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Validation of a Targeted Peer Relations Scale for Adolescents Treated for Substance Use Disorder: An Application of Rasch Modeling

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Abstract: The objective of this research is to use item response theory (IRT) to validate a 14-item peer relations scale for use in the adolescent treatment population. Subjects are 509 adolescents discharged from substance abuse treatment from 2004–2009. The person reliability is 0.76 and the Cronbach's alpha person raw score reliability is 0.93 both indicating the scale is a strong metric. The item reliability of 0.99 is high showing the model is reliable. The real separation (8.49) meaning items are placed on the Rasch "ruler" with about eight levels of importance identified. The mean-square statistics of the infit and outfit values were between 0.5 and 1.5 for the items indicating a low level of randomness and thus unidimensionality of the scale. Inspection of a Wright Item Map shows the hierarchical structure of the scale with a moderate degree of inter-item spread. The analysis shows the scale is a reliable unidimensional metric.

Keywords: substance abuse treatment, psychoactive substance use disorder, adolescents, treatment outcomes, peer relations

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Introduction

The body of drug and alcohol research examining treatment outcomes for adolescents with substance use disorders (SUDs) is relatively small and is generally regarded as being less well developed than that for adults. What is known and published draws heavily from the literature on adults. Research from the adult population has identified various risk and protective factors including sociodemographic characteristics, severity of addiction, involvement in risky behaviors, co-occurring psychological disorders and other risk factors that relate to treatment outcomes.^{1,2} While the issues identified for adults certainly have implications for adolescents, “caution should be taken not to generalize indiscriminately from the adult to the adolescent populations” due to social developmental factors unique to adolescence.^{3–5} Indeed, there is increasingly wide professional consensus that the recovery and relapse process in adolescents is a unique phenomenon—that is, a theoretical and methodological framework that is more adolescent-specific is necessary. Where theory or consensus exists about the variables that predispose adolescents to relapse and factors that prevent relapse, there are few standards for operationalizing, measuring and analyzing the variables. This makes it difficult for the academic community to identify and describe the dynamics of relapse therefore making it difficult to draw conclusions about best practice in the treatment field.

One area of difference in risk and protective factors emerging between the adult and adolescent population is the role the relationships the adolescents have with their friends plays as a possible protective or buffering factor. In other words, the “peer relations” of adolescents treated for SUD seems to be protective of relapse to alcohol, tobacco or other drugs post treatment. In fact, the adolescent substance abuse treatment literature is replete with evidence supporting the fact that the relationships adolescents maintain with their friends and other peer relation contacts are of great importance in understanding substance use initiation, persistence, abuse, addiction, treatment for addiction, recovery from addiction, and relapse to use after treatment.^{6–9}

The construct peer relations is imbedded in the broader construct of social support.¹⁰ Social support is related to self-efficacy and outcome expectancy which are based in social learning theory.

Applications of peer relations relate it to a stress buffering model that has been applied to various aspects of adolescent health and that could be a useful theoretical context for research on adolescent substance abuse treatment.¹¹ In particular, peer-supportive communities are known to be beneficial and have been supported by several theories like Festinger’s social comparison theory,¹² Bandura’s social learning theory and the theory of reasoned action.^{13,14}

Researchers have subdivided peer relations into several categories. Schaefer, Coyne & Lazarus described three kinds: emotional, tangible, and informational support.¹⁵ In addition they differentiate between two variables of peer relations: social network and perceived peer relations. Social network is defined as the number of social relationships that a person has, whereas perceived peer relations reflects the person’s perception of the benefits of social relationships. Perceived peer relations variables are better indicators of healthy well-being than social network index.¹⁵ More recently, Tardy delineated four kinds: emotional, instrumental, informational and appraisal support.¹⁰

Several papers have applied the constructs of peer relations and social support to the field of adolescent substance abuse treatment. For example, in their review of substance use treatment outcomes among adolescents, William and Chang noted that peer relations is an important post treatment variable related to positive treatment outcome.¹⁶ Boisvert, Martin, Grosek & Clarie found significant reductions of risk of relapse in clients who participated in peer-supported community programs.¹⁷ Also, Azrin and colleagues found that a new behavioral treatment focusing on restructuring family and peer relations was superior to a supportive counseling program.¹⁸

Adolescents’ social network characteristics may enhance or decrease the potential for risky behaviors.¹⁹ For example, low levels of peer substance use during follow-up are consistently associated with better substance use treatment outcomes among adolescents.²⁰ In a recent survey of 102 urban adolescents enrolled in a substance abuse treatment program, Mason identified five social network characteristics that were associated with adolescent substance use and non-use:²¹ presence of daily substance users in network, engagement in negative activities, presence of peers who support non-substance use,



engagement in positive activities, and presence of no daily substance users in network.

Unfortunately, as is true with so many other aspects of the adolescent substance abuse treatment literature, and as mentioned above, there are no standards for operationalizing, measuring and analyzing the peer relations construct. Given this limitation any relationship between peer relations to theoretical models that could inform research and practice by placing the construct in a broader theoretical context is unknown.

The purpose of this research is to use item response theory (IRT) to evaluate a scale designed to measure the peer relations of adolescents treated for substance use disorder and to suggest a possible tie-in of the construct of peer relationships to the literature on social support. If it can be shown that peer relations, once the construct is defined and operationalized in a manner appropriate for adolescent substance abuse population, is protective of relapse, then the academic and treatment communities can improve and design treatment programs consistent with the research. Once a targeted measure of peer relations is developed and becomes available to the treatment and research communities, it will be much easier to design and evaluate treatment programs based on the broad theoretical guidance of social learning theory.

Subjects

The subjects in this study are adolescents discharged from a short-term primary inpatient substance abuse treatment program at a facility in the Midwest region of the United States from the five successive years 2004–2009 ($n = 509$). The data were obtained from a survey of patient outcomes the facility sponsored annually. The outcomes study was conducted by independent, university-based researchers.

The outcomes study began each year in January when the researchers obtained a list of all of the adolescents who successfully completed treatment in the previous year and who gave appropriate consent. The sampling frame was all successful discharges in the previous year. The treatment facility discharges adolescents “with staff approval” if the adolescent has met all of his or her treatment goals which include maintaining abstinence from drugs and alcohol during treatment and a host of other behavioral goals. The criteria for treatment success comport with

prevailing professional standards in the substance abuse treatment field.

Each adolescent was contacted via telephone and asked to complete a 230-item questionnaire that contained questions in several domains thought to be related to treatment success, including: school/work, family, friends, criminal behavior, and relapse. The fourteen item peer relations questions are part of this instrument. The questions were read to the adolescent. The interviews were conducted at prearranged times so the privacy of the answers could be assured (eg, when parents were away or out of earshot). The list of consenting adolescents (the call list) contained the names and telephone number of the adolescent’s parent(s), guardian or guardian *ad litem*, emergency contact number and other contact information (grandparents, cell phone numbers, places of employment, etc.). Great effort was made to track-down and contact the adolescents; telephone numbers that are disconnected are recalled at a later date in case the number was reconnected, directories of telephone numbers were used to locate the adolescents and the treatment facility was queried for updated information. Every reasonable attempt was made to contact the adolescents but as is the case in all survey research, some of the adolescents were not contacted and were thus lost to follow-up. Recent research, however, has shown that characteristics of responders and nonresponders to surveys, such as the one presented here, are very similar across a wide range of variables thought to predispose relapse. The findings indicate that loss to follow-up did not introduce response bias and that the missing cases can be considered missing at random.²²

Only adolescents who agreed to participate by giving consent (assent where appropriate) were contacted. At the time of admission, the adolescent and their parents are asked to give consent/assent to participate in the outcomes study. The consent/assent includes permission to contact them via telephone sometime after they are discharged and to release their treatment information to the researchers. The potential participants are assured that the researchers are bound by federal confidentiality and privacy regulations. The research protocol, including the consent process, has been reviewed by the university institutional review board.

The treatment facility used standard methods in assessing incoming adolescents and in making



level-of-care placements. First, the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) is used to assign diagnosis. Second, the American Society of Addiction Medicine (ASAM), Patient Placement Criteria (PPC-II) is used to place patients in appropriate levels of care. All subjects in this study met the DSM criteria for dependence or abuse and were assigned to the ASAM Level I. A (primary inpatient treatment) short-term inpatient.

Methods

Data analysis

The data were analyzed using a one-parameter Item Response Theory (IRT) Rasch model, using Winsteps software.²³ The Rasch model used in Winsteps for this analysis is the polytomous “Partial Credit Scale” form which uses the equation:²⁴

$$\log\left(\frac{P_{nij}}{P_{ni(j-1)}}\right) = B_n - D_i - F_j \quad (1)$$

where,

P_{nij} is the probability that person n encountering item i is observed in category j ,

B_n is the “ability” or rater-severity measure of person n ,

D_i is the difficulty-to-endorse measure of item i , and F_j is the “calibration” measure of category j relative to category $P_{nij} B_n D_i F_j (j-1)$.

Rasch models are appropriately used in well-defined groups of people responding to a set of items for assessment of a latent trait or characteristic where the items are successively scored by integers in ordered categories of increasing level of magnitude of the latent trait or characteristic.^{25,26} Rasch models use the sum of the item ratings as a beginning point for estimating the latent trait.

Results and Discussion

As shown in Table 1, the sample was predominantly under 18 years of age with the average age being 17.34 (S.D. 1.55) and no one under age 12 or over age 21. Males outnumbered females 65.0 percent to 35.0 percent. Most of the sample was Caucasian (86.5%) with African-Americans and Hispanics the second and third most numerous with 6.5 and 5.8 percent, respectively. Marijuana was reported by 55.4 percent

Table 1. Demographic characteristics of the sample (N = 509).

Characteristic	Percent	Number
Age ^a		
<18 years	52.0	265
≥18 years	48.0	244
Gender		
Male	65.0	331
Female	35.0	178
Race		
African American	6.5	33
Caucasian	86.6	438
Hispanic	5.8	29
Asian/PI	0.8	4
Other	0.3	2
Drug		
Alcohol	29.7	151
Amphetamines	3.4	17
Marijuana	55.4	283
Cocaine	8.4	42
Opiates	2.0	10
Other drug	1.1	6

Note: ^aMean = 17.34, S.D. 1.55, range 12–21.

of the sample, and Alcohol reported by 29.7 percent, with cocaine, amphetamines and opiates less frequently reported with 8.4, 3.4 and 2.0 percent, respectively.

Table 2 shows the items in the peer relations scale, the response categories used and the response frequency of each for each scale item.

Table 3 shows the person and item reliability of the 14-item peer relations scale. The person reliability is 0.76 indicating that the scale is a strong metric. Person reliability is the probability of a correct response by an individual respondent to items and are scaled by difficulty (see Table 4 for difficulty). The Cronbach’s alpha is higher than the person reliability at 0.93 because it estimates extreme scores as measured perfectly (ie, with no error). A separation value of 1.13 gives one separation level, thus splitting the persons on the Rasch measure. The item reliability statistic is used to indicate the degree to which the response to items conform to the model. In this instance the item reliability of 0.99 is very high and serves as clear evidence that the model is reliable. The real separation is high at 8.49 meaning items are placed reliably on the Rasch “ruler.”

The first two items in the scale, item numbers 4 and 3, are less a part of the single dimension (unidimensionality) than the rest of the items, but not vastly different. This is probably because the



Table 2. Response frequency by category of the 14-item social support scale.

Item	Categories				
	None	A few	Some	Many	Almost all
1. How many of your friends have your parents met?	5	19	125	216	124
2. How many of your friends do your parents like and approve of?	30	76	106	165	100
3. How many of your friends are the same friends as before treatment?	80	97	115	108	79
4. How many of your friends are new friends since treatment?	173	144	67	76	0
5. How many of your friends attend school regularly?	30	24	40	73	273
6. How many of your friends get into arguments/fights?	30	45	132	125	116
7. How many of your friends spend time with their families?	17	40	115	64	91
8. How many of your friends drink too much alcohol?	14	16	63	82	153
9. How many of your friends use drugs?	54	44	113	63	156
10. How many of your friends hang out with "gangs"?	58	8	20	1	360
11. How many of your friends go to jail or prison?	131	9	20	1	292
12. How many of your friends cause trouble for you?	16	17	69	101	256
13. How many of your friends encourage you to stay in treatment?	149	38	83	50	119
14. How many of your friends help you quit drugs?	112	35	84	64	147
Sum	899	612	1,152	1,189	2,266

questions are dissimilar from the rest, the other items are characteristics of the adolescent's friends, and these two items are facts about their friends. This difference probably is responsible for the slight dissimilarity of these two items from the rest of the scale.

Table 4 shows the item difficulty statistics in misfit order and accompanying separation and reliability coefficients. The real separation reliability given in the table's footnotes is comparable to a Cronbach's alpha estimate.²⁶ Here, 'real' indicates that the estimated standard errors of measurement have been

Table 3. Person and item reliability.

	Raw score	Count	Measure	Model error	Infit		Outfit		RMSE	Adj.		
					MNSQ	Z-STD	MNSQ	Z-STD		S.D.	Sep.	Rel.
489 measured non-extreme persons (S.E. of person mean = 0.02)												
Mean	44.2	12.5	0.39	0.28	1.00	-0.1	1.02	0.1				
S.D.	12.8	2.6	0.51	0.12	0.56	1.2	0.70	0.9				
Max.	68.0	14.0	2.95	1.29	5.43	3.3	9.90	9.9				
Min.	3.0	1.0	-1.70	0.21	0.00	-3.3	.04	-1.6				
Real Model									0.34	0.39	1.13	0.76
									0.30	0.42	1.38	0.85
492 measured extreme and non-extreme persons^a (S.E. of person mean = 0.03)												
Mean	44.0	12.4	0.38	0.29	-	-	-	-				
S.D.	13.1	2.7	0.59	0.17	-	-	-	-				
Max.	68.0	14.0	3.87	1.81	-	-	-	-				
Min.	1.0	1.0	-3.39	0.21	-	-	-	-				
Real Model									0.37	0.46	1.25	0.81
									0.33	0.48	1.46	0.88
14 measured non-extreme items^b (S.E. of person mean = 0.11)												
Mean	1,547.5	437.0	0.00	0.04	1.00	-0.5	1.03	0.0				
S.D.	293.3	47.5	0.39	0.01	0.08	4.8	0.15	4.2				
Max.	1,941.0	489.0	0.76	0.06	1.21	9.9	1.38	9.9				
Min.	966.0	327.0	-0.77	0.03	0.88	-9.1	0.81	-7.2				
Real Model									0.05	0.39	8.49	0.99
									0.04	0.39	8.82	0.99

Notes: ^aPerson raw score-to-measure correlation = 0.73; chronbach alpha person raw score reliability = .93; ^bItem raw score-to-measure correlation = -0.76; Log-likelihood Chi-square: 14,422.73 with 5,563 d.f. P = 0000.



Table 4. 14-item social support scale, item difficulty statistics in misfit order including infit and outfit statistics.

	Item number	Total score	Count	Measure	Model S.E.	Infit		Outfit		Exact match	
						MNSQ	Z-STD	MNSQ	Z-STD	OBS%	EXP%
New friends since treatment?	4	966	460	0.76	0.05	1.47	7.5	1.70	9.2	30.1	34.1
Same friends as before treatment?	3	1,446	479	0.40	0.04	1.64	9.9	1.69	9.9	22.0	29.7
Attend school regularly?	5	1,855	440	-0.35	0.04	0.96	-0.5	1.11	1.0	47.6	42.7
Hang out with "gangs"?	10	1,938	447	-0.23	0.04	1.04	0.4	0.97	-0.1	53.8	52.9
Get into arguments/fights?	6	1,596	448	-0.02	0.05	1.02	0.3	1.01	0.1	33.1	33.8
Spend time with their families?	7	1,153	327	-0.03	0.05	0.97	-0.4	0.99	-0.1	32.1	31.8
Have your parents met your friends?	1	1,902	489	-0.77	0.06	0.97	-0.4	0.98	-0.3	47.1	45.9
Go to jail or prison?	11	1,673	453	0.13	0.03	0.92	-1.3	0.91	-0.5	31.6	31.5
Your parents like and approve of?	2	1,660	477	0.01	0.04	0.85	-2.7	0.84	-2.7	40.3	34.7
Encourage you to stay in treatment?	13	1,269	439	0.48	0.03	0.85	-3.0	0.83	-2.7	26.2	21.0
Drink too much alcohol?	8	1,328	328	-0.28	0.05	0.83	-2.2	0.77	-2.6	36.3	33.3
Cause trouble for you?	12	1,941	459	-0.48	0.05	0.81	-2.6	0.71	-3.5	40.6	40.2
Help you quit drugs?	14	1,425	442	0.31	0.04	0.77	-4.7	0.71	-4.8	27.1	22.0
Use drugs?	9	1,513	430	0.08	0.04	0.73	-5.1	0.73	-4.5	31.5	28.9
Mean		1,547.5	437.0	0.00	0.04	0.99	-0.3	1.00	-0.1	35.7	34.3
S.D.		293.3	47.5	0.39	0.01	0.25	4.1	0.31	4.3	8.8	8.5

Note: ^a1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = almost always.

adjusted for any misfit encountered in the data. The real person reliability of 0.75 suggests that the scale discriminates well between the persons. The real item separation reliability of 0.99 strongly suggests that the items are creating a well-defined variable.

Moving from left to right on Table 4 are the component questions of the 14-item scale which are scored with the successive ordinal integers 1 through 5, the "Item Number" which reflects the sequence of the question in the data, the "Total Score" which is the sum of the scored responses to the corresponding item by the adolescents taking the survey, and the "Count" which reflects the completeness of the responses for each item which range from 327 to 489. The next column from the right shows the "Measure" statistic for each item. The measure statistic is the Rasch estimate of item difficulty reported as logits.

The two pairs of columns to the right measure degree of agreement between the pattern of observed responses and the modeled expectations is described as fit, more specifically characterized by "Infit" and "Outfit" measures. These measures provide empirical evidence to detect: (1) when an item is not part of the same dimension being measured; (2) the item is not understood; and (3) when it is likely that the response is a guess or an adolescent possesses special knowledge.²⁷ Both the infit and outfit measures are composed of two separate but related statistics, the mean-square (MNSQ) and the z-score standardized t-tests (Z-STD). The mean-square statistics show the size of the randomness in the measure. MNSQ values ranging from 0.5 through 1.5 are productive for measurement; MNSQ values either less than 0.5 or greater than 1.5 up to 2.0 are not considered productive for measurement but do not degrade the scale. When values fall in these ranges the Z-STD can be ignored. For example considering the current data, all items except item number 3 fall in the 0.5–1.5 range in the infit measure, and all items except items 4 and 3 fall in the range in the outfit measure, but none of the items exceed 2.0 so no further considerations via Z-STD is necessary. Additionally, the model average infit MNSQ and outfit MNSQ are 0.99 and 1.00, respectively, with relatively small and similar standard deviations (0.25 and 0.31, respectively), indicating a near-ideal fit. Taken as a whole, it is reasonable to conclude that all 14 items are part of the same dimension and can be understood in their context as logically independent of each other.

**Table 5.** Threshold estimates and observed average by category.

Item	Threshold estimates				Observed average (Categories)				
	F ₂	F ₃	F ₄	F ₅	1	2	3	4	5
1	-1.34	-1.05	0.53	1.85	-0.02	-0.04	0.18	0.35	0.72
2	-0.93	-0.12	-0.05	1.09	-0.18	0.01	0.28	0.54	0.77
3	-0.47	-0.26	0.14	0.59	0.40	0.37	0.38	0.40	0.44
4	-0.28	0.49	-0.20	-	0.43	0.37	0.47	0.38	-
5	0.53	-0.04	0.03	-0.51	0.03	-0.19	0.11	0.32	0.57
6	-0.33	-0.83	0.47	0.68	0.02	-0.01	0.40	0.48	0.65
7	-0.64	-0.71	1.07	0.28	0.04	0.27	0.38	0.49	0.71
8	0.28	-0.84	0.39	0.17	-0.05	0.02	0.22	0.47	0.66
9	0.24	-0.76	0.92	-0.40	-0.02	0.00	0.26	0.50	0.79
10	2.23	-0.54	3.51	5.21	0.02	0.11	0.00	0.17	0.54
11	2.68	-0.67	3.26	-5.27	0.09	-0.11	-0.03	0.17	0.64
12	0.40	-0.79	0.38	0.01	-0.32	-0.16	0.08	0.42	0.59
13	1.09	-0.92	0.52	-0.69	0.12	0.13	0.34	0.72	0.81
14	1.01	-0.89	0.41	-0.53	0.04	0.07	0.28	0.59	0.79

The final pair of statistics in Table 4 under the heading “Exact Match” measure the predictability or randomness of each item in the scale in the context of the model as a whole. The OBS% is the percent of data points which are within 0.5 score points of their expected values or that match predictions. EXP% is the percent of data points that are predicted to be within 0.5 score points of their expected values. If $OBS\% < EXP\%$ then data are more random than the model predicts; if $OBS\% > EXP\%$ then the data are more predictable than the model predicts.²⁵ Looking at Table 4 one can see all of the OBS% statistics are greater than the EXP% statistics with the exception of items 4, 3 and 6, which shows lightly more randomness than the model predicts. This finding is consistent with the magnitude of the infit and outfit statistics in the previous columns, and it is important to note that the deviation from the predicted randomness is slight. The model average OBS% is less than the model average EXP% ($35.7 > 34.3$) and the standard deviations of the averages are proportionally small (8.8 and 8.5, respectively) indicating that the model as a whole conforms to the level of predictability implicit in the model.

Table 5 shows the threshold estimates and observed average statistics for the items in the scale. The threshold is an estimate of the Rasch model parameter which measures the transition from one category to the next. The number of thresholds equals to $(j-1)$, where j is the number of categories. Hence with five categories there are four thresholds. The thresholds

divide the latent scale into different regions that correspond to the categories of the items. The threshold estimates are expected to increase with category value. Disordering of these estimates indicates that the category is relative rarely observed and may indicate substantive problems with the rating scale category definitions. When the threshold estimates strictly increase (as for items 1, 2, 3, 6 & 10) the response categories adequately capture the response and are thus assumed to be clear and understandable to the respondent. When the threshold estimates are not strictly sequential, that is do not increase from one item to the next, (as for items 4, 5, 7, 8, 9, 11, 12, 13 & 14) the response categories are inadequate or confusing to the respondent and therefore do not capture the response attributes.

The observed average statistic is the average of the measures that the model produced in each category. The average measure is expected to increase with category value. Here the observed average of items 2, 7, 8, 9, 12, 13 & 14 increase with the category value and have ordered categories. The rest of the items have one or two disordered categories. Similar to the threshold estimate, ordered items indicate that the response categories were meaningful, unambiguous and understandable to the respondent.

The threshold estimates and the observed average statistic orderings could be improved by giving better anchors to the descriptions of the response categories. Specifically the respondents had difficulty differentiating between “rarely” and “sometimes”.



Future use of this scale should include clearer definitions for response categories, perhaps giving specific time frames such as the number of times per month.

Figure 1 shows a Wright Item Map. The figure is based on an equal-interval logit scale. The left side gives a frequency distribution of how well the respondents performed on the scale with the upper portion of the distribution having the more supportive friendships. The right side of the figure shows how rarely or frequently favorable response items occurred. The right side of the Wright Item Map shows a relatively well performing, uni dimensional scale across all levels of performance. The left side is essentially a frequency distribution with favorable responses occurring in a normally distributed pattern which, again, is an indication of uni dimensionality.

Conclusions

This paper presents the psychometric characteristics of a targeted peer relations scale for use in the adolescent substance abuse treatment population. The findings indicate that the scale has potential to serve as a standard metric of peer relations targeted at adolescents who have been treated for SUD. The evidence strongly suggests that peer relations are a measurable and useful trait that has potential in treatment design, outcomes evaluation, risk factor identification, and potentially as a research variable. Although this scale was developed using a post-residential sample, there is no reason it cannot be used for those treated in an outpatient setting. Indeed, if the references to treatment imbedded in the questions were removed this scale could potentially be adapted to use in general populations of adolescents or as a screening tool. While a thorough analysis, such as that presented here, would probably not be necessary, it is advisable that validation studies be undertaken if this instrument is used for nonclinical applications and purposes.

Rasch analysis was chosen because it has several advantages over other commonly used techniques of validating measures. Rasch models give specific measurement properties that provide criterion for successful measurement. They give information regarding how well the criterion under consideration is met. Application of the models also provides information about how well items or questions on assessments work to measure a trait. The scale presented in this paper has many desirable characteristics. The person reliability and the Cronbach's alpha person raw score reliability both indicate that the scale is a strong metric. The item reliability is high and shows that the model is reliable. The real separation shows that the scale items are placed reliably on the Rasch "ruler" with about eight levels of importance identified. The mean-square statistic of the infit and outfit values indicated a low level of randomness and thus uni dimensionality of the scale. The Wright Item Map shows the hierarchical structure of the scale with a moderate degree of inter-item spread. And the standardized t-tests indicates a moderate degree of item overlap.

In addition to the Rasch finding presented here, this scale has been further validated by way

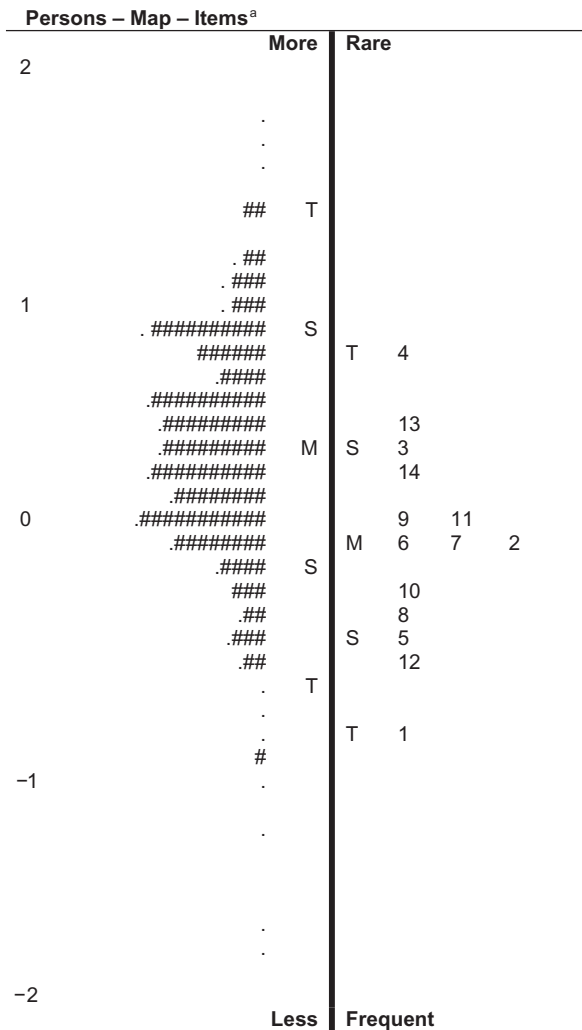


Figure 1. Wright item map.
 Note: ^aNumbers correspond to the items in Table 2.



of factor analysis and the results have been presented elsewhere.²⁸ A three-factor solution via promax rotation explaining 99 percent of the variance emerged as the best solution although results were similar using the other rotations. Factor 1 yielded ten items that are attributes of a peers' potential to be positive a or negative influence and thus supportive of recovery. Three items in Factor 2 related to emotional dimensions of social support. Factor 3 contained two items indicating a recovering adolescent's ability to seek-out and establish positive social contacts.

While the primary purpose of this paper is to evaluate the reliability of the scale, previous research has shown this scale to be highly predictive of relapse. Aretrospective cohort study used time-to-event analysis via Cox regression to analyze the relapse pattern and identified the peer relations score as a strong positive predictor of relapse. Results showed that a one point increase in the scale lead to a 1.8% (100%–98.2%) decrease in the odds of relapsing. Although certainly not a comprehensive study of the construct validity of this scale, the findings of this study lend support to the notion that this scale is valid.²⁹

It is clear that SUD is a chronic disorder and relapse to drug and alcohol use is common, but the best hope for preventing relapse and the harm of SUD is to study and measure risk factors. Social learning theory provides much theoretical guidance but the construct of peer relations has not been operationalized and used to design and improve programs or as a means of measuring risk of relapse post treatment. Scales such as the one presented and evaluated here will provide a needed link between theory and practice by allowing the academic and research communities to measure and understand the relationship between peer relation and abstinence and relapse and other constructs in the constellation of social learning theory.

Disclosures

Author(s) have provided signed confirmations to the publisher of their compliance with all applicable legal and ethical obligations in respect to declaration of conflicts of interest, funding, authorship and contribution, and compliance with ethical requirements in respect to treatment of human and animal test subjects.

If this article contains identifiable human subject(s) author(s) were required to supply signed patient consent prior to publication. Author(s) have confirmed that the published article is unique and not under consideration nor published by any other publication and that they have consent to reproduce any copyrighted material. The peer reviewers declared no conflicts of interest.

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