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ARE IMPLICIT ATTITUDES "IMPLICIT" FOR THEIR HOLDERS? TESTING GATA CONSTRUCT VALIDITY

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Abstract. This article examines the construct validity of the "Graphical Associative Test of Attitudes" (GATA). Presumably, its measurand is implicit attitude or implicit fraction (or implicit component) of holistic attitude, which depends on a theoretical conceptualization. A commonly accepted characteristic of implicit phenomena of the mind is their inaccessibility, or at least difficulty, to introspection. Some later studies have claimed that respondents are able to predict their results on the Implicit Associations Test, which in this case means that implicit content is accessible. Leaving aside the discussion about the degree of accessibility of implicit phenomena, we used the general theoretical assumption and operational design of some of our colleagues to test the construct validity of our own "indirect" measurement method. Would our respondents be able to predict their personal scores on GATA? The results of the experiment have shown — no, they would not. The respondents' predictions could be explained far more reliably by their explicit attitudes and by their expectations about the attitudes of the social environment. Thus, we

ДЕЙСТВИТЕЛЬНО ЛИ «НЕОСОЗНАВАЕМЫЕ» УСТАНОВКИ НЕ ОСОЗНАЮТСЯ ИХ НОСИТЕЛЯМИ? ТЕСТИРОВАНИЕ КОНСТРУКТНОЙ ВАЛИДНОСТИ ГАТО

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Аннотация. В статье рассматривается конструктная валидность Графического ассоциативного теста отношения (ГАТО). Предположительно, предметом его измерения является имплицитная (неосознаваемая) установка или же имплицитная фракция/компонента целостной установки (здесь имеются разные теоретической концептуализации). Общепринятая характеристика имплицитных феноменов — их относительная недоступность для осознания. Вместе с тем некоторые последние исследования показали, что респонденты способны предсказать свои результаты Теста имплицитных ассоциаций (IAT), то есть в данном случае имплицитный контент оказался осознаваемым. Оставив в стороне дискуссию о степени доступности имплицитных явлений для осознания, мы использовали общие теоретические допущения наших коллег и предложенную ими операционализацию, чтобы проверить конструктную валидность нашего собственного «косвенного» метода измерения имплицитной установки. Способны ли наши респонденты предсказать свои резуль-

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have not found any refutation of the initial assumption that the GATA measurand is an implicit fraction of attitudes. This allows us to focus our further research on the problem of the accuracy of the GATA measure.

Keywords: social measurements, social attitude, construct validity, direct measurements, indirect measurements, explicit attitudes, implicit attitudes, introspection, self-report, GATA

таты ГАТО? Результаты эксперимента показали: нет, не способны. Прогнозы респондентов с большей степенью достоверности объясняются их эксплицитными (осознанными) установками, но прежде всего — их представлениями об установках социального окружения. Таким образом, мы не обнаружили никаких свидетельств, позволяющих проблематизировать наши первоначальные предположения в отношении предмета измерения ГАТО как некой имплицитной фракции социальной установки. Это позволяет сфокусировать дальнейшие исследования на проблеме точности измерений ГАТО.

Ключевые слова: социальные измерения, социальная установка, конструктная валидность, прямые измерения , косвенные измерения, эксплицитная установка, имплицитная установка, метод самоотчета, интроспекция, ГАТО

The aim and scope of this contribution

The main purpose of this paper is to assess the congruence of the Graphical Association Test of Attitudes (GATA) measurand with its theoretically postulated construct, which is the “implicit” fraction or component of social attitudes. The final methodological impact of the expected conclusions should be additional data to support (or problematise) the construct validity of GATA.

In general, attitudes are thought to compel people to behave in accordance with them. A positive or negative attitude towards an object [Fazio, 2007] leads to internal or external actions of approaching or avoiding that object [Chen, Bargh, 1999]. Therefore, in order to predict people’s behaviour, it is important to measure their attitudes [Likert, 1932]. The structure of an attitude is considered to be divided into several independent components. They are “cognitive”, “affective” and “conative” in classical models [Smith, Bruner, White, 1956; Katz, 1960] or “explicit” and “implicit” in later theories [Evans, 2008; Fazio, 1990, 2007; Kahneman, Frederick, 2002; Kahneman, 2011; Gilovich, Griffin, 2002; Strack, Deutsch, 2004]. Depending on the preferences of the authors of a particular theory, these phenomena may be regarded either as components (fractions) of a single, more or less consistent attitude, or as two separate but somehow interacting attitudes (for a review, see [Perugini, 2005]). In this article we use all these terms interchangeably.

The “explicit” (overt, conscious) fractions of attitude are quite conscious phenomena that are relatively easily accessible to introspection, whereas the “implicit” (hidden, subconscious) fractions are relatively less accessible to direct probing

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and may remain unrecognised not only by the researcher but also by the respondents themselves.

The existence of implicit attitudes is well established. [Rosenberg, 1956; Rosenberg, et al., 1960], and their influence on behaviour has been demonstrated in numerous studies. [Metcalfe, Mischel, 1999; Strack, Neumann, 2000; Greenwald et al., 2009; Perugini, 2005; Perugini, Richetin, Zogmaister, 2010; Roccato, Zogmaister, 2010; Chernozub, 2022a, 2022b, 2023, 2024].

In practice, the acceptance of the theoretical and practical importance of the implicit component of attitudes leads to the problem of its correct measurement. Due to the peculiarities of implicit attitudes, the technique of "direct" questions is naturally inappropriate, as it faces a number of difficulties [Chernozub, 2022b]. For example, self-report methods, which currently dominate social research, have a major drawback: respondents may not be able to recognise and express their implicit attitudes [Gawronski, Hahn, 2019]. One possible way to overcome these difficulties is to complement or even replace "direct" self-report indicators with "indirect" ones. [Perugini et al., 2010].

Measurement is considered 'indirect' if it avoids the process of self-assessment of attitudes, or either self-assessment or self-translation of attitudes [De Houwer, Moors, 2007]. Usually, the attitude object is presented, but the researcher does not ask participants to report their attitudes or preferences towards this object. In some cases, the researcher will even ask participants to try not to be affected. Nevertheless, there is a reasonable expectation that spontaneous preferences will influence some relevant aspects of behaviour, which in turn will be measured by an "indirect" instrument. There are currently a number of instruments that can be used to measure attitudes "indirectly" (Appendix A).

The qualifying criterion for "indirect" measurement is the ability to reflect "mental content" regardless of the respondent's intentions to express it, and even their efforts to conceal it. Thus, the possibility of overcoming the disadvantages of "direct" measurement is created when the formation of measurement results is unintentional and uncontrollable by respondents [Gawronski, Hahn, 2019].

The purpose of this paper is therefore to assess the extent of the "implicit" nature of the GATA measure. Since its introduction in 2015, GATA has been incorporated into numerous predictive models of electoral, consumer, and communication behaviour and has proven its effectiveness as an incremental factor in predictive accuracy (for an overview of forecasting practice, see: [Chernozub, 2023], meta-analysis of 64 cases: [Chernozub, 2024]). However, despite its widespread and fairly successful use in practice, GATA still suffers from a lack of formal validation.

Thus, this article seeks to clarify some theoretical and methodological issues concerning the use of GATA as a producer of "indirect" measures of attitudes. Namely, we intend to test its construct validity. We are not testing any particular technical features of GATA, and we don't expect any direct instrumental implications from this paper.

In the following sections, we present the main results of an experiment designed to test the actual "implicit" status of the GATA measurand, which is assumed to be the implicit fraction of attitudes towards evaluating objects. The GATA procedure is described in Appendix B.

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Theoretical model, hypotheses and operationalisation

A few years ago it was demonstrated that respondents are able to predict the patterns of their scores on the Implicit Association Test (IAT), one of the most popular methods of "indirect" measurement of the (supposedly) implicit component of attitudes [Hahn et al., 2014]. Later, several other research groups conducted conceptual replications that demonstrated the generalisability of Hahn et al.'s findings to other attitudinal domains [Goedderz, Hahn, 2023; Morris, Kurdi, 2022; Rahmani Azad, Goedderz, Hahn, 2022]. These findings dramatically problematised the traditional conceptualisation of implicit attitudes as generally inaccessible to the introspection of attitude holders [Greenwald, Banaji, 2017; Lai, Hoffman, Nosek, 2013; McConnell et al., 2011; Nosek, 2005]. At the same time, they provide substantial support for some other dual-process models, which assume that implicit evaluations are in principle introspectively accessible [Fazio, 2007; Gawronski, LeBel, 2008; Gawronski, Bodenhausen, 2006, 2011]. In addition to the implications for the discussion of the introspective accessibility of implicit attitudes, these experiments have provided valuable insights for testing the claims of specific measures to assess implicit content.

Technically, in the original study by Hahn and colleagues [Hahn et al., 2014], the consistency between practical performance and theoretical concept was measured by assessing the accuracy of the respondent's prediction of his or her personal results over several attempts to complete the IAT test. After completing the IAT, respondents were informed of its purpose and instructed to make the prediction of their personal score for each of several attempts. An intra-subject correlation was then calculated, reflecting the strength of the association between two derivative variables: "predicted IAT scores" and "actual IAT scores". In this way, each correlation coefficient represented the respondent's personal accuracy in predicting his or her IAT scores. In turn, this accuracy was conceptualised as a degree of personal ability to introspect implicit attitudes. Assuming the validity of the IAT, the higher correlation was taken as an indicator of the accessibility of implicit attitudes for both the IAT and the respondent's introspection, the lower as an indicator of this introspection difficulty.

Background discussions about the conceptualisation of the implicit effects ontology and specifics are neutral to our goals, but the core of the theoretical model and its operationalisation seem perfectly suited to them.

Following Hahn and his colleagues [Hahn et al., 2014], we assume that the more unpredictable for subjects their personal "indirect" measurement results are, the more distant the "indirect" method being tested is from a given measurand that is simultaneously accessible to the respondent's introspection. This distance can be explained either by the invalidity of the test instrument (respondents are naturally unable to predict random errors), or by the ontology of the instrument's "true" measurand (it is naturally inconsistent with the one respondents were trying to predict). If we are sure that the respondent's prediction is at some level of explicit nature, and if we assume that the instrument does not produce the straight random error, we will have to explain this mismatch by the opposite nature of the measurands. The extent to which the instrument's measure is implicit will remain an open question, but the existence of some corresponding effects will be reliably demonstrated.

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This approach does not challenge any of the background theories about the degree of 'porosity' of explicit/implicit boundaries. Each of the potential results of our study should be considered as a specific feature of GATA, first of all — its instrumental ability to assess implicit fractions of attitudes. The relevance of this task is supported by the fact that not every method is able to demonstrate this ability to the full extent. For example, some of the problems faced by the IAT in this area have been mentioned in various publications. [Mitchell, Tetlock, 2017; Machery, 2021, 2022] In our practice, we tested the mutual consistency of "direct" vs. IAT vs. GATA measurements for the same attitudinal objects and found that IAT results are relatively closer to direct measurement, while GATA results keep dramatic distance from both [Chernozub, Shuraeva, 2023].

Within this framework, the main hypothesis of our study was formulated as follows: "GATA output does not represent the true implicit fractions of attitudes, but instead measures the same explicit fractions that are well accessible to the introspection of individuals". Technical hypotheses are (for interpretation of association strength, see Appendix C):

while **(H01)** "The average correlation coefficient for the pair of variables 'prediction of GATA personal output' and 'actual direct measurement output' will be moderate or weaker (Spearman $\rho \leqslant 0{,}499$)" and

while **(H02)** "The average correlation coefficient for the pair of variables 'prediction of GATA personal output' and 'prediction of GATA group output' will be moderate or weaker (Spearman $\rho \leqslant 0{,}499$)",

(H03) "The average correlation coefficient for the pair of variables 'prediction of GATA personal output' and 'actual GATA output' will be very strong or better (Spearman $\rho \geqslant 0{,}700$)".

If **(H01)** is true, it means that respondents are able to predict some outcomes that differ from their explicit *personal* attitudes.

If **(H02)** is true, it means that respondents are able to predict some results which are not projections of their cultural stereotypes.

If **(H03)** is true, it means that respondents are able to introspect their implicitly — guided results, problematising the implicit status of these drivers.

According to this design, we operationalised the study as a complex of interrelated variables.

AI — actual results of "indirect" measurement (GATA) collected according to the procedure of Appendix B for 7 attitudinal objects; 7-point scale.

AD — actual results of "direct" measurement, collected on each of the same 7 attitudinal objects, scaled with semantic differential "good" — "bad"; 7-point scale.

PG — predicted average group GATA output for each of the same attitudinal objects; 7-point scale.

PP — prediction of the respondent's personal GATA output for each of the same attitude objects; 7-point scale.

As objects of attitudes we used: "Love", "Pain", "Family", "Friends", "Work", "Leisure", "Most preferable academic subject", "Least preferable academic subject".

Thus, for intro-subject analysis we had four variables with 7 observations each.

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Data collecting and data yield

The fieldwork took the form of face-to-face interviews with 147 students at the State University of Management (Moscow) between 12 May and 24 June 2024. The sample is of "convenience" type and does not claim to represent any general population. All interviews were accepted and formed the bulk of the data for further analysis. The general overview of the data is presented in Table 1.

Table 1. ***Descriptive statistics for the actual output data***

	Mean	Mean s. e.	SD	Assym.	Exsess
Actual "indirect" (AI)					
Love	5,823	0,104	1,259	–1,143	0,745
Pain	3,592	0,152	1,839	0,217	–1,038
Family	5,327	0,136	1,643	–0,922	0,133
Friends	5,204	0,125	1,517	–0,495	–0,693
Work	4,687	0,132	1,604	–0,446	–0,392
Leasure	5,184	0,137	1,659	–0,571	–0,735
Least preferred	5,145	0,142	1,712	–0,658	–0,649
Most preferred	4,172	0,154	1,853	–0,077	–0,964
Actual "direct" (AD)					
Love	5,932	0,151	1,831	–0,618	–0,643
Pain	4,483	0,161	1,953	–0,287	–1,170
Family	5,728	0,155	1,875	–0,483	–0,781
Friends	5,816	0,144	1,748	–0,549	–0,611
Work	5,650	0,097	1,175	–0,691	0,058
Leasure	6,080	0,100	1,208	–1,648	2,952
Least preferred	5,560	0,117	1,414	–0,906	0,230
Most preferred	3,870	0,142	1,715	–0,045	–0,703
Actual "indirect" (AI), avg.	4,892	0,135	1,636	–0,512	–0,449
Actual "direct" (AD), avg.	5,390	0,133	1,615	–0,653	–0,084

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Table 2. ***Descriptive statistics for the prediction data***

	Mean	Mean s. e.	SD	Assym.	Exsess
Prediction for group (PG)					
Love	5,570	0,104	1,195	–0,901	1,288
Pain	2,540	0,112	1,294	0,845	0,269
Family	5,550	0,090	1,041	–0,931	1,122
Friends	5,760	0,090	1,038	–1,068	1,669
Work	4,290	0,111	1,278	–0,125	–0,184
Leasure	5,720	0,102	1,176	–0,688	–0,316
Least preferred	5,000	0,127	1,462	–0,680	0,214
Most preferred	3,260	0,149	1,722	0,464	–0,641
Prediction personal (PP)					
Love	5,860	0,090	1,043	–1,027	1,597
Pain	2,830	0,118	1,361	0,726	0,413
Family	5,770	0,103	1,191	–0,809	–0,137
Friends	5,700	0,114	1,314	–1,114	0,619
Work	4,910	0,114	1,317	–0,215	–0,244
Leasure	5,420	0,112	1,286	–0,722	0,318
Least preferred	5,270	0,128	1,478	–0,879	0,272
Most preferred	3,550	0,141	1,626	0,341	–0,578
Prediction for group (PG), avg.	4,711	0,111	1,276	–0,386	0,428
Prediction personal (PP), avg.	4,914	0,115	1,327	–0,462	0,283

As the data in Tables 1 and 2 show, there are no obvious anomalies in the data collected. Predictably, “love”, “leisure” and “friends” received the most favourable scores, while “pain” and “least favourite” received the worst scores. Some of the distributions look concentric (AD “Leisure” — SD = 1,208, Excess = 2,952), others more variable (AD “Pain” — SD = 1,953, Excess = –1,170). There is no direct evidence that different types of variables reproduce the main features of the distribution describing the same attitude object. For example, “Pain” has the lowest means for PP (2,830)

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and AI (3,592), but is relatively high for AD (4,483). In contrast, the means for "love" are almost the same (AD — 5,932, AI — 5,823, PP — 5,860). For "family" the PP mean (5,770) is closer to the AD mean (5,728) than to the AI mean (5,327), while for "work" there is an inverse relationship (PP — 4,910, AI — 4,687, but AD — 5,650).

All these observations suggest that, on the one hand, our variables can produce meaningful results: each "direct" and "indirect" variable differentiates specific attitudinal objects and can potentially lead to unequal scores for the same objects when considered in pairs. On the other hand, there is no evidence of any kind of systematic associations between any pair of DM—IM, DM—IP, IM—IP. This means that the analysis at the group level is not sufficient to accomplish our tasks.

Thus, the collected data set can be accepted as valid for further analysis, and then the personal (inter-subject) level of analysis seems to be obligatory for further investigation.

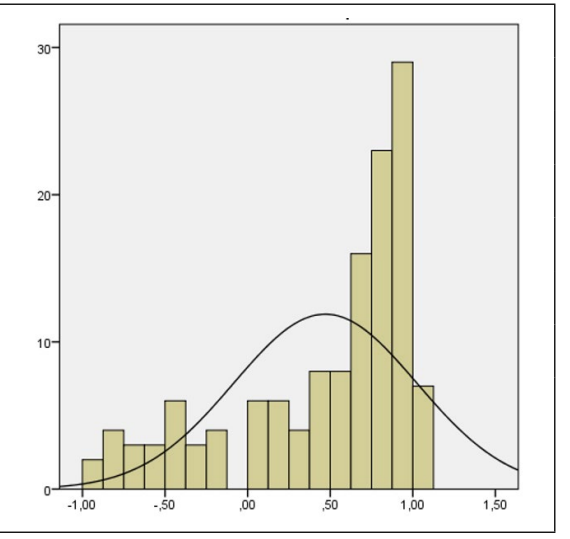
Data analysis and main findings

The main results of the processing of the data obtained are presented in Tables 3—5. Each table contains basic descriptive statistics of the distribution of the correlation coefficients for each of the tested pairs of variables. The corresponding histogram illustrates the shape of the distribution.

None of the distributions can be considered normal. For the Shapiro-Wilk test, $\rho = 0{,}000$ in all three cases. Therefore, both mean and median indicators are used to interpret the central tendency. We do not use mode statistics because our variables are interval and even the most common values on the scale have few observations [Kruskal, 1958].

Table 3. ***Descriptive statistics of the Spearman ρ distributions for the pair of variables "prediction of GATA personal performance" and "actual direct measurement performance"***

Mean	0,470
Median	0,693
SD	0,554
Asymmetry	−1,105
Excess	0,015
Range	1,990
Min	−0,990
Max	1,000



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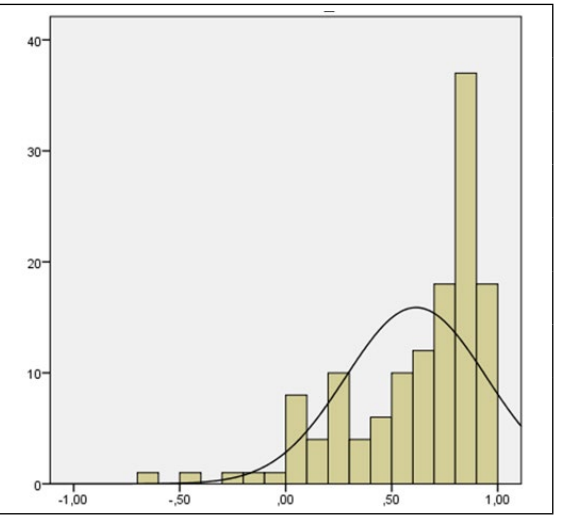
As the data in Table 4 show, the distribution of Spearman ρ for the potential range from −1,000 to 1,000 is significantly skewed towards high values. Mean = 0,470 (strong association), median = 0,693 (strong association). The interpretation of the strength of the association is given by C. Dancey and J. Reidy (Appendix C).

Supporting statistics and graphical analysis suggest that this central tendency is systematic in nature and cannot be explained by random error effects.

Thus, our **(H01)**: "The average correlation coefficient for pair of the variables "prediction of GATA personal output" and "actual direct measurement output" will be moderate or weaker (Spearman ρ ⩽ 0,499)" should be rejected. There is evidence of a fairly strong relationship between these variables. Since respondents first gave "direct" ratings of their attitudes and then tried to predict the results of their "indirect" test scores, there is reason to believe that the former may have biased the latter, but not vice versa. If this is the case, it can be concluded that the process of predicting the 'indirect' results of the measures was influenced by the "explicit" fractions of personal attitudes.

Table 4. ***Descriptive statistics of the Spearman ρ distribution for the pair of variables "Prediction of GATA personal outcome" and "Prediction of GATA group outcome"***

Mean	0,615
Median	0,758
SD	0,332
Asymmetry	−1,265
Excess	1,057
Range	1,570
Min	−0,600
Max	0,970



The shift of the central tendency towards the higher values is even more pronounced, as shown in Table 4. Spearman ρ mean = 0,615 (strong relationship), median = 0,758 (very strong relationship). This enable us to reject our **(H02)**: "The average correlation coefficient for pair of the variables "prediction of GATA personal output" and "prediction of GATA group output" will be moderate or weaker (Spearman ρ ⩽ 0,499)". This means that our respondents' personal "indirect" output predictions are (at least — partially) affected by their beliefs about the state of the mind of their social environment.

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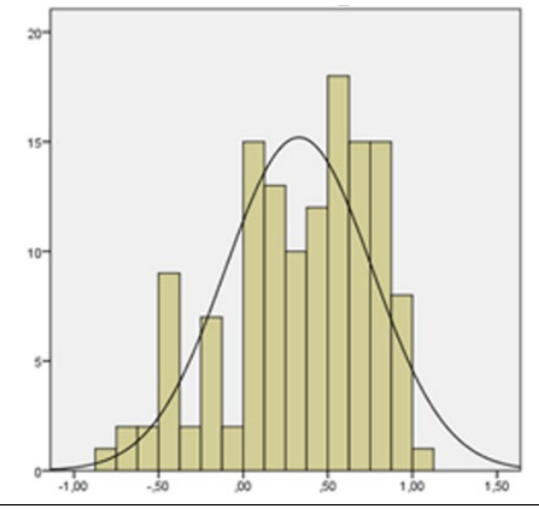
Table 5. ***Descriptive statistics of the Spearman ρ distributions for the pair of variables "prediction of GATA personal output" and "actual GATA output"***

Mean	0,329	
Median	0,435	
SD	0,433	
Asymmetry	–0,582	
Excess	–0,466	
Range	1,830	
Min	–0,830	
Max	1,000	

Finally, Table 5 describes the distribution of correlation coefficients for the core pair of our variables: personal predictions and actual results of 'indirect' measures. According to the data presented, this correlation is relatively weak. Mean = 0,329 (moderate relationship), median = 0,435 (strong relationship). These values mean that a certain relationship between the variables in question cannot be denied, but the strength of the relationship is too weak to explain the results of the other variables. Thus, our **(H03)**: "The average correlation coefficient for pair of the variables "prediction of GATA personal output" and "actual GATA output" will be very strong or better (Spearman $\rho \geqslant 0{,}700$)" should be rejected. Table 6 presents average *personal* Spearman ρ means for the percentiles. We regard these data as a supporting evidence for our assessments.

Table 6. ***Percentiles of the Spearman ρ distributions (reverse cumulative scores)***

Prediction of personal output and…	Direct actual output	Prediction of the group output	Indirect actual output
90 %	–0,486	0,084	–0,386
80 %	0,000	0,290	0,000
70 %	0,273	0,520	0,095
60 %	0,567	0,669	0,245
50 %	0,693	0,758	0,435
40 %	0,810	0,804	0,552
30 %	0,870	0,842	0,623
20 %	0,923	0,878	0,731
10 %	0,985	0,918	0,841

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As the data in Table 6 show, a "very strong" relationship ($\rho \geqslant 0{,}700$) characterised about 50 % of respondents for "indirect personal predictions" vs. "direct actual output" and vs. "Indirect group predictions", but only about 20 % for "Indirect personal predictions" vs. "Indirect actual outputs". These data in the other form support the conclusions drawn earlier.

Discussion

Thus, all three of our hypotheses were rejected as not supported by the empirical research material. This means that our respondents who attempted to "guess" their results from the "indirect" tests were largely (at least 80 %) unable to do so, retranslating their social stereotypes into their predictions or projecting their own explicit judgments.

The reason for this phenomenon can be seen in the fact that when they tried to predict their results, they were not guided by the results of introspection on their implicit attitude, but by the results of reflection on the mood of the social environment (primarily) and on their own explicit attitude (to a lesser extent). Consequently, the data from our "indirect" measurement with GATA can be considered as largely emancipated from those fractions of attitudes that are "explicit" in nature.

As we noted above, this independence of the GATA results can be explained either by a dependence on other (presumably implicit) attitude fractions, or by the fact that these results represent a set of random errors.

The second option should probably be rejected. For now, GATA have shown that some peculiarities are incompatible with the assumption that their output is a random error:

1. GATA demonstrates its retrospective criterion validity by being reliably explained by larger sets of attitudes [Chernozub, 2023].

2. It shows good perspective criterion validity being incorporated into behaviour prediction models based on independent theoretical grounds of Theory of Reasoned Action / Theory of Planned Behaviour (TRA/TPB) and Two-Dimensional Model (D2) [Chernozub, 2022b].

3. GATA observed variables are reliably associated with some latent variable that, in turn is clearly orthogonal to "directly" measured variables [Chernozub, Shuraeva, 2023].

4. GATA reliably meets the requirements of criterion validity in models of prediction of actual behaviour [Chernozub, 2024].

5. GATA has satisfactory test-retest reliability, good for short periods of one or two weeks, but declining considerably over longer periods. [Chernozub, 2023].

All this gives us grounds for rejecting the assumption of random error as the source of the distribution of GATA's output data. The only option left is to accept the general hypothesis that GATA's measurand is some implicit fraction of attitudes. For our current experiment, this character is directly supported by the inability of most respondents to introspect the state of GATA's measurand, whatever it may be.

In the context of our knowledge of other peculiarities of implicit attitudes, we can look at the corresponding peculiarities of GATA. For example, it is known that the GATA has a relatively high test-retest reliability for short time periods (one or two weeks), but this reliability decreases sharply for longer time periods (four weeks and more) [Chernozub, 2024]. According to the literature, this is typical of "indirect" instruments that claim to measure implicit attitudes. Some authors suggest accepting this as a natural characteris-

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tic of indirect measurements, the negative effects of which can potentially be eliminated by averaging the results of several consecutive measurements [Greenwald et al., 2021].

So far, the assumption that GATA measures the implicit component of attitudes has not been disproved once. In circumstances where the assumption of random error as a source of diversity in the GATA results should also be rejected, the explanation of these results by measuring the 'true' implicit component of attitudes should be regarded as the most satisfactory.

Conclusions

Taking a broad view, one might conclude that our experiment has effectively achieved its basic objectives. We have collected a reliable dataset that provides all the necessary means to assess the construct validity of GATA.

Analysis of the empirical data collected led to the rejection of all three of our hypotheses. The main conclusion is that we did not find any evidence to problematise the initial assumption that the GATA measure is the implicit fraction of attitudes. Since we have a solid data base supporting the orthogonality of the GATA measurand to all others accessible to "direct" methods, there is little doubt that it (at least in its core) is not related to explicit attitudes or their fractions or components.

Nevertheless, the validation of the method is a never-ending story. Thus, the focus of prospective studies could be shifted to the problem of random error within the overall composition of GATA output. Reducing this factor allows us in theory — to define the measurand of the method more precisely, in practice — to predict human social behaviour far more accurately.

Remarkable goals for further researches and researchers.

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Appendix A.
Instruments of indirect measurements and their principal developers

1. Name Letter Task (J. Nuttin).
2. Evaluative Priming Task (R. H. Fazio, J. R. Jackson, B. C. Dunton, C. J. Williams).
3. Linguistic Intergroup Bias (A. Maasset).
4. Implicit Association Test (A. G. Greenwald, D. E. McGhee, J.L.K. Schwartz).
5. Approach-Avoidance Tasks (M. Chen, J. A. Bargh).
6. Go/No-Go Association Task (B. A. Nosek).
7. Weapon Paradigm (B. K. Payne).
8. Extrinsic Affective Simon Task (J. De Houwer).
9. Personalized IAT (M. A. Olson, R. H. Fazio).
10. Affect Misattribution Procedure (B. K. Payne).
11. Evaluative Movement Assessment (C. M. Brendl, A. B. Markman, C. Messner).
12. Implicit Association Procedure (K. Schnabel, J. B. Asendorpf, A. G. Greenwald).
13. Single Category IAT (A. Karpinski, R. B. Steinman).
14. Identification Extrinsic Affective Simon Task (J. De Houwer, E. De Bruycker).
15. Single Block IAT (S. Teige-Mocigemba, K. C. Klauer, K. Rothermund).
16. Brief IAT (N. Sriram, F. Greenwald).
17. Recoding Free IAT (K. Rothermund, A. Gast).
18. Sorting Paired Features Task (Y. Bar-Anan, B. A. Nosek, M. Vianello).
19. Action Interference Paradigm (R. Banse, B. Gawronski, C. Rebetez, H. J. Gutt, B. Morton).
20. Implicit Relational Assessment Procedure (D. Barnes-Holmes, Y. Barnes-Holmes, P. Power, E. Hayden, R. Milne, I. Stewart).

Appendix B.
GATA procedure

The Graphical Association Test of Attitudes (GATA) intentionally avoids respondents' direct assessment of their attitudes towards the objects under investigation and can therefore be classified as a fundamentally "indirect" instrument. GATA was introduced as a supplementary measurement technique to complement the common self-report method. Focusing on the well-known problems of the self-reporting, we hypothesise

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that the accuracy of behavioural prediction models based on it could be improved by incorporating the "indirect" measurement of attitudes. Incremental effects should result from a comprehensive consideration of "directly" and "indirectly" measured attitudes which will add and correct each other.

To accomplish this task effectively, GATA uses the chain of two sequential associative procedures.

In the first step, a respondent is presented with a primary stimulus representing an object of interest, followed by a set of target stimuli represented by a set of abstract graphical shapes. (Figure 1.) To mask the object of the researcher's real interest, the primary stimulus is presented within a series of masking stimuli. The output of the first step is the graphical shape(s) that the respondent associates with the object under study.

Then we take the "diverting pause" of exposure to uncorrelated stimuli. Typically, these are common self-report questions from non-GATA sections of the questionnaire.

In the second step, the phrase containing the verbal markers of the approach — avoidance tendency is presented as the primary stimulus. Typically, the phrase uses wording such as "would like to look at", "would be nice to have around", "would like to touch" and so on. The presentation of the stimulus phrase is followed by the same set of graphic shapes.

At both stages, the respondent's task is to select from the target stimuli the graphical shapes that are perceived by respondents as "similar" or "close to" to the primary stimulus. In this way GATA is supposed to be able to produce "indirect" measurement outcome.

Technically, the method's procedure is structured as follows:

a. The respondent familiarises himself with the studied object, which is presented in the form of a verbal concept on the screen of a CAPI device. The set of graphic shapes is presented to a respondent on the screen of a CAPI device and the respondent associates the graphic shapes with the test object.

b. The respondent's attention is diverted to other questions in the survey, preferably not related to the subject under study.

c. The respondent reacts to the approach — avoidance phrase ranking graphic shapes from most to least preferable for longer contact.

d. An "individual scale" of preferences for graphic shapes is created, based on the ranking from phase "c".

e. The implicit preference score according to the "individual scale" is assigned to the studied object based on the association from phase "a".

As a result, each tested object receives a score on an ordinal scale, regardless of which particular shape each individual respondent may prefer or dislike, due to their psychological, cultural, mental, physical or other similar factors.

Figure 1. An example of the GATA set of graphical shapes

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Thus, methodologically, GATA claims to be an "indirect" measurement technique capable of producing some additive or even orthogonal results to "direct" measurements.

Appendix C.
Correlation interpretation

Table 1. ***Correlation interpretation by De Vaus***

Pearson r	Correlation Strength
0,00	No Correletion
0,01—0,09	Non-significant Correlation
0,10—0,29	Weak Correlation
0,30—0,49	Moderate Correlation
0,50—0,69	Strong Correlation
0,70—0,89	Very Strong Correlation
> 0,9	Almost Perfect Correlation

Adopted: [De Vaus, 2002].

Table 2. ***Correlation interpretation by Dancey and Reidy***

Spearman's ρ	Correlation
0,01—0,19	No or negligible relationship
0,2—0,29	Weak relationship
0,3—0,39	Moderate relationship
0,4—0,69	Strong relationship
⩾ 0,70	Very strong relationship

Adopted: [Dancey, Reidy, 2020].