Psycho-lexically based Openness to Experience

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We investigated whether NEO-PI-R Openness to Experience (Costa & McCrae, 1992) and its six facets could be identified in the natural trait lexicon. To represent the NEO-PI-R Openness, a list of 113 items was selected from a lexically derived trait list developed for the eight-factor trait model of De Raad and Barelds (2008). We used ratings from two samples. The first (N=271) filled out the lexical Openness scales, the NEO-PI-R Openness scales, and scales measuring the eight-factor model. From the second sample (N=1,466), ratings were used to analyze the lexical Openness scales. Correlations between the eight-factor scales and the two sets of Openness scales indicated that Openness scales are fairly covered by the eight factors, except for the Ideas and Values facets of the NEO-PI-R. The lexical Openness scales correlated well with the NEO-PI-R Openness scales. Openness to Experience and its six facets were identified in the natural trait lexicon, but exploratory factor analyses did not support the six-facet structure of the NEO-PI-R Openness, neither did they lead to a similar six-facet structure across samples. Moreover, it did not consistently support a proposed two-facet structure emphasizing internal openness (fantasy, aesthetics) and external openness (ideas, change).

Keywords: Openness to Experience, psycho-lexical approach, trait structure, facets

One of the conspicuous distinctions between the psycho-lexically based Big Five model (the "Big Five", Goldberg, 1981) and the questionnaire based Five Factor Model (FFM, Costa & McCrae, 1992) is the intellect-creativity related factor in the two models. This factor is labelled Openness to Experience in the FFM and typically labelled Intellect in the Big Five (De Raad, 1994; McCrae & John, 1992). The two related constructs have a different origin. While the Big Five Intellect factor emerged according to psycho-lexical principles in diverse indigenous studies, Openness to Experience was even denied such an origin by McCrae (1990), in particular where it concerns a lexical representation of the openness facets fantasy, aesthetics, and feelings. In psycho-lexical studies, the typical carrier of trait-descriptive meaning has been the trait-adjective. Although McCrae agreed that there are "of course, many words in English that denote aspects of Openness", as in such expressions as "wide interests" or "prefers variety", McCrae (1990) argued that the distinctive features of Openness to Experience, in comparison to Intellect, are not expressed in trait *adjectives,* and are not simply to be detected by scanning dictionaries for relevant descriptors. McCrae's argument that there are few adjectives in English denoting openness to fantasy, aesthetics, and feelings, led to some discussion by Saucier (1992; 1994) and Trapnell (1994). Saucier gave "illustrative evidence" (1992, p. 382) that proved McCrae's argument wrong.

Openness to Experience itself is not a single term that can be taken from dictionaries in the various languages; it is a compound construct stemming from the humanistic tradition in psychology for which self-actualization had become an important notion. The concept was supposed to capture relevant characteristics of the "individual's potentialities for various kinds of experience and expression" (Coan, 1974, p. 58). It is what Lakoff and Johnson (1980) call a conceptual container, here a device that should convey different characteristics of the optimal personality. With a questionnaire developed by Fitzgerald (1966) as a starting-point, Coan constructed a 114 item "Experience questionnaire" meant to tap into "an assortment of associations, memories, ideas, impulses, feeling states, and fantasy and dream phenomena". Responses were collected from 383 participants (college students), and the data were subjected to principal axis analysis followed by oblique simple structure rotation. Seven factors were considered to represent important dimensions of openness, and these factors were used as targets to form additional items, leading to a revised set of 181 items. This latter list was administered to a fresh sample of 219 participants. Factor analysis ultimately led to the acceptance of seven factors, describing "(a) aesthetic sensitivity versus insensitivity; (b) unusual perceptions and associations; (c) openness to theoretical or hypothetical ideas; (d) constructive utilization of fantasy and dreams; (e) openness to unconventional views of reality versus adherence to mundane, material reality; (f) indulgence in fantasy versus avoidance of fantasy; and (g) deliberate and systematic thought" (Coan, 1972, p. 346). Much of what is covered by these seven factors is expressed in the six Openness to Experience facets, as formulated by Costa and McCrae (1992), captured in the concepts Aesthetics, Fantasy, Feelings, Change, Val-

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ues, and Ideas. These concepts form the characteristic distinctive facets as measured by the widely used NEO-PI-R (Costa & McCrae, 1992).

The lexical fifth factor (Intellect) was suggested by McCrae (1990; cf. also McCrae, 1994) to be a "variant of the more psychologically fundamental dimension of Openness to Experience" (p. 123). We do not discuss here the relative status of the different versions of the factor as in Intellect or Openness to Experience. We focus on the appropriateness of the Openness to Experience facets, using psycho-lexically derived data, and thus explicitly challenge McCrae's bold denial of the lexical presence of the construct and its facets, and implicitly criticize the formulation of its specific contents. In short, we test the Openness to Experience domain factor and its six facets as described above in lexical material, and with it we question the theoretical adequacy of those facets. Griffin and Hesketh (2004) and DeYoung, Quilty, and Peterson (2007), for example, casted serious doubt on the adequacy of those six facets. This is important given the fact that the NEO-PI-R is so broadly used in making decisions about people.

The typical psycho-lexical study makes use of lists of some 300 to 500 trait-descriptive adjectives, selected from complete lists of often several thousands of possibly personality relevant adjectives taken from a dictionary. The reductions of those longer lists are usually made on the basis of familiarity and clarity, and guided by the concern to make the ultimate lists feasible for ratings by participants. Moreover, other word-categories (e.g., nouns, verbs) have usually been excluded because they were considered less evident as trait descriptors.

For a fair test of the Openness to Experience factor and its facets to emerge in the psycho-lexical domain, a less restricted list of trait descriptors would be more appropriate. In this study we make use of a data set used in De Raad and Barelds (2008), in which 1,466 participants provided self- or partner-ratings on a list of 2,331 personality descriptive items. That list of items is comprehensive and unrestricted including trait-descriptive adjectives, nouns, verbs, and adverbs.

The present study

This study comprised three parts. Part 1 dealt with the selection of a full list of items from the lexicon to describe Openness to Experience and its facets, and the construction of an Openness to Experience scale. Part 2 is about the evaluation of this scale in relation to NEO-PI-R Openness variables and in relation to the eight factors from De Raad and Barelds (2008), roughly representing the Big Five and three additional dimensions, Virtue, Competence, and Hedonism. Part 3 describes exploratory analyses of the different sets of Openness to experience items in order to detect facets of Openness.

Part 1:
Lexically Based Openness to Experience Items

For this first part of the present study use was made of the full list of 2,331 items used for the development of the eight factorial structure as described in De Raad and Barelds

(2008). That list was selected on the basis of relevance for description from a much larger list of 4,595 items. That larger list was available in case it would have been difficult to find sufficient Openness to Experience descriptors.

Using the Dutch descriptions of Openness to Experience and its facets (Hoekstra, De Fruyt, & Ormel, 2003) as instruction, an inclusive list of close to 700 items was selected by the first two authors, from which further selections could be made to describe Openness to Experience. The list with 700 items was discussed and subsequently reduced to some 300 items that were classified according to the facet definitions. A second round of discussion followed, leading to a reduction to 241 items, which were then evaluated by the first author of the Dutch version of the NEO-PI-R. This led to a final list of 113 items that should enable the measurement of the FFM Openness to Experience domain scale and the six facets of FFM Openness. The total list consisted of 10 items for the facet Fantasy, 11 items for Aesthetics, 19 items for Feelings, 25 items for Change, 25 items for Ideas, and 16 items for Values. The remaining set of 7 items could not unambiguously be assigned to facets but was used in the measurement of the Domain scale of Openness to Experience.

Making use of the original self- and partner-ratings from the 1,446 participants from the study by De Raad and Barelds (2008), the alpha-coefficients were calculated, which turned out to be all sufficiently high. The scales and alpha-coefficients are given in Table 1, panel 1. A first conclusion is that it was relatively easy to find a sufficient number of items describing Openness to Experience and its six facets from the lexicon of the natural language in a reliable way, thus also confirming Saucier's (1994) observation. A question is to what extent these lexically derived Openness facet scales correspond to the Original NEO-PI-R Openness scales. This is investigated in Part 2.

Part 2
Lexical Openness, in relation to NEO-PI-R Openness and the Big Eight

In part 2, we examined the relations between the lexically derived Openness to Experience scales, the NEO-PI-R Openness scales, and a full trait descriptive personality measure.

METHOD

Participants and procedure

A sample 271 participants took part in this study; most of them were students who obtained credits for participation. The group consisted of 67 men and 204 women, their age running from 16 to 60, with a mean age of 22.12 years (SD: 8.14). The educational level varied; all had finished high school and the majority were university student or had a university degree.

The participants filled out an on-line questionnaire consisting of three parts: a list of lexically based Openness to Experience items, the NEO-PI-R Openness scale (Costa & McCrae, 1992; Dutch version Hoekstra et al., 2003), and a

Table 1. Details on scales of the Big Eight factors, the NEO-PI-R Openness facets, and the Lexical Openness items

Questionnaires and scales		Item examples	N of items	Alpha
Panel 1 Lexically derived items in the Big Eight set (N=1,466)			113	0.92
	Fantasy	*An imaginative person*	10	0.78
	Aesthetics	*An artistic-minded person*	11	0.71
6 facets	Feelings	*A sensitive person*	19	0.82
	Change	*An adventurous person*	25	0.82
	Ideas	*Someone who likes to study things*	25	0.84
	Values	*A conservative person*	16	0.76
Panel 2 Lexically based Openness to Experience (N=271)			113	0.94
	Fantasy	*An imaginative person*	10	0.88
	Aesthetics	*An artistic-minded person*	11	0.78
6 facets	Feelings	*A sensitive person*	19	0.90
	Change	*An adventurous person*	25	0.89
	Ideas	*Someone who likes to study things*	25	0.83
	Values	*A conservative person*	16	0.78
Panel 3 NEO-PI-R Openness to Experience domain (N=271)			48	0.87
	Fantasy	*Has a vivid imagination*	8	0.85
	Aesthetics	*Is sometimes completely absorbed by the music he/she listens to*	8	0.79
	Feelings	*Does not find life very interesting without strong emotions*	8	0.77
6 facets	Change	*Finds it interesting to start new hobbies*	8	0.61
	Ideas	*often enjoys playing with theories or abstract ideas*	8	0.74
	Values	*Finds that ideas about good and bad of people in other cultures deserve respect, also when they seriously differ from ours*	8	0.63
Panel 4 Lexically based eight factorial trait questionnaire (N=271)				
	Virtue	*Someone who can be trusted*	10	0.77
	Competence	*A judicious person*	10	0.66
	Emotional Stability	*A relaxed person*	10	0.91
	Agreeableness	*A modest person*	10	0.73
8 scales	Conscientiousness	*A precise person*	10	0.88
	Hedonism	*Someone who seeks happiness*	10	0.71
	Extraversion	*Someone who seeks company*	10	0.87
	Conventionality	*An obedient person*	10	0.73

tentative list of markers measuring the eight personality factors of De Raad and Barelds (2008). The questionnaire was preceded by a brief explanation about its parts, and each part was introduced with a brief instruction about how to fill out that part. The total amount of time needed to fill out the questionnaires was about 20 minutes.

Materials

The lexically based Openness to Experience scale
The 113 Openness to Experience items intended to measure the Openness domain and its six facets were administered with a four-point answering scale, running from "not applicable" (1) to "applicable" (4). The lexically based facet-scales are listed in panel 2 of Table 1, each provided with an item-example.

NEO-PI-R Openness to Experience
Of the Dutch version of the NEO-PI-R (Hoekstra et al., 2003), the Openness to Experience scale was used (48 items,

8 items per facet-scale), consisting of the six facets mentioned before. These facet-scales are listed in Table 1, panel 3, each provided with an item-example. The items were scored using a five-point Likert scale, running from "not applicable at all" (1) to "completely applicable" (5).

Marker scales for the Big Eight factor structure
The comprehensive eight factorial trait structure (De Raad & Barelds, 2008) was used to construct an experimental version of a new questionnaire measuring those eight factors in the form of a list of marker scales. The eight factors were Virtue (*friendly* and *honest* versus *unfair* and *unreliable*), Competence (*inventive* and *enterprising* versus *passive* and *avoiding difficulties*), Emotional Stability (*self-assured* and *stable* versus *uncertain* and *vulnerable*), Agreeableness (*patient* and *helpful* versus *bossy* and *seeking conflict*), Conscientiousness (*disciplined* and *precise* versus *unstructured* and *careless*), Hedonism (*sensation-seeking* and *impulsive* versus *chaste* and *home-loving*), Extraversion (*open* and *talkative* versus *closed* and *reserved*), and Conventionality

Table 2. Correlations (x 100) between lexically derived Openness facet scales and NEO-PI-R facet scales

| | | Lexically derived Openness scale and facets | | | | | | | |
		Fan.	Aes.	Fee.	Cha.	Ide.	Val.	Domain	Multiple-R
NEO-PI-R Openness scale and facets	Fantasy	**78**	52	29	05	24	19	44	79
	Aesthetics	52	**56**	35	09	21	28	44	64
	Feelings	44	52	**71**	08	27	21	52	74
	Change	19	14	-06	**60**	26	29	38	62
	Ideas	31	27	13	15	**56**	31	41	59
	Values	05	03	12	04	25	**45**	22	49
	Domain-Openness	66	59	44	24	45	43	**65**	75
Multiple-R		81	69	73	62	61	55	70	

(*complex* and *creative* versus *obedient* and *docile*). Each factor was represented by ten items selected from among the highest loading ones on that factor. The eight scales are listed in panel 4 of Table 1, each provided with an item-example. The items were answered on a four point scale running from "not applicable" (1) to "applicable" (4).

RESULTS

Table 1 (panels 2 to 4) lists the various scales used in the present study together with reliability estimates as obtained in this study. Except for the Change and Values facets of NEO-PI-R Openness to Experience, all scales had high reliabilities.

How do the lexically derived Openness scale and facets relate to those of the NEO-PI-R Openness. The correlations are given in Table 2, together with the multiple correlations

(regressed on the facet-scales only). The multiple correlations show that the coverage of the lexically based facets by the NEO-PI-R system matches the coverage of the NEO-PI-R facets by the lexically based system. Although all the facet scales are expected to correlate positively with each other, the corresponding scales from the two different measures were expected to show the highest correlations (reported on the diagonal). For all facet-scales, the diagonal correlations were indeed the highest. Table 2 also shows that Fantasy, Aesthetics, and Feelings have relatively high inter-correlations, possibly suggesting a separate cluster. Also Values and Ideas tend to show somewhat higher inter-correlations, possibly related to a separate cluster as well.

In terms of reliability, the lexically derived domain-scale for Openness to Experience and the facet-scales form a good match for the NEO-PI-R Openness domain- and facet-scales. A question is whether the patterns of inter-correlations of the two sets of facet-scales are similar too. Table 3, panels 1 and 2, contains correlations among the scale and scale-facets for these two measures separately. We also added in panel 3 the corresponding correlations between scales based on the ratings from the original De Raad and Barelds (2008) data set.

For the three measures the average correlation among the facets is about half of the average correlation with the domain scale, with 0.25 and 0.61 for the NEO-PI-R scale and facets, with 0.36 and 0.68 for the lexical scale and facets, and with 0.32 and 0.65 in the original data set, respectively.

A next question concerns the discriminatory relations between the Openness domain and facet scales, both lexically derived and based on the NEO-PI-R, both obtained with the 271 participants, and with other scales defining personality structure. For the latter scales in the present study we used scales based on an eight-factor structure of traits that includes the semantics of the Big Five and some additional factors. The panels 1 and 2 of Table 4 contain the relevant information, with the eight factors being presented in the columns of Table 4. Corresponding information, based on the original De Raad and Barelds (2008) data set is given in panel 3 of Table 4. The Multiple-R's in the last column of Table 4 indicate that overall the Big Eight explain more of the lexically based Openness facets than of the NEO-PI-R facets of Openness. One might expect the strongest (negative) relations of the Openness traits with the factor Conventionality, the factor that is closest to Intellect. That is indeed the case for the NEO-facets, with the exception of the NEO-facet Feelings, which entertains a stronger relation

Table 3. Intercorrelations (x 100) among Openness scales

	Fan.	Aes.	Fee.	Cha.	Ide.	Val.
Panel 1. Lexically based Openness scales (*N*=271)						
Aesthetics	65					
Feelings	38	52				
Change	21	31	03			
Ideas	34	38	24	45		
Values	25	28	23	44	64	
Domain-O	63	72	59	66	77	69
Panel 2. NEO-PI-R Openness scales (*N*=271)						
Aesthetics	52					
Feelings	49	45				
Change	10	18	03			
Ideas	31	31	22	11		
Values	18	25	26	13	20	
Domain-O	76	77	67	36	58	50
Panel 3. Lexical Openness scales in Big Eight data (*N*=1,466)						
Aesthetics	55					
Feelings	22	41				
Change	15	34	12			
Ideas	17	37	36	37		
Values	05	26	38	41	62	
Domain-O	43	67	63	65	79	73

Table 4. Correlations (x 100) between Factors of the Big 8 and Openness to Experience Domain and Facet Scores

		Big Eight factor scales (De Raad & Barelds (2008)								
		Vir.	Com.	Emst.	Agr.	Consc.	Hedo.	Ext.	Conv.	Multiple-R
Panel 1										
	Fantasy	02	20	-12	02	-11	20	08	-22	42
	Aesthetics	09	30	-11	06	-05	29	25	-16	55
Lexically derived	Feelings	36	15	-34	10	18	03	26	07	66
Openness scales	Change	06	51	51	-08	-11	55	50	-43	81
(*N*=271)	Ideas	14	53	17	-15	04	13	24	-30	59
	Values	37	40	29	17	04	07	16	-38	64
	Domain-Openness	27	55	14	01	02	33	42	-36	73
Multiple-R		52	62	66	42	29	61	58	53	
Panel 2										
	Fantasy	-03	10	-12	-12	-22	13	01	-28	42
	Aesthetics	10	16	-09	07	-06	00	-08	-26	41
NEO Openness scales	Feelings	19	18	-35	-06	02	19	14	-05	59
(*N*=271)	Change	-04	28	26	-04	-16	29	16	-44	53
	Ideas	01	25	04	-08	01	04	03	-18	30
	Values	23	09	06	03	04	-10	-07	-13	35
	Domain-Openness	10	27	-09	-02	-11	14	04	-34	51
Multiple-R		32	38	46	17	32	42	30	51	
Panel 3										
	Fantasy	-10	04	-34	-11	-26	38	-08	-08	75
	Aesthetics	02	38	-19	00	-04	33	18	-01	59
Lexically derived	Feelings	36	37	-18	17	28	01	42	12	69
Openness scales	Change	18	53	36	-02	00	42	36	-36	77
(*N*=1,466)	Ideas	27	66	14	07	29	-06	13	-12	69
	Values	48	56	35	41	22	00	20	-12	73
	Domain-Openness	37	70	12	17	19	24	36	-15	79
Multiple-R		56	77	65	50	49	59	58	43	

Note: Vir.=Virtue; Com.=Competence; Emst.=Emotional Stability; gr.=Agreeableness; Consc.=Conscientiousness; Hedo.=Hedonism; Ext.=Extraversion; Conv.=Conventionality

with especially emotionality characteristics of Emotional Stability. Some of the Intellect traits are however also contained in the factor Competence with such traits as *inventive* and *has an open eye for things*. This may explain the relatively substantial correlations of Competence with the lexically based facet scales. With both the lexical facets and the NEO-facets the Agreeableness and Conscientiousness factors do have relatively little in common.

Part 3
Exploratory analyses of the different sets of Openness items

It is of interest to check the facet structure of the Openness clusters of traits. For that purpose, the ratings of the 271 participants on the 48 NEO-PI-R Openness items and on the 113 lexically based Openness items, and the ratings of the 1,466 participants in the original Big Eight data set on the 113 Openness items, were separately factored using PCA.

METHOD

Factors of NEO-PI-R Openness items

PCA was performed on the 48 items, followed by varimax rotation; the eigenvalues for the first 10 factors, given in terms of amounts of explained variance in Table 5, suggest some four factors at best. For a start, six factors were extracted to check if the NEO-O items could largely be organized according to the six facets. Table 6, panel 1, summarizes the results. It gives the percentages of Openness-facet items ending up with the factor on which they have the highest loading. It shows that most of the NEO facet items of Openness nicely correspond to the six factors (with the contents as indicated in Figure 1).

For a further search for an optimal structure of the NEO-O items, factor-solutions with two up to six factors were extracted and put in a hierarchical order in Figure 1. Each box represents a factor by a code and by characteristic words from high loading items. The box 5/1 (*vivid imagination* to

Table 5. The First 10 Eigenvalues in terms of percentages of variance explained in the three sets

	1	2	3	4	5	6	7	8	9	10	Total
48 NEO-PI-R O-items (N = 271)	16.7	6.4	5.9	5.5	4.6	3.8	3.4	3.0	2.7	2.5	54.6
113 Lexical Openness-items (N = 271)	15.4	8.5	5.1	4.1	3.6	2.6	2.2	2.2	1.8	1.8	47.3
113 Lexical Openness-items (N = 1,466)	13.1	7.1	4.9	3.6	2.7	2.2	1.9	1.9	1.7	1.6	40.6

Note: the data on which the last row eigenvalues are based, were corrected for acquiescence

Table 6. Percentages of items ending up in factors

	Panel 1						Panel 2						Panel 3					
	Factors of 48 NEO-O items (N=271)						Factors of 113 lexical items (N=272)						Factors of 113 lexical items (N=1,466)					
	6/1	6/2	6/3	6/4	6/5	6/6	6/1	6/2	6/3	6/4	6/5	6/6	6/1	6/2	6/3	6/4	6/5	6/6
Aesthetics	**100**						27	18	9	36		9	18	18	27	9	27	
Fantasy		**100**								**100**						20	**80**	
Feelings		**88**			12			**84**				16	11		16	**74**		
Ideas	12		**88**				4		**64**	8	12	12	25	12	16		4	16
Change				12	**88**		**72**				24	4	12	**60**	20			8
Values			**100**						**63**	6	31		**50**	13	31			6

Note: To improve readability, percentages higher than 40 are put in bold

enjoys music), for example, represents the first factor of the five-factor solution. The arrows with numbers (correlations) between factors from adjacent factor solutions represent the relations between the factors. Also, correlations of the factors with the six facet-scales were calculated, to assist in the understanding of the factors. In Figure 1, such correlations are given in the bottom row with square boxes for the NEO Openness facet scales.

A first clear distinction in the hierarchy is made with two factors, of which the factor 2/1 correlates -.81, -.76, and -.68 with the scales of Feelings, Fantasy, and Aesthetics respectively, with correlations running from .03 to -.49 with the other three facet scales. The factor 2/2 correlates .70, and .55 with Ideas and Change, respectively, with correlations close to zero up to .41 with the remaining facet scales. This organization into two clusters of facets tends to agree (yet, not fully: Values is not included) with the distinction supported in Griffin and Hesketh (2004), who speak of Openness to internal experience (Fantasy, Feelings, & Aesthetics), and of Openness to external experience (Ideas, Change, & Values). This contrast is also found in case of three factors. With four and five factors, Fantasy, Feelings, and Aesthetics also cluster in one factor, with more dispersion of the other facet scales. With six factors, all NEO-O facet scales load on different factors, thus agreeing with the findings in Table 6 (panel 1).

Factors of lexical-based Openness items (N=271)

PCA was performed on the ratings by the 271 participants on the 113 lexically based Openness to Experience items, followed by varimax rotation; the eigenvalues for the first 10 factors, given in terms of amounts of explained variance in Table 5, again suggest some four factors. Also in this case, a six-factor solution was inspected first in order to see how the items are distributed across the factors. Table 6 (panel 2) contains the results in terms of percentages of facet items distributed over the factors. In this case, three of the factors are mainly loaded by distinct sets of items belonging to Fantasy, Feelings, and Change. The Aesthetics items are distributed over five factors, and Idea and Value items mainly load on one factor.

Also in this case a hierarchy of factors was put together (Figure 2), again with two to six factors. As an aid in the interpretation of the factors, they were all correlated with both the NEO-Openness facet scales and with the lexically based Openness facet scales. Of the two-factor solution, the factor 2/2 correlates .71, .52, and .48 with the NEO facets Feelings, Fantasy, and Aesthetics, respectively, and .89, .65, and .74 with the lexical Openness facet scales Feelings, Fantasy, and Aesthetics. Factor 2/1 correlates .53 with the NEO facet scale Change, and .71, .89, and .69 with lexical O-facets Ideas, Change, and Values. The other correlations were clearly less substantial or close to zero. This seems to form a partial confirmation of the distinction between Openness to internal experience and Openness to external experience (Griffin & Hesketh, 2004). The distinction through these two clusters dissolves, however, with increasing numbers of factors extracted.

Factors of lexically based Openness items in De Raad and Barelds (2008)

PCA was performed on ratings by the 1,466 participants from De Raad and Barelds (2008) on the 113 Openness to Experience items, followed by varimax rotation; the eigenvalues for the first 10 factors, given in terms of amounts of explained variance in Table 5, again suggest some four factors. Also in this case, a six-factor solution was inspected first in order to see how the items are distributed across the factors. Table 6 (Panel 3) contains the results in terms of percentages of facet scale items distributed over the factors. In this case, especially Fantasy, Feelings, and Change items largely determined separate factors.
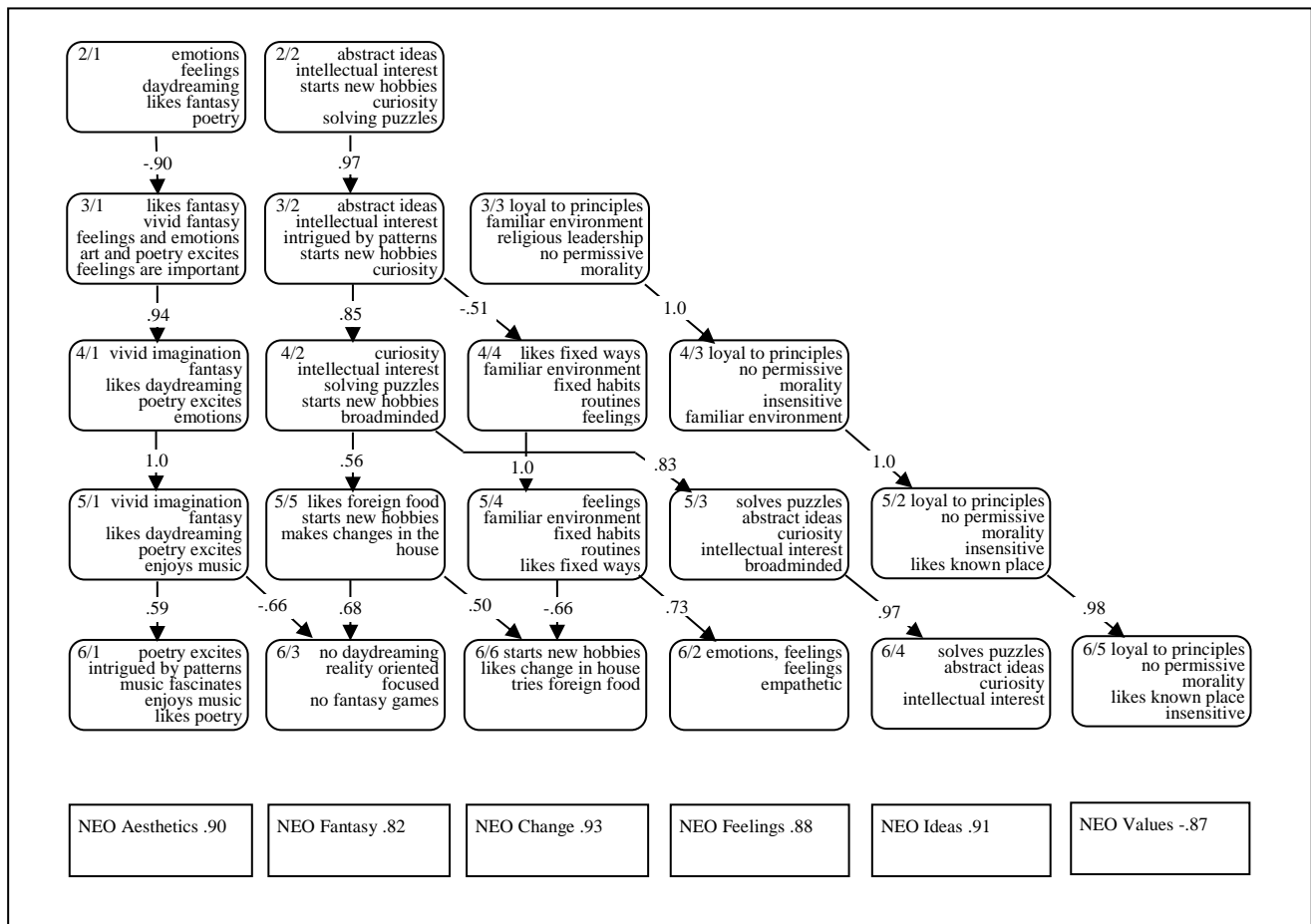
Figure 1. Hierarchy of factors based on ratings on the 48 NEO-PI-R Openness items

The hierarchy of factors in Figure 3 did not show the same distinction between internal and external Openness to experience, although the broadmindedness of factor 2/1 and the indulgence in dreams and fantasy in factor 2/2 could suggest that distinction. Factor 2/1 correlates highest with all lexically based Openness facet-scales except Fantasy, but the highest correlations were with Ideas (.80) and Values (.73), thus possibly pointing to the emergence of external Openness. Factor 2/2 correlates .69 with Fantasy and .54 with Aesthetics, thus possibly indicating internal Openness. With six factors, three lexically based facet-scales related mainly to separate factors, namely Fantasy (6/5), Feelings (6/4), and Change (6/2). Ideas related to both 6/1 and 6/6; Aesthetics had moderate relations with the two factors 6/2 and 6/5.

Congruencies

Because the two-factor solutions of the lexically based Openness items in the two different data sets could not be clearly identified as representing the same contents, it made sense to calculate congruencies. We calculated congruencies after rotation of the one set of factors to the other, and vice versa. The results are presented in Table 7. Panel 1 of Table 7 contains the congruencies calculated after rotation of the lexical Openness factors based on the 2008 data to the factors based on the present data; this was done with two up

to six factors. Panel 2 contains the congruencies calculated after rotation of the present lexical factors to the factors based on the 2008 data.

With only two factors there is no clear support for a correspondence between the two sets of two factors, thus confirming the conclusion above concerning the indecisiveness of the distinction between internal and external openness to Experience. With solutions with three to five factors the rotations to the present data based factors (panel 1) generally suggest similarity between factors, with congruencies near .80 up to just above .90. Factor 6/6 (*avoids things* to *restricted view*) does not accommodate well the information in the 2008 based factors. In case of rotations to the 2008 data based factors (panel 2), there is again for the last factor (Factor 6/6: *likes discussions* to *sceptical*) no correspondence in the 2008 based factors.

DISCUSSION

We investigated whether Openness to Experience and its six facets could be identified in the natural trait lexicon. This is contrary to McCrae's position (1990) that the natural language is a poor resource to find good descriptors of certain facets of Openness to Experience. We identified a set of 113 items in a full list of natural language trait-descriptors, used for the development of a psycho-lexically derived trait tax-
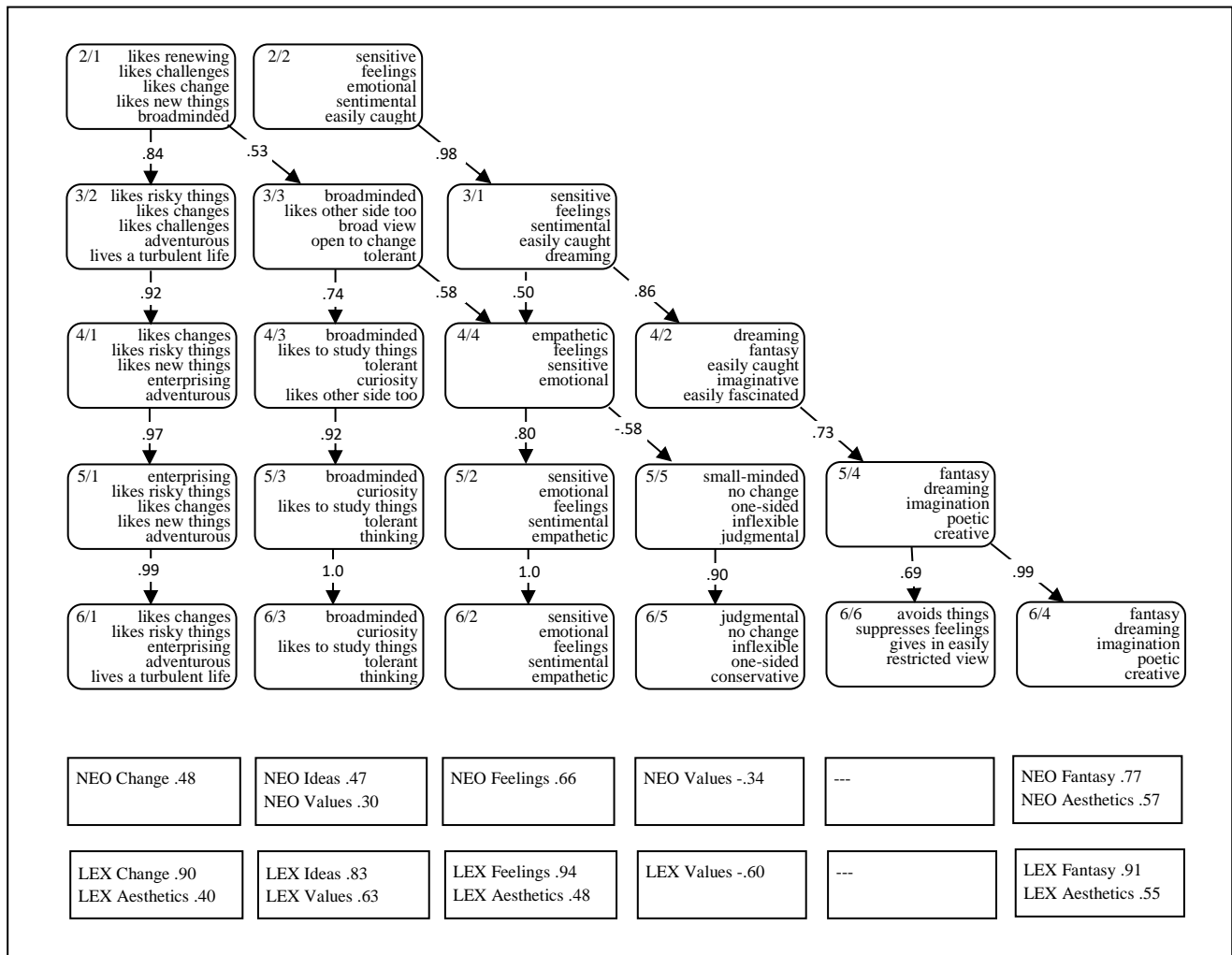
Figure 2. Hierarchy of factors based on ratings on the 113 lexically based Openness items in the *N*=271 sample
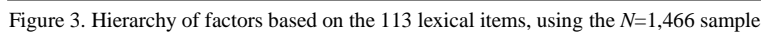
onomy in Dutch. Those 113 trait-descriptors reliably represented the NEO-PI-R Openness to Experience domain scale and its six facets.

We checked whether these lexically derived Openness scales also empirically related to the NEO-PI-R facets, which indeed turned out to be the case. Being facets of the same construct of Openness, there were obviously substantial correlations among those facets, and for five of the six facets (Aesthetics excepted), the correlations between the corresponding NEO facets and lexical facets are highest.

It may thus be concluded that both the Openness to Experience domain and its six suggested facets can well be discerned in the natural trait vocabulary. This conclusion should be put in its proper context, which is determined by the general question of how to conceive of the fifth factor domain, and of what would be the most adequate facet structure, if at all called for.

We started investigating this in exploratory factor analyses of ratings on the 48 NEO-Openness items and on the lexically based set of 113 items in a sample of 271 participants; moreover, for the same set of 113 items we studied this in a large sample of 1,466 participants. The three analyses were not consistently supportive of a two-facet structure distinguishing Internal Openness to Experience and External Openness to Experience or similarly formulated pairs

of concepts. This Griffin and Hesketh (2004) distinction does not stand alone. Johnson and Ostendorf (1993; 1994), for example, reasoned that the core of a factor is best to be found in the convergence across different measures. Subsequently, Johnson (1994) found Openness to Aesthetics and Openness to Ideas to form the core of factor five. Those characteristics are indeed typical of the distinction between Internal Openness to experience and External Openness to experience, respectively. Johnson (1994) pointed to Trapnell (1992), who made a similar distinction, called Absorption and Intellectance. Johnson himself (1994) links the distinction to what he suggests to be two basic orientations, namely the pursuit of knowledge and the appreciation of beauty. Saucier and Ostendorf (1999) found three subcomponents for Factor V across English and German, of which the two factor-pure subcomponents were Intellect and Imagination; the third, Perceptiveness, was a blend of Intellect and Conscientiousness. Woo, Chernyshenko, Longley, Zhang, Chiu, and Stark (2014) studied the structure of Openness to Experience using 35 scales from seven different instruments that were found to relate conceptually and empirically to the construct of Openness. Factor analysis revealed six facets of Openness, not matching the contents of the NEO-Openness facets. Those six facets are subsumed under two higher order facets, namely Openness to intellect-

Figure boxes:

- **2/1:** open-minded, empathetic, interested, broadminded, sensitive
- **2/2:** imagining things, dreaming, fantasizing, indulging, easily charmed

(.65) (.76) (.95)

- **3/2:** likes a challenge, adventurous, does daring things, likes change, enterprising
- **3/1:** empathetic, sensitive, interested, sympathetic, considerate
- **3/3:** dreaming, indulging, fantasizing, imagining things, avoidant

(.97) (.75) (.66) (.99)

- **4/2:** adventurous, does daring things, likes change, likes a challenge, in for many things
- **4/4:** sensitive, sympathetic, emotional, empathetic, easily touched
- **4/1:** likes to study, thinking, likes to fathom things, curious, broadminded
- **4/3:** dreaming, indulging, imagining things, fantasizing, avoidant

(.99) (.94) (.84) (.53) (.98)

- **5/2:** adventurous, likes change, does daring things, likes a challenge, in for many things
- **5/4:** sensitive, emotional, feelings, empathetic, easily touched
- **5/5:** likes to study, curious, likes to discuss, thinking, likes dialogue
- **5/3:** flexible, sees relativity of sth., broadminded, agreeable, sees different sides
- **5/1:** dreaming, indulging, fantasizing, avoidant, imagining things

(.96) (.99) (.77) (.55) (.72) (.69) (.72)

- **6/2:** likes a challenge, likes change, does daring things, adventurous, in for many things
- **6/4:** sensitive, emotional, feelings, easily touched, sentimental
- **6/6:** likes discussions, likes dialogue, curious, likes to study, skeptical
- **6/1:** thinking, likes nuance, broadminded, agreeable, sees different sides
- **6/5:** fantasizing, dreaming, indulging, philosophical, poetic
- **6/3:** one-sided, avoidant, inflexible, short-minded, shrinks back

Bottom labels:

LEX8 Change .89	LEX8 Feelings .90	LEX8 Ideas .57	LEX8 Values .68	LEX8 Fantasy .85	LEX8 Values -.46
LEX8 Aesthetics .48	LEX8 Aesthetics .36		LEX8 Ideas .69	LEX8 Aesthetics .48	LEX8 Change -.31
LEX8 Values .33					

Figure 3. Hierarchy of factors based on the 113 lexical items, using the *N*=1,466 sample

tual stimulations and Openness to artistic and cultural experiences. In a multivariate genetic analysis of the six NEO-Openness facets (Jang, Livesley, Angleitner, Riemann, & Vernon, 2002), two genetic factors best explained the data in both a German and a Canadian sample, with one factor primarily influencing Fantasy, Aesthetics, and Feelings, and the second factor influencing primarily Actions, Ideas, and Values. In data from two Big Five inventories, DeYoung, Quilty, and Peterson (2007) found support for the distinction captured by the labels Openness (emphasizing Fantasy, Aesthetics, & Feelings) and Intellect (emphasizing Creativity & Ideas), pointing at a distinct correlational pattern with crystallized intelligence and fluid intelligence, respectively.

It should be noted that the present findings for the fifth factor of the Big Five (whether that factor is called Intellect or Openness to Experience), through the use of the 113 items selected from a lexical corpus, were framed by the NEO-PI-R conceptualization. In the lexical tradition, unguided by the NEO framework, the NEO-facets for Openness to Experience have not typically emerged; instead, a variety of facets has come about empirically, conveying the richness of distinctions made in ordinary language, also with respect to the Intellect-Openness cluster of trait relevant descriptors. The AB5C model (Hofstee, De Raad, & Goldberg, 1992), for example, has demonstrated that, in English, Intellect has an extraverted side (e.g., *eloquent* or *theatrical*), an introverted side (*introspective* or *meditative*), an agreeable side (e.g., *diplomatic*), a conscientious side (e.g., *analytical*), a neurotic side (*passionate* or *poetic*), et cetera. A research design that is not framed by the NEO-Openness structure, may thus give rise to different emphases. The study by Saucier and Ostendorf (1999), who distinguished three facets, forms another good example.

In conclusion, the various possible features of Openness

Table 7. Congruencies after rotation of two to six factors of lexical Openness factors

Panel a	Target factors based on the 271 sample						Panel b	Target factors based on the 1,466 sample					
	.70	.73						.90	.44				
	.90	.93	.92					.90	.94	.84			
N=1,466 based factors	.94	.86	.88	.91			*N*=272 based factors	.86	.93	.88	.92		
	.93	.92	.89	.82	.87			.87	.93	.87	.92	.79	
	.93	.92	.89	.82	.84	.67		.87	.92	.87	.92	.85	.62

to Experience as defined in Costa and McCrae's Five Factor Model (1992) do not transcend ordinary language; the natural everyday personality vocabulary contains all the lexical items needed to map out the Openness facets. Moreover, while the NEO-Openness domain was put forward as having six facets, various studies, not only with the NEO items, but also with a variety of Openness related scales from different personality measures, are often presented with the tenor of having two facets, Openness to internal experiences and Openness to external experiences. This was confirmed in the present study when using the NEO-items. When working in the lexical domain with the two samples used for this purpose in the present study, but confined to the NEO framework, it was not confirmed. This also means that it has not become clear whether in a two-facet proposition of Openness, the distinction between a factor with an absorbent connotation and a factor showing more intellectual distance is called for.

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