2 (Muthén & Muthén, 2014), ML-estimations
  - 1-factor-model: \(\chi^2 = 78.56, df = 27, p < .001;\) CFI = 0.939, TLI = 0.919, RMSEA = .068 [90%-CI = .051-.086], SRMR = .040
## Descriptive Statistics and Reliability

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>M&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SD</th>
<th>Cronbach’s Alpha</th>
<th>r&lt;sub&gt;it-i&lt;/sub&gt; (min-max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Law - all yrs.)</td>
<td>112</td>
<td>3.51</td>
<td>0.68</td>
<td>.80</td>
<td>.42 - .65</td>
</tr>
<tr>
<td>2a (Psych. – 2nd yr.)</td>
<td>116</td>
<td>3.29</td>
<td>0.58</td>
<td>.81</td>
<td>.30 - .61</td>
</tr>
<tr>
<td>2b (Psych. – 2nd yr.)</td>
<td>115</td>
<td>3.22</td>
<td>0.64</td>
<td>.83</td>
<td>.33 - .69</td>
</tr>
<tr>
<td>3 (Educ. Sc. - all yrs.)</td>
<td>99</td>
<td>3.51</td>
<td>0.59</td>
<td>.75</td>
<td>.28 - .60</td>
</tr>
<tr>
<td>4 (Adults)</td>
<td>86</td>
<td>3.68</td>
<td>0.68</td>
<td>.86</td>
<td>.39 - .68</td>
</tr>
</tbody>
</table>

**Notes.**<sup>a</sup> Range of values: 1-5. N: sample size, M: arithmetic mean, SD: standard deviation, r<sub>it-i</sub>(min-max): Range of part-whole corrected item-total correlations
Study 2a/b: N = 115 Psychology students (BSc, 2nd year)

- t3 (beginning of 3rd semester)  
  $M = 3.29$ ($SD = 0.58$)

- t4 (beginning of 4th semester)  
  $M = 3.22$ ($SD = 0.64$)

[t = 1.81, df 113, n.s.]

- test-retest correlation (6 months): $r = .64^{***}$
Correlations with Information Behaviors (Self Reports)

„Information Behavior Questionnaire“ (IBQ; Mayer, in prep.): Self-reports about the typicality of behaviors during an information search on a health-related topic based on an information problem solving model (Brand-Gruwel, Wopereis, Vermetten, 2005; Brand-Gruwel, Wopereis, & Walraven, 2009).

<table>
<thead>
<tr>
<th></th>
<th>Planning the search ((k = 6))</th>
<th>Monitoring the search process ((k = 3))</th>
<th>Documenting &amp; organizing search results ((k = 4))</th>
<th>Reflecting the search process and its results ((k = 3))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>.32**</td>
<td>.12</td>
<td>.33**</td>
<td>.17+</td>
</tr>
<tr>
<td>Study 2a (t3)</td>
<td>.28**</td>
<td>.23*</td>
<td>.18+</td>
<td>.26**</td>
</tr>
<tr>
<td>– IBQ(t4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 2b (t4)</td>
<td>.18+</td>
<td>.17</td>
<td>.09</td>
<td>.23*</td>
</tr>
<tr>
<td>– IBQ(t4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>.25**</td>
<td>.08</td>
<td>.24**</td>
<td>.33**</td>
</tr>
<tr>
<td>Study 4</td>
<td>.41**</td>
<td>.24**</td>
<td>.36**</td>
<td>.32**</td>
</tr>
</tbody>
</table>
Correlations with Information Sources and Evaluation Criteria (Self Reports)

"Information Behavior Questionnaire" (IBQ; Mayer, in prep.): Self-reports about the typicality of
a) using specific types of information sources
b) applying specific types of criteria to evaluate information

<table>
<thead>
<tr>
<th>Study</th>
<th>Information Sources</th>
<th>Evaluation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Books</td>
<td>Press</td>
</tr>
<tr>
<td>Study 1</td>
<td>.26**</td>
<td>.21*</td>
</tr>
<tr>
<td>Study 2a (t3) – IBQ(t4)</td>
<td>.08</td>
<td>.11</td>
</tr>
<tr>
<td>Study 2b (t4) – IBQ(t4)</td>
<td>.18+</td>
<td>.06</td>
</tr>
<tr>
<td>Study 3</td>
<td>.49**</td>
<td>.25**</td>
</tr>
<tr>
<td>Study 4</td>
<td>.33**</td>
<td>.14</td>
</tr>
</tbody>
</table>
Correlations with NCC and „Big Five“

- Need for Cognitive Closure Scale NCC – German short form \((k = 16; \text{Schlink & Walther, 2007})\)
- NEO-FFI – German short form \((k = 30; \text{Koerner et al., 2008})\)
- Epistemic Curiosity Scale EC (Litman & Mussel, 2013) – Interest-type vs. Deprivation-type EC

<table>
<thead>
<tr>
<th>Study</th>
<th>NCC</th>
<th>NEO-N</th>
<th>NEO-E</th>
<th>NEO-O</th>
<th>NEO-A</th>
<th>NEO-C</th>
<th>EC-I</th>
<th>EC-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>-.32**</td>
<td>-.15</td>
<td>.17</td>
<td>.24**</td>
<td>-.16</td>
<td>.19*</td>
<td>.50**</td>
<td>.39**</td>
</tr>
<tr>
<td>Study 4</td>
<td>-.21*</td>
<td>-0.03</td>
<td>.08</td>
<td>.20*</td>
<td>.10</td>
<td>.17+</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Study 2a</td>
<td>-.31**</td>
<td>-.25**</td>
<td>.16</td>
<td>.25**</td>
<td>.28**</td>
<td>.18*</td>
<td>.29**</td>
<td>.08</td>
</tr>
<tr>
<td>(SOFI-t3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 2b</td>
<td>-.23**</td>
<td>-.12</td>
<td>.07</td>
<td>.24**</td>
<td>.31**</td>
<td>.24**</td>
<td>.14</td>
<td>.13</td>
</tr>
<tr>
<td>(SOFI-t4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Correlations With Cognitive Abilities and Scholarly Information Literacy

- **Intelligence:**
  - Nonverbal intelligence: Raven Advanced Progressive Matrices (Raven, 1962)
  - Verbal intelligence: Verbal Analogies (IST 2000R; Amthauer, Brocke, Liepmann, & Beauducel, 2001)

- **Scholarly Information Literacy:**
  - Procedural Information-Seeking Knowledge Test (PIKE; Rosman, Mayer & Krampen, 2015)

<table>
<thead>
<tr>
<th></th>
<th>Raven (t1)</th>
<th>Verbal Analogies(t1)</th>
<th>PIKE (t3)</th>
<th>PIKE (t4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 2a (t3)</td>
<td>.11</td>
<td>.07</td>
<td>.09</td>
<td>.22*</td>
</tr>
<tr>
<td>Study 2b (t4)</td>
<td>.07</td>
<td>.18*</td>
<td>.10</td>
<td>.17*</td>
</tr>
</tbody>
</table>
Study 2a/b: Prediction of changes in Information literacy by Openness for Information → Stepwise Multiple Regression

criterion = PIKE t4;
predictors: Step 1: PIKE t3
           Step 2: verbal analogies t1
           Step 3: SOFI t3

final model:  \( R^2 = .427, F = 27.34, df 3/110, p < .01; \)
  \( R^2_{\text{change}} (\text{SOFI}) = .025, p < .05 \)

<table>
<thead>
<tr>
<th></th>
<th>( b )</th>
<th>( \text{SE}(b) )</th>
<th>( \beta )</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>6.905</td>
<td>5.520</td>
<td>1.251</td>
<td>.214</td>
<td></td>
</tr>
<tr>
<td>PIKE (t3)</td>
<td>.639</td>
<td>.089</td>
<td>.534</td>
<td>7.170</td>
<td>.000</td>
</tr>
<tr>
<td>Verbal Analogies (t1)</td>
<td>.575</td>
<td>.203</td>
<td>.211</td>
<td>2.833</td>
<td>.005</td>
</tr>
<tr>
<td>SOFI (t3)</td>
<td>2.041</td>
<td>.938</td>
<td>.158</td>
<td>2.175</td>
<td>.032</td>
</tr>
</tbody>
</table>
Conclusions

• The Openness for Information Scale SOFI is a
  • economic,
  • reliable, and
  • stable measure of openness for information during information search and evaluation

• Validity & relevance: first hints, but more evidence needed, e.g. associations with
  • observations of information behaviors (planning searches, formulating and realizing search strategies, evaluating information, aggregating information)
  • additional constructs related to learning and achievement (e.g., styles of learning, goal orientations; epistemological beliefs)
  • quality of search results / decisions based on searches → situational variability in the „optimal level“ of openness (e.g., simple vs. complex tasks)?
Thank you!

Contact:
Dr. Anne-Kathrin Mayer
ZPID – Leibniz-Zentrum für Psychologische Information und Dokumentation
D-54286 Trier
mayer@zpid.de
References


