This is a peer-reviewed, accepted author manuscript of the following research article: Evans, S, Cooney, G, Young, D, O'Donnell, U & Tiffin, PA 2025, 'Measuring the care needs of young people with intellectual difficulties: construct validity of the learning disability vulnerability assessment scale and utility in establish the care needs of young people', *Journal of Intellectual Disabilities*. https://doi.org/10.1177/17446295251392108

Measuring the Care Needs of Young People with Intellectual Difficulties: Construct validity of the Learning Disability Vulnerability Assessment Scale (LDVAS) and utility in establish the care needs of young people

Abstract

Despite recent proliferation of risk assessment measures in CAMHS there has been limited research into their properties. The FACE CARAS young person's risk assessment toolkit includes a measure of vulnerability- the Learning Disability Vulnerability Assessment Scale (LD-VAS). This has demonstrated good inter-rater reliability but construct validation has not previously been demonstrated. The study had two aims to demonstrate construct validity and to determine how effectively scoring on the tool maps onto and quantifies care needs. Data were accessed for LD-VAS ratings for 143 young people, the dimensionality of the scale ratings was assessed using a parallel analysis and confirmatory factor analysis (CFA). The ability of scores to predict care level was modelled using discriminant function analysis and multinomial logistic regression. The CFA results showed a good fit of the data to a single factor model. The discriminant function analysis suggested several scoring profiles existed, relating to care level. The multinomial regression results showed the scores could significantly differentiate between those in the lowest and higher intensity care categories. The LD-VAS appears to have construct validity and is potentially useful in rationalising decision-making regarding care-provision for children affected by learning disability.

Introduction

Vulnerability is a concept that has largely avoided definition (Bracken-Roche, Bell, MacDonald and Racine 2017, Zarowsky, Haddad and Nguyen 2013). A useful definition of use in other healthcare settings provided by Wardrop, Rance and Chaboyer 2021 define it as a mix of *intrinsic factors* in the individual, such as cognitive deficits, and *extrinsic factors,* related to deficits in the patients' environment such as parental illness. Psychometric measurement of the concept had previously been attempted (Fischof, Nightingale and Ianotta 2001) but these efforts were not successful.

Findings and from Public Inquiries following critical incidents most notably the Victoria Climbie inquiry (Laming 2003) led to a proliferation in risk assessment measures in children's services in UK children's services in the early years of the twenty-first century. The Learning Disability Vulnerability Assessment Scale (LD-VAS) was developed as a component of the FACE – Child and Adolescent Risk Assessment toolkit. It became a measure commonly used CAMHS populations to quantify and define the risks from and to patients. The concept of vulnerability is central to these measures, but there is little research to explore and define vulnerability as a construct prior to the publication and implementation of the LD-VAS and it's partner scale the Vulnerability Assessment Scale (VAS).

Whilst there is no research specific to the LD-VAS scale the FACE-CARAS toolkit, overall has shown high inter-rater reliability (Tiffin, Kitchen and Weir 2015). The tool also showed good predictive validity in determining future risk related behaviour (Evans, Young, and Tiffin 2019). However, it was noted that practitioners often abbreviate the method of use of the FACE-CARAS cope with the clinical demands placed on them frequently relying on completing the summary 'risk profile' checklist rather than subscales of the toolkit. Consequently, the particular psychometric properties of the LD-VAS scale are largely unknown and it is essential to establish if the scale is measuring a definable construct, and whether the resulting scores map the real-world needs of the patients.

The care packages available to individual children and their families in Glasgow are currently established through multiagency discussion with the helping team and family. These are informed by assessments and existing diagnoses, but no specific measurement is currently utilised, with decision making solely through round table discussion meetings, and this model of decision making is likely to be similar throughout the UK. There are concerns that the factors that are consistently found to negatively influence group decision making (Sunstein and Hastie 2015, 2014, Morewedge and Kahneman 2010) that are likely to negatively impact on this form of decision making. Kahneman, Sibony, and Sunstein (2021) have discussed these factors as *bias* and *noise* where decisions in a group can be influenced by a number of extraneous factors leading to faulty judgement.

One of the initial uses of risk assessment measures was to determine resource allocation in penal systems (Quay 1983) and defining needs of individuals prevents litigation and focus services on individual's needs (Costaris, Peterson-Badali and Skilling 2022). Across all settings risk assessment research has shown that clinical decision making is inaccurate unless guided by the use of objective statistical information such as base rates and structured judgement (See Harris, Rice, Quinsey and Cormier 2015, Grove and Meehl 1996, Grove 2005). The work of Grove and others demonstrated that clinical judgement on its own whether in a group or individual is inherently flawed and this effect has been replicated in numerous settings including child protection decisions (Arruabarrena, Paúl, Indias and García 2017). Shlonsky (2015) and Shlonsky and Wagner (2005) have commented on the difficulties in integration of statistically based risk assessment protocols into decision making in children's services and the partial adoption of these measures.

Decision making in relation to the care of children with complex needs or additional support needs has rightly spoken about the need to empower families and service users and to place them at the heart of decision making (Epps and Jackson 2000, Jansen, van der Putten and Vlaskamp 2013, McNeilly, McDonald and Kelly 2017). Provision of support for families coping with the additional stress of disability is objectively seen as a positive enabling improvement in family functioning and this result is stable across cultures (Aldersey, Francis, Haines, & Chiu 2017, Fisher, Bellon Lawn and Lennon 2020, Panczykowski, Murphy, Heyward, & Hupp, 2022). The challenge for clinicians is the integration of accurate risk management for protection of children and empowerment with quality of life of families.

There is an inherent value in objectively measuring vulnerabilities within support systems. This should help ensure equity of provision with the limitations in funding and service provision. When there have been critical incidents the lack of support to a family is seen as a causal factor in harm to the child (again see Laming 2003 and other reviews). Families and children who are not able to effectively advocate for themselves or who lack effective advocates, will benefit from objective measurement and classification of their difficulties. Consequently, the aim of the current study was to gain evidence relating to the psychometric properties, and hence potential utility of the LD-VAS. The objectives were twofold. First, to understand the dimensionality and any patterns in the response structure of the instrument. The results from these analyses could inform how the scores were best summarised. Second, to gain evidence, or otherwise of the validity of the scores from the LD-VAS. That is, whether the scores related to other, external measures of care need. The study therefore was aimed at understanding whether the LD-VAS can fulfil its intended role in assessing the vulnerability and hence care needs of young people affected by intellectual disability.

Methods

The Learning Disability Vulnerability Assessment Scale

The LD-VAS scale is used as part of the FACE™ Child and Adolescent Risk Assessment Scale toolkit and is used to determine vulnerability in populations of children and adolescents with learning disabilities. It is composed of 20 items divided into three sections of *child / adolescent factors*, *care factors*, *parent / carer* factors. It should be noted that these sections reflect content domains rather than statistically derived dimensions. Items include issues related to the child's communication impairment, level of physical impairment or substance-use and mental health difficulties of carers. Individual risk factors are coded from on an ordinal scale from 0-3 with specific criteria used to determine the level of risk. The tool was developed through literature reviews and focus groups with clinicians with preliminary evaluation of reliability and face validity completed prior to implementation (Daniel, Weir and Tiffin 2013). As discussed above establishing predictive validity was only completed after implementation.

Sample

In NHS Greater Glasgow and Clyde Child and Adolescent Mental Health Service Learning Disability Pathway the scale is completed for each young person accepted by the service. A review of completed records in NHS Greater Glasgow and Clyde found 322 completed forms for the scale. Exclusion criteria were applied limiting to one rating per patient, and scales with three or more items rated as unknown were also excluded from the sample. If there were one or two items missing these were dual rated from information in the case files by clinicians involved in this research. This left 143 separate ratings of patient scores which all related to separate patients. All ratings were completed by qualified staff.

Nursing staff had completed the vast majority of the ratings with some scales being completed by psychiatry and clinical psychology staff.

The cases were also categorised into four levels of care provision initially through reviewing case notes and then ratified by a Learning Disability Child and Adolescent Mental Health Service team member. Non blind ratings had agreement through weighted Kappa of κ=0.82 priority was made to gain a shared view for analysis. A further blind rating was completed significantly after the initial ratings using a clinician familiar with the cases but blind to other ratings and this produced weighted Kappa of κ=0.42 (Z=7.03 P<0.0000). The time delay is likely to have affected the ratings although these are still in acceptable range they can be improved through altering the weighting function. This classification system will be returned to later in the article.

- *A- Cared for by the family with limited input from external agencies*
- *B- Cared for by the family with significant input from third sector services*
- *C- Cared for by the family with substantial periods in respite placements*
- D- *Primarily cared for in residential staffed care placements*

These ratings reflected the level of care provided to the young person at the time of assessment but were done blind of the subsequent statistical analysis.

In addition four dichotomous constructs were scored that it was thought would be predictive of care provided. Whether the young person suffered from *seizures*, displayed significant *self-harm and self-injury*, was *violent* to the care provider or parent, lastly whether the clinician had utilised the *additional item* in the measure and the nature of this risk factor was recorded.

Statistical Analysis

Consideration was given to using a sum of scaled scores method to analyse the data where the sum of all the item scores could be used to classify the patients. However, there are a number of items in the scale that are linked to the current issues of abuse and neglect and these items would not be present for children in full time residential care unless there are comprehensive failures in the care placement meaning scores would go down rather than up with the highest and most effective care packages. Consequently, the focus is on patterns of scores and associations between individual items to develop a profile of young people

Initial analysis of the database was completed in the University of Strathclyde and subsequent analysis took place in the University of York. A parallel analysis (Horn1965), adapted for categorical data (Timmerman and Lorenzo-Seva 2011) was used to establish the maximum number of plausible latent variables underlying the response data. This was implemented in the FACTOR v12.04.05 software package (Lorenzo-Seva and Ferrando 2021). This was followed by an ordinal Confirmatory Factor Analysis (CFA) to confirm the factor structure of the scale, implemented in MPlus v8.8 (Muthen and Muthen 2017). The use of full information maximum likelihood is considered optimum in ordinal factor analysis and was used to estimate the factor loadings and residual variances (Joreskog & Moustaki 2006). However, the analysis was repeated robust weighted least squares (WLSMV) to derive the full range of fit indices. Discriminant function analysis was to determine patterns within the data could be matched onto the levels of care with further analysis utilising a machine learning approach.

Lastly, the ability of the average scores derived from the LD-VAS to predict the level of actual care status was modelled using multinomial logistic regression. In this case the lowest highest intensity of care setting (A- Cared for by the family with limited external input) was coded ‘1’ (D- residential setting). Similarly, the highest intensity of care setting (D- residential setting) was coded a ‘4’, with the

intermediate care categories '2' and '3'. The base category was swapped twice when conducting the multinomial regression. This was to be able to compare all combinations of care level (e.g. A vs B, C vs D etc).

Results

Factor Analyses

The findings from the parallel analysis indicated there is one main factor ('perceived vulnerability') underlying the patterns of scores. This was because only one factor explained more variance in the response data than dimensions present in the pseudorandom data generated. This hypothesised unidimensional model was then tested using an ordinal CFA. The data showed a good fit to the unidimensional factor model. The Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) were both 0.97 (with 0.95 being conventionally taken as indicating 'good' fit). The Root Mean Squared Error of Approximation (RMSEA) value was 0.048, and the Standardised Root Mean Square Residual (SRMR) was 0.114. The chi-squared value was 201.622 with 152 degrees of freedom and the associated p value for this was 0.004.

Assessing the standardised factor loadings; all items, aside from two ('physical impairment' and 'community difficulties') had statistically significant, and more importantly, substantively meaningful loadings on the single latent variable. These are shown in Table 1.

LD VAS Item	Standardised loadings (* significant at 5% level)	Residual variance
Physical Impairment	0.006	0.994
Community Difficulties	0.013	0.987
Educational Stability	0.298*	0.702
Vulnerability to Exploitation	0.578*	0.422
History of Abuse and Neglect	0.75*	0.250
Current Indications of Abuse or Neglect	0.775*	0.225
Safeguarding Concerns	0.631*	0.369
Geographical Mobility	0.471*	0.529
Socio-Economic Stressors	0.582*	0.418
Attachment or Child Carer Relationship	0.682*	0.318
Exposure to Domestic Violence	0.595*	0.405
Care Boundaries	0.62*	0.380
Carer Engagement with Professionals	0.63*	0.370
Carer Learning Disability	0.555*	0.445
Carer Antisocial Traits	0.669*	0.331
Carer Physical Health Problems	0.211*	0.789
Carer Mental Health Problems	0.381*	0.619
Carer Substance Use	0.493*	0.507
Medical Concordance	0.526*	0.474

Table 1. Standardised loadings of the LD-VAS items on a single factor, along with the associated residual ('error') variances.

Internal reliability-consistency was measured throught theMcDonald's Omega value (which accounts for varying factor loadings) and found to be 0.904. The Cronbach alpha value for the scale was 0.86,

though this reliability metric may be less appropriate for scales with categorical indicators and where factor loadings vary more substantially. Thus, the findings from the factor analyses supported the use of a single summary score as an overall indicator of perceived vulnerability in a young person affected by intellectual disability. However, in order to evaluate whether there were any subtle patterns of scoring within this general dimension, that related to overall level of care, a discriminant function analysis was also conducted.

Discriminant Function Analysis

The levels of need could be linked to specific pattern scores that define the levels of care.

	A	B	C	D
Constant	-3.3104	-5.8867	-7.9032	-9.8659
Physical Impairment	1.2319	1.6586	2.0404	1.3675
Communication Difficulties	2.6367	3.2269	3.7901	3.3582
Educational Stability	-0.3347	-0.7846	-0.3943	0.1469
Vulnerability to Exploitation	0.3738	0.4194	0.2335	1.3638
History of Abuse Neglect	0.1660	0.4311	0.2571	2.1913
Current Indications of Abuse or	0.4312	1.5089	2.8727	-2.9842
Safeguarding Concerns	0.7670	1.0084	1.0703	2.0778
Geographical Mobility	-0.1653	-1.2849	-0.6979	3.7979
Socio-economic Stressors	-0.1819	0.8984	-0.3208	-1.4940
Attachment or Child Carer Relat	0.2609	0.7216	0.7949	0.7728
Exposure to Domestic Violence	-0.7356	-1.3588	-1.1404	-2.3972
Care Boundaries	0.0641	0.5294	-0.2240	0.2770
Carer Engagement with Professionals	-0.4630	-0.5689	-0.6240	0.8071
Carer Intellectual Disability	0.1299	-0.3242	-1.3133	0.0174
Carer Antisocial Traits	0.0735	-0.4852	0.3640	1.0009
Carer Physical Health Problems	0.5433	0.7409	1.2168	0.4279
Carer Mental Health Problems	0.5485	0.8765	1.0853	0.5971
Carer Substance Use	-0.4116	-1.7827	-1.8736	-1.6064
Medical Concordance	-0.0781	0.0503	0.7135	-0.5688

Table 2. Results for groups of a linear discriminant function analysis.

The key characteristics of the population considered to have a “Type A” profile are high negative loadings to exposure to domestic abuse, and carer substance abuse i.e. lower levels than other parts of the sample. Similarly safeguarding concerns are lower than in other categories. Extrinsic factors tend to be absent with levels of disability in the young person as the key risk factor. “Type B” care profiles were defined by professional concern in care boundaries and socio-economic stressors being

experienced by the family. “Type C” profiles were individuals who had support and periods of respite care. These showed variance in increasing intrinsic factors to the individual such as *communication difficulties* and *physical impairment*. There are also decreased resilience in the care provider with physical and mental health problems being apparent, and poorer concordance with medical regimes and appointments. “Type D” profiles represent young people in full time or near full time residential care. This is associated with increasing evidence of parental antisocial traits, but low levels of exposure to domestic violence which is likely to be explained by residing in regulated care settings where they would be protected from ongoing domestic violence. There is an increase in geographical mobility, but this is most likely to be linked to changes in care placement. There were strong positive associations with past difficulties in engagement with professionals by carers and a history of vulnerability and past abuse and neglect.

Summary of Classification

The classification maps the ability of the scale to match against the known groups e.g. the levels of care being provided. Categorisation of the sample using patterns of data in the scale provided accurate classification in 56% of cases (N141, Correct 79, Proportion 0.56). When the problematic “Other Risk Factor” is added i.e. a risk factor the clinician has added that is not included in the scale is added prediction improves to 60%.

	True Group			
Put into Group	A	B	C	D
A	47	8	6	0
B	9	12	7	2
C	7	9	17	3
D	3	1	1	9
Total N	66	30	31	14
N correct	47	12	17	9
Proportion	0.712	0.400	0.548	0.643

Table 4. [Classification of cases utilising additional "Other" factor]

A review of the type of issue being added by the clinician often found information about Autism diagnosis or other issues that overlapped with other items rated in the scale such as "Presence of Communication Impairment". It is likely that the improvement relates to added diligence of the clinician in completing the scale rather than the specific risk factor being identified.

Predictive validity

The results from the multinomial logistic regression predicting care level from the average score from the LD-VAS is shown in Table 3. As can be seen from the results in this table, the scores were statistically significantly able to predict care level. However, when the base category was swapped from 'A' (family care with minimal external support) it can be seen that the LD-VAS scores showed did statistically significance in discriminating between pairs of the other care levels (e.g. B vs C). Some caution should be exercised in interpreting this latter finding as the numbers of individuals in care levels other than 'A' were relatively small and this may reflect on a lack of statistical power to show differences between these smaller groupings.

Comparison between care levels (summarised): *A- Cared for by family with limited external support (N=66)* *B- Cared for with significant external input (N=30)* *C- Substantial periods in respite placements (N=31)* D- *Primarily cared for in residential placement* (N-15)	Relative Risk Ratio	p value	lower 95% confidence interval for RRR	upper 95% confidence interval for RRR
A vs B	21.45	<0.001	3.89	118.39
A vs C	34.69	<0.001	6.33	189.94
A vs D	76.55	<0.001	11.69	501.20
B vs C	1.62	0.46	0.45	5.83
B vs D	3.57	0.08	0.85	14.99
C vs D	2.21	0.24	0.59	8.28

Table 5. Results from a multinomial logistic regression model, predicting care level from the average LD-VAS scores.

Discussion

The research explored whether the tool was measuring a definable construct or constructs and if it is able to distinguish the levels of need in the families. The results provide evidence that the scale has utility in classifying the support needs of young people and that there is an identifiable unitary construct (assumed to be 'perceived vulnerability'). In the aegis of the NHS Glasgow those most vulnerable were generally (but not entirely) provided with higher levels of support than those with lower vulnerability. Increasing levels of care were linked to increases in levels of intrinsic factors such as communication impairments and greater extrinsic factors such as parental neglect and abuse.

Factor analysis of the scores indicate that the scale should be generally understood as measuring a single definable construct. However, there may be a fractal aspect to the scores, with some subtle distinctions in facets of vulnerability detected by the tool as evidenced by the discriminant function analysis. Indeed, the patterns observed via the discriminant function analysis match well with the definitions of vulnerability developed by Wardrop et al (2021) in an emergency room setting. Here vulnerability at lower levels was characterised by *intrinsic* disability in the individual. The movement to higher levels of care is linked to *extrinsic* factors where there are factors in the environments such as parental substance use or antisocial traits. However, it is not clear at present whether summarising the scores as more than just a unitary summary score (total or average) could specifically improve the usefulness of the LD-VAS. The ambiguity of the core meaning of the term vulnerability will remain, as clinicians will continue to use the term with subjective meaning. The LD VAS advances a common understanding of language in that the items of the scale in effect define the construct in this population. It is hoped to form this into a guidance document then prospectively test the utility for the staff group who would be utilising the tool.

Strengths and limitations

This preliminary analysis provides evidence of the *field validity* (Jeandarme, Pouls, De Laender, Oei, and Bogaerts 2017, Johnson, Clancy and Bastian 2015) of the LD-VAS. The patterns evident in this research show that clinicians are able to utilise the tool to determine care needs even if it is not integral to the current decision making process. The vulnerabilities identified did seem, to map onto the actual care needs, as reflected by the current care situation, in a real-world setting. This provides more robust evidence of the utility of the scale compared to research conducted in university settings. In the latter access to data is often easier, though pressures on clinicians may be reduced compared to routine practice settings. There is an obvious potential fallacy that it would not be expected that all current care plans would accurately reflect the best use of available resources given the issues with clinical decision making discussed.. It would be hoped to try to replicate these findings with a larger data set across different care settings utilising the tool and amending the methodology. The reliability values were high, and in keeping with the original psychometric analysis of the FACE-CARAS suite of tools as a whole (Tiffin, Kitchen and Weir 2015).

The kappa (agreement) value in this study is an obvious limitation the initial non-blind rating was used to establish a level of care that could be tested against, while the blind rating was included following feedback on the research. Accuracy was affected by the length of time that elapsed (more than a year) before blind ratings were completed. The assessor had to retrospectively evaluate cases they were often actively involved in and this added to pressure on judgement, as discussed researchers had active and busy caseloads and this needed to be completed outside of clinical commitments. This

rating does not compare unfavourably with other studies (Smargiassi, Inchingolo, Chiappetta, Ciavarella, Lopatriello, Corbo, Margaritora and Richeldi 2019) and is within what other raters consider good inter-rater reliability (Kraemer, Kupfer, Clarke, Narrow and Regier (2012). Nevertheless, the variation is an issues of concern and it would be hoped to use contemporaneous blind ratings in the future.

It was noted that the LD-VAS scores were statistically significantly able to predict care level. However, in the multinomial logistic regression, when the base category was swapped from 'A' (family care with minimal external support) the scores did not statistically significantly discriminate between pairs of the other care levels (e.g. B vs C). Some caution in interpreting this latter finding. The numbers of individuals in care levels other than 'A' were relatively small. Thus, these latter results could have reflected a lack of statistical power to show differences between these smaller groupings. There were also a small number of cases that could not be used due to missing data. This is consistent with the difficulties of data gathering in real world settings. We would also recommend that a dichotomous categorisation of high (support within a family where there is a focus on intrinsic risk factors) and low (focus on care away from the family where there is a focus on extrinsic risk factors) is adopted in future research into the categorisation properties of the tool.

Implications for practice and directions for future research

It should be possible to utilise the scale to map the levels of need within a population. This could support the allocation of care and support in a more evidence based and rational manner. This is an equity issue given the limited social care budgets of providers. In reality, resources may sometimes be allocated based on the ability of the family, young person or other representatives to advocate for their care. The use of the LD-VAS may help reduce this process distorting the care resource allocation process. A helping team could also potentially use this scale to project future support needs. This projection could be based on current vulnerabilities identified in the population and attempt to provide support to prevent the use of residential care until wholly necessary. The scale has potential to inform decision making within a helping team around a young person's support needs

From previous work on group decision-making (Kahneman et al 2021) as well as individual variations between raters in scoring, it is unlikely that the LD-VAS will produce perfect prediction. However, the scores could help facilitate thoughtful discussions in professionals on care needs and vulnerability. It is likely that dissemination of research will increase value of the scale to managers and teams and drive-up standards.. A cursory review of who had completed the scales best, often found those that these team members demonstrated good record keeping and this reflected effective supervision practices in the team.

Further work, using larger samples, could replicate and extend the analyses from this current study. In particular, given the development context, the influence of age on the LD-VAS scoring, and predictive validity should be explored. For children with substantial disabilities, where independent living is not likely to ever be possible, extrinsic resilience factors may play a strong role in determining care need. This includes factors such as the declining health of carers and the support challenges of managing a young person of increased weight and physical size.

Education is required for end users in how to use the scale and understanding the significance of individual scores in decision making. There is also a process around exploring how this knowledge can then best be shared with the helping team including Social Work and Local Authority professionals. If

accuracy of decision-making increases, then further analysis may further advance or refine the scale, for service users, their advocates, and their families this will help to make decision making more transparent open and testable.

There will always be factors that cannot be quantified and will be specific to the interaction between the needs of the carers and the young person. There will also be variation in the degree of representation for a young person and their families, and this will in turn affect the care plan. Budgetary issues and pressures on service managers to provide for young people in areas of deprivation where services are oversubscribed, will also limit what can be provided. Consequently, there is a need to consider further research where we look at the tool's performance against ideal levels of care- rather than what is currently provided. As previously discussed, there is also an intent to consider how the tool functions against other health boards in the UK currently using the FACE-CARAS system. There is also an opportunity to consider analysis using Item Content Characteristics and Rasch Analysis to test latent traits in the data. If further properties of the scale can be established there is also the opportunity to explore whether the care provision for individuals is more equitable where the tool is used.

Conclusions

Vulnerability is an often-used word with little uniformity in meaning. or development as a concept, this research would indicate that the Learning Disability Vulnerability Assessment Scale has developed a way to categorise and quantify vulnerability, and this construct can be used to categorise care needs in a population. If this can be improved and refined, this can help ensure equitable provision of resources focussed on the needs of the young people and their families. For those young people who lack effective advocacy, this can help ensure just care and equitable distribution of assets. There is further work to integrate the tool into decision making around supports offered and increasing the size of the dataset and expansion of the research across the UK.

References

Aldersey, H. M., Francis, G. L., Haines, S. J., & Chiu, C. Y. (2017). Family Quality of Life in the Democratic Republic of the Congo. *Journal of Policy and Practice in Intellectual Disabilities*, *14*(1), 78–86. https://doi.org/10.1111/jppi.12189

Arruabarrena, Paúl, J., Indias, S., & García, M. (2017). Racial/ethnic and socio-economic biases in child maltreatment severity assessment in Spanish child protection services caseworkers. *Child & Family Social Work, 22(2), 575–586*. https://doi.org/10.1111/cfs.12271

Bracken-Roche, D., Bell, E., Macdonald, M. E., & Racine, E. (2017). The concept of 'vulnerability' in research ethics: an in-depth analysis of policies and guidelines. *Health Research Policy and Systems, 15(1), 8–8.* https://doi.org/10.1186/s12961-016-0164-6

Costaris, M., Peterson-Badali, M., & Skilling, T. A. (2022). A Latent Class Analysis of the Antisocial Attitudes Domain of the Youth Level of Service/Case Management Inventory. Criminal Justice and Behavior, 49(8), 1192-1209. https://doi.org/10.1177/00938548221084301

Daniel, M. R., Weir, S., & Tiffin, P. A. (2013). A novel CAMHS risk assessment system: clinicians' views. *Journal of Forensic Practice*, *15*(3), 182–191. https://doi.org/10.1108/JFP-09-2012-0011

Evans, S. A., Young, D., & Tiffin, P. A. (2019). Predictive validity and interrater reliability of the FACE-CARAS toolkit in a CAMHS setting. *Criminal Behaviour and Mental Health*, *29*(1), 47–56. https://doi.org/10.1002/cbm.2104

Epps, S., & Jackson, B. J. (Eds.). (2000). *Empowered families, successful children: Early intervention programs that work.* American Psychological Association. https://doi.org/10.1037/10354-000

Fischoff, B., Nightingale, E. O., Ianotta, J. G. (2001). *Adolescent risk and vulnerability: Concepts and measurement*. Washington. DC: National Academy Press.

Fisher, A., Bellon, M., Lawn, S., & Lennon, S. (2020) Brain injury, behaviour support, and family involvement: putting the pieces together and looking forward. *Disability and Rehabilitation, 42:9,* 1305-1315, DOI: 10.1080/09638288.2018.1522551

Grove, W. M. (2005). Clinical versus statistical prediction: The contribution of Paul E. Meehl. *Journal of Clinical Psychology*, *61*(10), 1233–1243. https://doi.org/10.1002/jclp.20179

Grove, W. M., & Meehl, P. E. (1996). Comparative efficiency of informal (subjective, impressionistic) and formal (mechanical, algorithmic) prediction procedures: The clinical–statistical controversy. *Psychology, Public Policy, and Law, 2*(2), 293–323. https://doi.org/10.1037/1076-8971.2.2.293

Harris, G. T., Rice, M. E., Quinsey, V. L. and Cormier, C. A. (2015) Violent offenders: Appraising and manging risk: Third edition. Washington. DC: American Psychological Association.

Hatton, C. M., Paton, L. M., McMillan, D., Cussens, J., Gilbody, S., and Tiffin, P. A. (2019) Predicting persistent depressive symptoms in older adults: A machine learning approach to personalised mental healthcare. *Journal of Affective Disorders, 246, 857-860.* doi: 10.1016/j.jad.2018.12.095.

Horn, J.L. (1965)A rationale and test for the number of factors in factor analysis. *Psychometrika* **30**, 179–185. https://doi.org/10.1007/BF02289447

Jansen, van der Putten, A. A. J., & Vlaskamp, C. (2013). What parents find important in the support of a child with profound intellectual and multiple disabilities. *Child: Care, Health & Development, 39(3),* 432–441. https://doi.org/10.1111/j.1365-2214.2012.01381.x

Jarvis, & Fraser, L. K. (2018). Comparing routine inpatient data and death records as a means of identifying children and young people with life-limiting conditions. *Palliative Medicine, 32(2), 543–553.* https://doi.org/10.1177/0269216317728432

Jeandarme, I., Pouls, C., De Laender, J., Oei, T. I., & Bogaerts, S. (2017). Field validity of the HCR-20 in forensic medium security units in Flanders. *Psychology, Crime & Law, 23(4), 305–322.* https://doi.org/10.1080/1068316X.2016.1258467

Johnson, W., Clancy, T., & Bastian, P. (2015). Child abuse/neglect risk assessment under field practice conditions: Tests of external and temporal validity and comparison with heart disease prediction. *Children and Youth Services Review*, *56*, 76–85. https://doi.org/10.1016/j.childyouth.2015.06.013

Jöreskog, K.G., & Moustaki, I. (2001). Factor Analysis of Ordinal Variables: A Comparison of Three Approaches. *Multivariate Behavioral Research, 36*, 347 - 387.

Kahneman, D., Sibony, O., & Sunstein, C. R. (2021). *Noise: A flaw in human judgment*. Harper Collins: London ISBN : 9780008309039

Kraemer, H. C., Kupfer, D. J., Clarke, D. E., Narrow, W. E., & Regier, D. A. (2012). DSM-5: How Reliable Is Reliable Enough? *The American Journal of Psychiatry*, *169*(1), 13–15. https://doi.org/10.1176/appi.ajp.2011.11010050

Laming, W. H. (2003). *The Victoria Climbie inquiry: Report of an inquiry by Lord Laming* (Cm 5730). The Stationery
Office. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/273183/5730.pd

Lorenzo-Seva, U. and P. J. Ferrando (2006). "FACTOR: A computer program to fit the exploratory factor analysis model." *Behavior Research Methods 38(1).* 88-91.

Lorenzo-Seva, U., & Ferrando, P. J. (2021). Not positive definite correlation matrices in exploratory item factor analysis: Causes, consequences and a proposed solution. *Structural Equation Modeling, 28*(1), 138–147. https://doi.org/10.1080/10705511.2020.1735393

McNeilly, P. Macdonald, G., & Kelly, B. (2017). The participation of parents of disabled children and young people in health and social care decisions. *Child : Care, Health & Development, 43(6),* 839–846. https://doi.org/10.1111/cch.12487

Morewedge, C. K., & Kahneman, D. (2010). Associative processes in intuitive judgment. Trends in *Cognitive Sciences, 14(10), 435–440.* https://doi.org/10.1016/j.tics.2010.07.004

Muthén, L. K., & Muthén, B. O. (1998-2017). Mplus User's Guide (Eighth Edition). Los Angeles, CA: Muthén & Muthén.

Panczykowski, H., Murphy, L., Heyward, K., & Hupp, T. (2022) Lived experiences of parents of children with disabilities engaged in a support group incorporating equines. *Research in Developmental Disabilities, 128, 104294,* https://doi.org/10.1016/j.ridd.2022.104294.

Quay, H. O. (1983). Standards for adult correctional institutions. *Washington, DC: Federal Bureau of Prisons*.

Shlonsky, A. (2015). Current status and prospects for improving decision making research in child protection: A commentary. *Child Abuse & Neglect*, *49*, 154–162. https://doi.org/10.1016/j.chiabu.2015.09.006

Shlonsky, A., & Wagner, D. (2005). The next step: Integrating actuarial risk assessment and clinical judgment into an evidence-based practice framework in CPS case management. *Children and Youth Services Review*, *27*(4), 409–427. https://doi.org/10.1016/j.childyouth.2004.11.007
Smargiassi, A., Inchingolo, R., Chiappetta, M., Ciavarella, L. P., Lopatriello, S., Corbo, G. M., Margaritora, S., & Richeldi, L. (2019). Agreement between chest ultrasonography and chest X-ray in patients who have undergone thoracic surgery: preliminary results. *Multidisciplinary Respiratory Medicine*, *14*(1), 9–9. https://doi.org/10.1186/s40248-019-0171-x

Sunstein, & Hastie, R. (2015). Garbage in, garbage out? Some micro sources of macro errors. *Journal of Institutional Economics, 11(3), 561–583.* https://doi.org/10.1017/S1744137413000398

Sunstein, C. R., & Hastie, R. (2014). Making Dumb Groups Smarter. In *Harvard business review* (Vol. 92, Number 12, pp. 91-98). Harvard Business Review.

Tiffin, P. A., Kitchen, C. E. W., & Weir, S. (2015). Innovations in Practice: Piloting a new child and adolescent risk assessment suite in the UK. *Child and Adolescent Mental Health*, *20*(4), 225–229. https://doi.org/10.1111/camh.12110

Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. Psychological Methods, 16(2), 209–220. https://doi.org/10.1037/a0023353

Wardrop, R., Crilly, J., Ranse, J., & Chaboyer, W. (2021). Vulnerability: A concept synthesis and its application to the Emergency Department. *International emergency nursing*, *54*, 100936. https://doi.org/10.1016/j.ienj.2020.100936

Zarowsky, C., Haddad, S., & Nguyen, V.-K. (2013). Beyond 'vulnerable groups': contexts and dynamics of vulnerability. *Global Health Promotion*, *20*(1_suppl), 3–9. https://doi.org/10.1177/1757975912470062