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Methodological approaches to the analyses of elder abuse screening measures: Application of latent variable measurement modeling to the WC-RAPS

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Abstract

While several elder abuse screens exist, few measure risk and none target long term support services.

The aims were to examine the psychometric properties of the Weinberg Center Risk and Abuse Prevention Screen (WC-RAPS), comparing approaches to modeling self-reported risk and abuse in relation to reported Adult Protective Services contacts.

Methods—The sample (n = 7,035), admissions to managed long-term care (79%) and short-term rehabilitation (20%), was primarily (66%) female, with mean age 77.6 (S.D. = 9.10); 7% each were African American and Latino and 12% Asian.

Latent variable models were used to examine measurement properties of six indicators of abuse and five of risk.

Results—Good model fit and stable subscale measurement models were observed across analyses. Reliability was > 0.80 across methods, and concurrent criterion validity estimates were as expected.

Conclusion—Evidence supported the reliability and concurrent criterion validity of the risk and abuse subscales in an ethnically diverse cohort.

Keywords

methods latent variable models; measurement; elder abuse; risk; screen

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INTRODUCTION

A prerequisite for intervention in elder abuse is screening. Risk of abuse and abuse are two related constructs for which screens may be developed. There are few screening measures for risk (Conrad & Conrad, 2018; Jackson & Hafemeister, 2011; Pillemer, Burnes, Riffin, & Lachs, 2016); however, more are available in the areas of abuse (McDonald & Collins, 2000), including financial vulnerability and exploitation, physical, verbal or emotional, and sexual abuse (Cohen, 2011; Lichtenberg, Teresi, Ocepek-Welikson, & Eimicke, 2017; Teresi, Ocepek-Welikson, & Lichtenberg, 2017; Teresi et al., 2013; Wigglesworth et al., 2010). Screening measures for physical findings in the emergency room (Rosen, Hargarten, Flomenbaum, & Platts-Mills, 2016) have been developed recently. While abuse screens have been reviewed for use across settings (e.g., Cohen, 2011; Fulmer, Guadagno, Bintondo-Dyer, & Connolly, 2004; Moyer, 2013; Yaffe, Wolfson, Lithwick, & Weiss, 2008); no screens exist for detection of individuals who may benefit from long term support services (LTSS) such as temporary shelter and related programs (Reingold, 2006).

Risk and abuse screening efforts are generally desired; however, there is the potential for unintended and untoward effects (Pillemer et al., 2016). False positives (over-identification of abuse or risk) could result in placement of older persons in institutional settings earlier than necessary (Wolfe, 2003) or in decreased autonomy. Thus, development of a screen for use in LTSS populations is timely.

Aims:

The aims of these analyses were to examine the psychometric properties of the Weinberg Center Risk and Abuse Prevention Screen (WC-RAPS), and to compare different approaches to modeling risk and abuse in relation to self-reported Adult Protective Services (APS) contacts.

Conceptual Model Underlying the Analyses:

The approach to the analyses was based on a conceptual model of the constructs represented by the abuse screening indicators. Based on the literature extant (Beach, Carpenter, Rosen, Sharps, & Gelles, 2016; Castle, Ferguson-Rome, & Teresi, 2015; Hamby, Smith, Mitchell, & Turner, 2016; Teresi et al., 2016), abuse and risk are best modeled as two separate latent variables. Abuse is defined as an act (or actions) and/or inaction(s) by a caretaker or a person who is in a trusted relationship with the elder, which causes intentional or unintentional harm or distress to the elder (Connolly, Brandl, & Breckman, 2014; Panel to Review Risk and Prevalence of Elder Abuse and Neglect, 2003; World Health Organization, 2002). Its manifestations include physical, verbal-psychological, emotional, and sexual abuse; financial and material exploitation; and neglect and abandonment (Fulmer et al., 2004; Lachs & Pillemer, 2004). Risk is defined as the presence of multidimensional, multilevel factors that may increase the probability of elder abuse (Cohen et al., 2006; Hamby et al., 2016). Risk factors for elder abuse include individual characteristics of the older person and of the caregiver relationship, as well as community, environmental and socio-cultural factors (Acierno, et al., 2010; Dong, 2015; Garre-Olmo et al., 2009; Lacher et al., 2016; Pillemer et al., 2016; Post et al., 2010).

It was posited that while correlated, risk and abuse represent distinct underlying latent concepts and are both uniquely associated with an observed concurrent indicator, self-reported “contacted by adult protective services”. Although risk might be posited to be causally prior to abuse, it is also possible that both occur concurrently. Given the cross-sectional data, we examined the influence of each concurrently; however, also specified was a model in which risk was considered as causally prior.

Methodological Considerations in Modeling Risk and Abuse—Carefully considered were several approaches to model specification. One approach to developing measures is to treat all items as observed indicators and key items against a criterion; in this case self-reported contact with APS was treated as an observed criterion variable. In such a case, a simple logistic regression analysis, examining the multivariate relationship of the items measuring each construct (abuse separate from risk) is performed (see Figure 1 for an example). This approach although included for completeness, is atheoretical in terms of examining hypothetical latent abuse and risk variables.

The other main approach to examination of indicators is that of latent variable modeling. One model is to specify all variables (risk and abuse) as correlated indicators induced by one latent variable. Another method is to specify a second order factor with one latent abuse variable comprised of two subordinate factors: abuse and risk. However, these models resulted in poor fit for this data set and were not presented; thus, the focus was on modeling risk and abuse separately.

Also considered was the treatment of specific indicators as formative/causal (e.g., the indicators caused the latent variable) and others as reflective/emergent (the latent variable caused or gave rise to the intercorrelations among the indicators; Bollen & Diamantopoulos, 2017a, 2017b; Bollen & Ting, 2000; Cohen, Cohen, Teresi, Marchi, & Velez, 1990; Hardin, 2017; Jones et al, 2011). However, this approach was contrary to our theory and was also non-informative regarding the nature of the hypothesized underlying latent variables (risk and abuse; see Borsboom, Mellenbergh, & van Heerden, 2003). Thus, the variables were tested as reflective/emergent as shown in Figures 2 3, and 4.

METHODS

Measure

The interview instrument was developed to identify self-reported risk and abuse with the aim of intervention and prevention of further occurrences through providing a shelter or community services for the abuse recipient. The measure was comprised of six self-reported indicators of abuse, five of risk, and one item used to assess concurrent criterion validity: a self-reported and later partially verified indicator of APS contact. For brevity, the terms abuse and risk will be used; however, it is emphasized that all indicators were self-reported.

The qualitative analyses used in the development of the measure are described in a companion paper Ramirez et al., 2018. All items were binary with values of 0 or 1 for affirmative response. The abuse items included the following: has anyone “refused help”, “taken things or money without permission”, “called you names or threatened to hurt you”,

and “touched you inappropriately”. Other items were “does anyone prevent you from seeing your friends” and “are you afraid of anyone”. Additionally, a question was asked about whether a respondent had ever been contacted by Adult Protective Services (APS). This variable, although self-reported, was also externally validated for a sample of cases. For the cases reported to have contact with APS, 80% were able to be verified as having APS contact. Although this latter item was included as a validation measure, it was also examined in exploratory analyses as part of the abuse scale.

Five items were indicators of risk of abuse: “trouble managing money”, “does a family member depend on you for support”, “living with family members who abuse drugs or alcohol”, “living with anyone with psychiatric illness”, and “multiple hospitalizations”.

Analyses

Latent variable models were used to examine the measurement properties of the risk and abuse subscales of the WC-RAPS.

Dimensionality, Model Assumptions, and Fit: Essential unidimensionality was examined through a merged exploratory and confirmatory factor analysis procedure (Asparouhov & Muthén, 2009) performed by fitting a unidimensional model with tetrachoric correlations using Mplus (Muthén & Muthén, 2011); the abuse and risk item sets were examined separately with principal component analysis to estimate the eigenvalues for each set. The confirmatory factor analyses (CFA) was performed specifying a unidimensional model within the abuse and risk item sets, respectively; however, a two-factor model was also examined within each item set. Model fit was evaluated using the Comparative Fit Index (CFI; Bentler, 1990) and the root mean square error of approximations (RMSEA). Unidimensionality was also assessed with the explained common variance (ECV; Sijtsma, 2009), estimated as the percent of observed variance explained (Reise, Moore, & Haviland, 2010).

Reliability: Several reliability estimates were examined. McDonald’s (McDonald, 1999) Omega Total (ω_t), a reliability estimate from a factor analysis model, based on the proportion of total common variance explained was calculated. Both classical methods such as Cronbach’s alpha (Cronbach, 1951) and ordinal alpha were examined; however, these estimates were calculated using tetrachoric correlations (Zumbo, Gadermann, & Zeisser, 2007). Classical estimates of Cronbach’s alpha are based on Pearson correlations which assume continuous variables. Tetrachoric correlations which are more appropriate for binary and skewed data assume that the underlying latent item indicator is continuous, but has been discretized at a threshold value (see Lord & Novick, 1968). Simulations have shown that ordinal alpha calculated with polychoric and tetrachoric correlations produce higher estimates that are closer to true values (Zumbo et al, 2007).

Concurrent Criterion Validity: Several regression and combined regression and latent variable models predicting the probability of self-reported APS contact were tested. In the first two regression models five risk and five abuse items (excluding one with very low frequency) were included in the model simultaneously as observed indicators with direct

effects to the APS contact variable. There were two estimation methods performed for each model: weighted least squares with mean and variance adjustment estimator (WLSMV) to obtain the regression coefficients (β) for the items, and maximum likelihood estimator (ML) solution to obtain the odds ratios associated with the APS variable (see Figures 1a and 1b).

An additional set of models (Figures 2a and 2b) estimated latent constructs from the abuse item set and the abuse risk item set treated separately. Observed risk or abuse indicators were posited to be correlated, with the correlations induced by the latent abuse or risk factor, respectively. The items were examined in a measurement model, while the relationship of the latent (abuse or risk) factor to the observed variable, self-reported APS contact was estimated simultaneously.

In the third model (Figure 3), both latent measurement models (risk and abuse) and the relationship of the two latent variables to APS were estimated in one model. This is a type of structural equation model in which simultaneous estimation is performed for the item sets using a measurement model and the relationships of the latent construct with the APS contact variable are estimated using the structural equation part of the model. In this model, abuse and risk latent variables were assumed to influence APS contact concurrently.

Finally, in the fourth model (Figure 4) both latent measurement models (risk and abuse) were modeled together. However, in this model the risk latent variable was posited to influence the abuse latent variable, which in turn influenced APS contacts. This is also a type of structural equation model with simultaneous estimation of the measurement model and the relationships of the latent constructs using the structural equation part of the model. A model not tested would be to treat abuse as a mediator of risk and APS contact. In one sensitivity analysis a path was specified from risk to APS directly; however, formal mediation was not tested because the mediation formulation did not fit our theoretical causal model.

Sensitivity Analyses: Final models were specified with the first item fixed to 1. Because of the low item prevalences, the items with the highest estimated loadings (usually corresponding to items with higher prevalences) were fixed at 1 for some measurement models; other models were tested fixing the variance to 1. When an item parameter is fixed at 1, the standardized solution for the parameter for the item that is fixed is estimated (as shown in the Tables and Figures). Results in terms of CFI, RMSEA, and chi-square values and the variances estimated in the first two examples (fixing the lamdas) were almost identical across models.

RESULTS

Sample Description

The sample included 7,035 individuals who were referred from community agencies or were screened at admission to several community-based LTSS programs, including managed long-term care (79%) and short-term rehabilitation (20%). Among those with valid responses, about half (45.6%) were living with family and 44.5% were living alone. A small percent were from assisted living or other long-term care settings. About 97% (7035/7248)

of referrals were screened. Screening occurred over the period of several years from January 2012 until May 2017.

Most of the sample (66%) was female. The mean age was 77.6 (S.D. = 9.10); the age ranged from age 31 to 102. The majority was Caucasian (74%), 12% were Asian, and 7% each were African American and Latino (see Table 1).

Item Frequencies

The prevalence of the affirmative response was low for all items, ranging from 5.7% (multiple hospitalizations) to 0.1% (does anyone prevent you from seeing friends).

Factor Analyses

Tests of Dimensionality—The abuse and risk items were examined separately, and the abuse items were also tested including all seven items as well as with five items. The item “does anyone prevent you from seeing friends”, with the lowest prevalence was not included in the final analytical models and the APS-report item was the dependent variable in the regression models. For all models, the second eigenvalue was below 1.0 and the ratios between the first and the second eigenvalues were 6.0 and 5.7 for the seven- and five item abuse sets, and 4.2 for the five-item risk of abuse set. These values were all above 4, the suggested threshold for essential unidimensionality. The percent of variance explained by the first eigenvalue was 64%, 71%, and 59%, respectively for the two abuse and the risk analyses. These results indicate that the item sets measuring the latent variables of abuse and risk were sufficiently unidimensional (see Table 2).

Confirmatory Factor Analyses—The CFA was performed for both constructs separately (Table 3). However, as hypothesized, a factor analysis of ten risk and abuse items specifying a two-factor solution (not shown) resulted in the five abuse items loading higher on the first factor (λ from 0.68 to 0.87) and lower on the second, while the risk items loaded higher (0.62 to 0.88) on the second factor than the first. These results lend confirmation to the conceptual formulation of treating risk and abuse separately.

Abuse: The results demonstrated excellent model fit for both versions (abuse 7-item factor, including APS in the model: CFI = 0.991, RMSEA = 0.011; abuse 5-item factor (excluding APS and the item with low frequency): CFI = 0.995, RMSEA = 0.009). Among the 7 abuse items the factor loadings (λ) ranged from 0.58 (“does anyone prevent you from seeing friends”) to 0.87 for the items, “anyone refused help” and “anyone has called you names or threatened to hurt you”. The underlying factor variance was 0.76 (s. e. = 0.08). For the 5-item set the λ 's ranged from 0.68 (“has anyone touched you inappropriately without your permission”) to 0.87 (“has anyone ever refused to help you with household chores, medications, appointments, etc.”)

Risk: The CFA results for the abuse risk factor were also excellent (CFI = 0.997, RMSEA = 0.007). The loadings on the abuse risk factor ranged from 0.63 (“multiple hospitalizations”) to 0.85 (“living with a family member who abuses drugs or alcohol”). The factor variance was 0.73 (s. e. = 0.10; see Table 3).

Reliability—Table 4 provides the results for the reliability analysis. As discussed, because of the low prevalence of the affirmative responses and the binary response categories, tetrachoric correlations were used in the estimation. Cronbach's alphas for both the 7-item and 5-item abuse sets were 0.90. The ordinal alpha for the 7-item set was 0.92, McDonald's omega total was 0.92 and explained common variance was 79.92. For the 5-item version of the abuse scale the values for ordinal alpha, McDonald's omega total and the ECV were very close to the 7-item version: 0.91, 0.91 and 76.91, respectively (see Table 4).

Cronbach's alpha for the 5-item risk set was 0.82; the ordinal alpha was 0.87, McDonald's omega total was 0.88 and the ECV was 85.36.

Concurrent Criterion Validity

Individual Abuse Predictors of APS Contact: Shown in Table 5 are the regression results predicting contact with APS. To obtain a solution the first item regression coefficient (β) was constrained to 1 in the WLSMV estimation. In the ML estimation all parameters were estimated free. The most salient significant predictor of self-reported APS contact in the abuse regression was the item, "Has anyone taken things or money that belong to you without permission?" ($\beta = 0.14$, s. e. = 0.21, odds ratio = 17.7, $p = <0.001$). The other significant predictor was the item, "Has anyone called you names or threatened to hurt you?" ($\beta = 0.07$, s. e. = 0.29, odds ratio = 5.7, $p = <0.012$). The remaining three items were not significant predictors of the APS contact variable (see Figure 1, Model 1a and Table 5).

Individual Risk Predictors of self-reported APS Contact: In this model, the second item regression coefficient was constrained to 1 in the WLSMV estimation because the model fit of the solution with the first item constrained was not adequate. In the ML estimation all parameters were estimated free. Among the items reflective of risk, the indicator, "Do you live with anyone or have close family members who abuse drugs or alcohol?" is the most predictive of the APS contact ($\beta = 0.08$, s. e. = 0.43, odds ratio = 12.5, $p < 0.001$). Other significant predictors were: "Have you had multiple hospitalizations in the last 6 months?" ($\beta = 0.17$, s. e. = 0.15, odds ratio = 7.5, $p < 0.001$) and "Does a family member depend on you for care, shelter, or financial support?" ($\beta = 0.13$, s. e. = 0.00), odds ratio = 4.4, $p = 0.002$; see Figure 1, Model 1b and Table 5).

The next set of models estimated latent constructs from the risk and abuse item sets individually and regressed the APS contact variable on the estimated constructs.

Relationship of Latent Abuse to APS: The latent variable abuse model is presented in Figure 2, Model 2a and Table 6. All estimates were standardized, the factor variance was set to 1 and all factor loadings were estimated free. The λ 's ranged from 0.67 (s. e. = 0.11) for the item, "Has anyone touched you inappropriately without your permission?" to 0.86 (s. e. = 0.04), for the items, "Has anyone ever refused to help you with household chores, medications, appointments, etc.", and "Has anyone called you names or threatened to hurt you". The standardized β coefficient of the abuse factor on APS was 0.68 (s. e. = 0.07) and the odds ratio was 7.2. The model fit was very good (CFI = 0.996, RMSEA = 0.006). The residual variances ranged from 0.25 to 0.55 for the items included in the abuse factor and was 0.54 for the APS variable.

Relationship of Latent Risk to APS: The model for the abuse risk item set is presented in Figure 2, Model 2b and Table 7. All estimates were standardized, the factor variance was set to 1 and all factor loadings were estimated as free. The λ 's ranged from 0.62 (s. e. = 0.04) for the item, "Do you have trouble managing your money (paying bills, accessing cash, etc.)?" to 0.88 (s. e. = 0.05) for the item, "Do you live with anyone or have close family members who abuse drugs or alcohol?". The standardized β coefficient of the risk of abuse factor on APS was 0.71 (s. e. = 0.07) and the odds ratio was 8.1. The model fit was very good (CFI = 0.993, RMSEA = 0.009). The residual variances ranged from 0.23 to 0.61 for the items included in the abuse risk factor and 0.50 for the APS variable.

Relationship of Latent Abuse and Risk to APS: Model 3 was a simultaneous estimation of risk and abuse factors in the measurement model, examining the relationship to self-reported APS contact in the regression (structural equation) model (see Figure 3, Model 3 and Table 8). Both factor variances in each set were constrained to 1 while the item factor loadings were freely estimated. The model fit was excellent ($\chi^2 = 39.587$, d. f. = 42, $p = 0.577$, CFI = 1.000, RMSEA = 0.000, CI = 0.000 – 0.007). The non-zero value of the χ^2 indicates that the model was identified. The standardized β coefficients for APS were 0.22 (s. e. = 0.32, 2-tail $p = 0.49$) for the abuse factor and 0.52 (s. e. = 0.31, 2-tail $p = 0.10$) for the risk of abuse factors, both non-significant. The reason that the factors were not significant predictors of APS contact in combination was the high correlation between the factors (0.88, s. e. = 0.04). This result was in contrast to those of Model 2a and Model 2b in which the abuse and risk factors treated individually were significant predictors of APS contact. The residual variances ranged from 0.26, "Has anyone called you names or threatened to hurt you?" and "Has anyone taken things or money that belong to you without your permission?" to 0.59, "Do you have trouble managing your money (paying bills, accessing cash, etc.)?" and was 0.49 for the APS item.

The final Model 4 (see Figure 4, Table 9) modified the relationship between the latent variables and APS contact. The risk factor was modeled as a predictor of the abuse factor which then was the direct predictor of APS contact. The factor variances were constrained to 1 and the item parameters were estimated as free. All estimates were standardized. The model fit was again excellent ($\chi^2 = 42.227$, d. f. = 43, $p = 0.505$, CFI = 1.00, RMSEA = 0.000). The λ 's did not differ substantively from the Model 3 results. The standardized regression coefficients β were 0.90 (s. e. = 0.04) for the risk of abuse factor predicting the abuse factor and 0.73 (s. e. = 0.06) for the abuse factor as the direct predictor of APS contact. Both coefficients were highly significant.

Of interest is that including a path from risk directly to APS contacts changed the strength of the relationships. Although the relationship of risk to abuse remained high ($\beta = 0.88$), the path from abuse to APS reduced to 0.22 (not significant), while the path from risk to abuse was most salient ($\beta = 0.52$, $p = 0.09$). This indicates that when placed in the same model, the unique effects of abuse are less than that of risk (see Figures 3 and 4).

Sensitivity Analyses: Although one estimate of the relationship of the latent constructs of abuse and risk showed a very high correlation between the two variables (0.90), the measures provided unique explanatory power. In a logistic regression model (not shown)

examining the observed risk and abuse scales in relation to APS contact, entering risk first resulted in a pseudo (Nagelkerke, 1991) R-square of 0.148 and an incremental increase in R-square of 0.026 adding abuse. The incremental R-square adding risk following abuse was over twice as large, 0.067, for a total R-square explained of 0.174 for both models. The resulting odds ratios were 3.031 for risk and 2.418 for abuse. Thus, while the zero-order relationships of abuse and risk to APS were similar, risk was somewhat more salient in predicting APS contact in the multivariate context.

Summary: The results provided evidence that a screen comprised of 11 self-report items, 5 risk and 5 abuse, and an 11th item measuring APS contact performed very well using several observed and latent variable models.

DISCUSSION

The risk and abuse subscales of the WC-RAPS performed well in terms of reliability and concurrent criterion validity. Reliability estimates were all greater than 0.80. The measurement part of the model was very stable across different analyses, with estimates of the factor loadings that were quite similar, regardless of model specification.

Noteworthy is that the risk item set evidenced slightly lower reliability. From a methodological perspective, this differential reliability had an impact on the structural equation estimates between the abuse and risk factors and the APS contact variable. The higher reliability estimates for abuse resulted in an attenuated coefficient (β coefficient of 0.22; s. e. = 0.32, $p = 0.49$) for the relationship of abuse and APS contact, whereas the correction for the attenuated reliability coefficient for risk of abuse resulted in a higher estimate ($\beta = 0.52$, s. e. = 0.31; $p = 0.10$) for the structural relationship between the latent variable risk and APS contact. In other models, the relationship between risk and APS contact and abuse and APS contact were more equivalent and significant for the abuse and risk factors. The attenuated relationship of abuse to APS contact in the model (Figure 3) with both abuse and risk latent variables included is likely a measurement artifact resulting from differential reliability and may not be the best estimate. The zero-order polychoric correlation of the sum scores was 0.641; the relationships with APS were 0.590 for abuse and 0.525 for risk. As is well-known (e.g., Cohen et al., 1990), relationships between variables are attenuated by lowered reliability. The larger association for abuse in most of the latent variable models was due in part to the higher reliability of the abuse variable. Risk is somewhat less reliable and thus the relationship with APS contacts is somewhat attenuated. As shown in the individual models, the relationship between abuse and APS contact was 0.68 for the latent variable and 0.59 for the observed (sum score), and 0.71 for the relationship between APS contact and the latent risk and 0.54 for the observed risk variables. In the final model, the coefficient for the relationship between abuse and APS contact was $\beta = 0.73$. However, examination of the observed sum scores in simple regression analyses showed that the risk variable contributed a somewhat larger amount of incremental variance in explaining APS contact. It is thus concluded from these analyses that risk and abuse were both measured relatively well, and are salient correlates of APS contact; however, risk may be somewhat more contributory in terms of explaining APS contact.

A limitation of the data set is the low item prevalences observed. A strength was the relatively large sample size; however, low item frequencies resulted in sparse data for some items. Such limitations are to be expected with abuse and abuse risk data and must be modeled appropriately. Because of the low item prevalences, the item with the highest estimated loading was fixed to 1 for some measurement models; for other models tested the variance was fixed to 1. Additionally, proper correlation estimates, e.g., tetrachorics were used in the analyses. A limitation is that some sensitivity in parameter estimates to model specifications were observed in the structural equation (but not the measurement) model estimates. A further limitation is that APS contact was self-reported; however, in the sample of cases that were checked (APS status was later determined from external sources by checking with APS for confirmation) most self-reported cases had been reported to APS. It is also noted that the abuse and risk indicators were self-reported. Other limitations include the inability to model longitudinal outcomes such as hospitalization and morbidity and future service use. Additionally, it is noted that characteristics of the sample that may explain risk and abuse were not measured, and these unobserved variables could impact the implications and generalizability of findings. However, the main purpose of the analyses presented here was to examine the measurement properties of the self-reported abuse and risk item set. The primary aim was to apply latent variable models to examine item responses in the context of methodological approaches to scaling risk and abuse in chronic and long-term care populations.

From a substantive perspective, among the abuse indicators, the items related to financial abuse (taking money or property), and verbal and physical threatening were most predictive of APS contact. The most salient risk factor was living with or having a close family member who abused alcohol or drugs. Additionally, having a family member dependent on the victim for support or having recent, multiple hospitalizations were also significant predictors of APS contact. The items that were most salient in terms of defining the abuse factor were refusing help, name calling, and physical threats. The item that was most salient in defining the risk factor was: living with or having close relatives who abused drugs or alcohol.

In conclusion, these analyses using a large, ethnically diverse cohort provided evidence for the reliability and concurrent criterion validity of the WC-RAPS risk and abuse subscales.

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Model 1a. Abuse items as predictors of APS contact

§ First item β estimate was constrained to 1; however, the estimates are presented standardized with all loadings estimated

Model 1b. Risk of abuse factor as predictor of APS

§ First item β estimate was constrained to 1; however, the estimates are presented standardized with all loadings estimated

Figure 1.

Concurrent criterion validity: Regression models predicting Adult Protective Services (APS) activation by individual abuse items and risk of abuse items (analyses completed using Mplus)

Model 2a. Abuse item factor as predictor of APS Contact §

Model 2b. Risk of abuse factor as predictor of APS Contact §

Figure 2.

Regression models predicting self-reported Adult Protective Services (APS) activation by abuse and risk of abuse item factors (analyses completed using Mplus)

Figure 3.

Regression models predicting self-reported Adult Protective Services (APS) activation by abuse and risk of abuse item factors – Model 3 §

§ All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus

Figure 4.

Regression models predicting self-reported Adult Protective Services (APS) activation by abuse and risk of abuse item factors (Mplus) – Model 4

§ All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus

Table 1.

Demographic characteristics of the sample

Total	7,035
Gender	
Male	2,378 (34%)
Female	4,616 (66%)
Missing	41
Age groups	
<64	521 (7%)
65 – 74	1,950 (28%)
75 – 84	2,895 (41%)
85 & over	1,658 (24%)
Missing	11
Mean Age (std. dev.)	77.6 (9.1)
Min. and Max. Age	31 – 102
Race / Ethnicity	
AA/Black	477 (7%)
White	5,040 (74%)
Asian	850 (12%)
Latino	461 (7%)
Missing	207

Table 2.

Tests of dimensionality from principal components analysis (n = 7,035)

Statistic	Component 1	Component 2	Component 3	Component 4	Ratio Component 1/Component 2
Abuse item set, 7 items					
Eigenvalues	4.478	0.747	0.584	0.559	6.0
Explained Variance	64.0%	10.8%	8.3%	8.0%	
Abuse item set, 5 items (excluding items RH7 and RH14)					
Eigenvalues	3.570	0.627	0.394	0.241	5.7
Explained Variance	71.4%	12.5%	7.9%	4.8%	
Risk of abuse item set, 5 items					
Eigenvalues	2.94	0.692	0.57	0.484	4.2
Explained Variance	58.8%	13.8%	11.4%	9.7%	

Eigenvalues for abuse and risk of abuse item sets were estimated in MPlus.

Table 3.

Confirmatory Factor Analyses (CFA) standardized factor loadings for three item sets (n=7,035)

Item Name	Item Description	N and % Affirmative	Abuse 7 Item Set		Abuse 5 Item Set		Risk of Abuse 5 Item Set	
			$\lambda^{\$}$	s.e.	$\lambda^{\$}$	s.e.	$\lambda^{\$}$	s.e.
RH2	Do you have trouble managing your money (paying bills, accessing cash, etc.)?	270 (3.8%)					0.65	0.05
RH3	Has anyone ever refused to help you with household chores, medications, appointments, etc.?	36 (0.5%)	0.87	0.05	0.87	0.05		
RH4	Has anyone taken things or money that belong to you without your permission?	98 (1.4%)	0.84	0.04	0.82	0.04		
RH5	Does a family member depend on you for care, shelter, or financial support?	137 (1.9%)					0.66	0.05
RH6	Has anyone called you names or threatened to hurt you?	37 (0.5%)	0.87	0.04	0.86	0.04		
RH7	Does anyone prevent you from seeing your friends or family?	6 (0.1%)	0.58	0.05				
RH9	Are you afraid of anyone that you know?	30 (0.4%)	0.75	0.05	0.83	0.05		
RH10	Has anyone touched you inappropriately without your permission?	13 (0.2%)	0.81	0.07	0.68	0.10		
RH11	Do you live with anyone or have close family members who abuse drugs or alcohol?	29 (0.4%)					0.85	0.06
RH12	Do you live with anyone or have close family members with a psychiatric illness?	71 (1.0%)					0.70	0.05
RH13	Have you had multiple hospitalizations in the last 6 months?	404 (5.7%)					0.63	0.04
RH14	Have you ever been contacted by APS (adult protective services)?	42 (0.6%)	0.64	0.06				
Underlying construct variance and s. e. (in model constraining items w/highest loading to 1)			0.76	0.08	0.74	0.08	0.73	0.10
Model fit statistics								
CFI			0.991		0.995		0.997	
RMSEA			0.011		0.009		0.007	

^{\$}Geomin Rotated Loadings

Analyses completed using Mplus

Table 4.

Abuse and Risk item sets: Reliability analysis and Cronbach's alpha using tetrachoric correlations (n = 7,035)

Item Description	Abuse 7 Item Set		Abuse 5 Item set		Risk 5 Item Set	
	Corrected Item-Total Corr.	Alpha if Item Deleted	Corrected Item-Total Corr.	Alpha if Item Deleted	Corrected Item-Total Corr.	Alpha if Item Deleted
Has anyone ever refused to help you with household chores, medications, appointments, etc.?	0.83	0.88	0.80	0.87		
Has anyone taken things or money that belong to you without your permission?	0.83	0.88	0.78	0.87		
Has anyone called you names or threatened to hurt you?	0.82	0.88	0.82	0.86		
Does anyone prevent you from seeing your friends or family?	0.62	0.90				
Are you afraid of anyone that you know?	0.70	0.89	0.73	0.88		
Has anyone touched you inappropriately without your permission?	0.62	0.90	0.62	0.90		
Have you ever been contacted by APS (adult protective services)?	0.60	0.90				
Do you have trouble managing your money (paying bills, accessing cash, etc.)?					0.57	0.80
Does a family member depend on you for care, shelter, or financial support?					0.60	0.79
Do you live with anyone or have close family members who abuse drugs or alcohol?					0.74	0.75
Do you live with anyone or have close family members with a					0.63	0.78

Item Description	Abuse 7 Item Set		Abuse 5 Item set		Risk 5 Item Set	
	Corrected Item-Total Corr.	Alpha if Item Deleted	Corrected Item-Total Corr.	Alpha if Item Deleted	Corrected Item-Total Corr.	Alpha if Item Deleted
psychiatric illness?						
Have you had multiple hospitalizations in the last 6 months?					0.55	0.81

Abuse: Cronbach's alpha: Seven item set = 0.90; five item set = 0.90 (unstandardized and standardized); Seven item set: McDonald's omega total = 0.92; ordinal alpha = 0.92; explained common variance (ECV) = 79.92; Five item set: McDonald's omega total = 0.91; ordinal alpha = 0.91; ECV = 76.91

Risk: Cronbach's alpha = 0.82 (unstandardized and standardized)

McDonald's omega total = 0.88; ordinal alpha = 0.87; ECV = 85.36

Items are binary with values 0 and 1; SPSS was used for the analyses of Cronbach's alpha and R software was used for McDonald's omega, ordinal alpha and ECV.

Table 5.

Regression analysis predicting Adult Protective Services (APS) variable by individual self-reported abuse and risk of abuse items (analyses completed using Mplus)

Item Name	Item Description (Abuse Items)	Standardized β (s. e.) ^{§§}	Odds Ratio (2-tail p) [†]
Abuse items (Model 1a)			
RH3	Has anyone ever refused to help you with household chores, medications, appointments, etc.?	0.07 (0.00)	2.20 (0.316)
RH4	Has anyone taken things or money that belong to you without your permission?	0.14 (0.21)	17.66 (<0.001)
RH6	Has anyone called you names or threatened to hurt you?	0.07 (0.29)	5.65 (0.012)
RH9	Are you afraid of anyone that you know?	-0.002 (0.72)	1.03 (0.973)
RH10	Has anyone touched you inappropriately without your permission?	-0.002 (1.00)	0.84 (0.893)
Model Fit Statistics: $\chi^2 = 1.770$, d. f. = 1, p = 0.183 CFI = 0.979; RMSEA = 0.010 (90% confidence interval = 0.000 – 0.035)			
Risk of abuse items (Model 1b)			
RH2	Do you have trouble managing your money (paying bills, accessing cash, etc.)?	0.02 (0.21)	1.29 (0.615)
RH5	Does a family member depend on you for care, shelter, or financial support?	0.13 (0.00)	4.38 (0.002)
RH11	Do you live with anyone or have close family members who abuse drugs or alcohol?	0.08 (0.43)	12.48 (<0.001)
RH12	Do you live with anyone or have close family members with a psychiatric illness?	0.02 (0.53)	1.75 (0.472)
RH13	Have you had multiple hospitalizations in the last 6 months?	0.17 (0.15)	7.47 (<.001)
Model Fit Statistics: $\chi^2 = 2.506$, d. f. = 1, p = 0.113 CFI = 0.979; RMSEA = 0.015 (90% confidence interval = 0.000 – 0.038)			

[†]WLSMV: weighted least squares with mean and variance adjustment estimator

[†]ML: Maximum likelihood estimator; all β estimates were estimated free; 2-tailed p

Item rh7 – “Does anyone prevent you from seeing your friends or family?” was excluded because of low prevalence and did not fit the model

[§]First item β estimate was constrained to 1; however, the estimates are presented standardized with all loadings estimated

Table 6.

Regression (structural equation) analysis predicting the Adult Protective Services (APS) contact variable from the abuse latent variable estimated from the measurement model – Model 2a

Item Name	Item Description	λ (s.e.) ^{‡§}	Residual Variance
RH3	Has anyone ever refused to help you with household chores, medications, appointments, etc.?	0.86 (0.04)	0.26
RH4	Has anyone taken things or money that belong to you without your permission?	0.84 (0.04)	0.30
RH6	Has anyone called you names or threatened to hurt you?	0.86 (0.04)	0.25
RH9	Are you afraid of anyone that you know?	0.82 (0.05)	0.33
RH10	Has anyone touched you inappropriately without your permission?	0.67 (0.11)	0.55
RH14	Have you ever been contacted by APS (adult protective services)?		0.54
Underlying construct variance (s. e.) in model constraining items w/highest loading to 1		0.75 (0.07)	
Abuse items factor Standardized β (s. e.; 2-tail p) [‡]		$\beta = 0.68$ (s. e. = 0.07; $p = <0.001$)	
Abuse items factor Odds Ratio [‡]		7.17	
Model fit statistics [‡]			
χ^2 , d. f., p		11.586, 9, 0.238	
CFI		0.996	
RMSEA (90% confidence interval)		0.006 (0.000 – 0.016)	

[‡]WLSMV: weighted least squares with mean and variance adjustment estimator

[‡]ML: Maximum likelihood estimator

Item RH7 – “Does anyone prevent you from seeing your friends or family?” was excluded because of low prevalence and poor model fit

[§]All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus

Table 7.

Regression analysis predicting Adult Protective Services (APS) variable by risk of abuse latent variable estimated from the measurement model – Model 2b

Item Name	Item Description	λ (s. e.) ^{‡§}	Residual Variance
RH2	Do you have trouble managing your money (paying bills, accessing cash, etc.)?	0.62 (0.04)	0.61
RH5	Does a family member depend on you for care, shelter, or financial support?	0.66 (0.05)	0.56
RH11	Do you live with anyone or have close family members who abuse drugs or alcohol?	0.88 (0.05)	0.23
RH12	Do you live with anyone or have close family members with a psychiatric illness?	0.69 (0.05)	0.52
RH13	Have you had multiple hospitalizations in the last 6 months?	0.65 (0.04)	0.58
RH14	Have you ever been contacted by APS (adult protective services)?		0.50
Underlying construct variance (s. e.) in model constraining items w/highest loading to 1		0.77 (0.09)	
Risk of abuse items factor standardized β (s. e.; 2-tail p) [‡]		$\beta = 0.71$ (s. e. = 0.07; $p = <0.001$)	
Risk of abuse items factor Odds Ratio [‡]		8.08	
Model fit statistics [‡]			
χ^2 , d. f., p		13.710, 9, 0.133	
CFI		0.993	
RMSEA (90% confidence interval)		0.009 (0.000 – 0.017)	

[‡]WLSMV: weighted least squares with mean and variance adjustment estimator

[‡]ML: Maximum likelihood estimator

[§]All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus

Table 8.

Regression analysis predicting Adult Protective Services (APS) contact variable by abuse and risk of abuse factors – Model 3

Item Name	Item Description	Abuse Item Factor λ ^{‡§}		Risk of Abuse Item Factor λ ^{‡§}		Residual Variance λ ^{‡§}
		λ	s.e.	λ	s.e.	
RH2	Do you have trouble managing your money (paying bills, accessing cash, etc.)?			0.64	0.04	0.59
RH3	Has anyone ever refused to help you with household chores, medications, appointments, etc.?	0.86	0.04			0.27
RH4	Has anyone taken things or money that belong to you without your permission?	0.86	0.03			0.26
RH5	Does a family member depend on you for care, shelter, or financial support?			0.65	0.04	0.58
RH6	Has anyone called you names or threatened to hurt you?	0.86	0.04			0.26
RH9	Are you afraid of anyone that you know?	0.80	0.05			0.37
RH10	Has anyone touched you inappropriately without your permission?	0.66	0.10			0.57
RH11	Do you live with anyone or have close family members who abuse drugs or alcohol?			0.84	0.05	0.29
RH12	Do you live with anyone or have close family members with a psychiatric illness?			0.70	0.05	0.51
RH13	Have you had multiple hospitalizations in the last 6 months?			0.66	0.03	0.56
RH14	Have you ever been contacted by APS (adult protective services)?					0.49
Variance of Abuse and Risk of abuse factors (s. e.) in model constraining items w/highest loading to 1		0.74 (0.07)		0.71 (0.09)		
Standardized regression coefficients β (s. e.; 2-tail p) of Abuse and Risk of abuse factors on APS (item RH14 – “Have you ever been contacted by APS (adult protective services)?” λ [‡]		$\beta = 0.22$	s.e.=0.32 p=0.49	$\beta = 0.52$	s.e.=0.31 p=0.10	
Abuse factor with Risk factor correlation (s. e.) λ [‡]		0.88 (0.04)				
Model fit statistic λ [‡]						
χ^2 , d. f., p		39.587, 42, 0.577				
CFI		1.00				
RMSEA (90% confidence interval)		0.00 (0.00 – 0.007)				

[‡]WLSMV: weighted least squares with mean and variance adjustment estimator

[‡]ML: Maximum likelihood estimator

[§]All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus

Table 9.

Regression analysis predicting Adult Protective Services (APS) variable by abuse and risk of abuse factors – Model 4

Item Name	Item Description	Abuse Item Factor ^{‡§}		Risk of Abuse Item Factor ^{‡§}		Residual Variance ^{‡§}
		λ	s. e.	λ	s. e.	
RH2	Do you have trouble managing your money (paying bills, accessing cash, etc.)?			0.64	0.04	0.59
RH3	Has anyone ever refused to help you with household chores, medications, appointments, etc.?	0.85	0.04			0.28
RH4	Has anyone taken things or money that belong to you without your permission?	0.85	0.03			0.28
RH5	Does a family member depend on you for care, shelter, or financial support?			0.65	0.04	0.58
RH6	Has anyone called you names or threatened to hurt you?	0.85	0.04			0.27
RH9	Are you afraid of anyone that you know?	0.79	0.05			0.37
RH10	Has anyone touched you inappropriately without your permission?	0.65	0.10			0.58
RH11	Do you live with anyone or have close family members who abuse drugs or alcohol?			0.84	0.05	0.29
RH12	Do you live with anyone or have close family members with a psychiatric illness?			0.70	0.05	0.51
RH13	Have you had multiple hospitalizations in the last 6 months?			0.66	0.03	0.56
RH14	Have you ever been contacted by aps (adult protective services)?					0.47
Standardized regression coefficients β (s. e.; 2-tail p) of Risk of abuse factor on Abuse factor [‡]				$\beta = 0.90$	s.e=0.04 p<0.001	
Standardized regression coefficients β (s. e.; 2-tail p) of Abuse factor on APS (item RH14 – “Have you ever been contacted by APS (adult protective services)?” [‡]		$\beta = 0.73$	s.e.=0.06 p<0.001			
Residual variance Abuse factor						0.18
Variance of Risk of abuse factor						0.41
Model fit statistic [‡]						
χ^2 , d. f., p		42.227, 43, 0.505				
CFI		1.00				
RMSEA (90% confidence interval)		0.00 (0.00 – 0.008)				

[‡]WLSMV: weighted least squares with mean and variance adjustment estimator

[§]All estimates are standardized; Factor variances set to 1; all λ parameters are estimated free. Analyses completed using Mplus