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Validation of the Factor Structure and Gender-Related Measurement Invariance of the Inventory of Socially Supportive Behaviors (Short Form): Proposing an Alternative Design

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Abstract: The aim of this paper was to validate the factor structure and gender-related measurement invariance of the short form of the Inventory of Socially Supportive Behaviors (ISSB). The study sample consisted of 710 undergraduate students aged 19–55 years. A confirmatory factor analysis of the original design confirmed a three-factor structure with an acceptable goodness of fit (CFI = 0.910, TLI = 0.894, RMSEA = 0.066) and validity; however, some indices hinted at potential weak points. Therefore, we proposed an alternative model with the identical three-factor structure but fewer items. This model showed a better goodness of fit (CFI = 0.953, TLI = 0.936, RMSEA = 0.064) and was superior to the original design ($p < 0.001$). Convergent and discriminant validity and reliability were also good. Finally, a gender-related measurement invariance analysis demonstrated invariance in the ISSB structure for both models, while revealing partial metric and scalar invariance. In conclusion, the findings suggest that the ISSB-SF is a reliable, efficient and rapid tool for measuring received social support, with the proposed alternative design possibly being advantageous if validated on other populations.

Keywords: received social support; Inventory of Socially Supportive Behaviors; confirmatory factor analysis; validity; gender-related measurement invariance



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1. Introduction

Social support can be conceptualized in many ways. Heaney and Israel define it as 'aid and assistance exchanged through social relationships and interpersonal transactions' (Heaney Israel). Other authors take a similar view (Song et al. 2011; Li et al. 2015). More broadly, social support tends to be associated with other concepts such as social capital, social integration and social networks (Carpiano 2006; Elliott 2000), just as it can be divided into different subtypes as it is not a uniform construct. The two basic forms of social support are perceived and accepted. While perceived social support refers to the perceived availability and adequacy of social connections, received social support focuses on the quantity and quality of the support given (Eagle et al. 2019). Moreover, Haber et al. showed that these two aspects of social support were distinct from each other (Haber et al. 2007). Nevertheless, it is undeniable that social support is an important element of human social networks and an essential mechanism of social and interpersonal functioning that influences quality of life (LaRocca and Scogin 2015) and stress coping (Kaul and Lakey 2003), promotes health and mental health (Strine et al. 2008), strengthens social networks (Rabinowitz et al. 2006) and facilitates fitting into social groups and a sense of belonging (Beyrami et al. 2015).

Moreover, perception, providing and receiving social support, as well as its effects on different areas of life, may differ between genders. In fact, previous studies have repeatedly shown that sex and especially gender influence social support and its effects (Caetano et al. 2013; Gallicchio et al. 2007; Sonnenberg et al. 2013). This difference tends to be attributed to different socialization and social roles associated with gender (Matud et al. 2003), masculinity and femininity (Reevey and Maslach 2001) as well as different needs for social support due to greater emotional sensitivity (Flaherty and Richman 1989).

In order to understand an individual's social support and to intervene appropriately and timely, it is essential to have tools that measure social support effectively and accurately. One of the widely used measures of received social support is the Inventory of Socially Supportive Behaviors (ISSB). This questionnaire measures how often individuals received various forms of social support. Barrera et al. (1981) initially described the development of this 40-item questionnaire and several studies in the following years reported findings about the factor structure and validity of this tool (Barrera and Ainlay 1983; Stokes and Wilson 1984; Caldwell and Reinhart 1983), showing a considerable agreement on the factor structure. In most studies, the three-factor solution was used with factors (1) guidance, (2) emotional support and (3) tangible support, showing acceptable to good validity and reliability (Amarneh 2017; Erol and Bozo 2012; Crase et al. 2007; Walkey et al. 1987; Pretorius and Diedricks 1993; Gottlieb and Bergen 2010). Stokes and Wilson and Barrera and Ainlay proposed a slightly different structure that included an additional fourth factor: cognitive information, offering a different approach to the structuring of received social support, which was later used in some studies (Finch et al. 1997; Barrera and Ainlay 1983; Stokes and Wilson 1984). However, the three-factor solution prevails.

Later, a short 19-item version was developed, consisting of the same three factors. Due to its brevity, this version is particularly useful for rapid screening, use in larger test batteries, during the counselling process, etc. (Barrera and Baca 1990). Surprisingly, this short form has not, to our best knowledge, been validated for its psychometric properties. To fill this gap, we have investigated the factor structure, validity and reliability of this short version, including gender-related measurement invariance.

2. Materials and Methods

2.1. Study Design and Sample

At the onset of the study, 1028 university students from six Czech universities (Palacký University Olomouc, Masaryk University in Brno, University of Ostrava, University of Hradec Králové, University of South Bohemia in České Budějovice and Brno University of Technology) were addressed by the research team and collaborating academic staff during classes. The selection of students was non-random and included students who had attended lectures given by the academics involved in the research. There were no a priori exclusion criteria except active study at the university, ability to adequately answer the questionnaire and consent to participation in the study. Of these, 710 (69%) students participated in the study and completed the online version of the questionnaire via Google Forms. Data collection took place in person during class time under the supervision of a member of the research team or a trained collaborating academic.

2.2. Instruments

The short form of the Inventory of Socially Supportive Behaviors (ISSB-SF; Barrera and Baca 1990) is a 19-item tool using a 5-point Likert scale (ranging from 1 to 5). According to the authors, the ISSB-SF comprises three factors: guidance (GDN, 6 items), emotional support/non-directive support (EMS; 8 items) and tangible support (TNS, 5 items).

The questionnaire was initially translated to Czech by the standard double-blind approach (two independent translations to Czech, two back-translations to English by a native-speaker and a psychologist, comparison of the original and back-translated versions including a check for any changes or shifts in the meaning of the items). The Czech version of the ISSB-SF questionnaire is available upon request from the authors.

2.3. Data Analysis

The validation of the factor structure of the questionnaire proposed by the authors of the method was carried out using a confirmatory factor analysis. The quality of the model was tested using several goodness-of-fit indicators: Comparative Fit Index (CFI; Bentler 1990), Tucker–Lewis Index (TLI; Schreiber et al. 2006) and Root Mean Square Error of Approximation (RMSEA; Brown and Cudeck 1993).

Reliability was examined using Cronbach's alpha and composite reliability (CR) based on cross-sectional data. Subsequently, convergent and divergent validity was verified using the Multitrait Multimethod (MTMM) approach by comparing the intra-factor and inter-factor item correlations using the one-tailed Steiger's test with Benjamini-Hochberg correction for multiple comparisons, homogeneity index (within-scale interitem correlations), scaling success rate (the rate with which an item correlated more strongly with items within a factor than across factors), inter-factor correlation estimates with likelihood ratio tests against constrained models and comparisons of average variance extracted (AVE) with average shared variance (ASV).

The following thresholds were used to assess the structural models and their validity: factor loadings greater than 0.5 (preferably > 0.6), CFI and TLI greater than 0.9 (ideally > 0.95) (Ahmad et al. 2016), RMSEA around 0.06 or lower (Hu and Bentler 1999), significant likelihood ratio test of inter-factor correlations, Z-score of the difference of intra-factor and inter-factor correlations greater than 2 ($p > 0.15$), AVE above 50% (>0.5) and greater than ASV and reliability greater than 0.7 (Hair et al. 2010).

Finally, gender-related measurement invariance was analysed by estimating and comparing increasingly constrained confirmatory factor analysis models (evaluating sequentially configural, metric and scalar invariance). In case it was not possible to reach a fully invariant model at any of these levels, a partial measurement invariance option was identified. Statistical analyses and data visualizations were performed using the RStudio (v. 2022.02.3, with R v.4.2.0) using cocor, lavaan, performance, psy, semPlot, semTools and stats packages.

3. Results

3.1. Sample Demographics

The study population consisted of 710 university students, including 594 females (83.7%, mean age 23.3 ± 3.6 , range 19–42 years) and 116 males (16.3%, mean age 22.5 ± 4.3 , range 19–55 years). Most of the participants were in the non-graduate year (680, 95.8%) and were full-time students (631, 88.9%). 622 students (87.6%) studied teacher training (preschool teachers, primary school teachers, lower secondary school teachers, secondary school teachers), while the rest studied non-teaching courses (e.g., speech-language pathology, special preschool education, dramatherapy, mentoring, social work, etc.).

3.2. Validation of the Original Three-Factor Structure

Using all of the 19 items of the ISSB-SF, the confirmatory factor analysis showed a borderline goodness of fit (Table 1A).

With two exceptions, the loadings on individual factors were above 0.5 and in most cases above 0.6 (Figure 1A, Supplementary Table S1A). At the same time, however, relatively high correlations (ranging from 0.5 to 0.69) were found among the individual factors. The CFI was higher than the expected threshold of 0.9 (CFI = 0.91) and the RMSEA was just above the threshold. The overall reliability was very good (Cronbach's alpha = 0.89), however, the reliability of the factors was acceptable only for two of the three factors but composite reliability was below 0.7 for tangible support. In terms of validity, good convergent and discriminant validity was shown for intra- and inter-factor correlations with significant likelihood ratio tests in all of the cases (all $p < 0.001$, Supplementary Table S2A, Supplementary Figure S1A), the scaling success rate was 100% in two cases and 70% for tangible support and all Z-scores were greater than 2.

Table 1. Goodness of fit of the original and alternative model.

	A. Original Model	B. Alternative Model
N	710	710
N of parameters	44	30
χ^2	595.546	187.473
Df	146	48
<i>p</i>	<0.001	<0.001
Comparative fit index (CFI)	0.91	0.953
Tucker–Lewis index (TLI)	0.894	0.936
Root mean square error of approximation (RMSEA)	0.066	0.064
Akaike information criterion (AIC)	35,587.964	22,383.295
Bayesian information criterion (BIC)	35,788.835	22,520.253
Model comparison		
χ^2 difference		408.07
<i>p</i>		<0.001

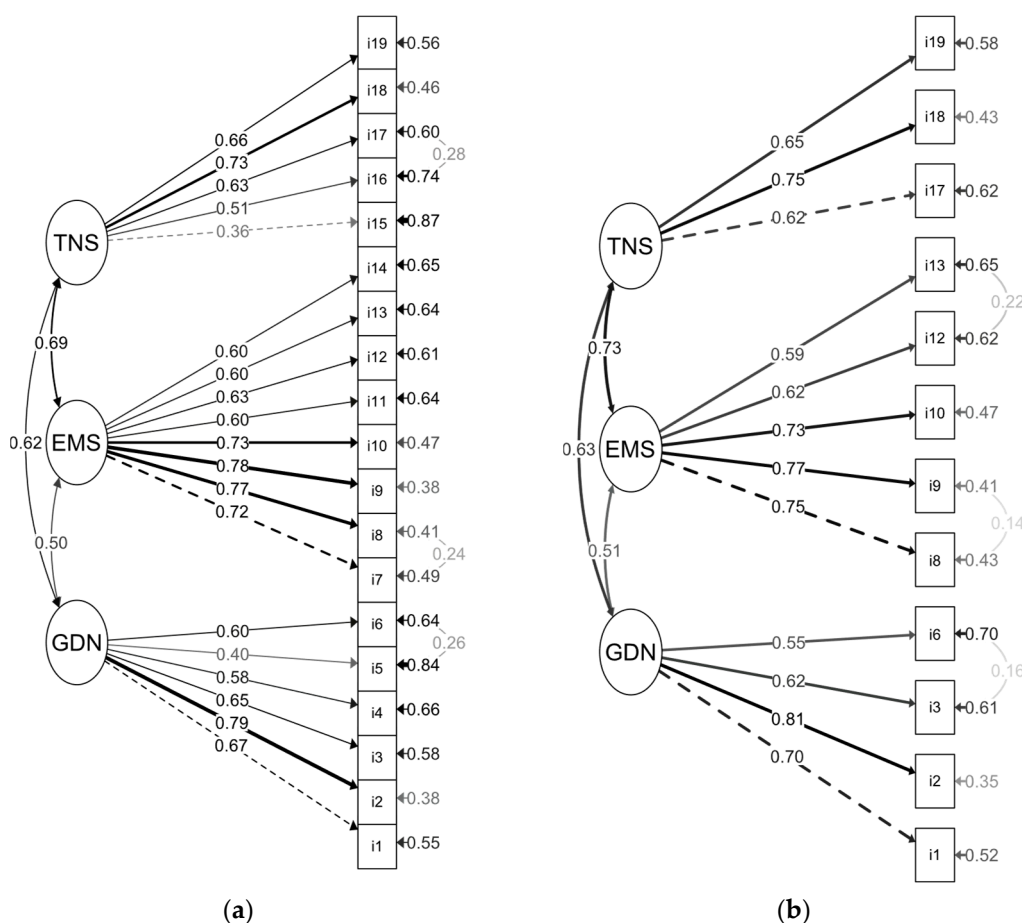


Figure 1. Path diagrams for the confirmatory factor analysis. The diagrams show standardized regression weights, inter-factor correlations, standardized item variances and selected correlated errors for (a) original model and (b) alternative model. Abbreviations: GDN—Guidance, EMS—Emotional support, TNS—Tangible support.

However, the TLI was below the desired threshold of 0.9 (TLI = 0.89), the loadings of some items were relatively low (up to 0.36) and the AVE was only slightly higher than the ASV and did not exceed the expected 0.6 (or 0.5). Finally, modification indices showed a

number of correlated errors between ISSB items (both intra- and inter-factors) with a strong potential impact on goodness of fit.

3.3. Proposal of an Alternative ISSB-SF Structure

Given the above shortcomings, we proposed an alternative ISSB-SF model after examining the weaknesses of the original test version and the suggested modification indices (Figure 1B). This retained the original three-factor structure but some of the items were removed (namely items 4 and 5 in Guidance, items 7, 11 and 14 in Emotional support and items 15 and 16 in Tangible support).

This alternative model showed a superior goodness of fit (Table 1B) compared with the original version with CFI = 0.953 and TLI = 0.963, RMSEA closer to the expected threshold, all loadings above 0.5 (except two items above 0.6, Supplementary Table S1B) and lower AIC and BIC. When comparing the two models, the alternative model proved to be significantly better (χ^2 difference = 408.07, $p < 0.001$). The reliability of the factors in this model decreased slightly but remained acceptable and composite reliability was above 0.7 for all of the factors. The overall reliability remained very good (Cronbach's alpha = 0.87).

Almost all of the indicators of convergent and divergent validity also improved (Table 2B). The difference between the AVE and ASV was larger and the AVE was close to the expected threshold of 0.5; MTMM correlations showed a better separation of the ranges of intra- and inter-factor inter-item correlations (Supplementary Table S2B, Supplementary Figure S1B). Additionally, the modification indices did not detect any inter-item correlated errors with a potential excessive (double-digit) effect on model quality.

Table 2. Validity and reliability of the original and alternative model.

		Convergent and Discriminant Validity					Reliability		
	No. Items	Conver. Validity ^a	Disc. Validity ^b	Scaling Success ^c	Homogeneity Index ^d	AVE	ASV	Composite Reliability	Alpha
A. Original model									
GDN	6	0.41–0.63	0.16–0.43	100	0.39	0.38	0.37	0.76	0.8
EMS	8	0.54—0.73	0.15–0.52	100	0.46	0.47		0.87	0.87
TNS	5	0.38–0.61	0.23–0.42	70	0.37	0.37		0.68	0.75
B. Alternative model									
GDN	4	0.51–0.64	0.27–0.41	100	0.46	0.45	0.4	0.75	0.77
EMS	5	0.55–0.70	0.26–0.51	100	0.52	0.5		0.81	0.83
TNS	3	0.49–0.57	0.29–0.45	66.7	0.45	0.45		0.71	0.71

Abbrev.: AVE—Average variance extracted, ASV—Average shared variance, GND—Guidance, EMS—Emotional support, TNS—Tangible support. ^a Range of intra-factor correlations of between items. ^b Range of correlations between item and items from other factors. ^c Percentage of occasions when items correlated significantly stronger with their proposed scale than with other scales. ^d Average inter-item correlation.

3.4. Gender-Related Measurement Invariance

Finally, we examined gender-related measurement invariance for both models (Table 3A,B). The results showed that the three-factor structure (configural invariance) was the same for both models for both genders. However, males and females differed in scalar invariance for the original and alternative models (due to items 8, 11, 13 and 18 in the original model and items 1, 8, 13 and 19 in the alternative model). By establishing partial scalar invariance, we observed that in the original model men scored lower on emotional support (std. B = −0.439, $p < 0.001$) and in the alternative model men scored lower on emotional support (std. B = −0.514, $p < 0.001$) and tangible support (std. B = −0.471, $p < 0.001$). In the alternative model, males also showed a greater factor loading of Emotional support item 13 ('Agreed that what you wanted to do was the right thing') within metric invariance (males, std. $\lambda = 0.741$ vs. females, std. $\lambda = 0.561$).

Table 3. Gender-based measurement invariance.

	Df	BIC	χ^2	$\Delta\chi^2$	CFI	Δ CFI	TLI	Δ TLI	RMSEA	Δ RMSEA	<i>p</i>
A. Original model											
Pooled overall	146	35,788.84	595.55		0.91		0.894		0.066		
Configural	292	36,161.27	788.13	−192.59	0.9	0.01	0.883	0.011	0.069	−0.003	
Metric	308	36,080.36	812.27	−24.14	0.899	0.001	0.887	−0.004	0.068	0.001	0.087
Scalar	324	36,036.73	873.69	−61.42 ***	0.889	0.01	0.883	0.004	0.069	−0.001	<0.001
Partial scalar ^a	320	36,020.91	831.6	−19.33 ^b	0.897	0.002	0.89	−0.003	0.067	0.001	0.081
B. Alternative model											
Pooled overall	48	22,520.25	187.47		0.953		0.936		0.064		
Configural	96	22,755.05	241.16	−53.69	0.951	0.002	0.933	0.003	0.065	−0.001	
Metric	105	22,715.1	260.29	−19.13 *	0.948	0.003	0.934	−0.001	0.065	0	0.024
Partial metric ^c	104	22,713.57	252.2	−11.04 ^d	0.95	0.001	0.937	−0.004	0.063	0.002	0.2
Scalar	113	22,693.55	291.27	−39.07 ***	0.94	0.01	0.93	0.007	0.067	−0.004	<0.001
Partial scalar ^{c,e}	110	22,684.05	255.51	−3.31 ^d	0.951	−0.001	0.94	−0.003	0.062	0.001	0.653

^a Intercepts for items 8, 11, 13 and 18 are unconstrained. ^b Compared with metric model. ^c Loading for item 13 is unconstrained. ^d Compared with previous level model. ^e Intercepts for items 1, 8, 13 and 19 are unconstrained. * $p < 0.05$, *** $p < 0.001$.

4. Discussion

The aim of this paper was to evaluate the factor structure, validity and reliability of the short form of the Inventory of Socially Supportive Behaviors. Given that most instruments measuring social support focus on perceived support, such as the Social Support Questionnaire—SSQ (Sarason et al. 1983), Multidimensional Scale of Perceived Social Support—MSPSS (Zimet et al. 1988), Oslo Social Support Scale—OSSS (Kocalevent et al. 2018) and others, the ISSB questionnaire is one of the few instruments available to measure perceived social support. Others include, for example, the Satisfaction Scale of the Duke Social Support Index—DSSI (Koenig et al. 1993), which offers only a total score, the Received Social Support Scale for Persons with Serious Mental Illness rSS-SMI (Chronister et al. 2022), which, however, was developed for a specific population, or the Actually Received Support Scale of the Berlin Social Support Scale (Schulz and Schwarzer 2003), which, similarly to the ISSB, describes received social support in several domains: emotional, instrumental and informational support, and satisfaction with support. This study is, to the best of our knowledge, one of the first (if not the first) validations of the short form of the instrument.

A confirmatory factor analysis showed that the original 19-item version with three factors demonstrated a relatively good goodness of fit, convergent and discriminant validity and reliability. Although the inter-factor correlations were relatively high, this can be considered acceptable given that the different dimensions of social support are not strictly delineated in real life. For example, the provision of advice often also conveys a sense of emotional support and closeness or the provision of tangible support is often accompanied by guidance. However, at the same time, some problematic aspects emerged. The loadings of some of the items were very low, the extracted variance was also rather low and the modification indices pointed to significant associations (correlated errors) between items within and between factors, suggesting a potential overlap in the meaning of the items (Harrington 2008).

Based on an analysis of individual indicators and modification indices, we proposed an alternative model that retained the three-factor structure but had a lower number of items. This model proved to be superior to the original version with a very good goodness of fit, better validity and extracted variance, while maintaining the same level of reliability with fewer items. A comparison of the reliability of the original ($\alpha = 0.89$) and alternative ($\alpha = 0.87$) models with previous studies showed similar overall Cronbach's alpha values (Swickert et al. $\alpha = 0.73$ (Swickert et al. 2002), Keller et al. $\alpha = 0.80$ (Keller et al. 2014), Crase et al. $\alpha = 0.93$ (Crase et al. 2007)). The alpha values of the individual ISSB factors were also similar (cf. Mrayyan (2009): GDN = 0.74, EMS = 0.80, TNS = 0.90, Pretty et al. (1996): GDN = 0.85, EMS = 0.86, TNS = 0.80). This version thus appears promising for use,

however, the suitability of this alternative version needs to be tested in other more general populations and in different cultural settings.

Finally, a gender-related measurement invariance analysis showed that the ISSB-SF was well applicable to both genders in terms of the factor structure. We particularly observed some differences in scalar invariance, with men scoring lower primarily on items related to emotional support (such as ‘Let you know that he/she will always be around if you need help.’, ‘Comforted you by showing you some physical affection.’ and ‘Agreed that what you wanted to do was the right thing.’). This difference is likely related to men’s and women’s differing emotional sensitivity (Bianchin and Angrilli 2012), associated need for emotional support and perceptions of its availability (Kneavel 2021; Flaherty and Richman 1989) and different patterns of expressions of emotional closeness depending on learned social roles associated with masculinity and femininity (Matud et al. 2003; Reevey and Maslach 2001). However, overall, no gender differences in the perception of social support received were demonstrated, which is consistent with the current disagreement about the extent to which perception and reception of social support is gender-specific (Rodríguez-Madrid et al. 2018; Fischer et al. 2018).

Study Limitations

The study has several limitations. First, the sample consisted of undergraduate university students which might have several implications. The younger age of university students and the specifics of this developmental period characterized by broader relational networks along with fewer close friendships and stable partnerships, fluctuation between autonomy from and dependence on family (Cohen et al. 2003) and a generally greater presence of social support (Schulenberg et al. 2005) may have influenced their perceptions of social support to some extent. However, these characteristics are unlikely to have a direct effect on the psychometric properties of the ISSB-SF instrument per se (as even the original version was verified on a sample of university students). Second, the lower number of male respondents may have had a partial effect on the evaluation of psychometric properties and especially the evaluation of gender-related measurement invariance, as respondents’ gender may affect the perception of social support as well as social situations (Mackinnon 2012; Weckwerth and Flynn 2006). Further studies with a more balanced gender ratio and more male respondents are needed to confirm our findings. Finally, as far as sample size is concerned, some fit indices, such as the chi-square, are more likely to reject models with a large sample size, while others are sensitive to a smaller sample size. This issue was addressed by reporting a variety of fit indices.

5. Conclusions

To our knowledge, this is the first study that assesses the factor structure, validity and reliability of the short form of the Inventory of Socially Supportive Behaviors. The results showed acceptable psychometric properties of the original 19-item version but also revealed some challenges. The proposed alternative model with fewer items demonstrated very good validity, reliability and a distinct factorial structure. Should this new version be validated in other populations and language variants, it may represent an even more convenient alternative of this instrument for rapid and reliable measurement of perceived social support (especially as a screening assessment during the counselling process or as part of larger research batteries).

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/socsci11110528/s1>, Figure S1: Multi-trait multimethod assessment of convergent and divergent validity; Table S1: Standardized loadings of items in individual factors and inter-factors correlations; Table S2: Discriminant validity estimates and likelihood ratio test against constrained model.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the Faculty of Education of Palacký University Olomouc.

Informed Consent Statement: Written informed consent was obtained from all subjects involved in the study. Participation in the study was voluntary and not tied to the study itself.

Data Availability Statement: Anonymised data are available from the corresponding author upon substantiated request. A brief description of the research intent and use of data, together with a timeline for completion of data use is requested.

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