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METHODOLOGICAL REMARKS ON STATISTICAL ANALYSES IN EMPIRICAL PAREMIOLOGY

Over the last few years, there has been an increasing interest in empirical proverb studies (cf. Chlosta/Grzybek 1995), the motivation of which is at least two-fold:

1. On the one hand, there is an enormous interest in the empirically evaluated material resulting from such studies. The interest in such *proverb corpora* is not only shared by foreign language teachers or language instruction researchers who want to know which proverbial items are familiar in a given culture in order to include them in schoolbooks, curricula, etc.; this interest is also shared by experts in comparative paremiology, cultural analyses, etc., for whom this material is of utmost importance.
2. On the other hand, there is an interest in possible factors correlating with proverb knowledge, be it personal and sociological features of the speaker (such as sex, age, education, etc.), or linguistic features of the proverbial items (such as syntactic complexity, imagery, rhythm, sentence length, etc.).

Empirical proverb studies to date have been very different in scope and various claims have been made as to implications and consequences of these studies; these claims have been cautious to rather different degrees, ranging from the (minimal) interest in finding a given number of familiar proverbs for any kind of further studies, up to the (maximal) interest in what has been called a 'proverb minimum', i.e., the totality of the most common proverbs in a given culture. Without any doubt, important results have been obtained in these studies; but regardless of these results and of some far-reaching claims which have been brought forth in this context, it is necessary to state that thus far,

there is no justified reason to enthusiastically celebrate the status quo. Criticism is appropriate for several reasons which cannot be discussed here in detail, such as selection of the material, composition of the sample, and many others – cf. Grzybek (2000) for a state-of-the-art report. Objectively speaking, therefore, we only have a number of valuable pilot studies, not more, not less – regardless of what some authors may claim.

This general pessimism need not necessarily be extended to the question of possible factors influencing proverb knowledge, since the impact of particular factors may well be studied on the basis of a smaller corpus which need not contain "all" familiar proverbs of the culture in question, but a particular subset of it. But again, for the time being, there are more problems than solutions, although a number of hypotheses have been brought forth (again with varying degrees of cautiousness); they seem to be reasonable at first sight, particularly since the validity of these claims has been "statistically proven" by some authors. Thus, studies by Grzybek (1991), or Schindler (1993), or Tóthné-Litovkina (1996), have been devoted to various factors; there seems to be a general tendency that – as far as a given proverb corpus, not individual proverbs are concerned –, sex does not play a crucial role, whereas age clearly does; with regard to education, the results are more than contradictory. Generally speaking, we are far from knowing the exact effect of these factors, since additionally, as will be shown in this article, the statistical tools and methods applied have not been fully appropriate. Therefore, the primary aim of this article is to develop sensitivity for the problems at stake, and to give some methodological hints at more adequate statistical procedures. The arguments are based primarily on the statistical results of Grzybek's (1991) pilot study on the familiarity of German proverbs, and secondly, on the extensive re-analyses of this study by Grotjahn/Grzybek (2000).

Let us briefly summarize the basic data of Grzybek's (1991) pilot study. The study was undertaken in 1989/90, in one German county (North Rhine-Westphalia) with 125 subjects. Up to that point, there had been practically no comparable research experience in the field of empirical paremiology, except for Permjakov's pioneering studies and Krikmann's (1986) subsequent statistical analyses of them. The material taken was the proverb collection *Deutsche Sprichwörter für Ausländer* by Frey et al. (1970), since this collection claimed to contain 275 proverbs current in contemporary German. The design employed was the so-called "partial text presentation"; neither this design (cf. Grzybek/Chlosta 1993; Chlosta/Grzybek 1995) nor the

procedure of classifying the individual text completions by the subjects can be described here in detail (cf. Grzybek, Chlosta, Roos 1994).

The present report focuses on the analysis of sociological factors; questions as to which concrete proverbs were known by whom (i.e. by which subjects or group of subjects), will be ignored (cf. Grotjahn/Grzybek 2000), as well as questions as to linguistic specifics of the proverbs under study. Rather, we will first concentrate on characteristics of the sample, and then on the factors influencing proverb knowledge in general.

As to the sample, data with regard to the following factors were obtained from each subject: sex, age, education, county, domicile (both contemporary and during youth). There were 49 male (39.20%) and 76 female (60.80%) subjects (Variable: 'SEX'), whose mean age (variable: 'AGE') was $\bar{x} = 40.91$ years ($s = 18.45$; $x_{min} = 19$, $x_{max} = 84$). Because of clear deviations from normal distribution in particular subgroups, for some of the following analyses, the whole sample was divided into different age classes with relatively identical sizes: on the one hand, the sample was dichotomized at the age median (variable: 'AGE_12'), on the other hand, the sample was split at the 33th and 66th age percentiles (26.58 and 50 years), respectively; the latter subdivision resulted in the variable 'AGE_13' with the three categories: (1) 'young' (≤ 26; $n = 41$; 32.80%), (2) 'medium' ($27 \leq x \geq 50$; $n = 43$; 34.40%), (3) 'elderly' (> 50; $n = 41$; 32.80%).

As to the factor of education, the sample was dichotomized into subjects without university qualification, on the one hand ($n = 44$), and subjects with university qualification ($n = 81$), on the other hand; the resulting variable was termed 'EDUR_12'. Additionally, two further subdivisions were realized with three or four categories, the recoded variables being termed 'EDUR_13' and 'EDUR_14', respectively.[1]

Since the overwhelming majority of subjects (n=108; 86.40%) came from one and the same county (NRW) and had also spent their youth there ($n = 89$; 71.20%), the sample was dichotomized in this respect, too, distinguishing between subjects coming from this county or not, with the dichotomized variables 'COUNTY-S' (county at time of study), and 'COUNTY-Y' (county in youth).

At the time of the study, 79.20% of the subjects ($n = 99$) lived in a large town, 12.80% ($n = 16$) in a small town, and 8% ($n = 10$) in a village (variable: 'RES-S'). 53.60% of the subjects ($n = 67$) had spent their youth in a large town, 22.40% ($n = 28$) in a small town, and 16% ($n = 20$) in a village (variable: 'RES-Y'); 8% ($n = 10$) of the subjects failed to provide data on this point.

A first important question to be answered relates to possible correlations among factors probably affecting proverb knowledge; therefore, we calculated correlations for all factors (except for age) in the form of the dichotomized variables, since the overall aim of this step is to search for particular tendencies. Table 1 presents the Pearson correlations with their corresponding levels of significance. A correlation is considered to be significant if $p < 0.05$ (*), and highly significant if $p < 0.01$ (**).

Table 1: Pearson correlations between potential influence factors

	Age	Edur_12	Sex	County-S_12	County-Y_12	Res-S_12	Res-Y_12
Age	1.000	-.609**	-.121	.010	.097	-.083	-.007
p		(< .000)	(.089)	(.456)	(.150)	(.179)	(.469)
Edur_12	-.609**	1.000	-.077	-.161	-.052	.241**	.069
p	(< .001)		(.196)	(.040)	(.291)	(.003)	(.230)
Sex	-.121	-.077	1.000	-.143	-.120	-.210**	-.094
p	(.089)	(.196)		(.061)	(.100)	(.009)	(.159)
County-S_12	.010	-.161*	-.143	1.000	.392**	-.289**	-.155
p	(.456)	(.040)	(.061)		(< .001)	(.001)	(-.054)
County-Y_12	.097	-.052	-.120	.392	1.000	-.029	-.385**
p	(.150)	(.291)	(.100)	(< .001)		(.378)	(< .001)
Res-S_12	-.083	.241**	-.210**	-.289	-.029	1.000	.390**
p	(.179)	(.003)	(.009)	(.001)	(.378)		(< .001)
Res-Y_12	-.007	.069	-.094	-.155	-.385**	.390**	1.000
p	(.469)	(.230)	(.159)	(.054)	(< .001)	(< .001)	

As can be seen, there are quite a number of significant correlations, some of which shall be mentioned here explicitly for sake of demonstration and explanation, e.g.

1. there is a negative correlation between age and education (EDUR_12): younger subjects tend to be more educated than older subjects ($r = -.609$);
2. there is a negative correlation between education and county of residence at the time of the study: subjects from NRW tend to have higher education ($r = -.161$);
3. there is a positive correlation between education and domicile at the time of the study: subjects from large towns tend to have higher education than subjects from small towns or villages ($r = .241$).

Further significant correlations can easily be found in table 1, which also shows that most of them are related to residence and county; the only correlation which does not include either of these two factors is the correlation between 'AGE' and 'EDUCATION'. Interestingly enough, we are concerned here with those two factors which have repeatedly and contradictorily been discussed in empirical studies (Grzybek 1991, Schindler 1993, Tóthné-Litovkina 1996). Therefore, the connection between these two variables will be analyzed and discussed in detail below.

For the whole sample, the mean of "correct" answers, calculated in percentage (variable: 'SWPERC'), is $\bar{x} = 70.12$ ($s = 12.40$; $x_{min} = 38.9$ 1, $x_{max} = 93.82$; $md = 71.27$). Table 2 presents the mean values and standard deviations of the variable 'SWPERC' for various subgroups.

The effect of each factor on the amount of proverb knowledge can be analyzed on the basis of these data. To this end, multiple one-factorial analyses of variance (ANOVA) can be calculated; in fact, such ANOVAs have been carried out in most paremiological studies. There are, however, two problems related to this approach: firstly, carrying out separate analyses on the same data inflates the statistical error; and secondly, the approach does not take into account possible interactions between factors. Therefore, as will be shown below, **the isolated analysis of separate factors**, which is often to be found in empirical phraseology and paremiology, **may lead to massive misinterpretations**. Before we illustrate this argument by way of some examples, let us first present the results of some one-factorial analyses.

As a look at the row 'Total' of table 1 shows, proverb knowledge seems to decrease with increasing degree of education. This tendency is even more clearly expressed if the factor 'EDUCATION' is only divided into the categories 'low' and 'high' ('EDUR_12'): in this case, the average proverb knowledge is $\bar{x}_1 = 77.17$ and $\bar{x}_2 = 66.22$. Yet, this tendency holds true only for an isolated analysis of the factor 'EDUCATION': if one additionally takes into consideration the factor 'AGE', it can be seen that within the two age groups the mean values for the two education groups 'low' and 'high' are almost identical. We will come back to this point below.

Table 2: Mean values and standard deviations of the variable 'SWPERC' in various subgroups

Variables			Education					TOTAL
			Haupt-schule	Real-schule	Gymna-sium	university studies (natural sciences)	(humani-ties)	
Age_12	≤ 34	$\bar{x}$	66.55	59.52	58.00	62.94	61.32	61.34
		s	0.00	3.89	12.75	6.78	9.04	8.73
		n	1	3	6	13	40	63
	> 34	$\bar{x}$	77.73	79.89	79.15	80.10	79.39	79.05
		s	10.44	8.32	6.02	5.27	8.63	8.63
		n	21	19	3	7	12	62
Sex	male	$\bar{x}$	77.21	75.60	69.53	70.94	70.62	72.32
		s	10.27	10.95	14.49	9.73	12.66	11.32
		n	6	9	5	14	15	49
	female	$\bar{x}$	77.23	78.15	59.45	64.30	63.41	68.70
		s	10.86	10.64	15.43	11.35	10.83	12.92
		n	16	13	4	6	37	76
County-S_12	Non-NRW	$\bar{x}$	66.55	73.53		59.45	76.18	70.55
		s	0.00	14.75		1.80	2.31	11.78
		n	1	5	–	2	2	10
	NRW	$\bar{x}$	78.45	77.73	63.79	69.84	65.03	69.85
		s	10.62	9.48	16.15	10.75	11.88	12.74
		n	19	16	7	17	49	108
County-Y_12	Non-NRW	$\bar{x}$	72.45	78.00	68.12	74.04	70.91	73.06
		s	9.68	15.87	13.88	10.11	11.71	11.93
		n	4	6	3	5	8	26
	NRW	$\bar{x}$	78.72	75.97	68.00	67.71	64.42	69.37
		s	10.96	8.77	13.69	10.50	11.84	12.36
		n	15	14	5	14	41	89
Res-S	village	$\bar{x}$	75.64	71.39		58.36	60.91	67.96
		s	13.90	9.93		0.26	4.89	11.07
		n	3	3	–	2	2	10
	small t.	$\bar{x}$	76.24	84.85			60.20	72.45
		s	9.13	5.71			13.43	15.12
		n	3	6	–	–	7	16
	large t.	$\bar{x}$	77.70	74.85	65.05	70.12	66.56	69.96
		s	10.74	11.06	14.92	10.32	11.57	12.12
		n	16	13	9	18	43	99
Res-y	village	$\bar{x}$	78.86	67.56		58.36	62.79	69.16
		s	10.75	11.67		0.26	5.72	11.58
		n	7	5	–	2	6	20
	small t.	$\bar{x}$	80.18	76.97	67.27	76.45	63.87	69.77
		s	10.41	7.28	13.46	6.10	15.40	13.96
		n	4	3	3	4	14	28
	large t.	$\bar{x}$	75.11	80.60	70.55	67.12	66.94	70.77
		s	10.84	9.78	15.12	11.07	11.11	11.99
		n	11	11	4	12	29	67
TOTAL		$\bar{x}$	77.22	77.11	65.05	68.95	65.49	70.12
		s	10.46	10.58	14.92	10.41	11.74	12.40
		n	22	22	9	20	52	125

Since the one-factorial analyses for sex, residence, and county yield non-significant results (see Grotjahn/Grzybek 2000 for details), we will concentrate here on the factors 'AGE' and 'EDUCATION'. In order to study the influence of the factor 'AGE' within a one-factorial ANOVA, the sample was divided at the median of $md = 34$ ('AGE_12'). The mean value of group 1 (≤ 34) is $\bar{x}_1 = 61.34$ ($s = 8.73$); the mean value of group 2 (> 34) is $\bar{x}_2 = 79.05$ ($s = 8.63$). ANOVA shows this difference to be highly significant ($F_{1,123} = 130.14$, $p < 0.001$). As mentioned, we also undertook a tripartition of the whole sample at the 33th and 66th age percentiles ('AGE_13'); the mean values and standard deviations for the three age groups were $\bar{x}_1 = 59.13$ ($s = 8.90$) for the young ($n = 41$), $\bar{x}_2 = 68.87$ ($s = 8.09$) for the medium ($n = 43$), $\bar{x}_3 = 82.42$ ($s = 6.95$) for the elderly (n = 41) subgroup. ANOVA showed these differences to be highly significant ($F_{2,122} = 87.25$, $p < 0.001$).

ANOVAs with the five subgroups of 'EDUCATION' yielded highly significant differences ($F_{4,120} = 6.88$, $p<.001$). Subsequently, Tukey tests were carried out to analyze differences between subgroups. These tests resulted in two homogeneous sub-groups: subjects with elementary and secondary education, on the one hand, subjects with higher education (high school and university), on the other hand. Further one-factorial ANOVAs were calculated on the basis of the recoded variables 'EDUR_12', 'EDUR_13', and 'EDUR_14', all of which led to highly significant differences ($p < 0.001$).

In summary, the one-factorial analyses of variance show a highly significant effect of the variables 'AGE' und 'EDUCATION'. In case of the variable 'AGE' the effect seems to be relatively strong, in so far as the proportion of variance explained by the variable 'AGE_13', for example, is 59% ($Eta^2 = .767^2 = .59$). This means: The **higher** the age, the **higher** proverb knowledge. As to the connection between 'EDUCATION' and proverb knowledge, it is particularly important to pay attention to the overall tendency which, at first sight, is astonishing: **The higher the education, the lower the proverb knowledge** – a tendency which diametrically contradicts the tendencies observed above.

It seems reasonable to hypothesize that these seemingly contradictory results are due to the fact that both the analysis of simple main effects and the analysis of bivariate relations between proverb knowledge and specific factors is misleading, when these factors are correlated in one way or another; previous paremiological studies

have not paid due attention to this problem. Therefore, a logical next stop would be a multi-factorial analysis. In our case, a possible approach would be an analysis of covariance (ANCOVA) of the dependent variable 'SWPERC' with 'AGE' as a covariate and 'EDUCATION' as a factor, provided the assumptions this procedure is based upon (such as normally distributed data) are fulfilled (see the discussion of ANCOVA in Grotjahn/Grzybek 2000). The results of ANCOVAs with 'EDUR_12', 'EDUR_13', and 'EDUR_14' as factors are shown in table 3.

Table 3: ANCOVAs of 'SWPERC' with 'EDUCATION' as factor and 'AGE' as covariate

Variables	*F*	*d.f.*	*p*
Age	123.34	1;122	< .001
Edur_12	1.04	1;122	.310
Age	126.63	1;121	< .001
Edur_13	1.59	2;121	.208
Age	133.91	1;120	< .001
Edur_14	2.49	3;120	.064

Table 3 not only shows that the effect of the dichotomous factor 'Edur_12' disappears when the covariate 'AGE' is taken into consideration – additionally, the differential effect of the various recodings of 'EDUCATION' becomes obvious: if one recodes 'EDUCATION' as 'EDUR_14', the effect is almost significant ($p = .067$). In summary, the results of ANCOVA may be interpreted in terms of some possible (very weak) effect of 'EDUCATION' on proverb knowledge. This interpretation is corroborated by the calculation of relevant partial correlations. Table 4 shows the correlation of 'SWPERC' with 'EDUR_12' and 'EDUR_14' after partialing out the influence of the variable 'AGE', together with the original correlations. We calculated Pearson correlations, although this is only partly justified for 'EDUR_14', since in this case, this variable is considered to measure on an interval scale (but see the multiple regression analyses below, where 'EDUR_14' will be treated as a nominal variable).

Table 4: Correlations between proverb knowledge and education after partialing out the influence of 'AGE'

	Correlation		Partial Correlation	
Variable	EDUR_12	EDUR_14	EDUR_12	EDUR_14
SWPERC	-.420	-.392	.092	.173
p	< .001	< .001	.310	.055

Table 4 shows very clearly how misleading the analysis of simple bivariate correlations between proverb knowledge and single factors can be: If the influence of the variable 'AGE' is partialed out, not only does the strength of correlation between proverb knowledge and 'EDUCATION' (in both recodings) change massively, but also the direction (from – to +). Also, the significance changes tremendously: in the case of 'EDUR_12', the correlation ceases to be significant after partialing out the variable 'AGE', in the case of 'Edur_14', the results are just below the conventional 5%-level of significance. In any case, the connection between 'EDUCATION' and proverb knowledge – if it exists – would now have to be formulated: the higher the education, the higher the proverb knowledge.

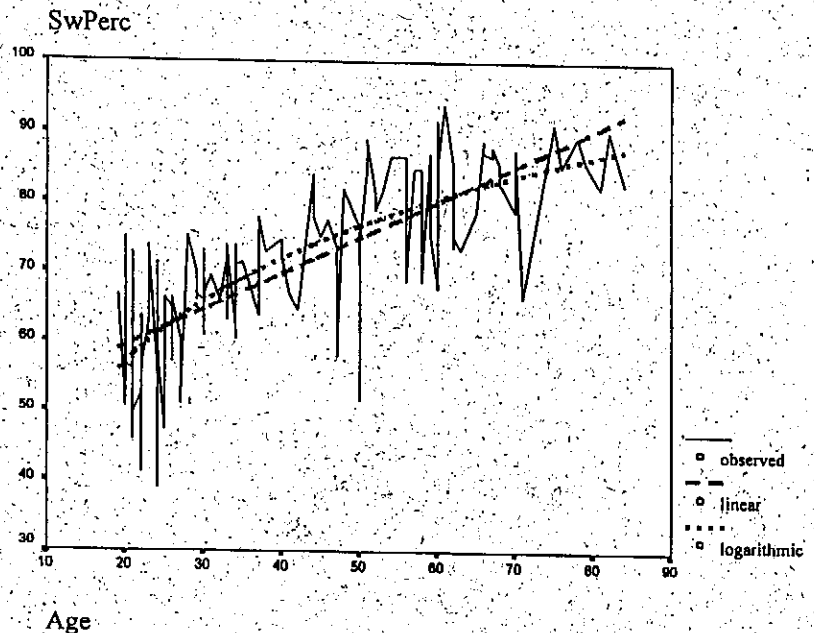
In this context, it is important to note that in both cases (i.e., in calculating ANCOVAs and partial correlations), the simultaneous influence of only two variables on proverb knowledge is studied: 'AGE' and 'EDUCATION'. Yet, as was shown above, we are concerned with a number of interrelations among the possible influence factors – if these are not taken into consideration in their totality, we still run the risk of partial or complete misinterpretation.

Therefore, the next step in our analyses involves regression analyses on the basis of the General Linear Model (GLM). The GLM provides not only additional procedures for the analyses of joint effects, but also includes ANOVA and ANCOVA as special cases. First, a stepwise regression analysis was carried out; in this analysis, age was treated as an interval variable, whereas all nominal variables ('SEX', 'EDUCATION', 'COUNTY-S', 'COUNTY-Y', 'RES-S', 'RES-Y') were taken in their dichotomized forms.[2] As a result, only 'AGE' turned out to be significant, all other factors were not included in the regression model.[3] This leads to a model of proverb knowledge which includes only 'AGE' as a factor, and which explains 58.7% of the variance of proverb knowledge ($p < 0.001$).

$$SWPERC_{EST} = 0.51 * AGE + 49.05$$

In addition to the linear regression model described above, we tested the adequacy of a logarithmic model: it also shows the variable 'AGE' to be highly significant and explains 1.7% more of the variance than the linear model. In other words: taking into consideration only the (logarithmized) variable 'AGE', 60.40% of the variance of proverb knowledge can be explained. Figure 1 shows both the empirical results and the corresponding linear and logarithmic models.[4]

Figure 1: Comparison of the linear and the logarithmic models



The logarithmic regression model, which includes the age factor in logarithmized form, can be expressed as follows:

$$SWPERC_{EST} = 21.35 * (\ln AGE) - 6.98$$

Such a logarithmic model can convincingly be interpreted theoretically: proverb knowledge increases relatively fast in younger persons, then flattens out with increasing age and may even decrease in elderly persons (due e.g. to mental or neurological factors).

It would be interesting to see how our model fits with younger and older populations. In any case, it might explain the contradictory reports on the effect of the factors age and education in paremiological literature. One thing, however, should have become very clear in the foregoing argumentation: The application of simplistic models is likely to produce misleading hypotheses and conclusions, and empirical paremiology as a young (sub)discipline might yet learn how to avoid methodological flaws.[5]

Notes

[1]These categorizations are based on the German school system. For 'Edur_13', they include (1) Hauptschulbildung, (2) Realschulbildung, (3) higher education; for 'Edur_14', they include (1) Hauptschulbildung, (2) Realschulbildung, (3) Gymnasialbildung, (4) Universitätsbildung.– Both Hauptschule and Realschule involve ten years of education, the Realschule being of a more practical-technical orientation; only the Gymnasium qualifies for university studies.

[2]Possible interaction effects among the independent variables were ruled out on the basis of multi-factorial analyses of variance.

[3] Only one of the nominal variables was relatively close to the traditional 5% level of significance. Therefore, we transformed 'EDUR_14' by way of effect coding into three indicator variables (coded as -1, 0, +1). A regression analysis with 'AGE' and these three indicator variables showed that the prediction of proverb knowledge can be slightly increased by approximately 2%. This increase was, however, due to only one of the three binary variables; for a detailed interpretation of this results see Grotjahn/Grzybek (2000).

[4]As in the case of the linear model, the prediction of proverb knowledge can be slightly improved by introducing 'EDUCATION' in terms of indicator variables into the logarithmic regression model.

[5]We are glad to express our gratitude for Genie Lamont's competent editing of this text.

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