Approaching Achievement Motivation - Comparing Factor Analysis and Cluster Analysis

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Abstract

What do students of different countries think about achievement related topics? Results form a survey of students are presented and special attention is given to motivational structures of male and female students as well as students of economy and social sciences. The survey was done with students of Germany and Slovenia. In the first part of the paper, dimensions of achievement are described by factor analyses resulting in the three theoretically postulated dimensions competition, mastery, and work for the whole sample. These dimensions are of differential relevance for males and females as well as economy versus social science students. In the second part, based on cluster analysis a typology of respondents is developed characterizing students of the different subgroups by their special achievement motivation profile. Both approaches to achievement motivation result in comparable dimensional and typological structures.

1 Introduction

1.1 Cluster-analysis versus factor analysis - terminological conventions

Comparing factor analysis with cluster analysis means to approach a data set from two complementary perspectives. The underlying logic of both procedures is classification. Classification in either approach is based on homogeneity.

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Homogeneity with respect to cluster analysis means that research units, located in the rows of the data matrix, either individuals or groups of individuals, are classified into clusters with respect to their similarity on variables. Clusters are ideally characterized by within homogeneity of objects and between heterogeneity of objects. Factor analysis, in contrast, concentrates on the homogeneity of variables resulting from the similarity of values assigned to variables by respondents. From the perspective of the data matrix, variables are located in the columns of the matrix and are classified into factors or dimensions. Although we are aware that the term cluster analysis cannot exclusively be identified with the object oriented approach to the data matrix (there are clustering procedures using variables as basis for classification as well as factor analysis procedures using objects as basis of factoring), in this paper we refer to cluster analysis in this specific meaning. Obviously, cluster analysis and factor analysis yield different information about the data. While factor analysis and especially structural equation modeling implies the aspiration of establishing a theoretically based causal relationship between indicators (items) and a latent variable (the factor or dimension), the goal of cluster analysis is to find an empirical classification or an a priori theoretically defined cluster structure. Which of the two approaches better fits the data is an empirical question (Bacher, 1996) the result of which can be that:

   a) the factorial (implicitly causal) model fits the data more adequately
   b) the cluster model fits the data more adequately
   c) both approaches fit the data equally well
   d) none of the two approaches fit the data adequately.

1.2   Achievement motivation

It is not possible to lengthy develop the theoretical background of achievement as personality trait or state here. Important is, that we used a questionnaire as a self-report measure to assess achievement motivation instead of the traditional TAT (Thematic Apperception Test) method[4]. This self-report measure is part of an instrument called the Work anf Family Orientation Questionnaire (WOFO) developed by Spence and Helmreich (1983) and "...contains items dealing with attitudes toward achievement related activities" (Spence and Helmreich, 1983:40).

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[4] The TAT (Thematic Apperception Test) is a projective method. The experimenter shows a subject several pictures and the subject is asked to tell or interpret what he/she sees on the picture. From content analysis of these stories the motivational state of the person is inferred. Many researchers have been dissatisfied with this projective method - although it has strongly been defended by Atkinson (1981) - and have already in the sixties started to develop more objective self-report measrues of achievement motivation. "Illustrative of these efforts are scales developed by Mehrabian (1968) which incorperate items tapping both the motive to approach success and the motive to avoid failure and thus were designed to yield a measure of resultant achievement motivation" (Spence and Helmreich, 1983:39).

The authors of the achievement motivation questionnaire could show by factor analysis that the pool of items revealed three modestly correlated factors showing similar structures in female and male respondents. This result bears considerable theoretical weight, "...suggesting that (...) the structures of men's and women's motivational systems are not qualitatively different (Sepnce and Helmreich, 1983:41). Additionally, this finding contradicts the classical theoretical position of McClelland (1961, 1987), McClelland and Koestner (1992) simply stated as: "Clearly we need a different psychology of motivation for men and women (1961:481).

According to the authors of the achievement questionnaire, items can be assigned to one of the three dimensions "work orientation", "mastery", and "competitiveness". "The "work" factor represents an effort dimension, the desire to work hard and to do a good job of what one does. The "mastery" factor reflects a preference for difficult, challenging tasks and for meeting internally prescribed standards of performance excellence. The "competitiveness" factor describes the enjoyment of interpersonal competition and the desire to win and be better than others. Unlike mastery, which involves a task-oriented standard of excellence, competitiveness involves pitting oneself against other individuals" (Spence and Helmreich, 1983:41). Items and scales are keyed in a way that high scores reflect a high degree of work, mastery, and competitiveness.

Because the WOFO achievement scales intend to measure general personality traits, items do not refer to specific situational contexts. It is assumed that individual responses reflect dispositional tendencies and that these tendencies are stable over time. Although achievement motivation is considered to be a stable dispositional tendency and as such can be seen as a trait, this does not mean that achievement motivation is independent of situational contexts. Instead, almost every situation can be turned into an achievement-oriented challenge by almost everyone. However, since we did not control for behavioral consistency in our study but rather focused our interest on the assessment of achievement motivation on the questionnaire level, this discussion is not followed in any detail here.

Without going into a detailed theoretical discussion it should be stated that achievement motivation is "... conceived as a series of more or less independent motives, each reflecting general dispositional tendencies or traits that are relatively enduring over time and remain latent until engaged or aroused by particular tasks or situations" (Spence and Helmreich, 1983:44). These motives are "work, "mastery" and "competition" that can either be guided by a general tendency to approach success (hope of success) or a general tendency to avoid failure (fear of failure) or by a combination of both as postulated by Atkinson and Feather (1966). Although these general tendencies are not explicitly operationalised in the items indicative of the above mentioned three motivational dimensions (or motives), acknowledgement of "hope for success" as well as "fear of failure" are valuable tools if it comes to understand and interpret motivational structures.

1.3 Description of the study

Subjects of the study were students of the University of Ljubljana, Slovenia and the University of Gießen, Germany. In both countries subjects did not enter the "sample" by a formal sampling technique but were gathered in lessons and asked to cooperate. Thus, the term sample in this paper does not refer to a simple random sample, but rather to an arbitrary sample. Table 1.1 gives the respective sample information for both countries.

In Germany, questionnaires were distributed either within teaching lessons or during the semester introduction in 1996 and 1997; in the first case, students were asked to fill in the questionnaire at once. In the same years Slovenian students were asked to go to the computer laboratory and to complete the questionnaire implemented on the computer by the INTERV system developed by Saris (1993).

The questionnaire consisted of different parts, each containing questions related to motivational aspects: power motivation, job motivation, job aspiration, self esteem, gender role stereotypes, etc. In Germany as well as in Slovenia mainly economics and social science students were included in the study.

Table 1.1: Description of Student Characteristics in Slovenia and Germany.

	Slovenia			Germany		
	male	female	study	male	female	study
economics	341	397	738	196	111	307
social science	119	268	387	86	107	193
	460	665	1125	282	218	500*

* because of missing values - the German sample is n=507

2 Factor analysis of the items

2.1 Overall dimensional structure of motivation items

The first step in the analysis was to uncover the dimensional structure in the items. According to the multidimensionality postulated by Spence and Helmreich (1983) substantial loadings (> 0.40) of items 1-4 and 18 should be expected on the "work" dimension, of items 5-11 (Work), on the "mastery" dimension and of items 12-16 (Mast.) and on the "competitiveness" dimension (Comp.); item 17 is not classified. Table 2.1 displays the results for the whole sample in both countries. Although the postulated dimensional structure is not completely replicated in either country, it is obvious from Table 2.1 that there is some overall structural similarity.

Table 2.1: Dimensionality and Factor Loadings[1] of Achievement Items based on the whole Sample of Slovenian and German Students.

	Slovenia n=1125			Germany n=507			Item Wording (abbreviated)[2]
	Work	Mast.	Comp.	Work	Mast.	Comp.	
1	.25	[3]		**.42**			exceeding performances
2	.33			**.43**			doing well
3	**.47**			**.43**			better than in past
4	.32	.28		**.63**			like to work hard
5		**-.50**					better familiar than difficult
6		**-.38**				.36	fun games - thought games
7		**.44**					struggling to master it
8		**.44**		.35			persist task
9		**.37**				.34	high level of skill
10		**.42**				.52	tasks that I am not sure
11	.30						busy all the time
12			.55			.51	try harder when competition
13		.35	.53			.57	enjoy competition
14		-.27	.64		-.52		annoy - other people better
15			.76		-.71		important - better than others
16			.60		-.44	.40	winning in work and games
17	**.60**					.65	talent - success
18	**.55**					.70	improving performance
Ev[4]	0.91	2.40	1.71	1.21	0.73	3.39	

1) Principal axis factoring with oblique rotation
2) Complete wording of items is given in the Appendix.
3) Loadings < 0.20 are not reported.
4) Eigenvalues of rotated solution

In the Slovenian sample, the "competitiveness" dimension contains only items supposed to show substantial loadings on this dimension. A similarly good dimensional fit can be observed in the items indicating the "mastery" dimension except for item 11 (I like to be busy all the time) that does not yield sufficiently consistent answers in Slovenian respondents to get a substantial loading on one of the three dimensions. Three of the five indicators for "work" are located correctly together on one dimension that contains additionally the previously not classified item 17 (The more talents I acquire, the more successful I feel I will be.) Thus, the dimension "work" is not replicated well in the Slovenian sample.

In the German sample four of the "work" indicators are located on one common dimension, the fifth (item 18) is connected to the "competitiveness" dimension. Besides one item (item 11) the "mastery" items do not show substantial loadings on either of the three dimensions. Item 10, however, seems to be

connected with "competition" while the "competition" items 14, 15 and 16 constitute a dimension of their own with negative loadings. Thus, in the German sample respondents seem to differentiate between "competition" that is fun (items 12, 13 and 16) and "competition" that has weary component on it (items 14, 15 and 16). Since items 10 (mastery) and item 18 (work) are obviously stronger related to the "competition" dimension than to the dimensions they should theoretically belong, the "competition" dimension seems to be mixed with "mastery" as well as "work" in the German sample. There seems to be a pattern of either enjoy or not enjoy competition. Items describing mastery and work are at least partially perceived as a kind of competition. Mastery as a dimension does not exist in the German sample. The theoretically specified dimensions seem to be overlapping to a considerable degree in the German sample, indicating, that German students obviously do not differentiate between enjoyment of interpersonal competition on the one hand and preference of challenging tasks as well as the desire to do a good job on the other hand. They do, however, differentiate between what can be called positive (enjoyment) and negative (anger) competition. Dimensional structures in the Slovenian sample are much clearer here indicating that motivational aspects are not entangled but clearly kept apart. From a social-psychological point of view the latter implies differentiation between achievement motivation related activities. Thus, persons can be achievement motivated with respect to specific contexts but not with respect to others. In the German group however, motivational aspects are not differentiated to the same degree.

2.2   Gender related structure of achievement motivation items

In order to test the stability of this factorial solution the next steps involve repeating the analysis in different subgroups of the samples. Subgroups can be compared either within each national sample, for example men versus women or economics versus social science students or one can compare groups across samples, for example economics students in Germany and Slovenia. First, Table 2.2 gives an overview of gender related similarities/differences in dimensional structures and second Table 2.3 gives the dimensional structure for both, economics and social science students in the German and Slovenian sample.

Table 2.2: Dimensionality and Factor Loadings[1] of Achievement Items based on Male and Female Students in the Slovenian and German Sample.

	Slovenia						Germany						Item Wording (abbreviated)[2]
	Females n=665			Males n=460			Females n=218			Males n=282			
	Work	Mast.	Comp.	Work	Mast.	Comp.	Work	Mast.	Comp.	Work	Mast.	Comp.	
1	.22	[3]		.35		-.24	.36			.35		-.08	exceeding performances
2	.24			**.40**			**.50**			.39		-.00	doing well
3	**.40**			**.43**	.27		**.41**			**.67**			better than in past
4		**.43**		**.42**			**.40**	**.43**		**.71**			like to work hard
5		**-.46**			**.58**			**-.40**			**.49**		better familiar than difficult
6		-.33			**.47**			-.34	**.63**		.23		fun games - thought games
7		**.50**		.37	-.21			.26			-.33		struggling to master it
8		**.49**		**.49**	-.20		.21	.24		.24	-.33		persist task
9		.34			**-.40**			.25	**.53**		-.28		high level of skill
10		.37			**-.44**				**.56**		-.40		tasks that I am not sure
11		.35		.30				.25			-.29	.21	busy all the time
12		.21	**.54**			**.55**			**.62**		-.26	**.49**	try harder when competition
13		.39	**.50**		-.20	**.53**		.29	**.68**		-.44	.44	enjoy competition
14		-.20	**.67**		.27	**.61**			**.66**			**.74**	annoy - other people better
15			**.80**			**.72**		.32				**.83**	important - better than others
16			**.59**			**.61**			**.67**			**.68**	winning in work and games
17	.70			**.45**					**.77**			.38	talent - success
18	**.59**			**.46**			.24	-.21	**.75**	.23	-.21	.28	improving performance
E^4	.93	1.68	2.50	2.43	.80	1.77	0.64	1.32	4.13	1.33	0.92	3.17	

1) Principal axis factoring with oblique rotation
2) Complete wording of items is given in the Appendix.
3) Loadings < 0.20 are not reported.
4) Eigenvalues of rotated solution

Table 2.3: Dimensionality and Factor Loadings[1] of Achievement Items based on Students of Economy and Social Sciences in the Slovenian and German Sample.

| | Slovenia | | | | | | Germany | | | | | | Item Wording (abbreviated)[2] |
| | Social Science n=387 | | | Economy n=738 | | | Social Science n=199 | | | Economy n=308 | | | |
	Work	Mast.	Comp.	Work	Mast.	Comp.	Work	Mast.	Comp.	Work	Mast.	Comp.	
1	.34	[3]		.30		.26	**.55**			.30			exceeding performances
2	**.52**			.26			**.55**			**.44**			doing well
3	.28	.32		**.50**			.31			**.71**			better than in past
4	**.53**			.25	.29		**.59**	-.23		**.61**			like to work hard
5	-.22	**.43**			**-.52**		-.32				**.57**		better familiar than difficult
6	-.30				**-.45**			.21	**.51**		.32		fun games - thought games
7	**.46**				**.43**		.29				-.29		struggling to master it
8	**.54**				**.45**		.32			.28	-.22		persist task
9	**.46**			.36					**.47**		-.37		high level of skill
10	.24	**-.45**		.36					**.56**		-.30		tasks that I am not sure
11	**.40**			.26	.24		.30	-.21			-.25		busy all the time
12			**.64**			**-.51**		-.34	**.73**			.35	try harder when competition
13	.20	-.20	**.60**		.32	**-.49**		-.33	**.64**		-.25	**.40**	enjoy competition
14	-.20		**.61**		-.28	**-.66**			**.63**			**.72**	annoy - other people better
15			**.72**			**-.78**	**-.41**					**.79**	important - better than others
16			**.57**			**-.61**			**.67**			**.64**	winning in work and games
17	.25	**.49**		**.60**					**.77**			.30	talent - success
18	.36	.32		**.57**					**.81**		.34	.15	improving performance
E[4]	2.40	0.98	1.79	0.92	2.43	1.72	1.51	0.66	4.33	1.30	0.88	2.42	

1) Principal axis factoring with oblique rotation
2) Complete wording of items is given in the Appendix.
3) Loadings < 0.20 are not reported.
4) Eigenvalues of rotated solution

Spence and Helmreich (1983) described the nearly identical factor structure of men and women as one of their major findings and took this as proof that there is neither a quantitative nor a qualitative difference in motivational structure between men and women. This finding is not confirmed by the student data from Slovenia and Germany. Although all Slovenian students are very consistent with respect to interpersonal competition resulting for both, males and females, in one clean factor undisturbed by items from other dimensions, similarity of motivational structure cannot be established for the other two postulated dimensions. For male students the desire to do a good job of whatever one goes together with meeting internally prescribed standards of excellent performance and the insight that acquisition of talents will rather support success than not. Regarding the "mastery" dimension, four of the eight items build one factor, one goes together with "work" and the remaining three do not produce any substantial loading at all.

For female students there are, in addition to the "competitiveness" dimension, two dimensions that resemble somehow the postulated dimensions but do not really replicate them. What can be observed is that dimensions in principle contain the items postulated to belong there but many of the items do not yield enough consistency in respondents' answers to result in substantial loadings. Thus, the conclusion so far for the Slovenian student sample is that, regarding gender related motivational structures, the postulated dimensions can be observed in men as well as in women. There are, however, too many items with too small loadings rendering them unimportant in eliciting consistent responses on achievement related behaviors. We return to this point immediately.

Inspection of results from the German student sample makes things even worse because there is only one unobtrusive dimension, "competitiveness" for male students. In this subgroup two work items sit on a dimension and two "mastery" items have a substantial loading on another dimension together with a negative loading on "enjoy competition". This dimension reflects rather the opposite of achievement motivation because the item "better familiar than difficult" (see Appendix for complete wording) with a strong positive loading on this dimension declines preference for difficult or challenging tasks and the negative loadings of the other two items also reflect that an inner standard of performance is not aspired. Again, the originally postulated motivational structure can be observed but many items obviously "do not work".

For the German female students, the structure of achievement motivation is one makeup of mainly "competitiveness", and "mastery", work has only a small share on this dimension containing 50% of all eighteen items. One interesting observation is that the item of the "competitiveness" dimension indicating the personal importance of being better than others (item 15) does not yield a substantial loading in the female subgroup of the German sample. The remaining two dimensions consist of (1) three "work" indicators and (2) one "work" and one "mastery" indicator, where the "work" indicator (I like to work hard) seems to

indicate both motivational dimensions equally well. Altogether, the motivational structure of male and female students in Germany is not easily comparable.

Regarding the considerable number of items that do not yield substantial loadings brings up the question whether the items need a reformulation. They have been developed twenty years ago and lack of substantial loading can be an indicator of social change, meaning that other achievement related behaviors than twenty years ago are important today. This interpretation seems reasonable because the motivational structure postulated by Spence and Helmreich (1983) can be observed, although rudimenatrily, also in the subgroups. Admittedly, there are differences between men and women indicating that all aspects of the assessed achievement topics are present undifferentially in women, while men seem to be highly consistent on "competitiveness" while less consistent or even disapproving (in that they do not give definite answers) in others.

It might also be the case that there are not only motivational structures on the variable level but that there are also motivational types of persons on the object level. This question is taken up again in the second part of this paper addressing it by the methodology of clusteranalysis.

2.3 Achievement motivation related to economics or social science as study

To test the stability of the factorial solution observed in the whole sample of both Slovenian and German students, one can additionally inspect the dimensional structure in subgroups of economics and social science students. Table 2.3 gives the relevant information for all four subgroups in the two samples.

Again, "competitiveness" is in both student groups a relevant and consistent motivational dimension because the respective indicators yield consistent reactions regardless of study. Additionally, in the subgroup of economics students most of the "mastery" indicators are located on one dimension, although not all items have substantial loadings. In this subgroup also a "work" dimension can be observed containing two of the postulated "work" indicators. Two mastery items overlap with the "work" dimension, indicating that statements like "I like to work hard" and "I like to be busy all the time" for economics students in Slovenia do not discriminate well between the desire to do a good job in whatever doing and the a task oriented (inner) standard of excellence. "Mastery" as preference for challenging tasks also overlaps with "competitiveness" in the case of Slovenian economics students, resembling closely the dimensional structure observed in Slovenian male students.

Social science students perceive "competitiveness" consistently but indicators of "work" and "mastery" dimensions are largely overlapping into one dimension. The effort dimension with the desire to always do a good job ("work") and the inner standard of excellence dimension ("mastery") do not produce internally

homogeneous but different response patterns but yield one big consistent pattern embracing the two of the originally postulated different dimensions of motivation. Thus, for Slovenian social science students doing a good job and performing according to an inner standard of excellence seems to be one consistent motivational pattern.

Besides these two dimensions there is a third one for Slovenian social science students made up primarily by three items. The approved items (positive sign) indicate that "familiar tasks are preferred over new or difficult ones" and that "acquisition of talents is a means to gain success", while the disapproved item (negative sign) refers to "trying new tasks challenging one's own abilities". This does not seem to be indicative of a desire to achieve anything but rather to avoid (especially challenging tasks). Although this pattern appears to resemble strongly to the above mentioned "fear of failure", additional data would be necessary to establish this interpretation .

While in the Slovenian sample "competitiveness" is equally prominent as motivational dimension in students of economics and social sciences, in the German sample this applies only for students of economics. For social science students "competitiveness" goes together with the better part of the "mastery" indicators and one "work" indicator. Additionally, the "competitiveness" item "It is important to me to perform better than others on a task" builds a dimension of its own with a negative loading, indicating that this "competitiveness" aspect is especially disapproved by social science students in Germany. Inspecting the other (non-substantial) loadings on this factor reveals that this dimension is one of "anti-achievement because the "mastery-indicators have mostly negative signs. For students of economics there is a very similar dimension, containing one substantial loading for the item indicating that "familiar tasks are preferred over challenging ones" while all other items indicating an inner standard of excellent performance have negative signs (and non-substantial loadings). Thus, the "mastery" dimension, expressing a preference for difficult tasks and for accomplishing an excellent performance according to an inner standard, is not prominent for German students. The meaning of this is that this achievement motive is not activated by the given items.

In contrast, the "work" dimension is observable in students of economics as well as of social science. This dimension corresponds to the desire to do a good job and German students perceive the items consistently enough to result in a fairly good observable factor.

2.4   Evaluating the results of factor analysis

While the results in Table 2.1 presented a fairly good match to the dimensional structure of achievement motivation items suggested by Spence and Helmreich (1983) subgroup analysis did not fit into this picture equally well. Although the

originally postulated structure could be detected with some good will in the responses of male and female, economics and social science students in both countries, there are many deviations from this structure. These result either from "aberrant" location of items on other than postulated factors or from non-substantial loadings of items on "their" theoretically intended dimension. While the former finding results from perceptions of respondents who do not differentiate between theoretically defined dimensions, the latter finding indicates that items are too weak to elicit consistent reactions from respondents. Again, while the former finding uncovers subgroup or cultural differences in perception, the latter finding uncovers the necessity to work on the operationalisation of the items to give them a more discriminating power.

To summarize the findings: the "competitiveness" dimension is the strongest of all three dimensions and can be observed in all subgroups with exception of the German females and the German social science students. For these latter two subgroups enjoyment of competition and the desire to win ("competitiveness") is closely related to a task oriented standard of excellence ("mastery") resulting in one homogeneous response where theoretically two different, internally homogeneous but externally heterogeneous response pattern was expected. What is special in German female students and in German social science students cannot be decided without referring to additional data (which cannot be included here).

"Competitiveness" is a "clean" motivational dimension mostly not disturbed by items from the other two achievement motives. Thus, the desire to win and be better than others is a motive that differs substantially from the other. This is not to the same degree true for "work" and "mastery". The items indicative of these achievement motives seem to be very similar for Slovenian male and social science students as well as for German female and social science students. The dimensions are often mixed with each other indicating that the desire to do a good job and the task oriented standard of excellent performance are perceptually not differentiated by respondents.

3   Cluster analysis based on the similarity of objects

Now that the dimensional structure of the achievement items is described attention is directed towards the typological structure of achievement motivation. Therefore this section concentrates on the object related analysis of the items to uncover groups of persons reacting similarly to achievement related activities described in the items. The within group similarity of persons is assessed by comparing individual scores on each item to the cluster-specific mean (of all persons belonging to that cluster) of the achievement motivation items. To describe and compare types of persons (clusters formed in an exploratory analysis) with respect

to their achievement motivation characteristics, deviations of cluster-specific means from the sample mean are considered.

While for the factor analyses have been accomplished by using the SPSS FACTOR procedure, for cluster analysis the software package CONCLUS (Bardeleben, 1995) was used. The algorithm of this software is based on Euclidean distances and minimization of a criterion function ('sum of squared errors'). To confirm a typology emerging from the data, the stability of iteratively estimated cluster structures can be tested.

Important criteria for evaluating the typological structure are consistency within and similarity between clusters. On the one hand side, consistency as a measure of homogeneity is defined as "1 - within cluster variance" and the consistency coefficient reaches its maximum value of one if individual score profiles and the cluster-specific profile of achievement motivation items are identical. A consistency coefficient of zero indicates complete absence of a common structure in individual responses thereby explaining no variance with respect to a typology[5]. Similarity, on the other hand side, describes the correspondence between cluster profiles. Clusters with a similarity coefficient of 1 are characterized by identical profiles, whereas values lower than zero are indicators of "unlikeness".

This section describes first, typologies found within the two countries, Slovenia and Germany, and second, typologies found on the basis of both countries together. While the first step uncovers country-specific achievement motivation types if there are any, the latter step can help to uncover types (groups) of similarly achievement motivated persons regardless of country affiliation.

3.1   Clusters within countries

An exploratory cluster analysis of German students results in an optimal and reproducible typology of four clusters. Consistency coefficients of all clusters are positive but rather low in the range of 0.13 to 0.28. The explained variance of the model is 21.5%. A stable four-cluster typology emerges also with Slovenian students with positive consistency coefficients ranging from 0.13 to 0.27. The explained variance of 19,8% in the Slovenian sample is somewhat lower than in the German one. Although within cluster consistencies are not very strong in both countries, inspection of similarity coefficients (Table 3.1) indicate considerable between cluster difference in both countries. Thus, it is possible to take it for granted that there are four discernibly different types of achievement motivation types within each country.

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[5] Variance in a typologiy is explained if within cluster homogeneity is strong and between cluster homogeneity is weak. Thus, if within cluster consistency is weak, the cluster does not contribute to the typology.

Table 3.1: Similarities between clusters.

	Germany				Slovenia			
	CL1	CL2	CL3	CL4	CL1	CL2	CL3	CL4
Cluster 1	1.000				1.000			
Cluster 2	0.213	1.000			0.368	1.000		
Cluster 3	0.295	-0.213	1.000		0.361	0.225	1.000	
Cluster 4	0.396	0.341	0.317	1.000	0.110	0.337	0.283	1.000

Table 3.2: Cluster pattern within countries.

	Cluster	Germany				Slovenia			
		CL 1	CL 2	CL 3	CL 4	CL 1	CL 2	CL 3	CL 4
ACH1	exceeding performances	+		--				-	
ACH2	doing well	+		-				-	+
ACH3	better than in past	+	+	-	-			-	+
ACH4	like to work hard		++	-		-		-	+
ACH5	better familiar than difficult					+	-		
ACH6	fun games - thought games						-	+	
ACH7	struggling to master it		++	-		-	+	-	+
ACH8	persist task		+	--		-	+	-	+
ACH9	high level of skill		+	-		-		-	+
ACH10	tasks that I am not sure		+			-	+		
ACH11	busy all the time		++	-		-			+
ACH12	try harder when competition	-	++	--	+	--			+
ACH13	enjoy competition	-	++	--		--			+
ACH14	annoy – other people better	-	++	--	+	-	--	+	+
ACH15	important - better than others	-	++	--	+	-	--	+	++
ACH16	winning in work and games	-	++	-		--	-	+	+
ACH17	ability – success		+	--				-	+
ACH18	improving performance		+	--				--	+
	number of persons	132	105	106	164	242	273	284	326

Characteristic profiles of an achievement motivation typology within each country can be described by referring to the structure of deviations of cluster means from the respective sample mean in each country. In Table 3.2 "+" and "-" describe values of individual cluster means above and below the sample mean each "+" or "-" indicating one third standard deviation distance to the respective overall sample mean within each country. For example, a distance of more than one standard deviation is described by "+++". it should be mentioned, however, that positive or negative signs can not be interpreted as indicating approving or

disapproving responses to the achievement related activities, because "-" deviations from high values of overall means, although negative in sign, can result in cluster means still indicating approval as well as "+" deviations from low overall sample mean values can still indicate disapproval. Cluster and sample means are given in the Appendix and values indicating disapproving responses are darkened in Table 3.2.

The typological structure of the German sample contains two extreme clusters with high deviations from the sample mean in either direction for nearly all achievement items. The profiles of clusters 1 and 4 are very close to the vector of the sample mean are, therefore these clusters can be defined as average clusters. In addition to the achievement items gender and study subject are considered to characterize the resulting achievement motivation types in both countries (Table 3.3).

- **Cluster 1:** „work orientation without competition" Germany (G-CL1)

Students in this cluster are characterized by a slightly more than average desire to do a good job of whatever they do; they display slightly less than average enjoyment of interpersonal competition. Women are slightly over-represented here (see Table 3.3).

- **Cluster 2:** „strong overall achievement motivation" Germany (G-CL2)

Persons belonging to this achievement motivation type display discernible more than average enjoyment of competition and desire to win and be better than others as well as a slightly to considerable more than average commitment to task oriented standards of excellent performance. This type is also characterized by approving effort, i.e. the desire to work hard as well as to improve one's own performance. This type characterizes students displaying all theoretically postulated achievement motivation dimensions in higher than average degree indicating that this type is really strongly achievement motivated. Inspection of cluster means in comparison to overall sample means in Table A.1 of the Appendix reveals that responses of this type are located in the approval region of the response scale. Men (68,6%) and students of economics as well (80%) are significantly over-represented in this achievement motivation type.

- **Cluster 3:** "low achievement motivation" Germany (G-CL3)

Compared with the whole sample persons of this group are considerably less approving of all achievement related activities described in the items. They especially disapprove any competition desire as well as effort to improve performance. Thus, persons belonging to this type can be described as less achievement oriented than persons belonging to cluster two. Especially social science students are characterized by this achievement motivation type because they are over-represented in this cluster of low achievement motivation.

- **Cluster 4:** „average overall achievement motivation" Germany (G-CL4)

Persons making up this type display slightly higher values on competition items than are observed in the whole sample. In general, however, this type can be

described as an average achievement motivation type with respect to the student sample of this study. The relation of male to female students as well as economists to social scientists resembles strongly the relation in the overall German student sample.

Summarizing the results of the within German achievement typology, one can generally resume that achievement motivation in the whole group of subjects is considerably strong. Although there are motivational differences with respect to the typological groups, the low amount of explained variance indicates rather homogeneity of the whole sample than a clear-cut cluster structure. The small variety of students with different study subjects might be one reason for this homogeneity. Therefore one has to be careful in interpreting and generalizing this typology. Especially the high rate of social science students in the "low achievement orientation" group must be judged with caution because the items refer to achievement related activities not especially familiar to social science students. Other activities might elicit more approval from social science students.

Table 3.3: Distribution of study subjects and gender within the clusters of the German and Slovenian sample (in %).

	Germany					Slovenia				
	CL1	CL2	CL3	CL4	Sample	CL1	CL2	CL3	CL4	Sample
economics	57.6	80.0	35.8	67.1	60.7	53.7	70.0	68.0	68.7	65.6
social science	42.4	20.0	64.2	32.9	39.3	46.3	30.0	32.0	31.3	34.4
male	48.9	68.6	54.4	56.1	56.4	28.9	41.8	54.9	36.8	40.9
female	51.1	31.4	45.6	43.9	43.6	71.1	58.2	45.1	63.2	59.1

The above mentioned problem of overall sample homogeneity with respect to the small amount of explained variance holds also for the Slovenian sample. Here the mean structure of individual cluster means compared to the overall sample mean is even less discriminating between the achievement types than in the German sample. Nevertheless there are small differences which, however, should not easily generalized. Considering the profiles of the estimated Slovenian clusters, none of them can be labeled as average cluster.

- **Cluster 1:** „low achievement motivation" Slovenia (S-CL1)

In content, the group of Slovenian students making up this achievement type resembles very much the group of German students constituting the German cluster 3. They do not approve of competition related activities nor do they commit themselves to a task oriented inner standard of excellence. As in Germany, social science students and women are over-represented in this achievement motivation type.

- **Cluster 2:** "task orientation without competition" Slovenia (S-CL2)

Students in this type are similar to those in the low achievement type not approving (with respect to the relation of cluster means to the overall sample mean they are actually disapproving) of any competition topic. However, in contrary to students of the "low achievement" type, students in this group admit preference of challenging tasks thereby displaying the "mastery" component of achievement motivation. Persons of this cluster are ambitious to master their work, but it is not at all important to be the winner in a competition. This type of achievement orientation is not found in Germany.

- **Cluster 3:** "competition without task orientation" Slovenia (S-CL3)

Persons in this cluster are characterized by the desire to be better than others in work and games. They are, however, not committed to a task orientated inner standard of performance. Men are over-represented. This type of achievement orientation can also not be found in the German sample.

- **Cluster 4:** „strong overall achievement motivation" Slovenia (S-CL4)

Students of this type are very similar in their orientation to those of cluster 2 in the German sample. However, distances of cluster-specific from overall sample means are not so discriminating as they are in the German sample. Although students of economics are over-represented in this type, men are not (while in the German sample this achievement orientation type seems to be nearly exclusively a male domain).

Comparing the within country typologies results in two similar clusters: „strong overall achievement motivation" G-CL2 and S-CL4) and „low achievement motivation" (G-CL3 and S-CL1). To a certain degree one can describe the „desire to work hard (without competition)" type in Germany (G-CL1) as similar to the „task orientation (without competition)" type in Slovenia (S-CL2). Both types display some degree of achievement motivation but do not at all approve interpersonal competition. The Slovenian type of „competition without the desire to work hard and without task orientation" (S-Cl3) does not have a counterpart in the German sample. Similarly, the German type that has been declared as average type (G-CL4) has no counterpart in the Slovenian sample. The latter two are similar only with respect to the slightly positive reactions to competition related activities.

With respect to demographic variables "competition" in Germany is a motivational type prevailing in the orientations of male students and students of economics. This is not the case in the Slovenian sample where the cluster-specific proportion of study and gender is very similar to the overall sample proportion. The "low achievement" type seems to be a female domain of orientation with Slovenian students but does not have the same gender bias in the German student sample. Social scientists, however, are over-represented in this "low achievement" type in both countries. This can again be understood as a hint to the necessity to refer to other achievement related activities to operationalise achievement motivation.

Although inspecting of similarities and differences of within country typologies are informative, a real comparison is difficult because cluster characteristics are described with respect to the sample means of each country. Thus, attributes common to both countries as well as cultural peculiarities can be disguised by differences in sample means between countries. This difficulty can be overcome by establishing a comparison of the achievement typology between countries on the basis of the joint sample.

3.2 Clusters between countries

To compare achievement types in Germany and Slovenia, the two samples can be pooled and a group comparison can be accomplished by a restricted cluster analysis on the basis of the joint sample. In this procedure estimation of four clusters is required for each country within one model rendering the possibility of considering similarities and differences between German and Slovenian clusters on the same basis. Like in a multiple group comparison in structural equation modeling, a single model with the same typological structure is estimated for each country and pooled statistics are given for the in joint sample. The target criterion in this analysis is the optimization of the typology with respect to a maximum of explained variance as well as similarity between the countries. Compared to the within country analysis, changes in cluster profiles can be expected in both countries, because profiles in the group comparison are interpreted in relation to the overall mean vector. To establish a terminological distinction of clusters within countries and clusters between countries, clusters resulting from the group comparison (based on the joint sample) are labeled as „types".

Table 3.4: Similarity coefficients[1] of achievement „types" (T) within and between countries (G=Germany, S=Slovenia).

	Germany				Slovenia			
	T1	T2	T3	T4	T1	T2	T3	T4
G-T1	1.000							
G-T2	0.274	1.000						
G-T3	0.294	0.373	1.000					
G-T4	-0.252	0.328	0.155	1.000				
S-T1	-0.063	0.266	0.376	0.407	1.000			
S-T2	-0.243	0.329	0.113	**0.684**	0.436	1.000		
S-T3	0.343	**0.590**	0.317	0.169	0.325	0.287	1.000	
S-T4	0.286	0.204	**0.602**	0.010	0.408	0.055	0.345	1.000

1) Similarity coefficients range from $-\infty$ to 1.0, the latter indicating complete identity of clusters or types.

The explained variance of the restricted cluster model is 22.7% and the similarity coefficients of achievement „types" within countries display substantial differences (Table 3.4). There are, however, some similarities between countries observable with respect to at least three „types" of achievement. Thus, while „types" seem to be dissimilar within countries as it should be, similarities are existent between countries, pointing to at least some cross-national achievement motivation „types". Such similarities can be observed with respect to the German „type 4" (G-T4) and the Slovenian „type 2" (s-T2), the German „type 2" (G-T2) and the Slovenian „type 3" (S-T3)" as well as for the German „type 3" (G-T3) " and the Slovenian „type 4" (S-T4).

Inspection of item deviations from the joint sample mean (Table 3.5) helps to describe the characteristic profiles of all achievement „types". In the German subgroup G_T1 can be labeled as „low motivation", G-T2 as „average achievement motivation" with a touch of work and task orientation", G-T3 can be described as „average in desire for interpersonal competition with considerable disapproval of work and task orientation" while G-T4 is best labeled as "strong achievement motivation" with strong approval of any achievement related activities. In the Slovenian subgroup S-T1 displays some „competition and the opposite of task orientation", while S-T2 is similar to G-T4, thus getting the same label „strong overall achievement motivation"; S-T3 is similar to the G-T2 labeled as „average achievement motivation" without competition desire. Finally, S-T4 resembles G-T3 and is thus called „average in desire for interpersonal competition with considerable disapproval of work and task orientation".

The similarity coefficients in Table 3.4 do, however, not indicate identity of „types" in the German and Slovenian subgroup. There are differences in several aspects that can be inferred from the patterns formed by items most characteristic of the „types". These patterns are given in Table 3.5.

By inspecting Table 3.5 one can see that items belonging to the theoretically postulated achievement dimension „work" are important in discriminating between German achievement „types" because all „work"-items are characterized by (more or less) deviations from the pooled sample mean. With respect to „work" Slovenian students are less heterogeneous than Germans. Items describing „competition" related activities are most important in discriminating between achievement types.

Although there is a high similarity coefficient between the „strong achievement motivation type" (G-T4 and S-T2), Slovenian students of this type prefer more „high level of skill works" and like more „to be busy all the time", whereas German students give stronger approval of items like „important to be better than others". The next corresponding „types" are the G-T3 and S-T4 with a high similarity coefficient of 0.602. Negative deviations from the pooled sample means in „work" and „mastery" items describe these „types" in both national subgroups and students of this type are less approving of „improving their past

work" and less ambitious to „master difficult tasks". In addition, Slovenian students prefer „familiar work" and „fun games".

Table 3.5: Pattern of types in the joint sample of German and Slovenian students.

		Germany				Slovenia			
		T1	T2	T3	T4	T1	T2	T3	T4
ACH1	exceeding performances	-	+	-					-
ACH2	doing well		+		+				--
ACH3	better than in past	-	-	---		+	+		
ACH4	like to work hard	-		-	++		+		--
ACH5	better familiar than difficult		-		-	+	-		+
ACH6	fun games – thought games					+	-		+
ACH7	struggling to master it			-	++		+		--
ACH8	persist task	-	+	-	+		+		--
ACH9	high level of skill	-		-			++		-
ACH10	tasks that I am not sure		+		+	-			
ACH11	busy all the time	---	-	--			++		-
ACH12	try harder when competition	---			+	+	+	-	
ACH13	enjoy competition	---			++		++	-	
ACH14	annoy – other people better	--			++	+	+	--	
ACH15	important – better than others	---	-		++	++	+	--	
ACH16	winning in work and games	--	--		++	+	++	-	
ACH17	ability – success	---	-		+		+		-
ACH18	improving performance		+		++		+		--
	number of persons	112	160	134	101	279	271	346	229

Finally, according to similarity coefficients in Table 3.4 there is also a similarity between G-T2 and S-T3. Slovenian students are disapproving of competition but on average with respect to all other item, while German students are slightly work and task oriented. Because of the minor deviations from the pooled sample mean, this „type" has been labeled as „average motivation". In both countries there is one group without a corresponding „type". The German „low motivation" (G-T1) and the Slovenian "competition and the opposite of task orientation" (S-T1). To be the best and disapproval of task orientation in preferring familiar activities and fun games over challenging tasks are the attributes primarily characteristic of this type.

By cross-tabulating within-cluster- and between-type membership of respondents homogeneity of the achievement motivation typology can be inferred from the proportion of country-specific (within) clusters reproduced by country-overlapping (between) „types" (Table 3.6). Homogeneity can be thought of as

spatial location indicating that respondents with similar reactions on items are located closely together while respondents less similar in their reactions are more dispersed within a cluster. In the between types resulting from the joint sample only the really homogeneous parts of country-specific within clusters can be reproduced. As a rule of thumb, homogeneity is high if proportions exceed 75%. According to this criterion there are two homogeneous achievement motivation types in the German sample and one in the Slovenian sample: in both samples the „strong achievement motivation" (G-CL2 and S-CL4) within clusters are best reproduced by the between „types" with 87% (G-T2) and 75% (S-T2) correspondence; in the German sample there is a second strong correspondence of 78% between the G-CL4 and G-T3 indicating that the slightly above average competition group of persons (within cluster 4) are very close to the pooled mean of the joint sample the strong overlap indicating the „average enjoyment of interpersonal competition" character of the group of people making up this intersection. Thus, the cross-tabulation of within clusters and between types gives a better insight into the make-up of achievement motivation typology than looking to the country specific resu lts alone.

Table 3.6: Cross-tabulation of within-clusters (CL) and between-types (T).

	German Type				Slovenian Type			
	T1	T2	T3	T4	T1	T2	T3	T4
CL1	31.3	59.4	1.5		13.3		37.0	33.6
CL2		10.6		**87.1**	1.4	17.7	**62.7**	1.7
CL3	**68.8**	1.3	20,1		41.9	7.0		**64.6**
CL4		28.8	**78.4**	12.9	43.4	**75.3**	0.3	

4   Summary and conclusion

While factor analysis was used to uncover the dimensional structure within the given pool of 18 achievement motivation items, application of cluster analysis helped to establish a typology of groups of respondents characterized by a special achievement motivation profile. A priori postulated theoretical dimensions of achievement motivation could be replicated to a considerable degree in the overall analyses within the two samples of Slovenian and German students. This was, however, not the case in the factor analyses done for gender and study subject subgroups within the two countries although it could be shown that enjoyment of interpersonal competition is a strong achievement motivation dimension because its items elicited widely similar responses from students in both countries.

Since factor analysis, however, can not give information about groups of persons characterized by a specific achievement motivation profile, two types of

cluster analysis were accomplished, first, within countries on the basis of the German and Slovenian sample separately, and second, between countries on the basis of the joint German and Slovenian student sample. This typological approach revealed the existence of different achievement motivation types. Although a considerable amount of homogeneity is observed in both samples, the existence of types of persons differing in achievement motivation dimensions can not be denied. One reason for this homogeneity might be the make up of the sample containing economics and social science students perhaps holding similar attitudes toward achievement related activities as described in the items.

The achievement typology gave distinctive achievement motivation types within each country as well as common types across the German and Slovenian joint sample. Within as well as across countries one can well differentiate between types high and low in achievement motivation where the type profiles (based on the distance of cluster-specific item means from their sample means) resemble the factorial structure to a considerable degree.

While factor analysis, however, especially within the subgroup of German females, gave one (of three) dimension with high loadings on most of the 18 achievement items, cluster analysis revealed two (of four) types with a distinctive strong profile, one, the low motivation type (G-CL3) representing men and women equally, the other, the strong motivation type (G-CL2) bearing an overrepresentation of men. In the Slovenian sample the theoretically postulated structure of achievement motivation items is - especially in the subgroups - much better reproduced than in the German sample. However, cluster analysis results in two very similar achievement motivation types, the strong motivation type (S-CL4) where male and female students are represented at the same rate as in the whole sample and the low motivation type (S-CL1) where again female students are over-represented.

Since the cluster profiles with their characteristic distances from the sample mean resemble very much the theoretically postulated dimensional structure of the items, we conclude that the data used here for a comparison between factor and cluster analysis can well be approached by both procedures. This double approach gives substantially more information about the practicability of the achievement motivation items than would be reached by one of the methods alone.

Evaluation the achievement motivation items against the background of this analysis leads to the conclusion that the „competition" items are „strong" items that do a good job in discriminating between personality types as well as between dimensions. The remaining item, although touching the theoretically important dimensions of „mastery" and „work", need (at least for our taste) a reformulation that makes them more up-to-date and thereby better discriminating between respondents.

References

[1] Atkinson, J.W. and Feather, N.T. (Eds.) (1966): *A Theory of Achievement Motivation.* New York: Wiley.

[2] Atkinson, J.W. (1981): Studying personality in the context of an advanced motivational psychology. *American Psychologist*, **36**, 117-128.

[3] Bacher, J. (1996): *Clusteranalyse*. München: Oldenburg.

[4] Bardeleben, H. (1995): *Conclus 3.0. Professionelle Clusteranalyse. Conclus Manual.*

[5] McClelland, D.C. (1961): *The Achieving Society*. Princeton, N.J.: Van Nostrand.

[6] McClelland, D.C. (1987): *Human Motivation*. Cambridge. Cambridge University Press.

[7] McClelland, D.C. and Koestner, R. (1992): The achievement motive. In C.P. Smith (Ed.), *Motivation and Personality. Handbook of Thematic Content Analysis*. New York: Cambridge University Press, 143-152.

[8] Mehrabian, A. (1968): Male and female scales of tendency to achieve. *Educational and Psychological Measurement*, **28**, 493-502.

[9] Spence, J.T. and Heilmreich, R.L. (1983): Achievement related motives and behaviors. In J.T. Spence (Ed.), *Achievement and Achievement Motives*. San Francisco: Free Press, 1-67.

Appendix

Table A.1: Wording of achievement motivation items

The instruction for answering the items:
Please rate how much you agree/disagree with each statement below, using this scale:
a = Strongly disagree
b = Disagree
c = Partly Agree/Partly disagree
d = Agree
e = Strongly Agree

1. I find satisfaction in exceeding my previous performance even if I don't outperform others.
2. I find satisfaction in doing things as well as I can.
3. Doing something better than I have in the past is very satisfying.
4. I like to work hard.
5. I would rather do something at which I feel familiar and relaxed than something which is challenging and difficult.
6. I would rather learn easy fun games than difficult thought games.
7. If I'm not good at something I would rather keep struggling to master it than move on to something I may be good at.
8. Once I undertake a task, I persist.
9. I prefer to do things that require a high level of skill.
10. I more often attempt tasks that I am not sure I can do than tasks I believe I can do.
11. I like to be busy all the time.
12. I try harder when I'm in competition with other people.
13. I enjoy being in competition with others.
14. It annoys me when other people perform better than I do.
15. It is important to me to perform better than others on a task.
16. I feel that winning is important in both work and games.
17. The more talents I acquire, the more successful I feel I will be.
18. I enjoy improving upon my past performance.

Table A.2: Cluster and sample means within countries.

	Achievement Cluster – Means									
	Germany					Slovenia				
	CL1	CL2	CL3	CL4	Sample	Sample	CL1	CL2	CL3	CL4
	Means	Means	Means	Means	Means	Means	Means	Means	Means	Means
ACH1	4.3	4.0	3.3	3.8	3.9	3.9	3.9	4.1	3.5	4.1
ACH2	4.7	4.5	3.7	4.1	4.3	4.0	3.8	4.2	3.6	4.3
ACH3	4.7	4.6	4.0	3.8	4.2	4.7	4.7	4.7	4.5	4.9
ACH4	3.1	3.8	2.5	2.7	3.0	3.1	2.8	3.3	2.7	3.5
ACH5	2.6	2.4	3.0	2.9	2.7	3.0	3.5	2.5	3.2	3.0
ACH6	2.3	2.3	2.5	2.6	2.4	2.5	2.8	2.0	2.9	2.3
ACH7	3.5	4.2	2.8	3.2	3.4	3.3	3.0	3.7	2.9	3.6
ACH8	3.9	4.2	2.8	3.6	3.6	3.6	3.2	4.0	3.2	4.0
ACH9	3.1	3.4	2.5	2.9	3.0	3.3	3.0	3.6	3.0	3.6
ACH10	3.0	3.4	2.5	2.7	2.9	2.6	2.2	3.0	2.5	2.7
ACH11	2.5	3.4	1.9	2.3	2.5	3.5	3.1	3.8	3.2	4.0
ACH12	3.1	4.3	2.6	4.0	3.5	3.7	2.8	3.5	4.0	4.3
ACH13	2.7	4.0	2.0	3.5	3.1	3.3	2.4	3.3	3.5	3.9
ACH14	2.5	3.8	2.1	3.4	3.0	3.0	2.6	2.2	3.5	3.6
ACH15	2.1	3.6	1.9	3.1	2.7	3.1	2.5	2.4	3.6	3.8
ACH16	1.8	3.7	1.8	2.8	2.5	3.1	2.3	2.5	3.5	3.8
ACH17	3.7	4.4	2.8	4.0	3.8	4.3	4.2	4.2	3.8	4.7
ACH18	4.5	4.7	3.8	4.3	4.3	4.0	4.0	4.0	3.5	4.4

Table A.3: Types and sample means between countries

| | | Germany | | | | Slovenia | | | |
	Average	1 Mean	2 Mean	3 Mean	4 Mean	1 Mean	2 Mean	3 Mean	4 Mean
ACH1	3.9	3.6	4.3	3.6	4.0	4.0	4.0	4.1	3.4
ACH2	4.1	4.1	4.5	3.9	4.5	4.2	4.2	4.0	3.4
ACH3	4.6	4.3	4.4	4.0	4.7	4.9	4.8	4.7	4.4
ACH4	3.1	2.7	3.2	2.5	3.7	3.2	3.5	3.1	2.4
ACH5	2.9	2.9	2.5	3.0	2.5	3.5	2.5	2.9	3.3
ACH6	2.5	2.6	2.3	2.8	2.4	2.9	2.0	2.2	3.0
ACH7	3.4	3.1	3.7	2.9	4.1	3.2	3.9	3.5	2.8
ACH8	3.6	3.1	4.2	3.2	4.1	3.6	4.1	3.8	2.9
ACH9	3.3	2.9	3.4	2.7	3.5	3.0	3.9	3.4	2.9
ACH10	2.7	2.8	3.1	2.7	3.2	2.3	3.0	2.8	2.4
ACH11	3.2	2.0	2.8	2.1	3.3	3.5	4.1	3.6	2.8
ACH12	3.7	2.3	3.7	3.9	4.4	4.1	4.3	3.2	3.4
ACH13	3.3	2.0	3.2	3.2	4.0	3.5	4.0	2.8	3.0
ACH14	3.0	2.1	2.7	3.3	4.0	3.6	3.4	2.2	3.1
ACH15	3.0	1.7	2.5	3.0	3.9	3.8	3.7	2.3	3.0
ACH16	2.9	1.7	2.1	2.8	3.8	3.6	3.7	2.2	2.9
ACH17	4.1	3.0	3.8	3.9	4.4	4.4	4.6	4.2	3.8
ACH18	4.1	4.1	4.5	4.2	4.7	4.0	4,4	4.0	3.5