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Normalization of the I-E at Work Scale by Xymena Gliszczyńska

Normalizacja skali „I-E w pracy" Xymeny Gliszczyńskiej

Keywords: locus of control; I-E at work scale; normalization

Słowa kluczowe: poczucie umiejscowienia kontroli; skala „I-E w pracy"; normalizacja

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Introduction

The issue of reliable recognition of employees' potential and motivational factors takes on special significance in the face of changes that have taken place in recent years in the employer-employee balance. The factor supporting the effective management of people in the organization may be the identification of employees' sense of control location corresponding with the feelings about the possibility of real impact on situations and events in the workplace. The locus of control (LOC) conceptualized by Rotter assumes a variable level of perception of cause-and-effect relationships among people resulting from their own actions (internal factors) or circumstances relatively independent of humans (external factors) [Rotter, 1966, pp. 1–27]. Xymena Gliszczyńska's I-E at work scale is focused on LOC measurement in the situational context of the work. To date, this tool, which is quite often used in modern research, has been only partially verified psychometrically and does not have a developed system of standards. The aim of this article is to carry out supple-

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

mentary and updating validation tests and analysis of the possibility of developing norms for the results of the I-E at work tool based on current research with a sample of 1,075 people.

1. Initial psychometric properties of the I-E at work scale

The Gliszczyńska questionnaire is widely used [see and cf.: Tokarczyk, 2010, pp. 77–92; Cybulski, Strzelecki, 2011, pp. 37–46; Kowalczyk, 2011, pp. 222–226; Kowalczyk, 2012, pp. 65–68; Matczak, Knopp, 2013, p. 136; Paluchowski et al., 2014, p. 76; Jasiński, 2014, pp. 95–97; Piskorz, 2016, pp. 174–179; Kata, 2016, pp. 91–93; Makarowski, 2016, p. 51]. However, complementing validation and developing standards for the tool have not been done.

Gliszczyńska's I-E at work scale was a diagnostic tool for measuring the location of control. However, contrary to Drwal's [1979, pp. 67–84] proposal, it was intended to measure internal LOC. The additional innovative attribute distinguishing it was its orientation in the work context and the assessment of workers' feelings regarding the possibilities of impact in the situation of work [Gliszczyńska, 1984, pp. 975–991]. The currently used version of the tool contains 25 items, of which 12 belong to the FŻ (*filozofia życiowa*) subscale (general sense of internal control with a philosophical reflection), and 13 are contained in the SP (*sytuacja pracy*) subscale, which refers directly to the sense of internal control in the work situation. The conceptual and substantive side of the LOC issue in Gliszczyńska's publications even today is a valuable informational and educational base. However, the psychometric material of I-E at work, although including analyses such as the assessment of accuracy, reliability and discriminatory power, was not finally completed with the procedure of proper normalization, as the author herself points out [Gliszczyńska, 1990, pp. 4–38]. Only preliminary measures of the central tendency and the measure of variability were presented, and a recommendation to treat them as temporary parameters was made. A very general and brief way of calculating and interpreting the results was also indicated. In the following years, the question of supplementing the validation studies on the scale of I-E at work was not mentioned because of Gliszczyńska's death in 2004 and the concentration of scientific interests on the development of other new tools to measure the sense of location of control in the work situation.

In preliminary validation studies on the conceptual validity of the I-E at work scale, Gliszczyńska herself supported the tool for measuring professional value with a satisfactory level of reliability of Cronbach's alpha of 0.794. The second relevance test referred to the analysis of the relationship between the sense of internal control and the variable of the high stature of employees (components: position in the hierarchy of the service, performed function in relationship to the difficulties of performed tasks). Two of these studies have provided satisfactory results in the estimation of psychometric validity. In turn, factor analyses carried out separately for three studies, first for

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

subscales of FŻ and SP and later for the whole scale, did not show the expected differences and did not allow for a clear separation of factors of the general sense of internal control and sense of control in the internal work situation as a whole. The analysis of the homogeneity of the subscales and the entire scale has shown that correlations of individual items with the results of subscales are not significantly higher than in the case of correlation with the overall scale score [Gliszczyńska, 1990, pp. 4–38].

The estimation of the reliability of the Gliszczyńska questionnaire was carried out in two ways. The first approach was the test-retest analysis carried out on the only possible, relatively different sample of N = 129 at an interval of three months, within which a satisfactory correlation result, r = 0.695 that is statistically significant, was achieved. The second approach referred to the internal conformity analysis calculated using the KR-20 Kuder–Richardson formula. This coefficient was calculated twice for the same sample as in the case of the retest. The result of the first test was 0.836, and the second was 0.882. Achieved indexes of the reliability of the I-E at work scale can be considered high and satisfactory, at the level of contemporary standards [see: Brzeziński, 2016 pp. 455–505; Hornowska, 2010, pp. 41–72].

The dimensional reductions, the successive improvements of reliability parameters and the final version of the questionnaire were greatly influenced by research on the discriminating power of particular items on the scale. One of the research stages was to compare the discriminative power parameters of seven items from the FŻ subscales, which were taken directly from the original Rotter tool, with the results obtained by an American researcher. As Gliszczyńska notes, the influence on the higher level of parameters obtained on the Polish sample could have been applied to a slightly different, although similar, point-biserial correlation coefficient. During the three tests, items with correlation coefficients that proved statistically insignificant were eliminated. The remaining ones were in the range of 0.314–614, and thus were at a level higher than the recommended limit of 0.2 [Gąsiorowska, Bajcar, 2006, pp. 43–44].

As the author of the scale I-E at work recognized, the specifics of the sample at that time did not give grounds for conducting the appropriate standardization procedure, which, however, due to the solid substantive base and satisfactory level of psychometric material, Gliszczyńska planned to perform in subsequent years. Only the temporary way of estimating the results was presented through the measures of central tendency and volatility calculated in the early 1990s. The analysis of the distribution of results obtained on the basis of Gliszczyńska's studies showed a similarity to the normal distribution of statistics D in the K–S tests (Kolmogorow–Smirnov) in the range of 0.420–0.555.

2. Results of supplementary tests on the I-E at work scale

The scope and reliability of Gliszczyńska's psychometric material with the author's feeling of lack of completing it with the normalization procedure, the continuous use of the I-E at work questionnaire by contemporary researchers, and finally

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

the author's personal need for research with an appropriate system of standards that allows correct interpretation of contemporary results were the reasons for the beginning of a series of studies supplementing and updating the validation of the I-E at work scale. These studies were carried out in 2014–2018 on the sample N = 1,075, the structure and specificity of which are presented in detail in the next section.

The first complementary validation analysis the author undertook was verification of the accuracy of the internal structure of the tool through factor analysis with Varimax rotation at the level of results of subscales FŻ and SP and at the level of items. The first approach found a self-referential structure of the questionnaire with a fairly high load value of 0.894, which means that the two subscales of FŻ and SP statistically measure one construct – in this case, the sense of location of internal control. This result coincides with earlier results of Gliszczyńska's research. Another item-level survey was based on the assumption of a one-factor structure of the questionnaire and thus obtained the value of factor loads for each of the 25 items. Table 1 presents detailed results. Both the varied level of loads and the noticeable lack of dependence between their values and membership in the subscales of FŻ and SP confirm the conclusions the author drew about the suggested way of perceiving the I-E at work scale as a whole. The result of participation in the variance obtained in this study (16%) is slightly higher than in Gliszczyńska's research (11.6%) [Gliszczyńska, 1984, pp. 975–991]. As part of other studies on criterion validity, the author with the participation of cooperating psychologists conducted a diagnosis, parallel to the measurement of I-E at work, using the DELTA questionnaires and KBPK for the youngest group.[1] According to conceptual predictions, r-Pearson's correlations of the result of the general scale I-E at work with the results of the DELTA scale of the generalized sense of control reached -0.526 (N = 1,075).

Even clearer results in the studies in 2018 were obtained by the people cooperating with the author of this article: -0.902 for N = 30 and -0.841 for N = 40.[2] All reported results were at the significance level of $p < 0.01$. These results can be considered satisfactory and confirm the conceptual correctness of the difference, because by design, the tools I-E at work and DELTA examine different constructs (internal control versus external control). There were no significant correlations between the results on the lie scale and the sense of internal and external control. The level of correlation in the author's research in cooperation with psychologists between the results of I-E at work and the overall result (generalized sense of control) of the KBPK: $r = 0.425$ for $p < 0.01$ was somewhat lower, although in a conceptually desirable direction. The reason for the slightly lower correlation could be the conceptual discrepancy of the tools – Gliszczyńska's scale refers to the work situation

[1] Full name of the tool: Questionnaire for the Study of the Sense of Control [Krasowicz, Kurzyp-Wojnarska, 1990, pp. 5–36].

[2] Similar analyses using the I-E at work and DELTA questionnaires were conducted by Gdesz in collaboration with the author [Gdesz, 2018, pp. 51–59] and Budzyńska-Musiał [2018, p. 48].

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

and the KBPK to the general psychological sense of the location of control (thus also outside of work). Supplementary validation studies on the criterial validity of the I-E at work scale relatively clearly demonstrated the conceptual correctness of the questionnaire, consistent with the author's intention.

The second update research was the analysis of the reliability calculated with Cronbach's alpha indicators, first for the FŻ and SP subscales and later for the entire questionnaire. The results obtained were 0.603 for FŻ, 0.633 for SP and 0.761 for the entire scale I-E at work.[3] The results showed a higher value of reliability for the entire Gliszczyńska questionnaire than in the case of results of individual subscales, which is consistent with both the obtained structural validity results and the suggestion of the author of the questionnaire. A detailed analysis of potential deletions of individual items from the subscales of FŻ and SP presented in Table 1 did not show a significant improvement in Cronbach's alpha parameters, while in the case of removing individual items from the entire I-E at work scale, reliability decreased. Thus, there was no need to remove any items from the questionnaire. The overall result of reliability, although achieved at a slightly lower level than results obtained by Gliszczyńska (0.836 and 0.882), is still at a satisfactory and universally acceptable level [cf. and see: Wudarzewski, 2017, p. 221 and the literature indicated there].

Because Gliszczyńska s psychometric material on the analysis of the discriminating power is in the author's opinion both comprehensive and convincing, the analysis of the discriminating power of individual items of the scale I-E at work was rejected in recognition that the current structure of the tool is relevant and substantively confirmed.

Table 1. Results of factor analysis with Varimax rotation and detailed analysis of I-E scale reliability

Item number	Factor charge values	Cronbach's alpha on removing the item	Correlation item-scale result
Item 1 – subscale FŻ	0.551	0.742	0.421
Item 2 – subscale FŻ	0.317	0.750	0.276
Item 3 – subscale SP	0.398	0.748	0.304
Item 4 – subscale SP	0.297	0.752	0.227
Item 5 – subscale SP	0.490	0.744	0.369
Item 6 – subscale FŻ	0.583	0.741	0.427
Item 7 – subscale SP	0.514	0.744	0.380
Item 8 – subscale SP	0.507	0.743	0.400
Item 9 – subscale SP	0.313	0.750	0.272
Item 10 – subscale SP	0.438	0.745	0.349
Item 11 – subscale FŻ	0.577	0.741	0.409
Item 12 – subscale FŻ	0.361	0.750	0.271
Item 13 – subscale SP	0.223	0.756	0.181
Item 14 – subscale SP	0.414	0.747	0.326

[3] In the studies Gliszczyńska carried out, similar reliability results were obtained: 0.642 for the FŻ subscales and 0.600 for the SP subscales in the original 20-item version [Gliszczyńska, 1984, p. 983].

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

Item 15 – subscale SP	0.423	0.750	0.281
Item 16 – subscale FŻ	0.158	0.757	0.169
Item 17 – subscale FŻ	0.226	0.755	0.202
Item 18 – subscale FŻ	0.524	0.746	0.359
Item 19 – subscale SP	0.298	0.752	0.245
Item 20 – subscale FŻ	0.125	0.759	0.117
Item 21 – subscale SP	0.458	0.748	0.313
Item 22 – subscale FŻ	0.495	0.744	0.365
Item 23 – subscale FŻ	0.256	0.754	0.221
Item 24 – subscale SP	0.192	0.757	0.167
Item 25 – subscale SP	0.292	0.752	0.242
The variance explained	**4.001**		
Participation in the variance	**0.160**		

Source: Author's own study using the SPSS Statistics program (version 17).

3. Analysis of the possibility of normalizing the scale of I-E at work

The selection of the sample for normalization tests was purposeful and quantitative. The Gliszczyńska trial included employees working in three institutions – industrial, scientific and research and design office – which is why, as the researcher herself noticed, the conditions for conducting a comprehensive standardization procedure were not met at that time. Taking into account these circumstances, the author selected the results of people in the sample in such a way that it would be appropriately diversified for the place of work, functions and the specificity of work positions and its character. The target sample was sufficiently numerous and, at the same time, in accord with the relevant concept of the contemporary structure of staffing, while at the same time satisfying the conditions of representativeness to a greater extent. In this way, the results of people employed in various organizations in several parts of Poland were selected for standardization studies, and situations in which results from one workplace would prevail were avoided. Acquiring diagnostic results using the I-E at work tool was just one of several years of the author's research. The nature of the sample required random selection of the appropriate number of results from different population groups in such a way that they would meet the conditions of representativeness as much as possible. However, as practice shows, even for such specialized institutions as the Warsaw Test Laboratory, those conditions are rarely met. The author is fully aware of the lack of full representativeness of the sample, but, at the same time, she acknowledges the open nature of the results so far achieved. As a result, from the several thousands of I-E at work results generated in 2014–2018, the results of 1,075 people were used for standardization studies. The very real problem of internal and external motivation factors also required the relative diversification of the sample both in the context of basic demographic variables (sex, age) and detailed characteristics relating to the work environment (location of employment in Poland, organizational level, specific workplace). Table 2 presents the sample

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

structure for complementary validation and standardization studies. Compared with the Gliszczyńska test sample in which the number of men clearly predominated, the author presented a larger number of women, while comparable proportions were obtained in terms of the variable organizational levels and level of education (with the advantage of people with higher education at the bachelor's and master's level).

Table 2. Characterization and structure of the standardization test

Sex	N	Age range	N	Place of employment	N	Organization level	N	The specificity of the position	N
Women	571	16–19	23	Dolnośląskie	382	Employees	664	Processing-physical	83
		20–24	50	Opolskie	279				
		25–29	56	Śląskie	134			Customer service and sales	437
		30–34	384	Wielkopolskie	65	Lower and middle managers	297		
Men	504	35–39	340	Małopolskie	56			Administrative and economic	480
		40–49	115	Mazowieckie	48				
		50–59	84	Kujawsko-pomorskie	63	Senior executives and business owners	114	Technical-engineering	75
		60 and more	23	Łódzkie	48				

Source: Author's own study.

The first procedure, commonly used in standardization analyses, is the verification of convergence of results with normal distribution [Brzeziński, 2016, pp. 269–272]. For the sample, the results of the K–S test were obtained: D = 0.0582, p = 0.0013, with skewness values of -0.273 and kurtosis of -0.235. The level of statistics *D* is similar to the results obtained by Gliszczyńska, who obtained distributions of results of her research that were close to normal [cf. and see: Gliszczyńska, 1984, pp. 975–991]. Although the value of statistics *p* is below the recommended level of α, all the values like the visual analysis of the distribution of results, the relatively low level of statistics *D*, parameters of skewness and kurtosis slightly distant from zero and the size of the sample allow the assumption that the distribution of results tested by the questionnaire I-E work scaled obtained by the author of this article can be considered close to normal, which is the basis for the generation of standardized norms. Table 3 summarizes the general comparative results achieved by the author and Gliszczyńska.

Table 3. Comparative results of standard averages and deviations from the studies of Gliszczyńska and the author

	Overall result		FŻ subscale		SP subscale	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Parameters from the Gliszczyńska study	14.330	4.920	6.480	2.220	7.840	2.690
Parameters from the author's research	17.173	4.324	7.838	2.383	9.335	2.453

Source: Author's own study and based on Gliszczyńska [1990, p. 35].

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

In further studies, the significance of the differences in average scores on the individual variables was analysed. Gender difference was analysed using student's *t*-test for two independent groups. After checking all the basic conditions, the obtained results (t = -2.275 at p = 0.021) showed that the average male population result is slightly higher than the female population, but the size of this difference does not give rise to separate standards due to sex. Average differences due to specificity of the workplace, occupied organizational level, age and place of employment (voivodeship), after verification of basic statistical conditions, were analysed with one-way ANOVA for independent groups, and the POST HOC Tukey HSD test were estimated for the identified differences. No significant differences were found in the average results due to the specification of the position (Eta square = 0.027; F = 2.485; p = 0.061). There was a noticeably lower average employee score noted for middle and lower level managers and senior managers (Eta square = 0.127; F = 11.202; p = 0.000), with no significant differences between the results of managers at various levels. Distinct differences in average results occurred at the variable of age. In the initial phase of the study, the same intervals as Gliszczyńska's were adopted. Obtained parameters (Eta square = 0.235; F = 8.823; p = 0.000) and POST tests HOC Tukey HSD and Tamhane's T2 quite clearly showed that the average result of the sense of internal control increases with successive age ranges, reaches the highest level for the 50–59 year range, and in people aged 60 and more declines to a level close to those of 30–34 and 35–39 years. This regularity is presented in Appendix 1. As part of the Tamhane's T2 trend test, after assigning ordinal values, the parameters F = 57.755 were achieved at the level of p = 0.000. No significant differences were identified due to the location of employment.

Summary

Supplementary and updating validation studies confirmed the high psychometric value of the I-E at work scale and the possibility of using this instrument in contemporary LOC research. The analysis of the results of the standardization test showed the possibility of developing standardized norms and highlighted the variables for which it is necessary to develop separate standards, i.e. level and age, with no significant differences for gender variables, position and employment specifics. Comparison of the general results of the mean and standard deviation in Gliszczyńska's and the author's tests showed the shift of the central measure towards higher results, which is also confirmed in the publications of other researchers who have been using the I-E at work scale in recent years. This confirmed the validity of the development of contemporary questionnaire standards, which, after the revision, can be used in scientific research as a reliable diagnostic tool.

Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

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Pobrane z czasopisma Annales H - Oeconomia **http://oeconomia.annales.umcs.pl**
Data: 21/10/2025 13:27:31

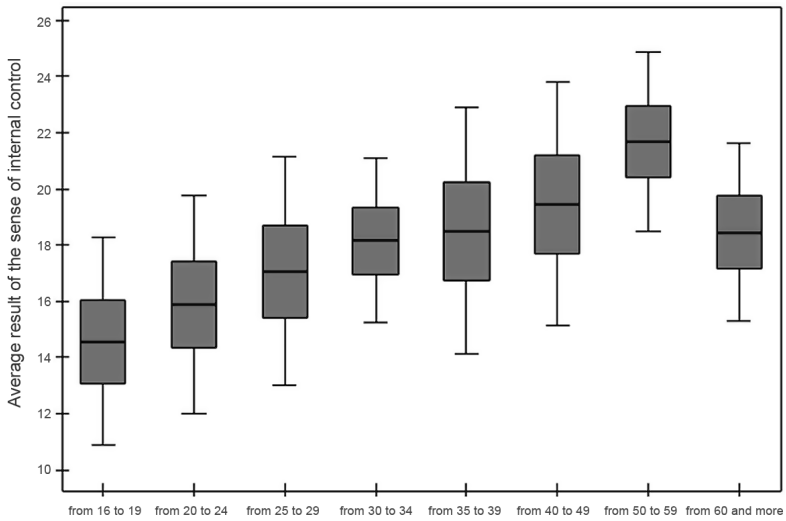
Normalizacja skali „I-E w pracy" Xymeny Gliszczyńskiej

Opracowanie zawiera opis i wyniki uzupełniającej procedury walidacji i normalizacji skali „I-E w pracy" Xymeny Gliszczyńskiej zrealizowanej na próbie N = 1075 w latach 2014–2018. Początek artykułu obejmuje genezę i charakterystykę psychometryczną narzędzia wypracowanego w latach 80. XX w. Kolejna część zawiera wyniki aktualnych i uzupełniających badań psychometrycznych potwierdzających aktualny i poprawny koncepcyjnie charakter narzędzia. W końcowej części przedstawiono rezultaty analiz możliwości i zasadności wypracowania aktualnego układu norm wraz ze wskazaniem istotności różnic pomiędzy średnimi wynikami. Zrewidowane narzędzie posiada zadowalające parametry psychometryczne.

Normalization of the I-E at Work Scale by Xymena Gliszczyńska

The study contains a description and results of a complementary procedure for validation and normalization of the I-E at work scale of Xymena Gliszczyńska, carried out on the sample N = 1,075 in the years 2014–2018. The beginning of the article covers the genesis and psychometric characteristics of the tool developed in the 1980s. The next part contains the results of current and supplementary psychometric tests confirming the current and correct conception of the tool's character. The final part of the publication presents the results of analyses of the feasibility and validity of working out the current system of standards together with an indication of the significance of differences between average results. The revised tool has satisfactory psychometric parameters.

Attachment 1. Box plots of average results I-E at work for age ranges (95%)



Source: Author's own study.