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Chapter 4

Measuring Trait Systems Intelligence: First steps towards a Trait-SI scale (TSIS)

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This research article reports first steps towards a scale that aims at measuring systems intelligence as a trait-like construct (Trait-SI, Systems Intellect). After describing the process of item generation and the item content of the Trait-SI Scale (TSIS), psychometric properties of the scale are investigated. Students (N = 408) provided self-reports on socio-emotional skills (Riggio, 1989), self-monitoring (Laux and Renner, 2002), self-esteem (Rosenberg, 1965), and the Big Five (Schupp and Gerlitz, 2008), as well as on a German 30-item version of the TSIS in an online-study. The scale's reliability (Cronbach's alpha) and construct validity are investigated. Further, the scale's factor structure is explored. Results show good psychometric properties of the TSIS and its four retained factors. SI factors are mostly positively related to the other scales. Relationships are discussed with respect to how Trait-SI might be linked to other constructs in a nomological network. Future lines of research, especially concerning improvement of the TSIS as well as measurement of (Trait-)SI in general, are discussed.

Introduction

In this book (Chapter 2), I have proposed Trait Systems Intelligence, or systems intellect, as opposed to Ability Systems Intelligence. Trait-SI refers to enduring mental and behavioral characteristics that individuals would attribute themselves, whereas Ability-SI refers to the abilities in the SI domain. Ability-SI is hard to capture with self-report data (Q-data), but Trait-SI can very well be measured with self-reports of people, and this chapter provides first steps towards a reliable and valid measure of Trait-SI.

First, theoretical assumptions underlying the item content are discussed, and then empirical findings concerning basic psychometric properties (e.g., descriptive statistics, item statistics, internal consistency, scale structure, etc.) are presented. The preliminary and yet to be improved *Trait-SI Scale (TSIS)* will also be linked to other psychological constructs (social and emotional intelligence, self-monitoring, self-esteem, Big Five). Finally, suggestions for improvements of the TSIS are given, and limitations of the study and its findings are discussed.

Theoretical Background

Regardless whether a nomothetic or idiographic (or even "idiothetic") approach is used, there are commonly three ways to measure a certain phenomenon or construct (cf. Cattell and Kline, 1977; see Table 1): *L-data* ("Life") and B-data ("Behaviour"), *Q-Data* ("Questionnaire"), and *T-data* ("Test").

L-data refers to any information obtained from or about the life of an individual (e.g., letters, emails, school grades, curriculum vitae, observed behaviour patterns, etc.) and is gathered by "external" information. A subgroup of L-data is B-data which refers to any data that is concerned with behaviour of a target individual. Q-data is any self-evaluation data gained from (standardised) questionnaires and thus taps into internal or introspectional information. T-data refers to data gained from standardised testing situations (e.g., experiments) or when obtaining objectively quantifiable data (opposed to interview data) in performance tasks.

A certain type of data or a certain assessment method should not be a priori favoured; rather, the three types have each their advantages and shortcomings and can be useful or inconvenient for certain research aims – hence, they should be treated as equal. Thus, the researcher will have to decide which kind of data he or she wants or needs to assess, and which suits best for his or her study, questions, and hypotheses.

Q-data will probably work best for Need- and Trait-SI, but most certainly not for Ability-SI as self-evaluations of abilities do not tend to be very accurate.[14]

Table 1. Overview of different types of data

Type	Data	Examples	Best for
L-data	assessment through others	– peer-ratings – behavioural observation (B-data) – videotaping and audio recording – autobiography, CV, handwritings, etc.	Trait-SI Ability-SI Competence-SI (SI skills)
Q-data	subjective self-report and self-evaluation	questionnaires	Trait-SI
T-data	objectives measures	– physiological tests – intelligence tests – performance tests	Ability-SI

[14] This is another point why we should at least distinguish Ability-SI and Trait-SI. "Systems Intelligence" has been conceptualised both as a disposition or trait *and* an ability. However, these two conceptualisations have different implications for assessment and for the research or diagnostic methods used. Usually, abilities do not correlate highly with self-evaluations of one's abilities, suggesting that we are not measuring the same constructs, but (at best) rather different aspects of it.

The Present Study

The present study aimed at assessing the psychometric properties (reliability and validity) of the TSIS items and scales. Reliability in the sense of internal consistency will be indexed by Cronbach's alpha. Validity will be assessed in terms of construct validity by embedding Trait-SI into a nomological network. For this purpose, a priori hypotheses on the associations between Trait-SI and other (related) constructs (socio-emotional skills, acquisitive self-monitoring, self-esteem, Big Five) were generated.

Specifically, all constructs should show positive relationships with Trait-SI. Systems intelligent individuals should be able to act intelligently also in interpersonal systems which would make them socio-emotionally intelligent. They may possess heightened levels of perceptional sensitivity to others' and also own states. This includes thoughts, feelings, desires, and behaviours. Also, systems intelligent people would need to adapt to varying circumstances within complex and dynamic systems, and if these are interpersonal or social in nature, then there should be tendencies to impression management (and lower behavioural consistency given that situational or contextual circumstances vary) in the sense of altering one's demeanour in a situation-appropriate manner to maximise (social) adaptivity. Being efficient and productive in systems should come along with self-efficacy and self-esteem (whereas it is not specified whether Trait-SI breeds self-esteem or vice versa). In terms of central personality traits, systems intelligent individuals should be rather emotionally stable (although possessing a certain sensitivity), outgoing and communicative (Extraversion), open-minded (Openness for experiences, Intellect, Culture, Fantasy), socially adjusted and warm (Agreeableness), as well as productive and persistent (Conscientiousness).

Item Generation

Item content of a trait-SI scale

Systems intelligence as the "behavioural intelligence of human agents in systemic environments" (Luoma, Hämäläinen, and Saarinen, 2008, p. 757) is a heterogeneous construct and comprises different levels (see Table 2): there are perceptional (perceiving oneself and reciprocal influences in systems), cognitive and meta-cognitive (thinking and reflecting within systems), emotional and motivational (intuitively guided actions, empathical experiences, motivation to persevere and exact productive action patterns, etc.), and behavioural (productive behaviours) components. An SI-scale should therefore be able to account for all these components and capture core elements of what is referred to as systems intelligent thinking and acting. Of course, one needs to take into account that the scale might turn out heterogeneous due to the theoretical assumptions of very different SI components although there should be a positive manifold among the factors of the scale as they ought to be tied together by an underlying super-factor, (global or general) Trait-SI.

Item generation

Based on the five stages of SI (Hämäläinen and Saarinen, 2007, p. 50) and other descriptions of what SI might comprise (Hämäläinen and Saarinen, 2004, 2008), preliminary items were generated based solely on theoretical grounds. Specifically, there were three

core areas of SI into which ten items each were fitted (see also Table 2): *perception*, *cognition*, and *action*. Due to the heterogeneity of the item content and also its overlap, no specific factor structure was expected except that there should be lower-order and hierarchically higher factors.

Table 2. Different core components of systems intelligence

Perception-SI: *seeing oneself in the system*
– seeing oneself, one's roles, and one's behaviour in a system – seeing through the eyes of others – contextual awareness
Cognition-SI: *thinking systems intelligently*
– identifying and envisioning productive ways of behaviour for oneself in a system – self- and meta-reflection – deep thoughts
Action-SI: *managing and sustaining systems intelligent behaviour*
– exercising productive ways of behaviour in a system – continuing and fostering systems intelligent behaviour in the long run

As there would be too much overlap in item content between SI and forms of leadership, the fifth dimension (leadership with systems intelligence) was omitted. It could be expected that the fifth dimension of SI is highly similar to transformational leadership and self-leadership. Also, the third (managing systems intelligence) and fourth dimension (sustaining systems intelligence) were both slightly modified and combined to one dimension (action). The second (thinking about systems intelligence) and first dimension (seeing oneself in the system) were left as separate dimensions, but were slightly modified and now comprise some additional aspects.

Answers should be given on a 5-point Likert scale ranging from "0 – I totally disagree" to "4 – I totally agree". Some items need to be reversed. Items can be found in Table 4 and Appendix B.

In particular, descriptions such as "I like . . ." or "I am motivated / try to . . ." were avoided as they would rather tap into need-like constructs. The measure is not designed to assess Need-SI nor will it account for Ability-SI. However, Trait-SI and Style-SI are probably confounded here. This scale can at no means be considered a valid and reliable way of assessing Ability-SI. It only aims at capturing some important aspects of self-perceived trait-like SI. It will assess self-evaluations of SI (being a measure of Trait-SI). Future research will have to demonstrate what the scale actually measures. There has got to be an extensive and rigorous validation process of the scale to make it useful for further research in the field of SI.

Methods

Procedure. Participants completed all scales online on a platform for online-studies founded by the author. The TSIS was administered intermingled with many other scales (some of which are not relevant to the present study and are thus not reported here). On average, participants took 30 – 40 minutes for the entire study.

Participants. Scales were adminitered online to $N = 408$ students from the University of Innsbruck. Their native language was mostly German, so German versions of all scales were used. The participants' mean age was 22.81 years ($SD = 4.91$; median: 21 years; range: 18 – 65 years). There were 316 women (77.50%) and 93 men (22.50%) in this sample. The online-study was conducted as part of a psychology course, and participants obtained credt points for participating.

Measures. Several measures were used to explore associations among Trait-SI and other constructs. The measures are listed in their order of administration in the online-study, but were interspersed with other measures too. The means, standard deviations, and internal consistencies (Cronbach's alphas) of all scales can be found in Table 6 (along with intercorrelations of the constructs).

Social skills inventory (SSI) by Riggio (1989). This self-report instrument, with 90 items to be answered on a five-point Likert scale from 1 (not at all like me) to 5 (exactly like me), is to assess basic social communication skills in non-verbal and verbal areas. The SSI consists of six subscales, *emotional expressivity* (EE; e.g., "I have been told that I have expressive eyes"), *emotional sensitivity* (ES; e.g., "I am often told that I am a sensitive, understanding person"), *emotional control* (EC; e.g., "I am very good at maintaining a calm exterior even if I am upset"), *social expressivity* (SE; "When telling a story, I usually use a lot of gestures to help get the point across"), *social sensitivity* (SS; e.g., "I'm generally concerned about the impression I'm making on others"), and *social control* (SC; e.g., "I am usually very good at leading group discussions"). The emotional skills are associated with the non-verbal, and the social skills with the verbal domain. Expressivity skills refer to encoding (communicating, sending), sensitivity skills to decoding (receiving, interpreting), and control skills to regulating and managing emotional and/or social information. Different scales can be assessed with the SSI: Socio-emotional intelligence (SEI) as a global scale consisting of all 90 items; social intelligence (SI) consisting of all items relating to the social/verbal domain (i.e., SE + SS + SC), SE, SS, SC; emotional intelligence (EI) consisting of all items relating to the emotional/non-verbal domain (i.e., EE + ES + EC), EE, ES, EC; expressivity (E), sensitivity (S), and control (C) (incorporating social and emotional facets each). Sum scores for all possible scales were computed.

Revised Self-Monitoring Scale by Laux and Renner (2002). Acquisitive self-monitoring was measured with two scales: "sensitivity to behaviours of others" (labelled here as *perceptiveness*; e.g., "In conversations, I am sensitive to even the slightest change in the facial expression of the person I am conversing with") and "ability to modify self-presentation" (labelled here as *impression management*; e.g. "I have the ability to control the way I come across to people, depending on the impression I wish to give them"). Both scales contained six items each to be answered on a five-point Likert scale ranging from 0 (totally disagree) to 4 (totally agree). For further readings on self-monitoring, see, for instance, Laux and Renner (2002) as well as Snyder (1987).

Big Five Inventory – SOEP (BFI-S) by Schupp and Gerlitz (2008). The Big Five, *Neuroticism or Emotional Stability* (e.g., "I am someone who becomes easily anxious"), *Extraversion* (e.g., "I am someone who is communicative"), *Openness to experiences* (e.g., "I am someone who has a vivid phantasy"), *Agreeableness* (e.g., "I am someone who can forgive"), and *Conscientiousness* (e.g., "I am someone who works thoroughly"), were measured with a 15-item inventory, using three items per Big Five dimension to be answered on a seven-point Likert scale from 1 (strongly disagee – not at all like me) to 7 (strongly agree – totally like me). For further readings on the Big Five, see Costa and McCrae (1992) and also John and Srivastava (1999).

Rosenberg's (1965) Self-Esteem Scale. This scale aims at measuring global self-esteem with ten items in a self-report format. People are to indicate on a four-point Likert scale (coded 0 – 3) whether they strongly disagree, disagree, agree, or strongly agree with the given statements about their self-esteem (e.g., "On the whole, I am satisfied with myself"). For further readings on self-esteem and its measurement, see Rosenberg (1965) and Wylie (1974).

Trait-SI Scale (TSIS). This preliminary scale was developed by the author and comprised 30 items related to Trait-SI aspects (e.g., "I exercise productive ways of influence within my surroundings", "I perceive myself as part of a whole") to be answered on a five-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree).

Statistical analyses. *Reliability* of the TSIS will be evaluated by internal consistency indexed by Cronbach's alpha. For purposes of item and scale refinement, also item difficulties, item-(total-)scale correlations, and alpha-if-item deleted statistics are reported. *Validity* of the TSIS will be assessed twofold: first, its structure will be investigated by exploratory factor analyses (principal component analysis; oblique: direct-oblimin rotation with $\delta = 0$) and Horn's parallel analysis (Horn, 1965) to evaluate the number of factors to be retained. Second, bivariate zero-order Pearson correlations will be used to explore the interrelationships of the TSIS scales (retained factors, global factor) with other scales (socio-emotional skills, acquisitive self-monitoring scales, self-esteem, Big Five factors). The presented results on associations can be interpreted as indications of construct validity.

Results

Descriptive and item statistics. Means, standard deviations, skewnesses, kurtoses, minimum and maximum values, dfficulties (P_i)[15], and item-(total-)scale correlations can be found in Table 3. The interested reader and researcher aiming at revising the TSIS might want to compare the items with each other.

Internal consistency. The global Trait-SI score obtained $\alpha = .89$, which is very good considering the heterogeneity of the item content. Cronbach's alpha could also not be optimized by excluding items (see Table 3). Even in the retained factors of the scale (see below) no item had to be excluded (see Table 4).

[15] Formula used: $P_i = \frac{M}{4} \cdot 100$. Values around 50 are deemed as opimal.

Factor structure. To investigate the factor structure, an exploratory factor analysis (principal components analysis; direct-oblimin rotation with $\delta = 0$, due to hypothesized un-orthogonality of factors) was conducted. An initial solution yielded a seven-factor structure that accounted for 57.03% of variance. As Kaiser's rule to retain factors that show eigenvalues above one (cf. Kaiser, 1970) tends to overestimate the number of factors to be retained (e.g., Zwick and Velicer, 1986) and Cattell's scree-plot turns out ambiguous at times, Horn's parallel analysis (1965) was performed (which, however, still slightly overestimates the number of retained factors; see Glorfeld, 1995). By comparing the eigenvalues of factors retained from the original correlation matrix (of items) and the random ones from Horn's parallel analysis (number of variables: 30; number of participants: 408; number of replications: 1,000), results indicate that four factors (accounting for 46.31% of variance) should be retained (see Table 4). Underestimating the number of factors to be retained generally leads to more problems than overestimating factor numbers although this also comes along with a set of problems (cf. Mumford, Ferron, Hines, Hogarty, and Kromrey, 2003).

The four retained factors are labelled *"effective systems handling"* (12 items), *"systemic reflection"* (6 items), *"holistic systems perception"* (5 items), and *"systemic perspective-taking"* (7 items). Due to the positive manifold of SI factors, a higher-order structure was postulated and secondary (exploratory) factor anlysis was conducted. A general factor, accounting for 53.51% of total variance, was extracted (factor loadings: systemic perspective taking: .81; effective systems handling: .80; holistic systems perception: .71; systemic reflection: .58). This g-factor can be interpreted as the general Trait-SI factor underlying the four SI factors. It is virtually identical with the total score obtained from all TSIS items. Thus, the TSIS is able to capture a broad, more complex, and abstract general Trait-SI factor (SI global factor) as well as more specified lower-order factors.

Table 3 A and B. Item statistics of the TSIS

A	***M***	***SD***	Skewness	Kurtosis
I perceive myself as part of a whole.	2.56	0.99	–0.34	–0.52
I am usually aware of my surroundings and its influences on me.	2.92	0.70	–0.64	1.14
I have an intuitive feeling for unspoken things.	3.02	0.80	–0.73	0.68
I am usually not quite aware of the impact of my actions on my surroundings.	2.65	0.92	–0.79	0.50
I feel as part of a bigger system.	2.31	1.04	–0.16	–0.56
I observe my own interdependence within my surroundings.	2.52	0.91	–0.16	–0.42
I have difficulties seeing things from different perspectives.	3.18	0.81	–0.96	1.12
I am very well aware that I live and interact within a complex and dynamic system.	2.75	0.91	–0.43	–0.12
I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	3.04	0.85	–0.95	1.19
I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	2.47	0.96	–0.31	–0.23
I would not describe my thinking as "holistic" and "intuitive".	2.69	0.96	–0.37	–0.49

I often ponder on my thoughts, feelings, intentions, and actions.	3.35	0.72	–0.96	0.68
I would describe my thinking as quite "complex" and "interwoven".	2.80	0.97	–0.55	–0.35
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	2.60	0.95	–0.33	–0.51
I am not a very self-reflexive and thoughtful person.	3.22	1.06	–1.5	1.55
I often ponder on others' thoughts, feelings, intentions, and actions.	3.20	0.77	–0.90	1.09
I often think about my role in my surroundings.	2.96	0.88	–0.76	0.57
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	2.60	0.84	–0.16	–0.15
My thinking is very action-oriented.	2.25	0.81	0.13	-0.14
I am a very reflexive person.	2.89	0.86	–0.38	–0.32
I am able to manage most of my everyday activities successfully.	3.10	0.79	–0.79	0.68
I can adapt to varying situations quite flexibly.	2.68	0.83	–0.49	0.27
I can influence my surroundings, be they living or not.	2.43	0.81	–0.04	0.03
When confronted with complexity, I persevere until I have found a productive solution.	2.71	0.87	–0.50	0.09
I exercise productive ways of influence within my surroundings.	2.51	0.78	–0.06	0.23
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	2.80	0.77	–0.69	1.07
I usually cannot influence much in my surroundings.	2.68	0.84	–0.39	–0.22
I tend to just do things right.	2.24	0.79	–0.16	–0.13
I do not give up until I have achieved my goal.	2.63	0.89	–0.61	0.40
I sometimes have the feeling that there is not much what I can influence by my own actions.	2.61	0.89	–0.33	–0.23

B	Range (min. – max.)	P_i	Corrected Item-Total correlation	Cronbach's α if item deleted
I perceive myself as part of a whole.	0 – 4	64.00	.437	.882
I am usually aware of my surroundings and its influences on me.	0 – 4	73.00	.525	.880
I have an intuitive feeling for unspoken things.	0 – 4	75.50	.433	.882
I am usually not quite aware of the impact of my actions on my surroundings.	0 – 4	66.25	.229	.886
I feel as part of a bigger system.	0 – 4	57.75	.436	.882
I observe my own interdependence within my surroundings.	0 – 4	63.00	.440	.882
I have difficulties seeing things from different perspectives.	0 – 4	79.50	.451	.882
I am very well aware that I live and interact within a complex and dynamic system.	0 – 4	68.75	.588	.878

I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	0 – 4	76.00	.414	.882
I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	0 – 4	61.75	.607	.878
I would not describe my thinking as "holistic" and "intuitive".	0 – 4	67.25	.419	.882
I often ponder on my thoughts, feelings, intentions, and actions.	1 – 4	83.75	.393	.883
I would describe my thinking as quite "complex" and "interwoven".	0 – 4	70.00	.274	.886
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	0 – 4	65.00	.424	.882
I am not a very self-reflexive and thoughtful person.	0 – 4	80.50	.221	.887
I often ponder on others' thoughts, feelings, intentions, and actions.	0 – 4	80.00	.283	.885
I often think about my role in my surroundings.	0 – 4	74.00	.341	.884
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	0 – 4	65.00	.527	.880
My thinking is very action-oriented.	0 – 4	56.25	.251	.885
I am a very reflexive person.	0 – 4	72.25	.408	.882
I am able to manage most of my everyday activities successfully.	0 – 4	77.50	.468	.881
I can adapt to varying situations quite flexibly.	0 – 4	67.00	.471	.881
I can influence my surroundings, be they living or not.	0 – 4	60.75	.545	.880
When confronted with complexity, I persevere until I have found a productive solution.	0 – 4	67.75	.495	.880
I exercise productive ways of influence within my surroundings.	0 – 4	62.75	.586	.879
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	0 – 4	70.00	.370	.883
I usually cannot influence much in my surroundings.	0 – 4	67.00	.509	.880
I tend to just do things right.	0 – 4	56.00	.466	.881
I do not give up until I have achieved my goal.	0 – 4	65.75	.420	.882
I sometimes have the feeling that there is not much what I can influence by my own actions.	0 – 4	65.25	.480	.881

Note. Standard Error of Kurtosis = 0.241; Standard Error of Skewness = 0.121.

Table 4. Item-scale correlations and Cronbach's alphas if item deleted for each Trait-SI factor

	Corrected item-scale correlation	Cronbach's alpha if item deleted
***Effective systems handling* (α = .85)**		
When confronted with complexity, I persevere until I have found a productive solution.	.597	.828
I do not give up until I have achieved my goal.	.503	.836
I exercise productive ways of influence within my surroundings.	.640	.826
I am able to manage most of my everyday activities successfully.	.558	.832
I can influence my surroundings, be they living or not.	.581	.830
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	.527	.834
I tend to just do things right.	.498	.836
I usually cannot influence much in my surroundings.	.559	.831
My thinking is very action-oriented.	.295	.850
I sometimes have the feeling that there is not much what I can influence by my own actions.	.486	.837
I can adapt to varying situations quite flexibly.	.468	.838
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	.466	.838
***Systemic reflection* (α = .72)**		
I often ponder on my thoughts, feelings, intentions, and actions.	.606	.652
I would describe my thinking as quite "complex" and "interwoven".	.476	.680
I am not a very self-reflexive and thoughtful person.	.254	.758
I often ponder on others' thoughts, feelings, intentions, and actions.	.475	.682
I often think about my role in my surroundings.	.479	.679
I am a very reflexive person.	.550	.658
***Holistic systems perception* (α = .86)**		
I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	.766	.809
I am very well aware that I live and interact within a complex and dynamic system.	.616	.847
I observe my own interdependence within my surroundings.	.550	.862
I feel as part of a bigger system.	.748	.813
I perceive myself as part of a whole.	.718	.821
***Systemic flexibility* (α = .69)**		
I have difficulties seeing things from different perspectives.	.480	.640
I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	.493	.636
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	.360	.671
I would not describe my thinking as "holistic" and "intuitive".	.361	.675
I am usually aware of my surroundings and its influences on me.	.474	.647
I have an intuitive feeling for unspoken things.	.428	.654
I am usually not quite aware of the impact of my actions on my surroundings.	.272	.699

Table 5. Factor structure of the TSIS

	Factors				h^2
	I	II	III	IV	
Effective systems handling					
When confronted with complexity, I persevere until I have found a productive solution.	**.77**	.14	–.08	–.08	.573
I do not give up until I have achieved my goal.	**.70**	.02	.03	–.14	.458
I exercise productive ways of influence within my surroundings.	**.67**	.06	.21	–.06	.568
I am able to manage most of my everyday activities successfully.	**.65**	–.06	–.07	.14	.460
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	**.62**	.05	–.22	.21	.467
I can influence my surroundings, be they living or not.	**.52**	.03	.09	.22	.443
I tend to just do things right.	**.49**	–.08	.13	.14	.361
I usually cannot influence much in my surroundings.	**.46**	–.20	.15	.33	.485
My thinking is very action-oriented.	**.46**	.09	.06	–.21	.217
I sometimes have the feeling that there is not much what I can influence by my own actions.	**.40**	–.16	.24	.21	.393
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	**.40**	.37	.07	.10	.415
I can adapt to varying situations quite flexibly.	**.40**	–.03	.03	**.34**	.368
Systemic reflection					
I often ponder on my thoughts, feelings, intentions, and actions.	.08	**.72**	.07	–.02	.558
I would describe my thinking as quite "complex" and "interwoven".	.13	**.68**	–.11	–.02	.476
I am a very reflexive person.	.13	**.67**	–.02	.09	.521
I often think about my role in my surroundings.	.00	**.67**	.19	–.08	.496
I often ponder on others' thoughts, feelings, intentions, and actions.	–.14	**.66**	–.01	.20	.495
I am not a very self-reflexive and thoughtful person.	–.06	**.27**	.07	.19	.136
Holistic systems perception					
I feel as part of a bigger system.	–.01	–.04	**.89**	–.11	.748
I perceive myself as part of a whole.	–.02	–.09	**.87**	–.05	.726
I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	.05	.03	**.80**	.13	.737
I observe my own interdependence within my surroundings.	.03	.17	**.67**	–.07	.495
I am very well aware that I live and interact within a complex and dynamic system.	.07	.21	**.62**	.12	.564
Systemic flexibility					
I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	.02	.18	–.11	**.68**	.514
I have difficulties seeing things from different perspectives.	–.01	.07	.07	**.67**	.488
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	.21	–.26	.08	**.51**	.408
I have an intuitive feeling for unspoken things.	.02	.21	.09	**.49**	.366
I am usually aware of my surroundings and its influences on me.	.10	.03	.28	**.48**	.432
I am usually not quite aware of the impact of my actions on my surroundings.	.01	.09	–.08	**.42**	.193
I would not describe my thinking as "holistic" and "intuitive".	.00	–.02	**.36**	**.38**	.333
Eigenvalues	7.40	2.58	2.34	1.58	
% of variance	24.66	8.59	7.80	5.25	

Note. N = 408. Extraction Method: Principal Component Analysis. Rotation Method: Direct-Oblimin ($\delta = 0$) with Kaiser Normalization. When components are correlated, sums of squared loadings cannot be added to obtain a total variance. Highest factor loadings on a factor are indicated bold. h^2 = communalities. Interpretation of factors: I = Effective systems handling; II = Systemic reflection; III = Holistic systems perception; IV = Systemic flexibility. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .882 (meritorious: .80, marvellous: .90; cf. Dziuban and Shirky, 1974); Bartlett's Test of Sphericity: Approx. $\chi^2(435) = 4{,}213.27$, $p < .001$.

Intercorrelations. All four factors of Trait-SI were moderately positively intercorrelated ($\bar{r}$ = .38, range: *r*s = .24 – .56). The four SI factors and the SI global factor were also correlated with socio-emotional skills, acquisitive self-monitoring, self-esteem, and the Big Five (see Table 6) to further investigate which (psychological) meaning each SI factor might have.

In general, there were positive association patterns among *socio-emotional skills* and SI factors, with the highest correlations mostly for effective systems handling. Only social sensitivity was negatively correlated with SI factors. The global SI score even correlated at $r = .53$ ($p < .001$) with socio-emotional intelligence (the global score from all social and emotional skills). Further, emotional sensitivity (facet score) and systemic perspective-taking ($r = .51$, $p < .001$), control (domain score) and effective systems handling ($r = .51$, $p < .001$), emotional intelligence (score from all emotional facets) and global SI ($r = .53$, $p < .001$), emotional intelligence and effective systems handling ($r = .53$, $p < .001$), and socio-emotional intelligence ($r = .51$, $p < .001$) and effective systems handling reached significant correlation coefficients at $r > .50$. Generally, the factor systemic reflection correlated the least with socio-emotional skills; from the socio-emotional skills facet scales, it was only positively associated with the sensitivity scales, emotional sensitivity ($r = .31$, $p < .001$) and social sensitivity ($r = .25$, $p < .001$).

There were largely significant positive relationships between *acquisitive self-monitoring* and the SI factors. Highest correlations were found for global SI and the perceptiveness-factor ($r = .43$, $p < .001$), global SI and impression management ($r = .48$, $p < .001$), effective systems handling and the perceptiveness-factor ($r = .51$, $p < .001$), and systemic flexibility and impression management ($r = .54$, $p < .001$). The lowest (and only marginally significant) correlation was found for systemic reflection and the perceptiveness-factor ($r = .08$, $p = .09$).

Nearly all correlations of SI factors and *self-esteem* turned out positively significant, except for the association with systemic reflection. Effective systems handling even showed a correlation of $r = .49$ ($p < .001$) with self-esteem.

From correlations with the *Big Five*, Emotional Stability (reversed Neuroticism) and Extraversion showed highest associations with effective systems handling ($r = .42$ and $r = .41$, respectively, *p*s < .001). The only exception from the positive association pattern among Big Five and SI factors was systemic reflection: it correlated negatively with Emotional Stability ($r = –.11$, $p < .05$) and non-significantly with Extraversion and Conscientiousness ($r = .05$ and $r = .07$, respectively, *p*s > .10). Further, it is noteworthy to mention that Agreeableness shows generally lower correlations with SI factors. The global SI factor shows highest associations with Extraversion and Openness to experiences ($r = .37$ and $r = .36$, respectively, *p*s < .001), the two most agentic traits of the Big Five.

Discussion

Summary of results. In general, the TSIS shows good psychometric properties which is reflected in good internal consistencies, a sensible factor structure, and associations with other constructs as were hypothesized. Four SI factors (effective systems handling, systemic reflection, holistic systems perception, systemic perspective-taking) were retained from

the TSIS with a general or global SI factor hierarchically above these. In particular, SI factors were positively associated with socio-emotional skills, (acquisitive) self-monitoring, self-esteem, and the Big Five. The only factor showing at times divergent (i.e., inverse) and even non-significant patterns was systemic reflection. The factor showing strongest associations was effective systems handling.

Interpretation of results. The results are interpreted with respect to the factor structure obatinef from the TSIS as well as the associations the retained factors show with other, theoretically related constructs.

Factor structure. Four factors were retained from the 30 items of the TSIS.

The first factor, *effective systems handling*, refers to efficient and productive ways of acting within complex and dynamic systems and problems. Individuals high in this factor exert positive and effective control within systems while remaining flexible and systems-oriented. Should hindrances occur, they persevere and seek action-oriented solutions. This factor is related to the action- or behavior-component of SI (which would also be a core factor in systems intelligent leadership).

The second factor, *systemic reflection*, refers to the tendency to reflect upon oneself *and* others concerning thoughts, feelings, intentions, and behaviors. Individuals high on this factor should be deep in thinking, very reflective, but also very sensitive to their surroundings. This factor relates to the thought- or cognition-component of SI.

The third factor, *holistic systems perception*, refers to the tendency to perceive oneself within a complex system, one's actions within this system, but also the feedbacks from this system. People high in this factor have perceptional and thought patterns referring to persons and environments "working together" as one whole. Their perception can be described as systemic or holistic. This factor reflects both a perceptional and attitude or opinion factor (e.g., one has the opinion that he or she acts within a complex system involving feedback processes).

The fourth factor, *systemic flexibility*, refers mostly to a factor of perspective-taking, empathy, flexibility, plasticity, and adaptivity. People high in this factor should be able to adapt sucessfully to different situations and also adopt views and opinions different from their own, which should make them not only cognitively but also behaviourally more flexible. Further, individuals might also employ a great deal of intuition. This factor relates to a cognitive and behavioral competence of taking different perspectives within systems.

In addition, the study showed that the four retained factors are tied together by an underlying super-factor, which could be tentatively labelled the g-factor of Trait-SI. Thus, the TSIS gives us the opportunity of studying Trait-SI both as a global construct and as differentiated subconstructs.

Table 6. Bivariate zero-order (inter-)correlations of SI scales with other constructs

	M	*SD*	α	SI (g)	ESH	SR	HSP	SF
Systems intellect								
Systems intellect (global)	2.75	0.42	.89	–				
Effective systems handling	2.59	0.51	.85	–	–			
Systemic reflection	3.07	0.57	.72	–	.28***	–		
Holistic systems perception	2.52	0.77	.86	–	.43***	.24***	–	
Systemic flexibility	2.90	0.50	.69	–	.56***	.33***	.40***	–
Socio-emotional skills								
Emotional expressivity	48.32	8.19	.76	.25***	.30***	–.00	.20***	.16**
Emotional sensitivity	53.44	6.98	.76	.48***	.38***	.31***	.22***	.51***
Emotional control	44.68	8.29	.80	.17**	.22***	.07	–.03	.18***
Social expressivity	49.58	9.93	.88	.41***	.43***	.08	.32***	.30***
Social sensitivity	50.20	9.08	.84	–.10*	–.26***	.25***	–.05	–.11*
Social control	52.77	8.31	.80	.47***	.56***	.03	.27***	.39***
Expressivity	97.89	16.53	.89	.37***	.40***	.04	.29***	.26***
Sensitivity	103.64	12.15	.81	.20***	.03	.36***	.09	.22***
Control	97.45	12.69	.81	.42***	.51***	.06	.16**	.37***
Emotional intelligence	146.44	12.95	.71	.53***	.53***	.21***	.23***	.49***
Social intelligence	152.55	16.82	.83	.42***	.39***	.19***	.30***	.31***
Socio-emotional intelligence	298.99	26.08	.86	.53**	.51***	.23***	.31***	.45***
Self-monitoring (acquisitive)								
Perceptiveness	2.48	0.70	.88	.43***	.51***	.08†	.18***	.36***
Impression management	2.69	0.59	.80	.48***	.39***	.28***	.21***	.54***
Self-esteem	2.26	0.54	.90	.40***	.49***	–.03	.26***	.33***
Big Five								
Emotional stability	3.64	1.23	.71	.29***	.42***	–.11*	.15**	.26***
Extraversion	4.97	1.26	.81	.37***	.41***	.05	.28***	.26***
Openness to experiences	5.25	1.10	.68	.36***	.31***	.22***	.21***	.30***
Agreeableness	5.39	0.94	.52	.22***	.11*	.15**	.13**	.29***
Conscientiousness	4.88	1.12	.69	.34***	.38***	.07	.25***	.20***

Note. $N = 408$.
SI (g) = global systems intelligence score; ESH = Effective systems handling; SR = Systemic reflection; HSP = Holistic systems perception; SF = Systemic flexibility.
*** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

Intercorrelations. As hypothesized, most associations turned out (significantly) positive. Particularly, high correlations emerged for socio-emotional intelligence and self-monitoring. The pattern of findings points towards the positive nature of SI: individuals scoring high on Trait-SI can be expected to be socially and emotionally intelligent, self-confident, flexible, stable, outgoing, open-minded, warm, and persistent.

One notable exception to the general pattern of findings (i.e., significantly positive correlations) is the correlations of the SI factor systemic reflection: they were one of the smallest, some were not even significant, and systemic reflection showed a negative association with Emotional Stability (whereas the other factors showed positive associations) and a positive one with social sensitivity (whereas the other factors showed negative associations). The latter findings can be explained by the nature of systemic reflection: reflecting upon oneself and others in complex systems gives rise to not only thoughtful but possibly also ruminative and even depressive (or dysphoric) moods (which is associated with Neuroticism as a domain of negative affect). Further, Neuroticism can be associated with sociometer theory (Leary and Baumeister, 2000) which posits that people show individual tendencies to detecting cues of inclusion (acceptance) and exclusion (rejection) which in turn determines their self-esteem (Penke and Denissen, 2008). People with a more sensitive sociometer are also more neurotic, sensitive to social cues (especially negative ones), and ponder on interpersonal problems (see, e.g., Denissen and Penke, 2008). Therefore, it is plausible that systemic reflection is associated with social sensitivity and Neuroticism. This is corroborated by the finding that it is not associated with self-esteem (and even shows a negative tendency, albeit small). Further, systemic reflection correlates the least with the other SI factors and also loads the least on the global Trait-SI factor. These findings seem to shed light on more negative aspects of systems intelligent people: even though they might be sensitive to themselves and surroudings and know what (is right) to do (i.e., they have high competencies in taking actions in systems), especially the sensitivity- and reflectivity-parts could be hindrances at some time (e.g., it may be better at times to not be too sensitive or perceptive as well as to not think so much about things and take them too seriously). However, there are two upsides that ought not to be forgotten: first, the self-concept, self-efficacy, and general self-esteem may buffer negative states and moods and thus counteract depressogenic symptomatology. Second, even if there are ruminative states that consume one's attention, thoughts, and time, this is actually indicative of solving complex analytical problems and serves an adaptive purpose (see Andrews and Thomson, 2009; see, however, also Lyubomirsky and Tkach, 2003).

Merits and limitations. The merit of this article lies in proposing a preliminary Trait-SI scale along with assessing basic psychometric criteria of the items and scale(s). First steps have been taken in developing a scale that can validly and reliably assess individual differences in Trait-SI. Other researchers could use the scale in their research and possibly revise and refine the items and scales (or at least adjust them to their needs). However, there are also certain limitations that should be briefly addressed.

One limitation of the findings is the sample used. First, there was a female overrepresentation (77.50%). Even though it is unlikely that females systematically differ in their SI

skills and traits,[16] future studies should seek to balance out the sex ratio. Second, all participants were students and thus had higher education levels which could have led to higher levels of SI-related traits (e.g., more and deeper reflection tendencies, striving to think holistically, etc.). Third, mostly adolescents were in the sample which restricts generalisability to other age classes. Fourth, all participants were native speakers of German, and so the TSIS and all other scales were administered in German versions. This may limit the findings on the TSIS. Future studies ought to use the English items[17] and replicate findings from this study. A further limitation is the reliance on self-reports and cross-sectional data. Due to the latter, no causal inferences can be made and associations cannot be sufficiently interpreted. The effects and interactions of the variables remain thus unclear. This limits our view to a structural rather than a process-oriented and dynamic one. Longitudinal data would be needed to gain insight into causality and dynamics. Self-reports should be complemented by peer-ratings and (observed) behavioural data in future studies. Also, multitrait-multimethod analyses should be employed. Another limitation concerns social desirability of answering. Most traits were genuinely positive traits (e.g., self-esteem, emotional stability) and correlations might be inflated due to a socially desirable response style. Further, the TSIS might not have any predictive and incremental abilities. No SI-related criteria were sampled and thus the predictive validity of the TSIS remains unclear as of yet. The scale's applicability will have to be tested in future research and under other circumstances. Moreover, the scale's content and face validity was not assessed. Face validity is not that important in the case of the TSIS, but content validity is, especially because there are no other scales that could be used to assess construct validity in terms of convergent (and discriminant) validity. Therefore, experts in SI should rate the proposed items according to their respective levels of capturing SI-relevant aspects.[18]

Prospects: future lines of research. Future research should be especially concerned with maximising content validity, revising, and validating the TSIS. In general, not only should self-ratings but also peer-ratings (with different levels of acquaintanceship) be sampled. Further, the factor structure of the TSIS ought to be replicated and confirmatory factor analyses employed (as opposed to the exploratory factor analyses conducted in this study). Moreover, test-retest reliability needs to be assessed for the scale in order to ensure that a stable trait (i.e., enduring characteristics) is measured. Additionally, the scale should be integrated into a wider nomological network of (theoretically) related constructs. The present

[16] Indeed, Mann-Whitney *U*s turned out non-signficant. No sex differences were found for the four SI factors and the global Trait-SI factors.

[17] The English items proposed are suggestions from the author; they have not (yet) been derived by the usual translation–backtranslation process.

[18] Lawshe (1975) proposed following method: a panel of subject matter experts (i.e., experts in SI) should examine the items and indicate whether they are "essential", "useful (but not essential)", or "not necessary". The *content validity ratio* (CVR) is calculated to indicate whether each item is pertinent to content validity or not:

$CVR = \frac{n_e - \frac{N}{2}}{N - 1}$ n_e = absolute number of times which an item is rated "essential"; N = absolute number of raters

CVR values range from +1 to –1. Positive values and such closer to +1 indicate that experts are in agreement that the item should be deemed as essential to content validity. A mean CVR across items as an indicator of overall content validity can also be computed.

study only used a small selection of possibly related constructs (and also measured each construct only with one instrument). Possibly, also latent state-trait models and multitrait-multimethod analyses could be used in the future. A further concern will be to establish criterion validity of the TSIS as the scale(s) should be able to "predict" SI-related real-life criteria (from the past, at the present, and in the future). Another area of investigation would be whether SI structures (and the constructs themselves) differ according to socio-demographic variables (sex, age, education, nationality, etc.) and whether there are cultural differences. Specifically, future research should focus on identifying (a) behavioural criteria of (Trait-)SI that can be observed and coded by raters (in order to show associations between behavioural scores and the TSIS) and (b) critical real-life outcomes (criteria) for (Trait-)SI. This will also help improve the scale.

Conclusion

The present article proposed a preliminary Trait-SI Scale (TSIS) to assess trait-aspects of SI. Thus, first steps towards measuring individual differences in SI in a psychometric sense were made. Self-reports might capture some trait-related aspects of SI, but the proposed scale should be under close and rigorous scrutiny in future empirical studies. Not only should basic psychometric criteria be met, but also should self- and peer-ratings as well as behaviour observations be employed to study the properties of the items and scale(s) more closely.

It is my hope that other researchers in the filed of SI find this article, its statistics, and the items of the TSIS useful for their own research and even strive to revise and improve the scale. Hopefully, a valid and reliable scale of Trait-SI will emerge that will be capable of quickly and easily assessing individual levels of Trait-SI.

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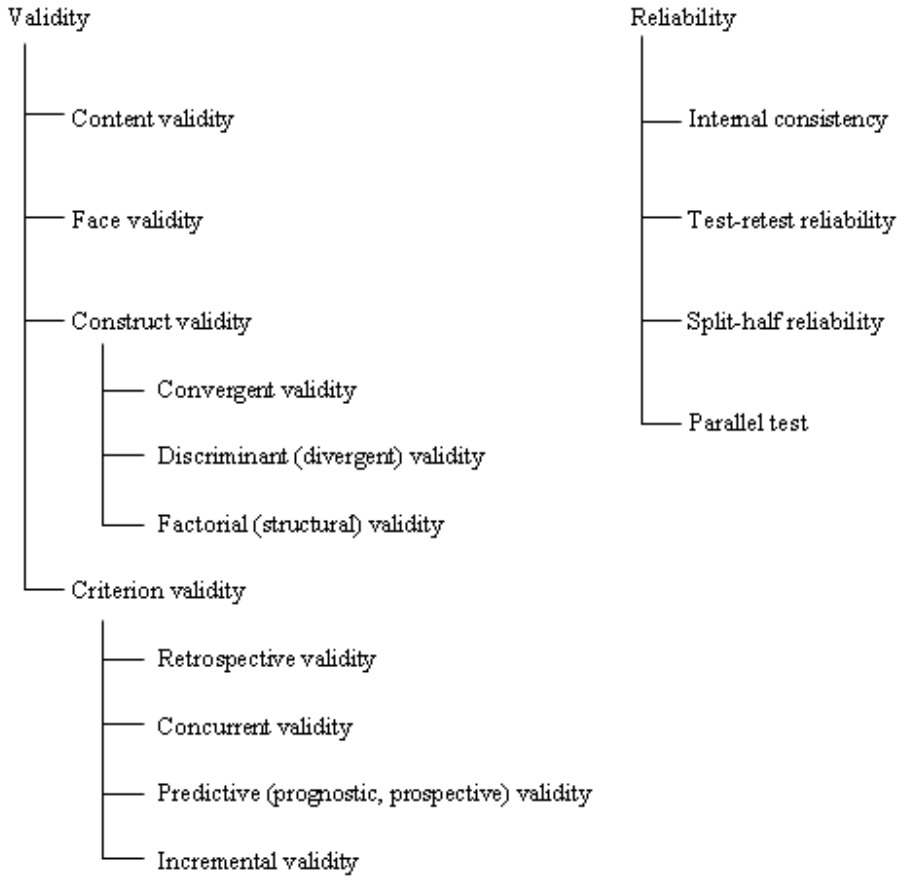
Appendix A. Overview and Explanation of Basic Psychometric Criteria



Psychometric criteria

Different psychometric criteria will have to be assessed for the preliminary Trait-SI scale. In the following, different "traditional" criteria of *validity* and *reliability*, which the Trait-SI scale should meet, are briefly outlined.

Validity

Validity refers to the extent to which the construct that should be measured by a certain measure is actually measured by this measure. This means that a scale aiming at measuring Trait-SI should indeed capture Trait-SI (or at least essential or constituting parts of it) and not measure (self-reported) intelligence or socio-emotional competences. The proposed scale is solely theoretically generated, and its validity needs to be evaluated in future empirical studies.

Content validity

Content validity refers to the extent to which a measure or rather its item content represents the construct that should be measured. Although this form of validity is not too often quantified, expert ratings can be used to evaluate whether the items are useful or not for a certain construct.

Face validity

Face validity refers to the ability of a measure to at least *appear* to superficially measure a certain construct (whether it may do this in fact or not). Face validity can be assessed by asking non-expert subjects (lay persons) whether the items account for SI aspects after giving them an introduction on what SI is and how it is mentally and behaviourally manifested. Of course, face validity is not essential in all measures, and some constructs might even provoke social desirability through their face validity.

Construct validity: convergent and discriminant (divergent) validity

Convergent validity refers to the extent to which one construct is similar to another theoretically near construct (within a nomological network). This is often used to show that one particular construct can be assessed by several measures that claim to measure that same construct. *Discriminant validity* refers to the extent of which one construct is *not* similar to certain other constructs (and should be lower than convergent correlations). Both forms of validity can be assessed in multitrait-multimethod analyses (Campbell and Fiske, 1959). In the future, also Gardner's multiple intelligences could be correlated with SI (if valid and reliable tests can be found)[19]. Yet, convergent validity cannot be clearly assessed as there are so far no valid and reliable scales to measure Trait-SI. However, one could find scales measuring certain constructs that are highly similar to sub-scales of the global SI or its subcomponents and explore correlations.

Construct validity: factorial (structure) validity

We should think about the structure of a scale that we expect: do we expect orthogonal or interrelated factors? Do we expect higher-order factors? Do we expect a hierarchical structure? Do we expect a circumplex? Why do or *should* we expect certain SI structures? These are questions that both theorisation *and* sound research ought to address. After excluding items that show poor content validity (they need not necessarily have high face validity, though), it might be advisable to reexamine the factorial structure of the TSIS. Also, it will be interesting to see *which* and *how much items* load on *which* and *how much extracted factors*. Further, the factor structure of the TSIS needs to be replicated in different samples. Future empirical studies should address these issues with both exploratory *and* confirmatory factor analyses.

[19] We need to be careful when "mixing" abilities with traits here: The intelligences should be assessed as both abilities *and* traits (cf. Ability-, Integrative, and Mixed-Models) and then convergent and discriminant correlations can be computed.

Criterion validity: retrospective, concurrent, and predictive/prospective/prognostic validity

Criterion validity refers to the extent to which the measured construct (predictor) can predict construct-related real-life phenomena or outcomes (criteria) either from the past (retrospective), at the moment (concurrent), or in the future (predictive, prognostic, prospective). The TSIS should especially be analysed concerning its criterion validity. For this, however, suitable indicators or criteria for (Trait-)SI need to be found. Future research should hence focus on *investigating SI-related criteria* (be they set in the past, present, or future), *evaluating their specific relevance to certain aspects of (Trait-)SI*, and eventually *assessing the criterion validity of the scale*.

Incrementanl validity

The most interesting "test" for SI will be its *incremental validity*: can Trait-SI predict relevant or critical real-life criteria when controlling socio-demographic variables (sex, age, education, socio-economic status, nationality, culture, etc.) *and* person variables (personality factors, intelligence, other forms of "intelligence", etc.)? Should the scale not perform well on incremental validity, then this does not necessarily mean that SI should not be treated as a distinct construct; it might also be due to unsatisfactory item generation and poor operationalisation. However, should the scale perform well on incremental validity, then this is no guarantee that (Trait-)SI is actually measured – the scale measures something that is able to predict certain criteria above the controlled variables (but what exactly is measured and why it contributes an incremental portion to predictive variance remains unclear). Therefore, we ought to maximise content and construct validity for the SI scale *before* aiming at incremental validity or else findings will not be interpretable that easily. Additionally, (Trait-)SI should be integrated into a *nomological network*.

Reliability

Reliability refers to the extent of how consistently a construct is measured by a certain measure. This means that measures of long-term stable tendencies such as traits should have a high reliability: a person should not be very systems intelligent in week 1 and then not in week 2 or vice versa. This is referred to as test-retest reliability. However, reliability can also be assessed in other ways (e.g., by internal consistency).

Internal consistency

Internal consistency of a scale can be indexed by Cronbach's alpha (Cronbach, 1951; see also Cortina, 1993; Schmitt, 1996) with a range from .00 to theoretically 1.00 (which is practically never achieved, though). Cronbach's alpha should not be mistaken as an index for dimensionality: a high alpha does not necessarily mean that the scale is unidimensional. Dimensionality should be investigated via factor analyses. Cronbach's alpha taps the consistency or homogeneity of a scale: if there are strong intercorrelations among items (which indicate that they are somehow tied together), then the scale, resulting from these items, can be expected to be homogeneous and show a high alpha.

Test-retest reliability

Test-retest reliability concerns stability, that is when administering the measure of a certain construct at two (or more) times apart and correlating the obtained scores, then there should be high correlations suggesting a certain stability of the measurement and construct (if we are assessing a trait). This type of reliability is very important for Trait-SI as it should be a stable construct. Under the presumption that there are minimal variations in Trait-SI over time, test-retest correlations should be quite high or else the measure might capture more state-related aspects of SI. Cases of SI-training can be particularly problematic here: people might be able to train and further their SI to some extent but this refers mostly to Ability-SI. The relationships between ability- and Trait-SI have yet to be explored and it will be interesting to see whether an increase in Ability-SI is also accompanied by an increase in Trait-SI (i.e., the person's values, self-descriptions, and traits have changed in some way)[20]. Then, test-retest reliability can be lower, indicating that a change has occurred.

[20] Also, it would be interesting to investigate if one or both (ability-SI, trait-SI) can decrease and how and why this may be the case.

Appendix B.

English Items	German items (used in the study)	Codings
I perceive myself as part of a whole.	Ich nehme mich als Teil eines Ganzen wahr.	+
I am usually aware of my surroundings and its influences on me.	Ich bin mir meistens über meine Umgebung und dessen Einflüsse auf mich bewusst.	+
I have an intuitive feeling for unspoken things.	Ich habe ein intuitives Gefühl für unausgesprochene Dinge.	+
I am usually not quite aware of the impact of my actions on my surroundings.	Meistens bin ich mir nicht bewusst, welche Auswirkungen meine Handlungen auf meine Umgebung haben.	–
I feel as part of a bigger system.	Ich empfinde mich als Teil eines größeren Systems.	+
I observe my own interdependence within my surroundings.	Ich beobachte eine wechselseitige Abhängigkeit von mir und meiner Umgebung.	+
I have difficulties seeing things from different perspectives.	Ich tue mich schwer, Dinge aus einer anderen Perspektive zu betrachten.	–
I am very well aware that I live and interact within a complex and dynamic system.	Ich bin mir voll bewusst, dass ich in einem komplexen und dynamischen System interagiere.	+
I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	Ich kann leicht die Perspektive anderer einnehmen und fühlen, was sie denken und fühlen.	+
I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	Ich nehme mich selbst als Teil eines Ganzen, den Einfluss des Ganzen auf mich sowie meinen Einfluss auf das Ganze wahr.	+
I would not describe my thinking as "holistic" and "intuitive".	Ich würde mein Denken nicht als „holistisch" (ganzheitlich) und „intuitiv" beschreiben.	–
I often ponder on my thoughts, feelings, intentions, and actions.	Ich denke oft über meine Gedanken, Gefühle, Absichten und Handlungen nach.	+
I would describe my thinking as quite "complex" and "interwoven".	Ich würde mein Denken als ziemlich „komplex" und „verwoben" beschreiben.	+
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	Ich habe normalerweise keine Schwierigkeiten mit komplexen und schweren Problemen, wenn ich diese in meinem Geist Stück für Stück durchgehe.	+

I am not a very self-reflexive and thoughtful person.	Ich bin keine sehr selbst-reflexive und nachdenkliche Person.	–
I often ponder on others' thoughts, feelings, intentions, and actions.	Ich denke oft über Gedanken, Gefühle, Absichten und Handlungen anderer nach.	+
I often think about my role in my surroundings.	Ich denke oft über meine eigene Rolle in meiner Umgebung nach.	+
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	Im Geist vergegenwärtige ich mir und identifiziere produktive Verhaltensweisen, wenn ich mit einem komplexen Problem konfrontiert bin.	+
My thinking is very action-oriented.	Mein Denken ist sehr handlungsorientiert.	+
I am a very reflexive person.	Ich bin eine sehr reflexive Person.	+
I am able to manage most of my everyday activities successfully.	Ich bin der Lage, die meisten meiner alltäglichen Anforderungen erfolgreich zu meistern.	+
I can adapt to varying situations quite flexibly.	Ich kann mich sich ändernden Umgebungsbedingungen sehr flexibel anpassen.	+
I can influence my surroundings, be they living or not.	Ich kann meine belebte und unbelebte Umwelt beeinflussen.	+
When confronted with complexity, I persevere until I have found a productive solution.	Wenn ich mit komplexen Dingen konfrontiert bin, dann bemühe ich mich beharrlich, bis ich eine produktive Lösung dafür gefunden habe.	+
I exercise productive ways of influence within my surroundings.	Ich übe einen produktiven Einfluss innerhalb meiner Umgebung aus.	+
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	Ich habe Schwierigkeiten, meine Gedanken, Gefühle und Handlungen meiner Umgebung sowie Situationen anzupassen.	–
I usually cannot influence much in my surroundings.	Meistens kann ich nicht viel in meiner Umgebung beeinflussen.	–
I tend to just do things right.	Ich habe die Tendenz, Dinge „einfach richtig" zu machen.	+
I do not give up until I have achieved my goal.	Ich gebe nicht auf, ehe ich mein Ziel erreicht habe.	+
I sometimes have the feeling that there is not much what I can influence by my own actions.	Ich habe manchmal das Gefühl, dass es nicht vieles gibt, was ich durch meine eigenen Handlungen beeinflussen kann.	–

English Items	Item content	SI concept	References
I perceive myself as part of a whole.	attitude self-description	Whole is more important than parts. In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes. Our perception mechanisms exhibit a similar tendency.	Saarinen and Hämäläinen (2007, p. 52/53)
I am usually aware of my surroundings and its influences on me.	situational awareness	In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes. Our perception mechanisms exhibit a similar tendency.	Saarinen and Hämäläinen (2007, p. 53)
I have an intuitive feeling for unspoken things.	intuition description	The behaviour of people often reflects their best guess of rational behaviour but that guess can be completely erroneous.	Saarinen and Hämäläinen (2007, p. 53)
I am usually not quite aware of the impact of my actions on my surroundings.	self-monitoring description	Human beings perceive themselves as independent individuals, yet they most often are encompassed in systems. In most systems, each subject separately reacts to the system without seeing the cumulative overall effect of the reactive behaviours on the others. Our perception mechanisms exhibit a similar tendency.	Saarinen and Hämäläinen (2007, p. 53)
I feel as part of a bigger system.	attitude	Whole is more important than parts.	Saarinen and Hämäläinen (2007, p. 52)
I observe my own interdependence within my surroundings.	self-monitoring description	Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.	Saarinen and Hämäläinen (2007, p. 52)
I have difficulties seeing things from different perspectives.	empathy social competences	Systems approach starts when you perceive the world through the eyes of another person.	Saarinen and Hämäläinen (2007, p. 52)
I am very well aware that I live and interact within a complex and dynamic system.	attitude description	Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.	Saarinen and Hämäläinen (2007, p. 52)
I can easily adopt the perspective of other people and "feel" what they are thinking and feeling.	empathy emotional intelligence	Systems approach starts when you perceive the world through the eyes of another person.	Saarinen and Hämäläinen (2007, p. 52)

I perceive myself as part of a whole, the influence of the whole upon myself, as well as my own influence upon the whole.	attitudes self-description	In most systems, each subject separately reacts to the system without seeing the cumulative overall effect of the reactive behaviours on the others. Our perception mechanisms exhibit a similar tendency. "Part" and "Whole" are relative abstractions that are always subject to potential redefinition by changing the perspective.	Saarinen and Hämäläinen (2007, p. 52/53)
I would not describe my thinking as "holistic" and "intuitive".	thinking style	Whole is more important than parts. In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes. Our perception mechanisms exhibit a similar tendency.	Saarinen and Hämäläinen (2007, p. 52/53)
I often ponder on my thoughts, feelings, intentions, and actions.	reflection meta-cognition	In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes. Our perception mechanisms exhibit a similar tendency. Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.	Saarinen and Hämäläinen (2007, p. 52/53)
I would describe my thinking as quite "complex" and "interwoven".	thinking style	In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes.	Saarinen and Hämäläinen (2007, p. 53)
I usually have no problems dealing with difficult and complex problems when going them through step by step in my mind.	complex problem solving	Human agents can influence entire systems.	Saarinen and Hämäläinen (2007, p. 52)
I am not a very self-reflexive and thoughtful person.	reflection (trait)	Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.	Saarinen and Hämäläinen (2007, p. 52)
I often ponder on others' thoughts, feelings, intentions, and actions.	reflection meta-cognition	In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes.	Saarinen and Hämäläinen (2007, p. 53)
I often think about my role in my surroundings.	reflection meta-cognition	In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes.	Saarinen and Hämäläinen (2007, p. 53)
I envision and identify productive ways of behaviour in my mind if confronted with complex problems.	visualising complex problem solving	Much of the time, people display behaviours they would change if they only could see the bigger picture of the setting they are in. A system can make people act in some undesirable ways but as people act in such ways, they maintain the system and its influence upon	Saarinen and Hämäläinen (2007, p. 53)

		the others, partly causing the system of undesirable behaviours to regenerate itself. In most systems, each subject separately reacts to the system without seeing the cumulative overall effect of the reactive behaviours on the others.	
My thinking is very action-oriented.	thinking style	Beliefs regarding structures produce behaviour.	Saarinen and Hämäläinen (2007, p. 53)
I am a very reflexive person.	reflection (trait)	Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.	Saarinen and Hämäläinen (2007, p. 52)
I am able to manage most of my everyday activities successfully.	successful intelligence behaviour description	Human agents can influence entire systems. There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007, p. 53)
I can adapt to varying situations quite flexibly.	situational adaptability flexibility	There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007, p. 53)
I can influence my surroundings, be they living or not.	social / emotional intelligence behaviour description	Human agents can influence entire systems. There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007, p. 53)
When confronted with complexity, I persevere until I have found a productive solution.	perseverance conscientiousness (trait)	There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007)
I exercise productive ways of influence within my surroundings.	social / emotional intelligence behaviour description	Human agents can influence entire systems.	Saarinen and Hämäläinen (2007, p. 53)
I have difficulties adjusting my thoughts, feelings, and actions to my surroundings and situations.	social / emotional intelligence	Much of the time, people display behaviours they would change if they only could see the bigger picture of the setting they are in. Systems approach starts when you perceive the world through the eyes of another person.	Saarinen and Hämäläinen (2007, p. 52/53)
I usually cannot influence much in my surroundings.	social / emotional intelligence behaviour description	There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007, p. 53)

I tend to just do things right.	(behavioural) intuition behaviour description	The behaviour of people often reflects their best guess of rational behaviour but that guessan be completely erroneous.	Saarinen and Hämäläinen (2007, p. 53)
I do not give up until I have achieved my goal.	perseverance conscientiousness goal achievement	Human agents can influence entire systems.	Saarinen and Hämäläinen (2007, p. 53)
I sometimes have the feeling that there is not much what I can influence by my own actions.	social / emotional intelligence (learned) helplessness	There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.	Saarinen and Hämäläinen (2007, p. 53)