RUNNINNG HEAD: Performance of the RCMAS in a South African sample

# Performance of the Revised Children's Manifest Anxiety Scale in a Sample of Children and Adolescents from Poor Urban Communities in Cape Town

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Abstract

The Revised Children's Manifest Anxiety Scale (RCMAS) is regularly used with South African children; however, its performance in this context has not been empirically evaluated. This study assessed the basic psychometric properties of the RCMAS using data collected in a large study examining the mental health of children and adolescents living in poor urban communities around Cape Town. Reliability of the full-scale was good, and predicted relationships between anxiety, depression, PTSD, delinquency, age, gender, and somaticism scores offered evidence of construct validity. However, reliabilities for the physiological, worry/oversensitivity, and concentration subscales were low and confirmatory factor analysis revealed the hypothesized three-factor model did not adequately fit the data. Exploratory analyses suggested a four-factor solution consisting of social evaluation, worry, affective responses, and physiological symptoms/sleep disturbance factors. Further confirmatory research examining this four-factor structure is needed. Given the continued use of the RCMAS in South Africa, these findings provide an important first step in establishing its reliability and validity for use with South African youth; however, scores obtained on the three subscales should be interpreted with caution and further detailed psychometric evaluation of the RCMAS in South African samples is clearly required.

*Keywords*: Anxiety, Measurement, Psychometric, South Africa, Adolescents

Anxiety disorders are among the most common psychiatric disorders experienced by children and adolescents, with an estimated 8-20% of youths suffering from anxiety symptoms severe enough to interfere with daily functioning (Bernstein, Borchardt, & Perwien, 1996; Langley, Bergman, & Piacentini, 2002). Symptoms of anxiety are often associated with symptoms of depression, posttraumatic stress, and the experiencing of somatic symptoms (Bernstein et al., 1997; Langley et al., 2002; Last, Strauss, & Francis, 1987; Nutt, Argyropoulos, Hood, & Potokar, 2006). Additionally, childhood anxiety has also been associated with both conduct problems and delinquency (Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999; Russo & Beidel, 1994). Research with adults suggests that females consistently obtain higher anxiety scores than males (Angst & Dobler-Mikola, 1985; Bruce et al., 2005; Costa, Terracciano, & McCrae, 2001; McLean & Anderson, 2009). This gender difference has also been reported in children and adolescents (J. C. Anderson, Williams, McGee, & Silva, 1987; Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998; McLean & Anderson, 2009). Rates of anxiety disorder also increase with age through childhood and adolescence (Essau, Conradt, & Petermann, 2000; Newman et al., 1996).

South Africa has among the world's highest rates of community violence and household-level abuse, and interpersonal violence is often targeted at or witnessed by children (Liang, Flisher, & Lombard, 2007). Additionally, an estimated 3.4 million South African children are parentally bereaved, with 65% of deaths attributed to HIV/AIDS (B. Anderson & Phillips, 2006). It is perhaps unsurprising then that research with South African children reports elevated anxiety levels in comparison with western samples (Muris, Schmidt, Engelbrecht, & Perold, 2002). Recent research, focused on the mental health of South African children orphaned by HIV/AIDS, has reported that AIDS-orphaned children report elevated symptoms of anxiety, posttraumatic stress disorder (PTSD), and depression, even when compared with children orphaned by other causes (Cluver, Gardner, & Operario, 2007).

In both research and practice self-report questionnaires are frequently used to measure child anxiety, and much of the research in South Africa has relied on the Revised Children's Manifest Anxiety Scale (RCMAS).

The RCMAS (Reynolds & Richmond, 1978) is one of the most widely used self-report measures of child anxiety. The RCMAS is a 37-item questionnaire responded to on a yes/no scale and contains 28 anxiety-related items and nine items designed to provide an index of the child's tendency to falsify responses. The anxiety-related items provide three narrow anxiety factors (physiological – 10 items, worry/oversensitivity – 11 items, and concentration – 7 items; Reynolds & Paget, 1981) as well as a total anxiety score. The psychometric properties of the RCMAS have been well documented. The full anxiety scale shows good internal consistency ($\alpha$ = .79-.85) and Reynolds (1981) demonstrated that scores showed reasonable stability over a nine month period ($r$ = .68). Additionally, Wisniewki, Mulick, Genshaft, and Coury (1987) reported a test-retest reliability of $r$ = .88 after one week and $r$ = .77 after five weeks. The concurrent validity of the RCMAS is also well established. Reynolds (1980) reported a correlation of .85 between the RCMAS scores and scores obtained on the State-Trait Anxiety Inventory for Children (STAIC). More recently, Muris and colleagues (2002) reported substantial correlations between the RCMAS and a variety of children's anxiety measures; including the STAIC ($r$ = .88), the Fear Survey Schedule for Children ($r$ = .63), and the Multidimensional Anxiety Scale for Children ($r$ = .76).

Although the psychometric properties of the RCMAS are well documented, White and Farrell (2001) have argued that further work is needed to clarify the underlying dimensions of childhood anxiety measured by the RCMAS. They argue that because the factors of the RCMAS were identified using exploratory factor analysis they may reflect dimensions that are not consistent with the underlying construct being assessed. Relatedly, they suggest that the subscales may not represent well-defined or stable factors, and that

individual items load onto factors that appear inconsistent with the item content (White & Farrell, 2001). Additionally, White and Farrell (2001) argue that although the reliability, validity, and factor structure of the RCMAS has been assessed in a number of languages, including German, Spanish, and French-Canadian samples (Boehnke, Silbereisen, Reynolds, & Richmond, 1986; Ferrando, 1994; Turgeon & Chartrand, 2003), little is known about its performance in more ethnically diverse populations. For researchers working with children in the South African context it is important to evaluate the psychometric properties of the RCMAS in South African samples. Cultural and linguistic differences may affect the reliability of measures developed in western samples (van der Vijer & Hambleton, 1996) and also make it difficult to know whether measures developed in western societies truly reflect local understandings of distress and wellbeing (Snider & Dawes, 2006).

Given the current research focus on sub-Saharan Africa in fields such as public health, psychology, and nursing, the need for mental health measures validated for use with African samples has been emphasised by international organisations (such as UNICEF and the World Health Organisation) and academics. The aim of this study was to assess the basic psychometric properties of the RCMAS in a South African community sample, using data collected in a large study examining the mental health of children and adolescents living in poor urban townships of Cape Town (Cluver et al., 2007). Reliability of the RCMAS was assessed by examining item-total correlations for individual RCMAS items, as well as Cronbach's alpha (α) for the full scale and the three narrow anxiety factors identified Reynolds and Paget (1981). Validity of the RCMAS was assessed by examining the associations between total scores and previously identified correlates of anxiety (gender, age, symptoms of depression, posttraumatic stress, somaticism, and delinquent behaviour). The underlying factor structure of the RCMAS was assessed using a combination of confirmatory and exploratory factor analyses.

## Method

### *Participants*

Analyses were conducted on data obtained from a sample of 1025 children and adolescents recruited in 2005/2006 for a previous study exploring psychological distress amongst children in urban South Africa (Cluver et al., 2007). The study sampled poor urban areas of Cape Town characterised by high levels of population density, violent crime, property crime, rape, and unemployment (South African Police Services, 2009). Participants were recruited from 18 non-government organisations, nine schools, and from door-to-door sampling. The sample consisted of 540 male and 485 female children, ages ranged between 10 and 19 years ($M$ = 13.40, $SD$ = 2.35), and the majority of participants were Xhosa-speaking (96.10%). Additional information regarding the sampling procedure and methodology can be found in the original Cluver et al paper (2007).

### *Measures*

*RCMAS* (Reynolds & Richmond, 1978): Due to time constraints, only the 28 anxiety-related items of the RCMAS were administered in the original Cluver et al (2007) study. Additionally, in the context of high levels of orphanhood the wording of item 10 ('I worry about what my parents will say to me') was altered to 'I worry about what my carers will say to me'.

*The Children's Depression Inventory – Short Form* (Kovacs, 1992): The short form of the inventory contains 10 items representing a range of depressive symptoms. For each item the child is asked to choose one statement that best reflects their feelings. Item scores (ranging from zero to two) are summed to give a total score. The Children's Depression Inventory (Short Form) has good psychometric properties ($\alpha$ = .71-.94; Saylor, Finch, &

Spirito, 1984), and is highly correlated with the full version of the inventory ($r$ = .89; Kovacs, 1992). Internal consistency in the Cluver et al (2007) study was α = .65.

*Somatic symptoms and delinquency*: Somatic symptoms and delinquency were measured using the Somatic Complaints and Delinquent Behavior subscales of the *Youth Self Report Inventory* (YSR), a self-report version of the well validated Child Behavior Checklist (Achenbach, 1991). Somaticism (e.g. I feel dizzy) and delinquency (e.g. I steal from home) items are responded to on a three-point scale (*0: Not true; 1: Somewhat or sometimes true; 2: Very true, or often true*). The YSR demonstrates sound reliability (Weisz, Sigman, Weiss, & Mosk, 1993), with internal consistencies for subscales reported to range between α = .71 and α = .95 and one week test-retest reliability ranging between $r$ = .47 and $r$ = .79 (Achenbach, 1991). Due to time constraints, in the original Cluver et al (2007) study only the Somatic Complaints and Delinquent Behavior subscales were administered and internal consistencies were α = .66 and α = .61 respectively.

*Child PTSD Checklist* (Amaya-Jackson, McCarthy, Cherney, & Newman, 1995): The Child PTSD Checklist is a child-friendly 28-item scale derived from the DSM-IV, which rates the presence (in the past month) of symptoms required for a diagnosis of PTSD. Prior to completing the checklist children identify the most frightening thing that has happened to them. Items are responded to on a four-point frequency scale (*0: Not at all; 1: Some of the time; 2: Most of the time; 3: All the time*). The psychometric properties of the Child PTSD Checklist are unpublished, although Amaya-Jackson, Newman, and Lipschitz (2000) have reported that the full scale shows excellent test-retest reliability ($r$ = .91) and internal consistency (α = .82-.95) in U.S. clinical samples. Correlations between the Child PTSD Checklist, the Beck Depression Inventory, and the Multidimensional Anxiety Scale for Children suggests that the checklist has good convergent validity (Amaya-Jackson et al., 2000). Internal consistency in the Cluver et al (2007) sample was α = .93.

*Procedure*

Ethical approval for the study was obtained from the University of Oxford, the University of Cape Town, and the Western Cape Department of Education. All measures were translated from English into Xhosa by two Masters level researchers and independently back-translated by a Xhosa-speaking research psychologist. Translated and back-translated questionnaires were cross-checked by a team of five Xhosa-speaking community health and social workers. Informed consent was obtained from both children and their caregivers, but other than consenting to child participation no information was collected from caregivers. Due to low literacy rates (Mulis, Martin, Kennedy, & Foy, 2007) questionnaires were administered verbally by seven interviewers. Interviewers were local community health or social workers who received training in both working with children from deprived communities and the administration of standardised questionnaires. The design of the overall questionnaire package was assisted by a 'Teen Advisory Group' of 14 children. In weekend camps, children co-designed the questionnaire booklet into the style of a teen magazine, including pictures of popular music stars and cartoons. Confidentiality was maintained unless children requested assistance or were at risk of significant harm. In total participation took 40-60 minutes and no incentives for participation were provided.



## Results

Administering questionnaires via interviewers resulted in minimal missing data (less than 1%). Where missing items were identified, responses were imputed using the mean of the child's responses to all other items on the scale. Total anxiety ($M$ = 11.52; $SD$ = 5.27), depression ($M$ = 2.88; $SD$ = 2.72), PTSD ($M$ = 16.12; $SD$ = 14.11), and somaticism ($M$ = 5.10; $SD$ = 3.58) scores were calculated by summing relevant items.

*Reliability of the RCMAS*

Correlations between RCMAS items and total anxiety score were calculated. Given that items are responded to on a dichotomous yes/no scale (with an assumed underlying continuity) but total anxiety scores form a continuous scale, the relationship between individual items and total anxiety score was estimated using biserial correlation ($r_b$) (Field, 2005). An item-total correlation of less than .30 indicates an item is a poor indicator of the measured construct (Nunnally & Bernstein, 1994). In the current sample item-total correlations ranged between $r_b = .33$ (Item 2: "I get nervous when things do not go the right way for me") and $r_b = .62$ (Item 11: "I worry about what other people think about me"), with an average item-total correlation of $r_b = .52$. All item-total correlations met the .30 criteria.

Cronbach's α was used to assess the internal consistency of the RCMAS. Alpha above .70 is considered to be acceptable and α above .80 is considered good (Nunnally & Bernstein, 1994). Internal consistency for the full-scale RCMAS was α = .81. Reliabilities for the three subscales were α = .58 (physiological), α = .59 (concentration), and α = .68 (worry/oversensitivity). Although the reliability of the full-scale RCMAS was good, none of the subscales met the .70 criteria. Sun and colleagues (2007) argue that α may be underestimated when response scales are dichotomous; however, even bearing this in mind, internal consistencies for the physiological and concentration subscales were low.

*Correlates of the RCMAS*

As predicted, a small but significant gender difference in anxiety scores was obtained with females ($M = 12.02$; $SD = 5.20$) scoring higher than males ($M = 11.18$; $SD = 5.32$); $F(1, 1016) = 6.48$, $p = .01$. Consistent with previous research anxiety scores were significantly correlated with depression ($r = .44$, $p < .001$) and PTSD scores ($r = .54$, $p < .001$), as well as

somatic symptoms ($r = .46$, $p < .001$), delinquency ($r = .34$, $p < .001$), and age ($r = .13$, $p < .001$).

*Confirmatory Factor Analysis of the RCMAS*

In order to determine whether the previously identified three-factor structure of the RCMAS (physiological, worry/oversensitivity, and concentration factors) was obtained in the current sample a confirmatory factor analysis (CFA) was conducted. Due to the dichotomous response scale of the RCMAS, CFA was conducted using the matrix of tetrachoric correlations (Woods, 2002). The matrix of tetrachoric correlations were calculated using the TetMat program (Uebersax, 2006), which is based on the Brown (1977) algorithm. CFA was conducted directly on the matrix of tetrachoric correlations using maximum likelihood estimation in AMOS 16. The 10 physiological items were constrained to load onto a physiological factor, the 11 worry/oversensitivity items were constrained to load onto a worry/oversensitivity factor, and the 7 concentration items were constrained to load onto a concentration factor. The three hypothesized factors were allowed to correlate and no correlated error terms or item cross-loading were specified in the model.

The following fit indices are reported: chi square ($\chi^2$) and $\chi^2$/degrees of freedom, RMSEA, CFI, and SRMR. A non-significant value of $\chi^2$ indicates good model fit; however, $\chi^2$ divided by its degrees of freedom ($\chi^2$/df) is less sensitive to sample size. The minimum acceptable value of $\chi^2$/df is three, although a $\chi^2$/df of less than two is preferred. For both RMSEA and SRMR values of .05 or less indicate good fit, values up to .08 indicate acceptable fit, and values exceeding .10 indicate fit. For CFI values of .90 or greater indicate acceptable fit and values of .95 or greater indicate good fit (Blunch, 2008). Fit statistics for the specified model were: $\chi^2 = 3386$ ($p < .001$), $\chi^2$/df = 9.76, RMSEA = .09, SRMR = .08,

CFI = .63. With the exception of SRMR, none of the fit statistics for the model representing the previously reported three-factor structure were acceptable.

*Exploratory Factor Analysis of the RCMAS*

Given that the previously reported three-factor structure of the RCMAS was unsupported in the CFA, a series of factor analyses (using principal axis factoring – PAF) were conducted in order to explore the structure of RCMAS in the current sample. PAF was chosen because variance unique to individual items as well as error variance is excluded from the analysis (Tabachnick & Fidell, 2001). PAF was conducted on the matrix of tetrachoric correlations using oblique rotation (as the factors were hypothesized to be correlated). Eight components with eigenvalues greater than one emerged; however, examination of the scree-plot revealed a four (or possibly three) factor solution to be most optimal. In both the three and four-factor solutions item 15 ("my hands feel sweaty") performed poorly (factor loadings less than .30) and this item was therefore dropped from the analyses. Item breakdown of the final three and four-factor solutions showed the four-factor solution to be the most parsimonious and it was also consistent with previous research (White and Farrell, 2001); factors were labelled 1) social evaluation, 2) worry, 3) affective responses, and 4) physiological symptoms/sleep disturbances (Table 1). This four-factor structure accounted for 44.22% of the total co-variance. Whilst this is below the traditional 50%, the four-factor structure is similar to an expert-derived model reported by White and Farrell (2001). Specifically, the clear emergence of a social evaluation factor is consistent with the expert-derived model, and the physiological/sleep disturbance factor obtained in the current sample also corresponds closely to the anxious arousal factor identified in the expert-derived model (White & Farrell, 2001).

**(Insert Table 1 approximately here)**

## Discussion

Previous psychometric evaluations have established the reliability of the RCMAS in American, German, Spanish, and French-Canadian samples (Boehnke et al., 1986; Ferrando, 1994; Turgeon & Chartrand, 2003). The RCMAS has also been widely used to measure anxiety in South African children; however, the performance of the RCMAS in South African samples has not been empirically evaluated. This study aimed to assess the basic psychometric properties of the RCMAS in a large South African sample, using data collected in a study examining the mental health of children and adolescents living in poor urban townships of Cape Town (Cluver et al., 2007).

The internal consistency of the full scale was good ($\alpha = .81$) and all item-total correlations met the .30 criterion. The current findings suggest that the full-scale score of the RCMAS is a reliable measure of anxiety symptoms in South African youths. Unfortunately, due to constraints of the dataset, the test-retest reliability of the RCMAS in the current sample was not able to be assessed. This is a limitation of the study and future research is needed to establish the test-retest reliability of the RCMAS in South African samples.

Although the reliability of the full scale was good, none of the subscales reached the .70 criterion for internal consistency. Sun and colleagues (2007) argue that $\alpha$ may be underestimated when response scales are dichotomous; however, even bearing this in mind, reliabilities of the physiological and concentration subscales were still low. CFA revealed the three-factor structure (physiological symptoms, worry, and concentration subscales) did not adequately account for item co-variation in the current sample. This suggests that the factor structure of anxiety symptoms in South African youth may differ from that previously reported in American, German, Spanish, and French-Canadian samples (Boehnke et al., 1986; Ferrando, 1994; Turgeon & Chartrand, 2003). Exploratory analyses on the current dataset

revealed a parsimonious four-factor solution (social evaluation, worry, affective responses, and physiological symptoms/sleep disturbances). The clear emergence of a social evaluation factor is consistent with previous research by White and Farrell (2001) who demonstrated the presence of a social evaluation/oversensitivity factor in both expert-derived and empirical models of the RCMAS. Additionally, the physiological/sleep disturbances factor corresponds closely with the anxious arousal factor identified by White and Farrell (2001). However, the co-variance accounted for by this four-factor model was below the traditional 50% and the internal consistencies of the four factors were low (α = .56-.65). Additionally, whilst clearly loading most strongly on the social evaluation factor, item 12 ('I feel alone even when there are other people with me') did cross-load on the physiological/sleep disturbances factor. These results suggest that further research examining the structure of the RCMAS in South African samples is clearly required before firm conclusions can be made.

Regarding the validity of the RCMAS, consistent with research reporting gender differences in anxiety (McLean & Anderson, 2009), a small but significant gender difference in RCMAS scores was obtained. As predicted females reported more anxiety symptoms than males and future research may want to examine gender differences at the latent construct level, as well as examining the measurement invariance of the RCMAS across genders. Hypothesized correlations between anxiety, depression, PTSD, delinquency, age, and somaticism scores were also observed in the current sample (Bernstein et al., 1997; Essau et al., 2000; Langley et al., 2002; Last et al., 1987; Newman et al., 1996; Nutt et al., 2006) and this is further evidence of the construct validity of the RCMAS. Additionally, physiological symptoms and somaticism scores were significantly correlated ($r$ = .44 for the original RCMAS physiological subscale; $r$ = .43 for the physiological/sleep disturbances scale obtained from the EFA) and this is also consistent with previous research.

However, a number of limitations of the current study should be noted. First, reliabilities of the Children's Depression Inventory (Short Form), as well as the Delinquent Behavior and Somatic Complaints subscales of the YSR in the current sample were below α = .70. These measures have not been validated in South African samples and findings therefore need to be interpreted with caution. Further research examining the psychometric properties of these measures in South African samples is required. Additionally, due to the constraints of the dataset, conclusions regarding the validity of the RCMAS are limited to establishing relationships between the RCMAS and known correlates of child anxiety. Future research in South Africa should examine correlations between the RCMAS and other measures of child anxiety and also administer measures known to be negatively correlated or uncorrelated with anxiety. Collecting this information would allow firmer conclusions regarding the convergent and divergent validity of the RCMAS to be made. Additionally, the fact that the nine items designed to provide an index of the child's tendency to falsify responses were not administered in the original Cluver et al (2007) study means that any children who may have provided falsified responses were not identified.

It should also be noted that whilst a potential strength of the study (in terms of minimising missing data and children's understanding of questionnaire items), verbally administering questionnaires via interviewers is a non-standard method for administration of the RCMAS. This is also the case for the Children's Depression Inventory (Short Form), the Child PTSD Checklist, and the Child Behavior Checklist. Therefore, it is possible that the current findings regarding the psychometric properties of the RCMAS may not hold when measures are completed by self-report. Future research should attempt to replicate these results using self-reported data obtained from South African community samples. Additionally, the current study was not able to evaluate the diagnostic performance of the RCMAS in the South African context. Further research evaluating the diagnostic

performance of the RCMAS in terms of its sensitivity and specificity is clearly required before conclusions regarding its use as a diagnostic tool in South African samples can be drawn. Finally, this study did not use a representative sample of the South African population. At present the findings cannot be generalised beyond children from poor, urban communities.

## Conclusion

Given the continued use of the RCMAS in South Africa, these findings offer an important first step in establishing the reliability and validity of the RCMAS for use with South African youth. Results suggest that the full-scale shows good internal consistency, displays expected gender differences, and correlates predictably with depression, PTSD, delinquency, age, and somatic symptoms. However, the widely replicated three-factor structure of the RCMAS (physiological, worry, and concentration subscales) was not obtained in the current sample. Rather, preliminary evidence for a four-factor structure was obtained. This four-factor solution is similar to expert-derived models reported by White and Farrell (2001) and warrants further investigation. Taken together these findings suggest that the full scale score of the RCMAS appears to be a reliable and valid measure of child anxiety in the South African context; however, scores obtained using the three subscales should be interpreted with caution and further detailed psychometric evaluation of the RCMAS in South African samples is clearly required.

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*Table 1.* Factor loading of RCMAS items for the four-factor solution

| Item | Social Evaluation | Worry | Affective Responses | Physiological and Sleep Problems |
|---|---|---|---|---|
| 9. Others do not like way I do things | .58 | | | |
| 3. Others do things easier than me | .56 | | | |
| 18. Other children happier than me | .54 | | | |
| 12. Feel alone even when people with me | .45 | | | .38 |
| 27. A lot of people are against me | .43 | | | |
| 24. Hard to keep mind on schoolwork | .42 | | | |
| 8. Worry about what carer will say | .42 | | | |
| 1. Trouble making up my mind | .33 | | | |
| 5. Worry a lot of the time | .32 | | | |
| 28. Worry about something bad happening | | .71 | | |
| 17. Worry about what is going to happen | | .55 | | |
| 6. Afraid of a lot of things | | .47 | | |
| 21. Someone will tell me I do things the wrong way | | .39 | | |
| 2. Get nervous when things do not go the right way | | .37 | | |

| | | | | |
|---|---|---|---|---|
| 11. Worry about what other people will think about me | .34 | | | |
| 14. Feelings get hurt easily | | .86 | | |
| 7. Get angry easily | | .62 | | |
| 20. Feelings get hurt when criticised | | .50 | | |
| 19. Have bad dreams | | | | .65 |
| 26. I am nervous | | | | .56 |
| 23. Worry when I go to bed | | | | .54 |
| 22. Wake up scared | | | | .52 |
| 16. I am tired a lot | | | | .49 |
| 10. Hard for me to get to sleep | | | | .48 |
| 25. Wiggle in my seat a lot | | | | .41 |
| 13. Often feel sick in my stomach | | | | .36 |
| 4. Often have trouble getting my breath | | | | .33 |
| Eigenvalue | 6.92 | 2.18 | 1.50 | 1.34 |
| Variance | 25.64% | 8.07% | 5.57% | 4.95% |
| α | .68 | .60 | .56 | .64 |

*Note:* PAF using oblimin rotation. Factors loadings < .30 are suppressed