

Eliminate the effect of severity of the Personal Outcomes Scale: Linear regression in persons with intellectual disability

Maria Carbó-Carreté^{1,2}, Cristina Cañete-Massé¹, Maribel Però-Cebollero¹, and Joan Guàrdia-Olmos¹

¹ Universidad de Barcelona and ² Serra Hùnter Fellow

Abstract

Background: The Personal Outcomes Scale (POS) is used to assess quality of life (QoL) in people with intellectual disability (ID) but the results are influenced by the severity of the disability. To address this issue, we present the standardization of the Spanish adaptation of the POS. One of the limitations of the Classical Test Theory is the differential effect in some items due to the effect of an external variable. For this reason, we propose the use of multiple linear regressions. **Method:** We used a sample of 529 people with ID, along with 522 professionals and 462 parents who were administered the POS in order to carry out an in-depth psychometric study. For the analysis, we used the correction strategy by multiple linear regressions to generate centiles corrected for the severity effect of ID. **Results:** Following this technique, the results show the centiles from the raw POS score corrected for the effect of the severity of ID. **Conclusions:** This standardization technique is a feasible option to provide a QoL scale without biased results due to the severity of ID.

Keywords: Personal Outcomes Scale; linear regression; intellectual disability; severity; Quality of Life.

Resumen

Eliminar el efecto de la severidad en la Escala de Resultados Personales: uso de la regresión lineal en personas con discapacidad intelectual.

Antecedentes: la Escala de resultados personales (ERP) se utiliza para evaluar la calidad de vida (CdV) en personas con discapacidad intelectual (DI), pero los resultados pueden estar influenciados por el nivel de gravedad de la discapacidad. Para resolverlo, presentamos la estandarización de la adaptación española de la ERP. Una de las limitaciones de la Teoría Clásica de los Tests es el efecto diferencial en algunos ítems debido a una variable externa. Por esta razón, proponemos el uso de regresiones lineales múltiples. **Método:** para lograr este objetivo, se utilizó una muestra de 529 personas con DI, 522 profesionales y 462 familiares a quienes se les administró la ERP para realizar un estudio psicométrico en profundidad. Para el análisis, utilizamos la estrategia de corrección mediante múltiples regresiones lineales para generar percentiles, que se corrigieron por el efecto de gravedad de la ID. **Resultados:** las tablas muestran los percentiles de la puntuación bruta de la ERP, corregida por el efecto de la gravedad de la DI. **Conclusiones:** la técnica de estandarización utilizada es una opción factible para proporcionar una escala de CdV sin resultados sesgados debido a la gravedad de la DI.

Palabras clave: escala de resultados personales; regresión lineal; discapacidad intelectual; calidad de vida.

The concept of developmental and intellectual disability (DID) is experiencing an evolution that emphasizes human rights as well as community services and individualized supports (Schalock et al., 2019). This evolution goes hand in hand with the relevance that the concept of Quality of Life (QoL) is attaining in this field. The concept of Quality of Life (QoL), defined by Schalock and Verdugo (2002), is a social construct that has provided professionals with a framework to assess the impact of processes and services addressed to people with intellectual disability (ID), the degree of their satisfaction, and the meaning of the results obtained within the context. The concept of QoL continues to evolve and is part of the determination of public policies, evaluation of services,

and the development of innovative, individualized programs. As a result, the QoL concept is closely linked to the assessment of personal results and, for both institutions and the community, it is increasingly becoming an agent of social change (Gómez, Peña et al., 2016; Schalock et al., 2016; Schalock et al., 2018).

In recent decades, this interest in the QoL has led to a large number of standardized instruments seeking a valid QoL measure for people with ID. Schalock and Verdugo (2002) argue that most QoL assessment techniques used with people with ID are quantitative, with scales and questionnaires that respond to adequate psychometric properties (e.g., Carbó-Carreté et al., 2015; Gómez, Alcedo et al., 2016; Verdugo et al., 2014).

It is necessary to remember that a person's QoL is composed of both subjective and objective aspects. Therefore, the evaluation of the QoL includes, on the one hand, the measure of subjective wellbeing (including individual preferences) and, on the other hand, the circumstances and objective experiences of life (Schalock et al., 2007). The literature reflects certain discrepancies about which of the two measures is best suited to evaluate QoL (Finlay

& Lions, 2002). However, to solve this dilemma, most experts in the field accept that the evaluation of the QoL should contemplate both the objective conditions of the person's life and his or her personal satisfaction (Schallock & Verdugo, 2002). This position has been supported by research. It can be observed in the studies focused on the importance of evaluating and analyzing the degree of agreement between different sources, including the person with ID, the professionals, and the family. Those studies either were carried out with self-reports and reports of the others using the same measuring instrument (Balboni et al., 2013; Carbó-Carreté et al., 2015; Claes et al., 2012) or else by using the data from more than one instrument (Simões et al., 2015).

When assessing QoL, therefore, both subjective and objective measures must be considered, but their respective weighting will depend on the intended use of such evaluation. As indicated by Schallock and Felce (2004), if researchers or professionals want to know if people with ID are satisfied with their lives, their level of satisfaction should be assessed and compared to the results of other subgroups of that population. If the main goal is to evaluate the design or implementation of a program, it is essential to reduce the measurement error of the psychometric scales of life experiences and circumstances that conform to the dimensions of the QoL model.

The present work is closely linked to the second utility of the QoL evaluation that we just mentioned. Specifically, we are referring to the use of the Personal Outcomes Scale (POS) as an instrument with which to evaluate the impact on the QoL of the individuals who attend a service and are recipients of an Individualized Support Plan. The use of the Spanish version in the services has shown the need to generate scales and typified scores for persons with high levels of support needs. To respond to this situation, previous studies have identified the effect of the ID severity on the QoL assessment. The results show that at high levels of severity, certain values of the POS are completely compromised. This effect has been identified through IRT models and the differential functioning of the items (Carbó-Carreté et al., 2019; Guàrdia-Olmos et al., 2017).

The effect of severity is indeed neither homogeneous nor constant. Thus, research reflects how this bias is more clearly present in the evaluations carried out by professionals, who tend to provide slightly lower scores than relatives, and even lower than the self-evaluations derived from self-reports (Carbó-Carreté et al., 2019).

One of the interesting effects of such evaluation is the result associated with the factor of rights, which shows lower values in those people with higher levels of severity. It seems as if, in this case, the severity diagnosed is a predictor of the values that the POS presents in this factor in individuals with severe ID. There are other items and factors with behaviors that are strongly influenced by the severity of the ID. This study does not list all the items affected by severity since they were already covered in previous publications (Carbó-Carreté et al., 2019). Nonetheless, it is crucial to note this effect and the added need for a scale that is sensitive to this potential difference. Severity is a variable to be considered in the generation of POS scores. The effect of severity is not negligible when assessing QoL through such a sensitive instrument as POS, as seen in other studies (Petry et al., 2009) or others models centered on high levels of ID (Gómez et al., 2015; Ouellette-Kuntz & McCreary, 1996).

Among the different baremation procedures, we believe that the easiest to apply are those that attempt to minimize the number of tables and facilitate the task of obtaining a typified score. The POS

and the model of QoL on which it is based (Schallock & Verdugo, 2002; Wang et al., 2010) deals with eight latent first-order factors and three second-order factors for three different sources of information.

We should bear in mind that the use of the POS involves three informants: the person with ID, their family (or legal guardians), and a professional who knows the person well in different contexts. This multi-faceted approach is presumed to be the best approximation for an accurate QoL evaluation (Balboni et al., 2013; Claes et al., 2012; Perry & Felce, 2002, 2005; Schmidt et al., 2010; Schwartz & Rabinovitz, 2003; Simões et al., 2016).

This approach, through conventional and classical techniques, would lead us to 33 tables for each level of severity, i.e., a total of 132 baremation tables using any of the standard typified scores. This option does not seem viable to us, and we see the need to reduce this excess of tables drastically. For that reason, we chose the regression method to extract the component caused by each score's severity for each of the defined factors and sources of information. With this approach we will achieve a typified score that is comparable throughout severity categories and can be easily obtained by the evaluators.

Therefore, the objective of this paper is to present, through linear regression, the typified POS scores for all the latent factors and information sources. That would avoid the bias effect due to the evaluated person's disability severity, and would thereby facilitate obtaining a typified score.

Method

Participants

The sample comprised 529 persons with ID (296 men and 233 women), with $M_{age} = 35.03$, $SD = 10.82$, age range: 16-66, who came from seven Autonomous Communities in Spain: Andalusia (20.9%), Aragon (4%), Catalonia (25%), Castile and León (6.6%), Castile-La Mancha (14.8%), Madrid (17.4%), and Galicia (11.7%). In addition, professionals ($n = 522$) and families ($n = 462$) also participated. Following the guidelines of the administration of the POS, the professionals ($M_{age} = 37.26$, $SD = 9.30$) needed to have known the person for at least three months and observed their functioning in different contexts.

In this study, an accidental and nonrandomized sampling was carried out in every Autonomous Community. Spanish law assigns a "handicap" percentage to every person with a disability to represent its severity. The law stipulates that those with a percentage of 33% or higher receive an economic subsidy or support to facilitate everyday life. The disability percentage is assigned administratively based on all types of impairments (e.g., intellectual, physical, sensorial). Half of the participants (51.2%) were at 65-74% (high level of dependency). The second largest group (36.8%) were at 75% (very high level of dependency), and the smallest group (12.1%) of participants were at 33-64% (moderate level of dependency). ID was evaluated by using the following psychometric scales: the Wechsler Intelligence Scale for IQ and the ICAP (Inventory for Client Agency and Planning) for adaptive behavior. Some Autonomous Communities used other scales, but both domains were assessed to determine the level of ID. In our sample, the participants predominantly had a moderate (47.3%) or mild level of ID (33.3%). In contrast, the smallest groups consisted of individuals with a severe or profound ID (11.3%) or borderline ID (8.1%).

Table 1 shows the main descriptive data regarding the individual with ID. Additionally, Tables 2 and 3 present the descriptive data provided by the professionals from service organizations and families.

Instruments

The Spanish version of the POS (Carbó-Carreté et al., 2015) aims to assess QoL in Spanish-speaking persons with ID based on the eight dimensions of Schalock and Verdugo's (2002) model, arranged into three higher-order factors (Wang et al., 2010). As mentioned above, this scale is divided into three information sources, including: (a) a self-report, where the individual answers on their own; (b) a report by the professional, which assesses the individual's experiences and circumstances from the viewpoint of

direct care staff or a service technician; and (c) a family report, which indicates scores from a family member's perspective. Every dimension has 6 items, for a total of 48 item responses for the scale as a whole. Every item is assessed using a 3-point Likert scale. Scores are obtained through an interview conducted by an interviewer who has previous training in the theoretical model and the proper administration of the scale. Outcomes are obtained for every dimension and for the three factors. For every dimension, the sum of all the scores from the six items is obtained by using the following calculation: (3) = *always*, (2) = *sometimes*, and (1) = *rarely or never*. After summing the dimensions of every factor, a final score is calculated for each factor. The Spanish POS adaptation (Carbó-Carreté et al., 2015) is consistent with the multidimensionality of the QoL construct and with the three second-order factors. The psychometrical analysis of this

Table 1
Descriptive data of participants with ID (n=529). % of observed distribution according to the Autonomous Community

	Andalusia	Aragon	Catalonia	Castile and León	Castile-La Mancha	Madrid	Galicia
Gender							
Male	58.6	61.9	53.8	62.9	52.6	56.5	53.3
Female	41.4	38.1	46.2	37.1	47.4	43.5	46.7
Area of residence							
Rural	21.1	14.3	4.5	37.1	19.2	3.3	16.7
Semi-urban	34.9	85.7	34.1	–	46.2	17.4	41.7
Urban	44.0	–	61.4	62.9	34.6	79.3	41.7
Intellectual disability level							
Borderline	10.8	14.3	5.3	2.9	19.2	4.3	1.7
Mild	31.5	23.8	36.4	62.9	33.3	30.4	20
Moderate	50.5	57.1	46.2	31.4	44.9	52.2	45
Severe and/or profound	7.2	4.8	12.1	2.9	2.6	13	33.3
Day care							
Special work center	1.8	9.5	22.7	5.7	3.8	12	1.7
Occupational therapy services	76.1	81	73.5	85.7	88.5	59.8	45
Day center	8.3	9.5	3.8	2.9	3.8	17.4	43.3
Educational center	5.5	–	–	5.7	–	5.4	5
Others	8.3	–	–	–	–	5.4	1.7
Place of residence							
Residence	8.7	9.5	5.3	17.6	6.6	8.7	3.4
Supervised flat	–	–	22	23.5	10.5	–	6.8
Family home	86.5	81	68.9	58.8	81.6	88	89.8
Independent home	4.8	9.5	3.8	–	1.3	3.3	–

Table 2
Descriptive data of professionals (n=522). % of observed distribution according to the Autonomous Community

	Andalusia	Aragon	Catalonia	Castile and León	Castile-La Mancha	Madrid	Galicia
Type							
Direct care (day)	75	47.6	79.5	–	66.2	49.5	76.7
Direct care (night)	–	–	2.3	–	–	–	–
Direct care (physical activity and sport)	6.7	–	–	–	13	29.7	5
Technical staff of service	13.5	42.9	17.4	100	20.8	6.6	11.7
Others	4.8	9.5	–	–	–	8.8	3.3
Educational level							
Secondary education	22.1	9.5	9.1	–	17.9	6.6	16.7
University degree	58.7	42.9	64.4	94.3	51.3	42.9	41.7
Higher university degree	1.9	–	11.4	5.7	14.1	5.5	21.7
Others	17.3	47.6	15.2	–	16.7	45.1	20

Table 3
Descriptive data of family (n=462). % of observed distribution according to the Autonomous Community

	Andalusia	Aragon	Catalonia	Castile and León	Castile-La Mancha	Madrid	Galicia
Relation with person with ID							
Parent	72.4	42.9	66.4	54.5	81.2	83.1	74.6
Sibling	21.8	52.4	21.8	36.4	15.9	12	22
Other family member	4.6	4.8	2.7	–	1.4	4.8	3.4
Legal tutor	1.1	–	9.1	9.1	1.4	–	–
Educational level							
No studies	19.8	4.8	6.4	–	20	12.2	6.8
Primary education	41.9	23.8	42.2	60	47.1	20.7	52.5
Secondary education	18.6	38.1	26.6	30	15.7	24.4	18.6
University studies	16.3	14.3	18.3	10	11.4	32.9	15.3
Others	3.5	19	6.4	–	5.7	9.8	6.8
Place of residence							
Rural	19.5	14.3	14.5	23.3	21.4	3.6	16.9
Semi-urban	43.7	85.7	36.4	3.3	42.9	15.7	45.8
Urban	36.8	–	49.1	73.3	35.7	80.7	37.3

Table 4
Cronbach's α values per every factor and source of information

	Self-report (N = 529)	Report of Professional (N = 522)	Report of Family (N = 462)
First-order factors			
Personal development	.734	.796	.802
Self-determination	.775	.855	.788
Interpersonal relations	.707	.856	.839
Social inclusion	.800	.625	.627
Rights	.629	.854	.776
Emotional well-being	.758	.685	.696
Physical well-being	.636	.703	.672
Material well-being	.680	.755	.723
Second-order factors			
Independence	.823	.877	.841
Social Participation	.878	.892	.854
Well-being	.865	.891	.866

adaptation may be consulted in Carbó-Carreté et al. (2015). However, the Cronbach's α estimations appear in table number 4 (the reliability study provides appropriate values for the first-order domains and, particularly, for the second-order factors, with values higher than .82).

Procedure

Organizations that provide services were asked to participate by the Spanish Confederation of Organizations for Persons with Intellectual Disability (named *Plena Inclusión*).

Before the training sessions and the POS administration, informed consent forms were prepared for each source of information, following the instructions of the *Universitat Ramon Llull* Ethical Committee. These informed consent forms were read by all the participants of the project. When individuals with ID did not understand the document, the interviewer or a proxy helped them.

In every Autonomous Community, specific training was given to the professionals who would participate as interviewers as to how to administer the POS. For this reason, we were able to

guarantee the consistency of the instrument's application with the original authors' guidelines. The professionals who acted as interviewers administered the POS to 670 participants, 529 of whom gave complete responses to all the items and scales across all three sources. Finally, following the POS instructions, in all cases, the scale's administration was conducted through an interview. For the ID sample, if the person evaluated presented communication difficulties, a support professional was present to facilitate communication.

Data analysis

To generate the scales in the POS baremation adapted to Spanish, we bore in mind the effect of the severity of ID on the values of the items that we have already described. Accordingly, we decided on a scale that considered this effect. Thus, the direct score obtained contains a bias that can generate dubious interpretations. Therefore, it seems appropriate to correct that direct score to obtain a more credible and independent assessment of the level of severity. To accomplish this goal, we implemented the technique described by Van der Elst et al. (2006), Van der Elst et al. (2011), Van der Elst et al. (2012), adapted by Guàrdia-Olmos et al. (2015). The stages that follow are simple and involve, briefly:

1. Generating a dummy variable (values 0 and 1) to indicate the membership of each participant in each of the severity categories (Mild, Moderate, Severe and Profound).
2. Establishing the linear regression model for each direct score of the POS factors and for each of the information sources (person with ID, professional or family reference) to estimate the impact of the severity categories on those direct scores. Subsequently, studying the following linear regression model for each factor and source of information:

$$\hat{Y}_i = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \quad (1)$$

where ($\hat{Y}_i$) is the predicted value of the direct score of each factor of the POS, β_i is the partial regression coefficient of each level of severity, and X_i is the dummy variable [0,1]

that indicates membership (or lack thereof) in each of the four severity categories.

3. Estimating the individual prediction error once the previous model was validated through the following expression:

$$\hat{\epsilon}_i = Y_i - \hat{Y}_i, \quad (2)$$

where the value of $\hat{\epsilon}_i$ is the residual of every direct score. However, this value of $\hat{\epsilon}_i$ represents the part of the direct punctuation that is not affected by the severity impact, so it can be defined as the score of every factor and the information source that is independent and free of the effect of severity.

4. Estimating the centile values (C_k) with each value of $\hat{\epsilon}_i$ for the direct scores and for the corrected scores to eliminate the severity effect. Using this approach, we can show the undervaluation or overvaluation effect that the severity of the person's ID generates on the direct scores of the POS. In addition, the use of centile scales for the location of corrected scores allows us to compare the situation of individuals in different severity categories. Such comparison would be impossible to make with the uncorrected direct score since severity influences those values.

Results

First, we present the tables of the multiple regression models indicating the significance of the partial regression coefficients and the model fit data (Table 5).

Below, we present the table of the direct values, the direct centiles, and the corrected centiles for the POS self-reports. To avoid an extensive document, we have included only these. Please contact the authors for the tables with the professionals' and parents' POS scores (Table 6).

Use of the tables

We propose a simulated example to exemplify the use of the scale tables. Given the characteristics of the standardization carried out, we believe that in a first approximation, the best option is using the tables of the POS direct scores for each dimension with the direct centiles and the corrected centiles. Let us suppose that a person evaluated with the POS scale obtained the following values in the self-report in each of the eight first-order factors (Table 7):

To obtain the corrected scores, we must establish the level of severity that the score presents. Suppose that the assessment classifies a person as borderline. Therefore, the standardized scores are found in table number 6 of this work (which gathers the values of the results of the self-report for all severity categories). For each direct value (score), researchers must establish, based on this table, the direct centile (C_k) and the corrected centile (C_{corr}). Thus, the previous table is complemented with the following values (Table 8):

In light of the above results, important differences are observed between the values of the direct centiles and the corrected centiles.

With the corrected centiles, comparisons can be made between the results of different individuals, regardless of their severity, since the effect is controlled. The use of direct centiles can be deceptive if severity is not considered. Obviously, the procedure described above must be repeated for the other two sources of information (parents and professionals), but the process follows the same logic.

Discussion

The results presented suggest the possibility of scaling the most recent adaptation of the POS, based on an estimate that allows for the effect of one of the fundamental variables to be corrected, i.e., the severity of the ID. The standardization technique used here is thus a feasible option.

However, the viability of these standards and scores based on the group norm is subject to continuing discussion, and it may be arguable that in the case of ID, these standardized scores would be useful. The utility of a comparison between the individual value and a general group value is not clear, given the complexities derived from the QoL construct itself. Now, if we differentiate between the various approaches, we would like to reassert that – because the information sources (person with ID, family and professional) are scaled – it is possible to calculate a triangulation on independent measurement backgrounds based on the three components of the severity variable's effect. That can facilitate comprehensive and far more accurate evaluations than before, especially for researchers seeking to analyze subjects with different severities. In this case, using direct values would be excessively risky.

In fact, we understand that it is an important contribution to show that a simple scaling of a scale as complex as the POS is feasible and produces unbiased results. As a result of this idea, it seems appropriate to assess the possibility of taking advantage of this type of approach to scale other tests and scales that, due to their characteristics, are difficult to use and present direct values with effects of contextual variables. These cases are common, and they must be addressed rigorously and simply. Our conclusion, then, is to focus on more contextualized standardization processes.

From a more applied perspective, we would like to note that the standardization process, whatever the technique used (percentiles or another type of typified scores), must grant a better use when interpreting and assessing results. Moreover, the tables provided in this study will prevent an erroneous comparison between intra scores or between subjects. Comparing subjects with different severities through direct scores would be a serious error of interpretation. Finally, we would like to point out that the following step to this type of approach would be, firstly, to broaden the sample with subjects of high needs for supports, since that was one of the limitations of this project. Secondly, we should consider the correction of scores standardized through population probabilities of each of the severity groups identified in the current sample. And we should also adjust the scores corrected through “a priori” probabilities under the scheme of Bayesian psychometry.

Table 5
Estimation of the regression models to estimate corrected scores

Factor	Severity effect				Signification of the regression model	Observations
	Borderline	Mild	Moderate	Serious		Residual analysis
Self-report						
PD	NS	NS	-1.228**	-2.738**	$F = 34.222^{**}$ $R^2 = .123$	Normal distribution and mean = 0
SD	1.271**	1.181**	NS	-.814*	$F = 16.423^{**}$ $R^2 = .092$	
IR	NS	NS	NS	-.808**	$F = 7.275^{**}$ $R^2 = .015$	
SI	.282	-.185	NS	-.595	$F = .966$ $R^2 = .006$	
R	1.521	NS	-.869	-2.382	$F = 24.037$ $R^2 = .130$	
EWB	-1.113	NS	.343	NS	$F = 12.448$ $R^2 = .048$	
PWB	NS	NS	.442	NS	$F = 6.206$ $R^2 = .013$	
MWB	NS	NS	NS	-1.554	$F = 13.916$ $R^2 = .028$	
Professional						
PD	2.691	1.707	NS	-1.407	$F = 52.107$ $R^2 = .236$	Normal distribution and mean = 0
SD	NS	-.707	-2.293	-3.830	$F = 49.917$ $R^2 = .226$	
IR	.761	NS	NS	-.994	$F = 7.922$ $R^2 = .030$	
SI	NS	NS	NS	-1.567	$F = 16.470$ $R^2 = .031$	
R	1.136	NS	-1.295	-2.886	$F = 33.660$ $R^2 = .172$	
EWB	NS	NS	.626	NS	$F = 11.486$ $R^2 = .022$	
PWB	NS	NS	15.339	NS	$F = 4.991$ $R^2 = .010$	
MWB	.871	NS	-1.013	-1.923	$F = 14.909$ $R^2 = .083$	
Family						
PD	NS	NS	-1.109	-2.625	$F = 27.647$ $R^2 = .110$	Normal distribution and mean = 0
SD	NS	NS	-.771	-2.240	$F = 21.155$ $R^2 = .086$	
IR	-.448	-.340	NS	-.536	$F = 1.194$ $R^2 = .008$	
SI	NS	NS	NS	-1.086	$F = 6.602$ $R^2 = .014$	
R	2.443	1.232	NS	-.950	$F = 22.637$ $R^2 = .135$	
EWB	NS	NS	.539	NS	$F = 9.559$ $R^2 = .021$	
PWB	NS	NS	.628	NS	$F = 12.837$ $R^2 = .028$	
MWB	NS	NS	-.911	-2.231	$F = 17.685$ $R^2 = .073$	

** $p < .001$ * $p < .01$. NS = Non significative partial regression coefficient

Self: Self-report; PO, Professional's Observation, FO: Family member's Observation, PD= Personal Development, SD= Self-Determination, IR= Interpersonal Relations, SI= Social Inclusion, R=Rights, EWB= Emotional Well-Being, PWB= Physical Well-Being, MWB= Material Well-Being

Table 6
Self-report POS direct scores for each dimension, direct centiles and corrected centiles to avoid the effect of severity

	Personal development			Self-determination			Interpersonal relationships			Social inclusion			Rights			Emotional Well-being			Physical Well-being			Material Well-being		
	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}	Score	C _k	C _{corr}
Borderline	6-9	1	0	6-8	0	0	6-12	2	2	6-10	10	8	6-10	5	0	6-9	0	0	6-9	0	0	6-7	0	0
	10	4	1	9-11	10	4	13	7	6	11	18	15	11-13	35	10	10	0	0	10	0	0	8-10	10	9
	11-13	33	20	12	20	10	14	17	16	12	30	26	14	51	20	11	0	1	11	1	2	11	19	17
	14	49	35	13	34	21	15	34	32	13	45	39	15	66	34	12	0	4	12	5	6	12	31	28
	15	65	52	14	51	37	16	54	53	14	60	54	16	79	51	13	3	11	13	13	16	13	45	43
	16	79	69	15	68	55	17	73	72	15	73	69	17	89	67	14	10	26	14	28	31	14	60	58
	17	89	83	16	82	71	18	87	87	16	84	80	18	95	81	15	24	47	15	47	51	15	73	71
	18	95	92	17	91	85				17	91	89				16	44	69	16	67	70	16	84	83
				18	96	93				18	96	94				17	65	85	17	82	85	17	91	91
																18	83	94	18	92	94	18	96	95
Mild	6-7	0	0	6-7	0	0	6-8	0	0	6	0	0	6-9	2	1	6-7	0	0	6-9	0	0	6-7	0	0
	8-10	4	1	8	0	0	9-10	0	0	7	0	0	10	5	2	8-9	0	0	10	0	0	8	2	1
	11	9	4	9-10	4	1	11	0	0	8	2	2	11	11	7	10-11	0	0	11	1	2	9	5	4
	12	19	9	11	10	4	12	2	2	9	5	5	12	21	15	12	0	0	12	5	6	10	10	9
	13	33	20	12	20	11	13	7	6	10	10	11	13	35	27	13	3	3	13	13	16	11	19	17
	14	49	35	13	34	22	14	17	16	11	18	19	14	51	43	14	10	10	14	28	31	12	31	28
	15	65	52	14	51	38	15	34	32	12	30	32	15	66	60	15	24	24	15	47	51	13	45	43
	16	79	69	15	68	56	16	54	53	13	45	46	16	79	75	16	44	45	16	67	70	14	60	58
	17	89	83	16	82	73	17	73	72	14	60	61	17	89	86	17	65	67	17	82	85	15	73	71
	18	95	92	17	91	85	18	87	87	15	73	74	18	95	93	18	83	84	18	92	94	16	84	83
Moderate				18	96	93				16	84	85										17	91	91
										17	91	92										18	96	95
										18	96	96												
	6-7	0	0	6-8	0	0	6-9	0	0	6-8	2	2	6	0	0	6-9	0	0	6-9	0	0	6	0	0
	8	0	0	9	1	2	10	0	0	9	5	4	7-8	0	0	10-11	0	0	10	0	0	7	0	0
	9	1	1	10	4	5	11	0	0	10	10	9	9	2	2	12	0	0	11	1	1	8	2	1
	10	4	5	11	10	13	12	2	2	11	18	18	10	5	6	13	3	2	12	5	4	9	5	4
	11	9	11	12	20	25	13	7	6	12	30	29	11	11	13	14	10	7	13	13	11	10	10	9
	12	19	23	13	34	41	14	17	16	13	45	43	12	21	25	15	24	19	14	28	24	11	19	17
	13	33	38	14	51	59	15	34	32	14	60	58	13	35	40	16	44	37	15	47	42	12	31	28
Severe	14	49	56	15	68	75	16	54	53	15	73	72	14	51	57	17	65	60	16	67	62	13	45	43
	15	65	73	16	82	87	17	73	72	16	84	83	15	66	73	18	83	79	17	82	79	14	60	58
	16	79	85	17	91	94	18	87	87	17	91	91	16	79	85				18	92	90	15	73	71
	17	89	93	18	96	98				18	96	95	17	89	93							16	84	83
	18	95	97										18	95	97							17	91	91
																						18	96	95
	6-8	0	3	6-7	0	0	6-7	0	0	6-9	5	7	6-8	0	4	6-12	0	0	6-10	0	0	6	0	1
	9	1	8	8	0	1	8-9	0	0	10	10	14	9	2	9	13	3	3	11	1	2	7-8	2	6
	10	4	17	9	1	4	10-12	2	5	11	18	24	10	5	19	14	10	10	13	13	16	9	5	13
	11	9	30	10	4	11	13	7	14	12	30	37	11	11	33	15	24	24	14	28	31	10	10	23
	12	19	47	11	10	22	14	17	29	13	45	52	12	21	49	16	44	45	15	47	51	11	19	36
	13	33	65	12	20	38	15	34	49	14	60	67	13	35	66	17	65	67	16	67	70	12	31	51
	14	49	80	13	34	56	16	54	69	15	73	79	14	51	80	18	83	84	17	82	85	13	45	66
	15	65	90	14	51	73	17	73	84	16	84	88	15	66	89				18	92	94	14	60	78
	16	79	95	15	68	85	18	87	94	18	96	97	16	79	95							15	73	87
	18	95	99	16	82	93							18	95	99							16	84	93
				17	91	97																17	91	97
				18	96	99																18	96	98

Table 7
Simulated values of an evaluated person in the POS

Factor	Direct punctuation
Personal development	14
Self determination	15
Interpersonal relationships	13
Social inclusion	17
Rights	14
Emotional	16
Physic	13
Material wellbeing	17

Table 8
Direct centile and corrected values of the data from the table 7

Factor	Direct score	Direct centile	Corrected centile
Personal development	14	49	35
Self determination	15	68	55
Interpersonal relationships	13	7	6
Social inclusion	17	91	89
Rights	14	51	20
Emotional	16	44	69
Physic	13	13	16
Material wellbeing	17	91	91

References

- Balboni, G., Coscarelli, A., Giunti, G., & Schalock, R. L. (2013). The assessment of the quality of life of adults with intellectual disability: The use of self-report and report of others assessment strategies. *Research in Developmental Disabilities, 34*(11), 4248-4254. <https://doi.org/10.1016/j.ridd.2013.09.009>
- Carbó-Carreté, M., Guàrdia-Olmos, J., & Giné, C. (2015). Psychometric properties of the Spanish version of the Personal Outcomes Scale. *International Journal of Clinical and Health Psychology, 15*(3), 236-252. <https://doi.org/10.1016/j.ijchp.2015.04.002>
- Carbó-Carreté, M., Guàrdia-Olmos, J., Peró-Cebollero, M., & Giné, C. (2019). Impact of the intellectual disability severity in the Spanish Personal Outcomes Scale. *Journal of Intellectual Disability Research, 63*(10), 1221-1233. <https://doi.org/10.1111/jir.12634>
- Claes, C., Vandevelde, S., Van Hove, G., van Loon, J., Verschelden, G., & Schalock, R.L. (2012). Relationship between self-report and proxy ratings on assessed personal quality of life-related outcomes. *Journal of Policy and Practice in Intellectual Disabilities, 9*(3), 159-165. <https://doi.org/10.1111/j.1741-1130.2012.00353.x>
- Finlay, W.M.L., & Lyons, E. (2002). Acquiescence in interviews with people who have mental retardation. *Mental Retardation, 40*(1), 14-29. [https://doi.org/10.1352/0047-6765\(2002\)040<0014:AIWPW>2.0.CO;2](https://doi.org/10.1352/0047-6765(2002)040<0014:AIWPW>2.0.CO;2)
- Gómez, L. E., Alcedo, M. A., Arias, B., Fontanil, Y., Arias, V.B., Monsalve, M. A., & Verdugo, M. A. (2016). A new scale for the measurement of quality of life in children with intellectual disability. *Research in Developmental Disabilities, 53-54*, 399-410. <https://doi.org/10.1016/j.ridd.2016.03.005>
- Gómez, L.E., Arias, B., Verdugo, M.A., Tassé, M.J., & Brown, I. (2015). Operationalisation of quality of life for adults with severe disabilities. *Journal of Intellectual Disability Research, 59*(19), 924-941. <https://doi.org/10.1111/jir.12204>
- Gómez, L. E., Peña, E., Arias, B., & Verdugo, M. A. (2016). Impact of individual and organizational variables on quality of life. *Social Indicators Research, 125*(2), 649-664. <https://doi.org/10.1007/s11205-014-0857-6>
- Guàrdia-Olmos, J., Carbó-Carreté, M., Peró-Cebollero, M., & Giné, C. (2017). Item response theory analysis applied to the Spanish version of the Personal Outcomes Scale. *Journal of Intellectual Disability Research, 61*(11), 1021-1033. <https://doi.org/10.1111/jir.12407>
- Guàrdia-Olmos, J., Peró-Cebollero, M., Rivera, D., & Arango-Lasprilla, J.C. (2015). Methodology for the development of normative data for ten Spanish-language neuropsychological tests in eleven Latin American countries. *NeuroRehabilitation, 37*(4), 493-499. <https://doi.org/10.3233/NRE-151277>
- Ouellette-Kuntz, H., & McCreary, B. (1996). Quality of life assessment for people with severe developmental disabilities. In R. Renwick, I. Brown & M. Nagler (Eds.), *Quality of Life in Health Promotion and Rehabilitation. Conceptual Approaches, Issues and Applications* (pp. 268-278). Sage Publications.
- Perry, J., & Felce, D. (2002). Subjective and objective quality of life assessment: Responsiveness, response bias, and resident: Proxy concordance. *Mental Retardation, 40*(6), 445-456. [https://doi.org.sire.ub.edu/10.1352/0047-6765\(2002\)040<0445:SAOQOL>2.0.CO;2](https://doi.org.sire.ub.edu/10.1352/0047-6765(2002)040<0445:SAOQOL>2.0.CO;2)
- Perry, J., & Felce, D. (2005). Factors associated with outcomes in community group homes. *American Journal on Mental Retardation, 110*(2), 121-135. [https://doi.org/10.1352/0895-8017\(2005\)110<121:FAWOIC>2.0.CO;2](https://doi.org/10.1352/0895-8017(2005)110<121:FAWOIC>2.0.CO;2)
- Petry K., Maes B., & Vlaskamp C. (2009). Psychometric evaluation of a questionnaire to measure the quality of life of people with profound multiple disabilities (QOL-PMD). *Research in Developmental Disabilities, 30*(6), 1326-1336. <https://doi.org/10.1016/j.ridd.2009.05.009>
- Schmidt, S., Power, M., Green, A., Lucas-Carrasco, R., Eser, E., Dragomirecka, E., & Fleck, M. (2010). Self and proxy rating of quality of life in adults with intellectual disabilities: Results from the DISQOL study. *Research in Developmental Disabilities, 31*(5), 1015-1026. <https://doi.org/10.1016/j.ridd.2010.04.013>
- Schwartz, C., & Rabinovitz, S. (2003). Life satisfaction of people with intellectual disability living in community residences: Perceptions of the residents, their parents and staff members. *Journal of Intellectual Disability Research, 47*(2), 75-84. <https://doi.org/10.1046/j.1365-2788.2003.00436.x>
- Schalock, R.L., Baker, A., Claes, C., González, J., Malatest, R., van Loon, J., Verdugo, M.A., & Wesley, G. (2018). The use of quality of life scores for monitoring and reporting, quality improvement, and research. *Journal of Policy and Practice in Intellectual Disabilities, 15*(3), 176-182. <https://doi.org/10.1111/jppi.12250>
- Schalock, R.L., & Felce, D. (2004). Quality of life and subjective well-being: Conceptual and measurement issues. In E. Emerson, C. Hatton, T. Thompson & T.R. Parmenter (Eds.), *International handbook of applied research in intellectual disabilities* (pp. 261-279). Wiley.
- Schalock, R.L., Gardner, J.F., & Bradley, V.J. (2007). *Quality of Life for People with Intellectual and Other Developmental Disabilities: Applications Across Individuals, Organizations, Communities, and Systems*. American Association on Intellectual and Developmental Disabilities.
- Schalock, R.L., Luckasson, R., & Tasse, M.J. (2019). The contemporary view of intellectual and developmental disabilities: Implications for psychologists. *Psicothema, 31*(3), 223-228. <https://doi.org/10.7334/psicothema2019.119>
- Schalock, R.L., & Verdugo, M. A. (2002). *Handbook on quality of life for human service practitioners*. Washington, DC: American Association on Mental Retardation.
- Schalock, R.L., Verdugo, M. A., Gómez, L.E., & Reinders, H.S. (2016). Moving us toward a theory of individual quality of life. *American Journal on Intellectual and Developmental Disabilities, 121*(1), 1-12. <https://doi.org/10.1352/1944-7558-121.1.1>
- Simões, C., Santos, S., & Biscaia, R. (2016). Validation of the Portuguese version of the Personal Outcomes Scale. *International Journal of Clinical and Health Psychology, 16*(2), 186-200. <https://doi.org/10.1016/j.ijchp.2015.11.002>

- Simões, C., Santos, S., & Claes, C. (2015). Quality of life assessment in intellectual disabilities: The Escala Pessoal de Resultados versus the World Health Quality of Life-BREF. *Research in Developmental Disabilities*, 37, 171-181. <https://doi.org/10.1016/j.ridd.2014.11.010>
- Van der Elst, W., Van Boxtel, M. P. J., Van Breukelen, G. J. P., & Jolles, J. (2006). Normative data for the animal, profession and letter M naming verbal fluency tests for Dutch speaking participants and the effects of age, education, and sex. *Journal of the International Neuropsychological Society*, 12(1), 80-89. <https://doi.org/10.1017/S1355617706060115>
- Van der Elst, W., Hurks, P., Wassenberg, R., Meijs, C., & Jolles, J. (2011). Animal verbal fluency and design fluency in schoolaged children: Effects of age, sex, and mean level of parental education, and regression-based normative data. *Journal of Clinical and Experimental Neuropsychology*, 33(9), 1005-1015. <https://doi.org/10.1080/13803395.2011.589509>
- Van der Elst, W., Dekker, S., Hurks, P., & Jolles, J. (2012). The letter digit substitution test: Demographic influences and regression-based normative data for school-aged children. *Archives of Clinical Neuropsychology*, 27(4), 433-439. <https://doi.org/10.1093/arclin/acs045>
- Verdugo, M.A., Gómez, L.E., Arias, B., Navas, P., & Schalock, R.L. (2014). Measuring quality of life in persons with intellectual and multiple disabilities: Validation of the San Martín Scale. *Research in Developmental Disabilities*, 35(1), 75-86. <https://doi.org/10.1016/j.ridd.2013.10.025>
- Wang, M., Schalock, R.L., Verdugo, M.A., & Jenaro, C. (2010). Examining the factor structure and hierarchical nature of the quality of life construct. *American Journal of Intellectual and Developmental Disabilities*, 115(3), 218-233. <https://doi.org/10.1352/1944-7558-115.3.218>