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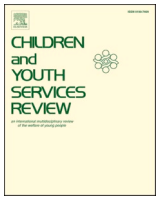

Design and development of the trauma informed care beliefs scale-brief☆

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ABSTRACT

Background: Trauma informed care (TIC) practices have been developed to diminish the range of negative consequences associated with adverse childhood experiences (e.g., unemployment, welfare, incarceration, and medical and psychiatric treatment). They have been demonstrated to benefit young people, their carers, and child welfare staff. However, a gap that has been identified in this area is the absence of psychometrically sound TIC instruments, which has hindered the TIC literature in terms of transitioning to a more methodologically robust and data driven research area.
Objective: The current study aimed to develop a psychometrically sound instrument (i.e., the TIC Belief Scale) that could assess the TIC beliefs of child welfare carers who reside with youth.
Methods: Initially, 143 items were developed based on widely used TIC models. After a review by an expert panel of 10 experienced trauma practitioners, 85 items were retained and administered to a sample of 469 child welfare carers. The psychometric properties of the scale were investigated using Item Response theory (Rasch analyses).
Results: Following analyses, a final scale of 13 items was accepted. The scale had good internal reliability (PSI = 0.77), showed evidence of unidimensionality, and there was no evidence of differential performance across sub-groups.
Conclusions: The application of the Rasch model in this study provides support for the TIC Belief Scale as a psychometrically sound scale for measuring child welfare carers' beliefs about TIC practices. An algorithm proposed here for converting ordinal to interval scoring increases the precision in understanding carers' less favourable TIC beliefs.

1. Introduction

Adverse childhood experiences (ACEs) refer to a single or repeated experience of physical, sexual, or emotional abuse; losing a parent; divorce; neglect; exposure to domestic violence, natural disaster, parental drug or alcohol misuse; or parental experience of mental health disorders (Cook et al., 2017). Higher incidents of ACEs are associated with a greater likelihood of physical and mental health problems across the lifespan, at an estimated cost of $750 billion annually in the United States (Bellis et al., 2019; Copeland et al., 2018). ACEs have a range of negative consequences including unemployment, welfare, incarceration, and medical and psychiatric treatment costs (Baker et al., 2016). For children and adolescents,[1] ACEs have been associated with an increased risk of further trauma, including drug use, sexual abuse, separation from family and placement into child welfare. Youth trauma symptoms can manifest as severe psychopathology, including criminal behaviour, aggression, violence, conduct disorders, suicidality, *para*-suicidal behaviours, social problems, anxiety, depression, personality disorders and post-traumatic stress disorder (Giaconia et al., 1995; Porche et al., 2011; McMillen et al., 2005). Consequently, ACEs have been identified as a public health epidemic that requires immediate attention (Women and Trauma Federal Partners Committee & United

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[1] In this project, children and adolescents will be referred to using the term 'young person'.

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States of America, 2013). A prominent treatment approach that aims to reduce the negative outcomes associated with ACE is trauma informed care (TIC) practices (Harris & Fallot, 2001).

1.1. Trauma informed care (TIC)

TIC practices aim to reduce re-traumatisation and increase the rehabilitation of young people who have experienced ACEs and are involved in child welfare settings (McLean et al., 2011). Young people in child welfare settings typically present with trauma symptoms that are difficult to manage, and punitive parenting strategies can exacerbate these symptoms (Metz et al., 2007). Inadequate training for child welfare carers can lead to coercive discipline styles that can re-traumatise young people and result in placement breakdown and psychological stress and trauma for both the carers and young people (McGrath et al., 2020; Newell et al., 2016). For the purpose of the current study, "carers" includes foster carers, adoptive carers, kinship carers, respite carers, or residential carers.

TIC practices that recognise the traumatic histories of young people under care have been argued to be critical for stabilisation and rehabilitation (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014; National Child Traumatic Stress Network, 2008). These practices are service delivery models of care implemented across entire organisations (Harris & Fallot, 2001). Rather than viewing young trauma victims as uninterested or uncooperative and therefore requiring disciplining, TIC practices instead see the young people's response as a trauma symptom and focus on building safety and reparative relationships (Levenson, 2017). Service delivery based on these practices aims to make individuals feel safe, reduce re-traumatisation, assist in trauma recovery, and realign the individual's developmental trajectory (Baker et al., 2016).

The number of TIC models implemented across the child welfare sector in developed countries has increased significantly over the last 20 years. These models integrate (i) knowledge of the impact of ACEs; (ii) evidenced-based TIC interventions; (iii) staff or carer self-care; and (iv) whole organisational cultural and systemic change and understanding of TIC (SAMHSA, 2014; McLean et al., 2011).

Past literature reviews (e.g., Bailey et al., 2019) indicate that TIC practices benefit young people, their carers, and child welfare staff. Benefits include reduced carer stress, stable placements, fewer behavioural incidents, reduced youth trauma symptoms, improved placement outcomes, and increased knowledge of TIC principles (Conners-Burrow et al., 2013; Kramer et al., 2013; Bartlett et al., 2016; Hodgdon et al., 2016; Arvidson et al., 2011).

1.2. TIC measurement limitations

Recent literature reviews (e.g., Bailey et al., 2019) have identified the need for the TIC literature to transition to a more methodologically robust and data driven research area. At present, the use of inconsistent and psychometrically weak assessments to evaluate TIC practices is a key weakness hindering this transition. Outcome measures vary across TIC studies, and there is little consensus about the desired outcomes from TIC models (e.g., stable placement, fewer trauma symptoms, reduced carer stress or long-term benefits such as reduced costs on society, etc.). Several studies used researcher-developed scales, with limited information reported regarding their psychometric properties (Baker et al., 2016; Jankowski et al., 2019; Lang et al., 2016; Bartlett & Rushovich, 2018). In addition, scales have been custom designed for specific TIC models and therefore have limited applicability in evaluating other TIC models (e.g., Brown, Baker & Wilcox, 2012; Lang et al., 2016). Similarly, clinicians trained in different TIC models may encounter problems when supporting families across different agencies. Therefore, there is currently a pressing need for a valid and reliable scale measuring core beliefs about TIC practices that can be used across different programs and countries.

1.3. Current TIC attitudes/beliefs psychometric instruments

There are clear challenges when assessing TIC implementation fidelity. Observing carers for extended periods is impracticable and expensive. Carer self-reports of TIC implementation are open to social desirability effects (Baker et al., 2016). This difficulty poses a significant dilemma for agencies as the degree to which a service is regarded as trauma informed is related mainly to the moment-to-moment behaviour of the child welfare carers' interactions with youth (Metz et al., 2007). Measuring beliefs about TIC represents a possible solution to this dilemma (Baker et al., 2016). Foundational work on professional training (e.g., Ajzen, 1991 postulates that training and knowledge can change carers' behaviour and beliefs, making successful implementation more likely. Similarly, beliefs can block the implementation of TIC models (Baker, Kupersmidt, Voegler-Lee, Arnold & Willoughby, 2010; Baker et al., 2016). Two studies reported a positive correlation between carers' favourable attitudes towards TIC, and reduced trauma symptoms in young people (Lang et al., 2016; Brown et al., 2012) although neither of these studies used a psychometrically reliable measure of TIC beliefs or attitudes.

Currently, three psychometric scales assess TIC beliefs or attitudes. Colton and Xiong's (2010) scale identifies deficits in staff TIC beliefs. Similarly, Brown et al. (2012) designed a scale to assess staff beliefs about the Risking Connection model of TIC. However, these two scales have several limitations that include (a) they primarily focus on organisational systems of TIC, rather than the beliefs or attitudes of child welfare carers (e.g., foster carers and youth workers), (b) they have been designed for a specific TIC model (e.g., Risking Connection), and (c) neither scale demonstrates adequate reliability or validity.

More recently, Baker et al. (2016) developed the Attitudes Related to Trauma-Informed Care (ARTIC). The ARTIC comprises seven subscales that measure attitudes relevant to TIC implementation (i.e., origins of problem behaviour, responses to these problem behaviours/symptoms, on-the-job behaviour, self-efficacy at work, reactions to the work, personal support of TIC, and organisational support for TIC). The ARTIC was shown to have robust psychometric properties in a study of 760 teachers, healthcare workers, and community-based mental health workers. This scale has excellent internal consistency and test–retest reliabilities, as well as confirmation of the proposed seven-factor structure of the scale. However, a key limitation in confirming this scale's factor structure was that the same sample used to develop the scale was used for the confirmatory factor analysis rather than a new independent sample. In addition, while the ARTIC is a valuable tool for assessing TIC attitudes, it has been developed primarily for use in school environments, to be completed by individuals employed by human services and/or educational departments and not those who reside with young people with trauma histories. Child welfare carers who live with youth with ACEs spend the most amount of time and, arguably, play the most integral role in ameliorating trauma symptoms compared to other stakeholders involved in the delivery of TIC services (Kinniburgh et al., 2005). The daily interactions and relationships between carers and young people with trauma histories are the most important components of TIC (Metz et al., 2007).

1.4. Benefits of TIC beliefs scales

Currently, there are no scales with demonstrated psychometric properties available to evaluate TIC practices for child welfare carers. The absence of a psychometrically sound scale is a key gap in the current literature given that: 1) there is evidence linking favourable TIC beliefs to reduced youth trauma symptoms and higher TIC implementation; 2) there is a clear need to identify the mechanisms of behavioural and attitudinal change to enhance the likelihood of successful TIC implementation (Purtle, 2020); and 3) the extent to which a system is regarded as 'trauma informed' often depends on the moment-to-moment and day-to-day interactions between carers and youth (Metz et al., 2007;

Brown et al., 2012). Carers' beliefs about TIC practices are potentially a critical mediator for TIC practice implementation, and with this in mind, accurately measuring these beliefs becomes key to successful implementation (Baker, Kupersmidt, Voegler-Lee, Arnold, & Willoughby, 2010; Fixsen et al., 2009).

The development of a TIC beliefs scale will provide an efficient and effective way to evaluate TIC practices and may be useful as both an outcome measure for studies of child welfare carers and a mediator for other more applied youth outcomes (e.g., reduced incidents). A scale of this kind may assess the suitability of placements for highly traumatised young people and identify which carers and staff require further TIC training. It could act as an outcome variable for organisations implementing TIC practices, and provide researchers interested in investigating factors such as trauma symptom reduction with an important outcome variable.

2. The current study

The current study aimed to develop a psychometrically sound instrument to assess the TIC beliefs of child welfare carers who reside with young people with ACEs, and which can be used across different TIC models. This study used Rasch analysis (Rasch, 1961), as opposed to classical test theory (CTT), to develop a scale that could identify less favourable TIC beliefs in child welfare carers with more precision and sensitivity.

While Rasch analysis has been commonly used to develop and evaluate measures in education and rehabilitation (Chalmers et al., 2016; Misajon et al., 2016; Tennant et al., 2004), it has increasingly been applied to other constructs such as depression (Siegert et al., 2010), stress (Medvedev et al., 2017), and pregnancy-related anxiety (Brunton et al., 2018). Advantages of Rasch analysis over CTT are (a) Rasch analysis evaluates the measure at the item level, with a focus on the person's ability and the item difficulty, allowing for finer detail and increased information on the measure's performance (Tennant et al., 2004); (b) the Rasch approach assesses differential item functioning (DIF), i.e., the principle that the measurement instrument should perform consistently independent of person characteristics (e.g., age, gender, or culture; Thurstone, 1939). A measure with good DIF allows for valid comparisons between groups; (c) Rasch analysis verifies the unidimensionality of the measure, which is considered a fundamental requirement for summed scale validity (Tennant & Conaghan, 2007); and (d) if a unidimensional Rasch model is achieved, ordinal to interval conversion tables can be produced from the Rasch model estimates, enhancing the precision of the measure. Lastly, Rasch analysis provides a range of diagnostic information allowing for a comprehensive assessment of the scale's properties.

3. Method

The development of the scale proceeded in several stages as described below.

3.1. Questionnaire development process

One hundred and forty-three (143) candidate items were developed to capture the key principles in prominent TIC models (e.g., the ARC, Sanctuary, and Risking Connection models) and the literature (e.g., Horwitz et al., 2001; Kinniburgh et al., 2005; McLean et al., 2011; SAMHSA, 2014). The items were written at a grade 6 reading level, as recommended by Kincaid and Fishburne (1975). Based on TIC definitions relevant to child welfare carers, the items examined three broad areas: (i) beliefs about the impact of trauma (e.g., emotion dysregulation); (ii) beliefs about specific TIC interventions; and (iii) beliefs about self-care and stress self-awareness. These items were reviewed by the first and second authors before presentation to an expert review panel (ERP). The ERP was included in the candidate item development to ensure content validity of the items.

Following ethics approval from the first author's institution (protocol H20324), potential members of the ERP were invited to participate. These individuals were approached based on their extensive experience (minimum of five years' experience with child welfare carers) in implementing TIC practices. The final ERP comprised 10 practitioners (clinical psychologists, psychologists, and social workers) with extensive experience in TIC implementation and who currently provide TIC interventions in community, government, and private practice settings. No incentives were offered to the ERP members to participate in the study.

ERP members evaluated the 143 items independently from each other, with each member asked to rate the relevance of each item on a 5-point rating scale (i.e., 1 = not relevant, 5 = extremely relevant). They also could make suggestions on the wording of items. The scores for each item were totalled and then divided by the number of ERP members to develop item average scores. Items with an average score below 3.50 were deleted unless the TIC literature indicated that they assessed a core belief or practice. Based on the feedback, collated relevance scores and in consultation with the literature, the number of items was reduced to 85 – these items were included in an online questionnaire and administered to child welfare care workers.

3.2. Participants

Care providers and online carer support groups in Australia, the US, the UK, and Canada were invited to participate in the psychometric testing phase, which took approximately 25 min to complete. These organisations were asked to distribute a brief description of the study (with the online link to the survey) to their child welfare carers and/or to post a description of the study on their websites/Facebook pages. Of the 544 participants who started the online survey, 469 (86.2%) completed all trauma informed care belief items and 455 (83.6%) completed the trauma informed care belief and demographic items. These participants were current child welfare carers, including foster carers and residential care youth workers. As with the ERP members, these participants were not offered incentives to complete the survey. As shown in Table 1, there was a higher proportion of female (91.1%) than male (7.9%) participants. Approximately 74.3% provided a form of foster care, while 25.7% provided residential care. Approximately 80% of the participants reported to be either knowledgeable or very knowledgeable about TIC, and 86% have been providing child welfare care for 2 or more years. Only 13% of participants had not completed any TIC training.

3.3. Online questionnaire

The participants were presented with the 85 TIC items and asked to rate how much they agreed or disagreed with each of the items on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). After completing these items, the participants were presented with 12 demographic questions (see Table 1).

3.4. Data analyses

Data were screened before conducting Rasch analyses. This included assessing ceiling and floor effects and item-to-total correlation for internal consistency. Subsequent Rasch analysis was conducted using the software package RUMM2030 (Andrich et al., 2009) to evaluate compliance of the data to fundamental principles of measurement such as unidimensionality, invariance of subgroups using differential item functioning, and consistency in measurement unit across the continuum of the scale (Hobart & Cano, 2009). We evaluated the Rasch model fit and psychometric properties of the TIC Belief Scale using statistical parameters outlined by Tennant and Conaghan (2007). A likelihood-ratio test was conducted before the analysis to determine which polytomous model is most appropriate. If a significant difference is found across threshold distances between items, the unrestricted Partial Credit

Table 1
Summary of the relevant demographic data in percentages for the 455 participants who completed the demographic items.

Demographic Variable	N (%)
Gender	
Female	415 (91.1%)
Male	36 (7.9%)
Age Range	
21–29	61 (13.4%)
30–39	108 (23.7%)
40–49	152 (33.4%)
50–59	105 (23.1%)
60 or older	29 (6.4%)
Highest Level of Education	
Did not complete High School	21 (4.6%)
High School	73 (16.0%)
Tertiary qualification with no bachelor degree	155 (34.1%)
Tertiary qualification with bachelor degree or higher	206 (45.3%)
Years of Experience	
0–1 years	63 (13.8%)
2–5 years	165 (36.3%)
6–10 years	108 (23.7%)
More than 10 years	119 (26.2%)
Type of Current Care Provided	
Foster Care	284 (62.4%)
Kinship Care	43 (9.5%)
Respite Foster Care	11 (2.4%)
Residential Care	117 (25.7%)
Knowledge of TIC	
Not very knowledgeable	95 (20.9%)
Knowledgeable	247 (54.3%)
Very Knowledgeable	113 (24.8%)
Amount of Training on TIC	
No training	59 (13.0%)
1–2 relevant training sessions	173 (38.0%)
3 or more relevant training sessions	223 (49.0%)
Country of Residence	
Australia	239 (52.5%)
England	45 (9.9%)
USA	130 (28.6%)
Ireland	22 (4.8%)
Other country	13 (2.9%)

model is recommended (Tennant & Conaghan, 2007).

3.5. Results

Before conducting the Rasch analysis, the kurtosis and skewness values of each of the 85 candidate items were inspected. Items that exceeded the range of −1.00 to 1.00 were discarded as this is considered evidence of floor and ceiling effects (Muthén & Kaplan, 1985). This reduced the item pool from 85 to 30. In the next step, item-to-total correlations for the remaining pool were calculated. Any items with a value of<0.30 were discarded. This cut-off value can still be considered conservative and was applied only to remove items clearly unrelated to the remaining items. As a result, eight items were deleted, resulting in a set of 22 items included in the initial model of the Rasch analysis.

Item-trait interaction for the model with 22 items was significant ($\chi^2(154) = 435.36, p < 0.001$), indicating the overall misfit to the Rasch model. Individual item locations and fit residuals are shown in Table 2. Five of the items (17, 27, 37, 42, and 52) demonstrated very high chi-square values and were sources of a significant misfit at the individual item level and thus were deleted in the subsequent analysis. After the deletion of these five items, the overall fit improved but was still unsatisfactory ($\chi^2(119) = 235.14, p < 0.01$). At this stage, two other items, 78 and 79, displayed significant misfit, with high chi-square values of 29.76 and 35.82, respectively. After these two items were discarded, the fit improved further, but person-item interaction was still significant ($\chi^2(105) = 176.70, p < 0.01$). After this iteration, item 32 remained the only item of the remaining 15 items with a high fit residual of 2.74. While the deletion of item 32 in the subsequent analysis resulted in only

Table 2
Descriptions of procedures of Rasch analyses.

Concept examined	Procedure description
Overall Rasch model fit	Overall fit to the Rasch model was evaluated by observing χ^2 statistics for item-trait interaction, item, and person fit residuals. The ideal fit is for the item-trait interaction not to be significant, standard deviations and means to be close to 1.00 and 0.00 respectively for item and person fit residuals. When the χ^2 is significant, it indicates a violation of the hierarchical order and difficulty of items across the construct or trait. Individual item fit residuals between −2.50 and + 2.50 were considered an acceptable fit to the Rasch model (Balalla et al., 2019).
Unidimensionality	Principal component analysis (PCA) of residuals was used to test unidimensionality. The PCA excluded the latent trait component to evaluate whether there were any other associations between items. Unidimensionality is confirmed with < 5% of significant independent *t*-test comparisons.
Reliability	The Person Separation Index (PSI) is the Rasch model estimate of scale reliability with acceptable values > 0.70 for group comparisons and > 0.85 for individual evaluation.
Targeting of item and persons	Person-Item targeting allows for understanding how well sample trait levels are covered by the measure, with means above 0.00 indicating the sample is located at the higher level of the construct; and means below 0.00 indicating the converse.
Differential Item Functioning (DIF)	DIF examines an item's invariance across demographic variables, such as age, sex, years of caring, etc.
Local dependency	Local dependency is where an item response influences the response on another item. Local dependency can be identified by residual correlation values that exceed the margin of 0.20 compared to the mean of residual correlations.
Testlets	When issues with DIF, ordering thresholds or local dependency are identified, testlet models including two or more related items can be used to reduce the error variance while maintaining construct validity (Krägeloh et al., 2015)

marginal improvement of the overall model fit ($\chi^2(126) = 158.57, p = 0.03$), there was evidence of multidimensionality with 46 (9.81%) significant *t*-test comparisons.

Multidimensionality may be evident due to local response dependency between items. Therefore, the residual correlation matrix was examined and indicated a strong local dependency of items 7 and 25, as indicated by residual correlation values exceeding the average residual correlation coefficient by more than 0.20. The content of these and other items was analysed by team members and item 7 was removed due to semantic redundancy, as it overlapped in meaning with items 6 and 8. While the analysis with the remaining 13 items demonstrated an overall adequate Rasch model fit ($\chi^2(117) = 135.82, p < 0.11$), and none of the item thresholds was disordered, there was still evidence of multidimensionality with 53 (11.30%) significant *t*-test comparisons. To distinguish between trait-related multidimensionality and multidimensionality due to local dependency between items (Lundgren Nilsson & Tennant, 2011), testlets were created for the subsequent analysis. Item grouping was informed by correlational analysis and included testlet 1 (items 5 and 6), testlet 2 (items 8, 14, 15, 16, 21, 29), and testlet 3 (items 33, 23, 25, 26, and 28; Wainer & Kiely, 1987). If multidimensionality is caused by local response dependency, after combining dependent items into testlets the data should fit the Rasch model (Lundgren-Nilsson et al., 2013; Medvedev et al., 2017). The best fit was obtained in this final model, which contained three testlets with the above item grouping ($\chi^2(12) = 18.42, p = 0.10$), and unidimensionality was now confirmed with<5 (4.26%) significant *t*-test comparisons. The person separation index, a measure of the reliability of the scale, was 0.77 and thus acceptable. Lastly, there was no evidence of differential item functioning by demographic categories., including no difference it item responses

across the different countries, gender, age, or years of experience.

Fig. 1 below shows the person-item thresholds distribution for the final set of 13 items as a visual illustration of how well the trait measured in this scale is covered by thresholds of individual items. The distribution is close to normal, and item thresholds cover over 95% of the sample. However, targeting was not perfect as indicated by the person mean being slightly elevated compared to the item mean. However, there were no significant ceiling or floor effects with 95% of the sample perfectly covered by item thresholds.

As a final step in the present Rasch analysis, conversion algorithms were generated to permit the transformation of ordinal-scale summary scores to interval-level data. Instructions for scoring conversion are provided in Table 3. Note that this conversion can only be conducted for respondents with no missing data. The authors can be contacted for assistance with this conversion (see Table 4).

4. Discussion

This study aimed to develop a psychometrically sound scale that measured the TIC beliefs of child welfare carers using Rasch analysis. The use of inconsistent and psychometrically weak assessments to evaluate TIC practices is a key weakness hindering this transition (Bailey et al., 2019). The resulting 13-item TIC Belief Scale will facilitate the transition of TIC research and practice to become a more methodologically robust and data driven research area. The scale can be used as an efficient and practical way for welfare agencies and clinicians to assess the need for TIC training, the benefits of TIC training, and matching youth with carers. The TIC 'service delivery' definition covers four main areas: (i) knowledge of the psychological and medical impact of ACE; (ii) evidence-based interventions for ACE (e.g., safety, reparative relationships, interpret behaviour via a 'trauma lens'); (iii) carer self-awareness and self-care; and (iv) TIC congruent systems and procedures across organisations (SAMHSA, 2014; McLean et al., 2011). This study focused on the first three aspects of TIC that are most relevant to child welfare carers, as these individuals play the most important role in supporting and rehabilitating youth with ACEs (Metz et al., 2007).

The results of the Rasch analysis indicate that the final 13-item TIC Belief Scale is psychometrically sound. The final Rasch model for this scale achieved a good fit after deleting misfitting and/or redundant items and some minor modifications. This scale showed no evidence of DIF indicating that it performs consistently independent of test-taker demographic characteristics (e.g., age and gender). This scale also showed acceptable reliability and unidimensionality, thereby supporting the validity of summed scaled scores. While this scale could differentiate between individuals at the low and middle range of the scale, it was less able to differentiate between test-takers at the very high end of the scale. However, this is not regarded as a serious limitation given that this scale aims to identify test-takers who may not subscribe to or have limited knowledge of TIC practices (i.e., test-takers at the low end of the scale). Moreover, the ordinal to interval conversion of TIC Belief Scale scores provides greater precision in the scoring and analyses of data, which makes the scale suitable for use in research and applied settings. For example, transformed scores can be calculated and used to identify child welfare carers who may need additional support and training in TIC practices and to monitor and assess changes in beliefs following the provision of support and training.

Of the final 13 items, six (items 23, 25, 26, 28, 29, and 30) measured carers' beliefs about the impact of ACEs on young people's current and future functioning. These items covered critical aspects of the consequences of trauma, including its detrimental impact on self-belief, hypervigilance, distrust of others, and relationship difficulties (NCTSN, 2008). Trauma-informed research and practice show less favourable beliefs on the impact of ACEs can have negative effects on youth (Burch et al., 2010; SAMHSA, 2014; Rudasill et al., 2013). Carers who underestimate the impact of ACEs tend to place unrealistic expectations on youth and misinterpret their behaviour. For example, avoidance of physical affection with carers may be a trauma symptom resulting from the experience of sexual abuse, but when interpreted by carers as a lack of desire for attachment can lead to placement termination or impact caring practices (Levenson, 2017). Lower scores on these items indicate the carer cannot understand the role of trauma in the youths' behaviour and may misinterpret the youths' trauma symptoms. This should be seen as a trigger for intervention by care agencies and at the least, further training in TIC practices.

The five items (5, 6, 8, 16, and 21) that assessed carers' beliefs about evidence-based interventions included two items that focused on safety, a fundamental element of TIC (Harris & Fallot, 2001). Subjective perceptions of safety are important for interventions with traumatised youths, such as psychotherapy or pharmacotherapy (Baker et al., 2016). Evidence of less favourable beliefs on either safety item would indicate that further TIC training is required. Further items assessed youth connections within the community and understanding of the child welfare system. These are both fundamental in understanding and caring for traumatised young people (Baker et al., 2016). Unfortunately, items measuring carers' understanding of their relationship with the youth were found to psychometrically misfit the Rasch model and were deleted

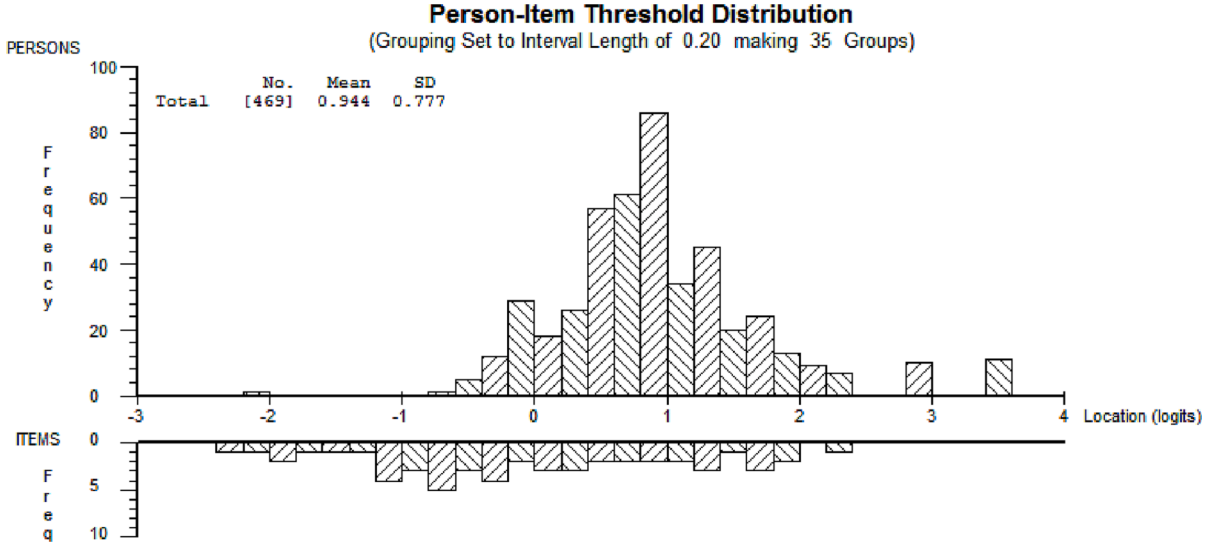

Fig. 1. Person-item threshold distributions for the 13-item TIC Belief Scale (TIBS) scale. Results are shown in logit units.

Table 3
Individual item Rasch model fit statistics, including item location, fit residual, and item-trait interaction chi-square for the initial analysis with 13 items.

Item number	Item wording	Location	Fit Residual	Chi-Square
5	It's very important to learn how to make the young person with a trauma history feel safe. (TIC specific interventions)	−0.38	0.82	6.15
6	One of the most important things for caring for traumatised young people is that they feel safe in their environment. (TIC specific interventions)	−0.49	0.06	2.51
8	Knowing the impact of trauma on young people helps me to understand their challenging behaviours. (TIC specific interventions)	0.51	0.31	3.77
14	It's important to role model how I manage my own emotions. (Carer's self-care/self-awareness)	−0.13	0.66	13.96
15	When I am stressed from caring for the young person in my care, it's important to talk to someone about it. (Carer's self-care/self-awareness)	0.06	−0.97	3.36
16	It's important to understand how the child welfare system works. (TIC specific interventions)	0.38	−1.81	11.42
21	It is important to maintain the young person's connections within the community (TIC specific interventions)	−0.04		
23	Young people with trauma histories are more likely to have drug and alcohol problems when they are older. (Beliefs about impact of trauma)	−0.73	−1.44	16.59
25	Young people with trauma histories often develop mental health conditions. (Beliefs about impact of trauma)	0.14	−1.34	11.37
26	Young people with trauma histories are often on the alert for danger. (Beliefs about impact of trauma)	0.51	2.25	5.21
28	Young people with trauma histories often blame themselves for the bad things that have happened to them. (Beliefs about impact of trauma)	0.18	−3.87	41.46
29	Young people with trauma histories often struggle to maintain relationships. (Beliefs about impact of trauma)	0.33	0.38	8.03
33	Young people with trauma histories can be overly trusting and/or not very trusting of others. (Beliefs about impact of trauma)	−0.52	2.47	18.96

from the final scale. Statistically, the misfitting items did not contribute to the Rasch model, possibly because they do not exclusively measure TIC practices. For example, the importance of parent or carer and child relationship is not exclusive to TIC, it is fundamental to most parenting practices which may explain why these items did not fit the Rasch model (Feeney, 2000). If child welfare staff or practitioner would like to assess the carers attachment with the youth, they could consider using other validated scales that measure beliefs of attachment style, such as The Attachment Style Interview and Vulnerable Attachment Style Questionnaire (Bulfaco, 2014).

Two items (14 and 15) measured carers' self-awareness and self-care. An ongoing problem in the child welfare system is high carer burnout and addressing it effectively is a key challenge for agencies seeking to implement TIC practices. The reasons for burnout include compassion fatigue, vicarious trauma, and an inability to effectively manage the youth's trauma symptoms (Farmer et al., 2005; Newell et al., 2016). Placement termination is often a result of individuals feeling overwhelmed and unable to cope with the young person in their care (Farmer et al., 2005). Placement changes and carer changes often trigger or perpetuate underlying abandonment and distrust schemas for youth (Young et al., 2003. Effective self-care is therefore essential to maintaining a long-term and reparative placement for youth. A further item focused on the ability to communicate with others when feeling stressed, which is a helpful practice to ameliorate the stress of caring for traumatised youth (NCTSN, 2008). Another item focused on carers' perceptions of role modelling for the youth, which requires both insight and appropriate self-regulation of emotions. Youth have typically been exposed to emotionally dysregulated parents, therefore positive role modelling from carers can help prevent patterns of *trans*-generational trauma (Castro-Vale et al., 2019).

Table 4
Converting from ordinal- to interval-level scores for the 13-item TIC Belief Scale.

Ordinal	Interval Logits	Interval Scale	Ordinal	Interval Logits	Interval Scale
13	−2.95	13.00	40	−0.18	35.48
14	−2.52	16.48	41	−0.10	36.14
15	−2.23	18.85	42	−0.01	36.83
16	−2.03	20.47	43	0.08	37.54
17	−1.87	21.78	44	0.17	38.26
18	−1.73	22.92	45	0.26	39.00
19	−1.60	23.96	46	0.35	39.73
20	−1.48	24.95	47	0.44	40.48
21	−1.36	25.87	48	0.53	41.22
22	−1.26	26.75	49	0.63	41.98
23	−1.16	27.56	50	0.72	42.73
24	−1.06	28.31	51	0.81	43.49
25	−0.98	28.97	52	0.91	44.24
26	−0.91	29.54	53	1.00	45.00
27	−0.85	30.04	54	1.09	45.77
28	−0.79	30.49	55	1.19	46.56
29	−0.74	30.89	56	1.29	47.36
30	−0.70	31.26	57	1.39	48.20
31	−0.65	31.62	58	1.51	49.10
32	−0.61	31.96	59	1.63	50.08
33	−0.57	32.30	60	1.76	51.20
34	−0.53	32.66	61	1.92	52.49
35	−0.48	33.03	62	2.12	54.11
36	−0.43	33.43	63	2.39	56.30
37	−0.38	33.86	64	2.81	59.70
38	−0.32	34.33	65	3.47	65.00
39	−0.25	34.88			

4.1. Implications for research and practice

The TIBS can contribute to future research by providing a means of efficiently assessing the beliefs of child welfare carers about trauma-informed care. It is the first scale that is specifically designed for use with child welfare carers and can be used across TIC models. Future uses of the TIBS include tracking changes in TIC beliefs before and after TIC training, assessing the need for further TIC training for carers, assessing trauma-informed carers' beliefs across an agency, and assessing the suitability of specific carers with youth with trauma symptoms. The scale is brief, has sound psychometric properties, and will be an important tool for agencies responsible for child welfare. It will be particularly useful in identifying less favourable TIC beliefs and providing a means to address this problem.

4.2. Limitations and future directions

While the final TIBS has strong psychometric properties, the scale does not cover all principles of TIC. Many candidate items were deleted from the scale because of a significant misfit to the Rasch model. It is

possible that the Likert response scale adopted in this instrument may have resulted in ceiling effects. It was evident that participants tended to respond positively to items (i.e., they were more likely to endorse the belief), which led to limited variability on a few items. Members of the sample group were also relatively experienced in the care system (86% of participants had 2 or more years of caring experience) and likely to have received care training (87% of participants had completed one or more TIC training sessions), therefore most had favourable beliefs about TIC. There were no reverse-scored items which may have led to response bias and contributed to the pattern of strong agreement with the items.

Future studies should address these limitations and aim to recruit a more varied population of carers, particularly carers with little or no experience. The original Likert response scale could have contributed to the pattern of positively skewed responses. A continuous rating scale could provide a solution to this, where participants are asked to give a response on a continuum anchored at each extreme. Inclusion of reversed scored items and negatively worded items may also reduce the response bias, and ceiling and floor effects evident in the current study. The combination of these changes may create more variability in participants' responses and help develop a scale that more comprehensively assesses the full theoretical content of TIC principles.

Future versions of this scale could consider adding open-response items to cover the essential aspects of TIC not included in the current TIC Belief Scale. One of the critical components of TIC models is the importance of the carer/youth relationship. The literature demonstrates that the relationship between the carer and youth is arguably the most critical agent for change (Marvin, Cooper, Hoffman & Powell, 2002; Metz et al., 2007). Unfortunately, all the relational based items demonstrated floor and ceiling effects and were excluded from the final version of the scale. A similar effect was observed with carer self-care. Therefore, more items that assess carer beliefs relating to self-care and the importance of the carer-youth relationship are needed.

One of the key strengths of this study was the use of a relatively large sample of child welfare carers from Australia, the UK, the US, and Canada, although we did not measure the racial and ethnic profile of our sample. However, future studies need to confirm the fit of the Rasch model in a new, large sample of child welfare carers, with appropriate racial and ethnic participation. Moreover, with any instrument developed for use in applied settings, further validation studies need to be undertaken, particularly in terms of its predictive validity.

5. Conclusion

The TIC Belief Scale is the first scale designed exclusively for child welfare carers, who play the most integral role in rehabilitating youth with ACEs. While the TIC Belief Scale does not provide comprehensive coverage of all aspects of TIC practices, it nevertheless provides a brief, efficient, and accurate method to assess carers' beliefs about TIC. The conversion of ordinal to interval scoring increases the precision in understanding less favourable TIC beliefs.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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