He Piki Raukura: Assessing Ao Māori developmental constructs – Part I: Reliability of novel strengths-based measures among preschool Māori children

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This is the first of two papers describing the creation of measurement tools for four Māori constructs of positive child behaviour – tuakiri (secure local Māori identity); whānauranga (acting as a member of a whānau); manawaroa (persisting despite difficulty); and piripono (having integrity, commitment and responsibility). This paper describes the psychometric properties of these new measures. Parents and teachers completed questionnaires on 28 children aged 0-5 years five times over 10 months in a Māori-medium early years setting, and video observations were made. Ratings of the videos showed good inter-rater reliability. All questionnaire measures had good internal consistency. Associations of questionnaires with rated observations varied at some timepoints suggesting a need to include both in ongoing research. This study provides initial evidence about reliability of our novel Māori measurement tools for assessment of preschool Māori children.

Keywords: *Māori Indigenous psychology, Māori constructs, Māori child behaviour measures, Māori child development, reliability, validity*

Introduction

In Aotearoa, a number of measurement tools are used to assess and evaluate young children's development and behaviour. These assessments are commonly carried out by psychologists in research or practice settings, through government programmes such as Plunket's Well Child Tamariki Ora, or in early childhood settings and primary schools (Pannekoek & D'Souza, 2018). Assessments typically involve measures created by non-Māori researchers such as the Strengths and Difficulties Questionnaire or the Social Competence Scale which assess prosocial behaviours and conduct problems (Corrigan, 2002; Goodman, 1997). Tamariki Māori are automatically included in assessments using these measurement approaches (Morton et al., 2017; Peterson et al., 2018), despite the tools being created by non-Māori researchers and practitioners. What this means is that measurement tools often do not take into account Māori cultural priorities and other Indigenous factors, such as the child's cultural context, language, and whānau, hapū and iwi connections (Bishop, Berryman, Cavanagh, & Teddy, 2009; Durie, 2006; G. H. Smith, 2003b).

There is a need to create child behaviour measurement tools, that are both strengths-based and grounded within Indigenous Māori worldviews. There is strong evidence in Aotearoa that interventions in the early years (i.e., 0-5 years) lead to improved life outcomes (Fergusson, Horwood, Ridder, & Grant, 2005; Horwood, Gray, & Fergusson, 2011; Sturrock, Gray, Fergusson, Horwood, & Smits, 2014). Running parallel with this are the growing number of initiatives, programmes and approaches by Māori communities or groups, which are increasingly recognised as alternative ways to work with tamariki Māori, whānau and community to improve life outcomes for Māori (Durie, Cooper, Grennell, Snively, & Tuaine, 2010; Hond, 2013; King & Turia, 2002; Mane, 2009; Royal Tangaere, 2012). These include Māori language, health and education initiatives. However, to date, there have been few evaluation studies conducted in these early life kaupapa Māori community initiatives. Moreover, deficit theories have tended to dominate the way outcomes of interest to Māori have been analysed (Blank, Houkamau, & Kingi, 2016; Pihama, 2012), further emphasising the need for the development and validation of strengths-based Māori measurement tools to assess the development of tamariki Māori and the outcomes of Māori programmes and interventions.

While there are many studies that have examined the development of measures of young children's behaviour (D'Souza, Waldie, Peterson, Underwood, & Morton, 2017; Goodman, 2001; Ponitz et al., 2008; Rothbart, Ahadi, Hershey, & Fisher, 2001), there are few psychological measures that have been developed from within Indigenous worldviews. Those that have been developed have focussed on Indigenous youth and adults, such as measures of Māori identity in adulthood (Houkamau & Sibley, 2010a; Houkamau & Sibley, 2010b; Palmer, 2004; Sibley & Houkamau, 2013). Examples from overseas include measures of protective factors in Alaskan youth engaged in alcohol abuse and for suicide prevention (Allen et al., 2014); growth and empowerment in Indigenous Australians (Haswell et al., 2010); cognitive assessment of rural-based middle-aged Indigenous Australians (LoGiudice et al., 2011); and the

emotional intelligence of Indigenous adults in Pakistan (Batool & Khalid, 2011).

Measures that have been created from within Indigenous worldviews or adapted through application of an Indigenous cultural lens have been applied in Indigenous-specific research. Examples include Indigenous language assessment in children and Māori parenting interventions (Housman, Dameg, Kobashigawa, & Brown, 2011; Keown, Sanders, Franke, & Shepherd, 2018). In the development of the measures, these studies used culturally-grounded approaches including collaboration, community involvement and contribution (Batool & Khalid, 2011; Keown et al., 2018); iterative processes of dialogue and workshopping (Allen et al., 2014); participation of Indigenous experts on health and education (Schlesinger, Ober, McCarthy, Watson, & Seinen, 2007); and the initial generation of items from within an Indigenous language context (Batool & Khalid, 2011; Housman et al., 2011).

Cultural psychometrics

The measures used in the assessment of tamariki Māori typically assess non-Māori constructs. For example, Goodman's Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) assesses both conduct issues and prosocial behaviour from a Western worldview. While the SDQ has been validated in Aotearoa across age, gender, ethnicity and deprivation groups (D'Souza et al., 2017; Horwood et al., 2011; Pannekoek & D'Souza, 2018), Māori-specific measures are needed because of concerns about the cultural relevance of Western measures of Māori children (D'Souza et al., 2017). For example, a qualitative study into the cross-cultural acceptability and utility of SDQ reported concerns from Māori parents about the lack of consideration of tamariki Māori in their cultural context and the need for multiple perspectives when interpreting scores (Kersten et al., 2016). A subsequent study evaluating the concurrent validity of the SDQ in comparison to child referral for intervention found that the SDQ had unacceptably low sensitivity in Māori preschool children due to high rates of false positives and, therefore, young Māori children with need for referral were potentially not receiving the appropriate support needed when SDQ was the only method of assessment (Kersten, Vandal, Elder, Tauroa, & McPherson, 2017). Moreover, the 2013 Incredible Years Evaluation report involving young children (Sturrock & Gray, 2013) highlighted concerns about the appropriateness of child and whānau interventions that were not grounded in a Māori worldview nor delivered by Māori and for Māori, an issue that is well documented in the wider literature on Māori identity, well-being and development (Berryman, Macfarlane, & Cavanagh, 2009; Durie, 2004, 2006; McClintock, Mellsop, & Kingi, 2011; McClintock, Tauroa, Mellsop, & Frampton, 2016; Pihama, 2012; Rameka, 2011; G. H. Smith, 2003b).

Given questions about the cultural appropriateness of current measurement tools for tamariki Māori, researchers have argued that the assessment of young Māori children should be culturally relevant, culturally specific and culturally valid, and that measures should be developed by Māori for Māori and reflect Māori realities (Elder, Czuba, Kersten, Caracuel, & McPherson, 2017; Rameka, 2011; Sibley & Houkamau, 2013). It is important for psychology in Aotearoa to understand how best to develop reliable measures to use with tamariki Māori, and how to take into account cultural priorities that may have been overlooked due to presumptions or unconscious bias in mainstream approaches, spanning a range of disciplines (Blank et al., 2016; Pihama, Smith, Taki, & Lee, 2004; G. H. Smith, 2003a; L. T. Smith, 2001). This raises questions about how Indigenous children are unconsciously perceived or stereotyped, thus affecting understandings and judgements during assessment, which in turn might undermine their cultural validity (Blank et al., 2016). Therefore, the development of measurement tools that are not only reliable and valid but also culturally relevant is essential to accurate assessment. These understandings can help foster better clinical practice, as well as informing equitable approaches when working with Māori children and their whānau.

The current study

The current feasibility study, He Piki Raukura, is part of Te Kura Mai i Tawhiti (TKMT), a long-term Māori community-initiated research programme that began in 2012 and has been previously described in detail (Ratima et al., 2019). In brief, the aim of TKMT is to examine the impact that kaupapa Māori early life and whānau programmes have on health, well-being and educational outcomes of the whole whānau. TKMT is a collaboration between Te Pou Tiringa Incorporated and the University of Otago's National Centre for Lifecourse Research. Te Pou Tiringa is the governance entity of Te Kōpae Piripono, a Taranaki Māori-medium early childhood and whānau programme that has been operating since 1994 as an early childhood education centre (ECE). Te Kōpae Piripono was recognised nationally as a 'Centre of Innovation' in 2005 and its programme has previously been described in detail (Tamati, Hond-Flavell, & Korewha, 2008). Te Kōpae Piripono provides a 'real world' kaupapa Māori child and whānau intervention to support and reinforce positive behaviours among young children. The term 'He Piki Raukura' refers to the flight feathers of the toroa (giant albatross), a cherished emblem of the historic Taranaki community of Parihaka as a symbol of peace and of resistance in the face of adversity, and sustained well-being. These are concepts that underpin the work of Te Kōpae Piripono and inform the Māori constructs (Tamati et al., 2021a).

Epistemologically and methodologically the TKMT research programme has a lifecourse orientation and applies an interface approach. This means that the research is located at the interface between the mātauranga Māori and Western science paradigms (Edwards, 2010; Ratima et al., 2019). An interface approach acknowledges that both Māori and Western knowledge systems are equally credible and relevant to the disciplined inquiry in contemporary Aotearoa (Durie, 2004; Edwards, 2003).

The aim of He Piki Raukura has been to both develop and investigate ways to measure Māori constructs underpinning important behaviours in early childhood. In the first phase of the study, interviews were held with whānau and Māori education experts. The Māori researchers then ran a series of wānanga to develop Māori developmental constructs (Tamati et al., 2021a). The four

strengths-based Māori child behaviour constructs identified are – tuakiri (a secure local Māori identity); whānauranga (feeling and acting, as a member of a whānau/community); manawaroa (having courage in adversity, persisting despite difficulty and a positive outlook); and piripono (having integrity, commitment and responsibility for a shared kaupapa/purpose) (Tamati et al., 2021a). In this second feasibility phase of He Piki Raukura, we sought to create a novel set of child behaviour measurement tools based on the above Māori constructs and to determine if these measures were reliable and valid. While other studies have developed Māori measures of identity and wellbeing, following our review of the literature, we concluded that none adequately captured all the necessary elements of the constructs we wished to measure in early childhood. In this stage of the overall study, our aims were to:

1. Develop a set of measurement tools to quantitatively measure identified Māori child behavioural constructs.
2. Test the psychometric properties of the novel measurement tools (i.e., inter-rater reliability, internal consistency and concurrent validity).
3. Refine the measurements tool by developing shortened versions that retain appropriate psychometric properties.

A further aim of He Piki Raukura was to use the validated measures in a third stage, to investigate whether we could detect changes in children's behaviour over the course of 10 months by mapping the trajectories of change in these constructs. This work could only be conducted once the psychometric validation had occurred. The results of this third stage are described in the companion paper, He Piki Raukura - Assessing Ao Māori developmental constructs Part II: Mapping positive change over 10 months among preschool Māori children (Tamati et al., 2021c).

METHODS

Participants

A cohort of 28 children and their 22 immediate whānau (i.e., parents/caregivers) who were enrolled at Te Kōpae Piripono during 2016 agreed to take part in this study. Each whānau was asked to complete a quantitative questionnaire about their child/children and their family at five timepoints, over the course of the 2016 school year (March, June, August, October, December). Data collection occurred across one working week for each of the timepoints. Parents were also asked to consent to their children being videoed over a number of structured activities and also as a part of the day-to-day activities at Te Kōpae Piripono for a rating process described below. In terms of completeness of data, all 28 tamariki and their whānau participated for the entirety of the study, with occasional random missing data due to issues such as illness and tangihanga.

Parents ranged in age from the early twenties to mid-forties (median = 35). However, 88% of parents were aged 27 years and older. Children ranged in age from 11 months to 5 years (median = 3 years 5 months). The gender of the child participants was relatively even (13 boys/15 girls). Mothers made up 81% of adult participants who filled in questionnaires. Twenty-five children attended Te Kōpae Piripono on a full-time basis (35 hours per week). The three children who attended for fewer hours (approximately 30 hours per week) were either younger in age (between 11 months and 15 months) or lived a substantial distance from Te Kōpae Piripono (up to 90 kilometres round trip).

The nominated parent of each child completed the questionnaire at a time and place convenient to them, with one of a team of three research assistants asking the questions (see detailed description of Māori child behaviour questionnaires below). This often happened in families' homes and during weekends. The remainder of whānau completed the questionnaire at Te Kōpae Piripono. Kaitiaki (teachers) at Te Kōpae Piripono also participated in the study. Kaitiaki were randomly allocated a small group of children (approximately N=4) to answer questions about at each of the five timepoints, during data collection. There was a change in one of the kaitiaki at T3 and T4 meaning two other kaitiaki took over rating the children allocated to the original kaitiaki, for T4 and T5. The video observations of children (see detailed description below) were also carried out at Te Kōpae Piripono.

Input and oversight were provided by an expert project advisory group throughout the course of the study. The University of Otago Human Ethics Committee approved the study (16/003). Participants gave informed consent to participate. All of the researchers involved in fieldwork were or had been part of Te Kōpae Piripono in some way, and so there was high trust and strong whānau participation.

Measures

Parents and kaitiaki were asked a series of questions about the children that would best describe their behaviour in relation to the four Māori constructs of interest – tuakiri, whānauranga, manawaroa and piripono. Parents were also asked a series of general demographic questions (e.g., age, gender). A draft questionnaire was composed during the series of wānanga involving the Māori researchers and expert project advisory group and piloted for appropriateness over a seven-month period with relevant whānau in the wider community who were not currently enrolled at Te Kōpae Piripono. During the pilot work, feedback was gathered about the questionnaire's usability and comprehensibility. The resulting Māori Child Behaviour Questionnaire – whānau version (MCBQ-W) and kaitiaki version (MCBQ-K) – measured the four Māori constructs of interest, which are described in detail in Tamati et al. (2021a). For each construct, we generated a set of items that reflected key aspects of that construct. Parents and kaitiaki indicated on a 5-point frequency scale, the extent to which each item in the questionnaire reflected the level of their child's behaviours for each construct (1 = 'not at all'; 2 = 'rarely'; 3 = 'sometimes'; 4 = 'often'; 5 = 'very often'). Parents were asked to rate the four constructs for their children, in three different contexts (i) the home environment (ii) at Te Kōpae Piripono and (iii) in the wider community. Kaitiaki answered questions only in relation to the Te Kōpae Piripono context. All items are available on request.

Parents were also asked to provide feedback on the questionnaire at each timepoint including the extent to

which the questionnaire was easy or difficult to complete, clear or confusing, and appropriate or inappropriate.

Development of the short-form measures

Following data collection, item-total analysis was carried out on the full set of questionnaire items to determine whether it was possible to shorten the multi-item scales. This was to ensure whānau and kaitiaki had clear comprehension of the questions, when rating a child's behaviour, and how they represented a given construct. An item-total correlation test was carried out for both the whānau and kaitiaki ratings and 34 items of the total 199 items (17%) were found to have weak to moderate relationships (r = 0.3-0.4) with the totals of other items. A further 26 items (13%) were removed due to repetition, for being unclear in how they represented a construct, or for not being relevant to a specific context (e.g., one question referred to 'playing in a group environment at home' which was not the case for a number of whānau). Table 1 lists the number of items per construct in the original long-form and the refined short-form. Following this process, the short-form version only was used for the remainder of the analyses.

Child behaviour observations

A series of video observations of children's behaviour were recorded at each timepoint to further evaluate the four constructs of interest and allow testing of convergent validity with the ratings of parents and kaitiaki. This involved videoing children interacting with their peers and kaitiaki during two structured and two unstructured activities (described below) in two different contexts – the kopa kai (dining room) and the kopa mahi (main classroom). Two video cameras, each able to record for a full day, were placed in fixed positions in the kopa kai and the kopa mahi above the whāriki (mat area where most whole group activities occurred (e.g., group reading and kapa haka).

Structured activity #1: Introduction of a new toy

Children were assigned to five groups of approximately five children. The makeup of these groups remained constant for the duration of data collection. Children were randomly selected across mixed age-bands. Each day during data collection week, in the kopa mahi, one of the five groups was introduced to a new toy. Over the course of each data collection phase, all children participated in the activity, at least once. Kaitiaki were asked not to get involved in the play, other than if a child asked for or needed help. The activity lasted for 20 minutes; however, if a child or children spontaneously negotiated for the continued use of the toy then another five minutes was added to the playing time. The introduction of a new toy task sought to elicit children's democratic turn-taking.

Structured activity #2:Pōwhiri (formal welcome)

On two separate days, at each data collection timepoint, a manuhiri (visitor) was welcomed into Te Kōpae Piripono. All children participated in the Taranaki pōwhiri process including harirū first (hongi/shaking of hands) then mihi (words of welcome) and waiata (song), and kai (sharing of food). The video observations, from fixed positions, captured the behaviour and actions of all participating in the welcome process. The pōwhiri provided opportunities to observe children's understanding, behaviour and engagement in tikanga Māori (Māori cultural norms) – including taking on roles, participating in kōrero (speaking) and waiata, assisting others and being able to sit calmly for extended periods.

Unstructured activity #1: Kopa kai (dining room)

The unstructured activities were guided by time sampling principles. The activities in the kopa kai sought to capture children's behaviour during normal meal time activity. Children were randomly selected across age-bands, into three larger groups of between 7-10 children. At morning wā huihui (mat time), each group was assigned a colour e.g. red, green, or yellow group for each of the three dining tables. Each group then ate at the same colour-designated table for the day – across three meal times – kai ata (morning tea), kai poutū (lunch time) and kai ahiahi (afternoon tea). The 'red' table was the table designated to be video recorded. Over three days of the week, each of the groups received a red-coloured card, meaning each group got to sit at the red table at least once.

Unstructured activity #2: Kopa mahi (classroom)

The video camera installed in the kopa mahi was essentially a 'fly on the wall', capturing routine activity during the whole Kōpae day between 9am-3.15pm.

Video rating

The observational data was rated by three researchers, trained to criterion, to rate the Māori constructs of interest. A Māori Child Behaviour Rating Schedule (MCBRS), developed by the research team, was used by the raters (full schedule available on request). The rating given for each of the four constructs was the average rating given across the four different contexts listed above (e.g., structured and unstructured activities). This provided a single rating for each construct (e.g., tuakiri) for each child.

Table 1. Long-form and short-form questionnaire number of items

	Tuakiri		Whanauranga		Manawaroa		Piripono		Total	
	Long	**Short**	Long	**Short**	Long	**Short**	Long	**Short**	Long Total	**Short Total**
Home	10	**8**	16	**10**	13	**9**	10	**7**	49	**34**
Kōpae	10	**7**	16	**11**	13	**9**	10	**7**	49	**34**
Community	13	**10**	16	**11**	13	**9**	10	**7**	52	**37**
Total Whānau	33	**25**	48	**32**	39	**27**	30	**21**	150	**105**
Total Kaitiaki	10	**7**	16	**11**	13	**9**	10	**7**	49	**34**

The MCBRS included a detailed description and characteristics of each construct, as well as observable examples of how a child may display behaviour related to the construct. The schedule also provided instruction on how to rate the observed behaviour on a scale from 1 to 5. A rating of five (5) was given to a child who 'consistently and unprompted, demonstrated examples' of the construct. A rating of four (4) was for a child who 'often, both spontaneously, and sometimes with encouragement by others' exhibited the construct. A rating of three (3) was if a child 'showed some examples of (the construct) with regular encouragement by others.'
A rating of two (2) was if a child demonstrated examples of the construct, 'only if they were reminded or prompted by others and required support to do so'. And a rating of one (1) was if a child demonstrated none of the listed examples of the construct.

Data Analysis

A series of psychometric analyses were conducted to assess inter-rater reliability, internal consistency and concurrent validity of the new measurement tools - the MCBQ-W (whānau questionnaire), MCBQ-K (kaitiaki questionnaire), and the MCBRS (child behaviour rating schedule).

Intra-class correlation coefficients (single measures, one way) were used to measure inter-rater reliability of the video observations. Inter-rater reliability, measured across the three raters at baseline, evaluated how closely aligned their rating were for the same observed child behaviour from the video observations (Cicchetti & Sparrow, 1981; Fleiss, 1981). This process assessed the preliminary ratings and also informed the ongoing training of raters.

Video observations were rated at baseline (T1) for the N=25 children who were enrolled at Te Kōpae Piripono at the time. These ratings were averaged across the four behavioural scenarios (structured activities #1 and #2, and unstructured activities – kopa kai and kopa mahi). A further three children enrolled at T2 and started participating in observational tasks from then on.

Cronbach's alpha were calculated to determine the internal consistency of each measure. This was carried out to show whether the items on each subscale produced similar scores to measure the same underlying constructs (Nunnally & Bernstein, 1994). Cronbach's alphas were calculated individually for the three ratings (child behaviour observations, whānau and kaitiaki ratings) for each of the four Māori constructs over five data collection points (Table 2). Subscales of the MCBQ-W included all three contexts – home, Te Kōpae Piripono and the wider community. A minimum recommended level of alpha coefficients is .70 for preliminary research, .80 for basic research tools and .90 for applied or real-life research – with the ideal being .95 (Nunnally & Bernstein, 1994). Correlations of measures of the same construct were examined to determine associations within multiple measures of the same construct. Factor analyses could not be run with this cohort given the limited number of participants in comparison to the number of items. A regression analysis was carried out for each of the four Māori constructs between the child behaviour ratings (the dependent variable) and the kaitiaki ratings and whānau ratings.

RESULTS

Inter-rater reliability

There was either good or excellent inter-rater reliability for the four constructs, with the intra-class correlation for tuakiri being 0.72 (95% *CI* = 0.46, 0.87); whānauranga 0.65 (95% *CI* = 0.35, 0.83); manawaroa 0.78 (95% *CI* = 0.57, 0.90); and piripono 0.79 (95% *CI* = 0.57, 0.90) (Cicchetti & Sparrow, 1981).

Internal consistency

All four Māori constructs showed very strong internal consistency, with alpha coefficients ranging from .90-.98 (long-form) and .90-.98 (short-form). The scores for the kaitiaki ratings also showed good to excellent internal reliability with alpha coefficients ranging from .89-.97 (long-form) and .88-.97 (short-form). The ratings for the child behaviour video observations showed strong to excellent internal consistency across the four videoed scenarios for all of the four Māori constructs with alpha coefficients ranging from .83-.96.

Within source correlations

There were strong correlations between the scores for the four constructs (Table 3). The constructs were considered to be conceptually distinct based on the kaupapa Māori construct development process, which is described in detail in Tamati et al., (2021a), and involved a series of expert wānanga following qualitative consultation with whānau. We have therefore treated the constructs as separate variables in our analyses despite their inter-correlated scores. However, we still would have expected some relationship between the four constructs, which also aligns with an holistic Māori worldview.

Concurrent validity

Bivariate correlation analyses were carried out between the child behaviour observational ratings and the kaitiaki and whānau ratings, for each of the four Māori constructs. Across the five data collection points, there were generally significant positive associations between the kaitiaki ratings and the child behaviour observations, particularly at T1 and T2 (Table 4). The relationship be tween the majority of the whānau scores and the child behaviour ratings were weak to moderate. Additionally, weakened patterns were experienced for T3 and also for parts of T4 (see Table 4). The reliabilities within subscales remained consistently strong but there was a noticeable dip in the correlations of both the kaitiaki and whānau ratings with the child behaviour observations at T3. There was an increasingly stronger relationship at T4, and at T5 where significant associations for all four constructs were again evident.

Concurrent validity: Regression analyses

The general pattern of the regression analyses (Table 5), indicated that the kaitiaki ratings were likely to be significantly associated to the child behaviour observations, above and beyond the whānau ratings. Again, a dip in associations at T3 was evident in the results. We conducted further correlations and regressions, removing the three children who enrolled at T2, to check whether the same patterns existed for the cohort enrolled for the whole year. The correlations for T3

Table 2. Range of Cronbach's alphas for child behaviour, whānau and kaitiaki ratings

	Tuakiri	Whānauranga	Manawaroa	Piripono
Child observation ratings	.88 - .94	.83 - .93	.88 - .96	.94 - .94
Whānau ratings	.90 - .98	.95 - .97	.94 - .97	.94 - .97
Kaitiaki ratings	.91 - .97	.94 - .97	.92 - .94	.88 - .95

Table 3. Correlations (r) for four Māori child behaviour constructs (sources of information - whānau, kaitiaki, and child observations), at five different timepoints, and the range of magnitude and associated p values, accounting for age.

	Tuakiri	Whānauranga	Manawaroa	Piripono
Whānau				
Tuakiri	1			
Whānauranga	.72, .75, .72, .81, .74 ***p*'s<0.001**	1		
Manawaroa	.58, .56, .32, .49, .48 ***p*'s<0.001-0.101**	.86, .87, .68, .82, .85 ***p*'s<0.001**	1	
Piripono	.59, .74, .77, .80 ,.80 ***p*'s<0.001-0.002**	.82, .88, .88, .93, .93 ***p*'s<0.001**	.67, .82, .67, .78, .77 ***p*'s<0.001**	1
Kaitiaki				
Tuakiri	1			
Whānauranga	.86, .88, .84, .90, .90 ***p*'s<0.001**	1		
Manawaroa	.73, .69, .50, .72, .81 ***p*'s <0.001-.014**	.87, .80, .75, .81, .90 ***p*'s <0.001**	1	
Piripono	.59, .73, .69, .79, .86 ***p*'s <0.001-0.003**	.72, .78, .75, .84, .85 ***p*'s <0.001**	.71, .75, .77, .77, .85 ***p*'s <0.001**	1
Child observations				
Tuakiri	1			
Whānauranga	.91, .94, .88, .94, .92 ***p*'s <0.001**	1		
Manawaroa	.83, .89, .87, .91, .85 ***p*'s <0.001**	.88, .91, .98, .93 ,.91 ***p*'s <0.001**	1	
Piripono	.86, .85, .83, .84, .90 ***p*'s <0.001**	.86, .82, .89, .88, .89 ***p*'s <0.001**	.86, .90, .90, .92, .92 ***p*'s <0.001**	1

Table 4. Correlations of the child behaviour observations with the whānau or kaitiaki ratings

		Correlation with Child Behaviour Observations (r)				
Construct	Source	T1	T2	T3	T4	T5
Tuakiri	Whānau	.644**	.761**	.050	.336	.327
	Kaitiaki	.826**	.840**	-.089	-.083	.464*
Whānauranga	Whānau	.611**	.687**	.086	.445*	.404
	Kaitiaki	.803**	.742**	-.063	.104	.585**
Manawaroa	Whānau	.450*	.564**	.012	.506*	.428*
	Kaitiaki	.755**	.696**	-.038	.031	.635**
Piripono	Whānau	.438*	.588**	-.003	.417	.415
	Kaitiaki	.676**	.739**	-.077	.132	.640**

Table 5. Regression coefficients for associations of child behaviour observations with both the whānau and kaitiaki ratings

	Child Behaviour Observations (beta)				
	T1	T2	T3	T4	T5
Tuakiri					
Whānau ratings	.276	.255	.334	.283	.083
Kaitiaki ratings	.676**	.637**	-.356	.219	.415
Whānauranga					
Whānau ratings	.361**	.404**	.211	.293	.090
Kaitiaki ratings	.668**	.524**	-.196	.257	.532**
Manawaroa					
Whānau ratings	.246	.399**	.033	.481**	.076
Kaitiaki ratings	.682**	.583**	-.052	.068	.590**
Piripono					
Whānau ratings	.336**	.285	.122	.387	-.121
Kaitiaki ratings	.621**	.594**	-.167	.460**	.729**

a. Dependent Variable: Child Behaviour ratings

***** Correlation is significant at the 0.01 level (2-tailed)***

**** Correlation is significant at the 0.05 level (2-tailed)***

and T4 looked more similar to the other timepoints (albeit slightly weaker).The regressions showed an association between kaitiaki ratings and the child behaviour observations at T3 but the whānau ratings were more associated with the child behaviour observations at T4, which was in keeping with the whole cohort. These secondary findings are available on request.

DISCUSSION

The behaviour and development of tamariki Māori in Aotearoa and other Indigenous children, globally, are often assessed using purportedly universal child assessment tools created by non-Indigenous researchers, which often decontextualise a child's behaviour (Achenbach & Ruffle, 2000; Corrigan, 2002; Goodman, 1997; Reedtz et al., 2008). Moreover, child assessment has historically taken a deficit-based approach such as identifying conduct problems (Achenbach & Ruffle, 2000; Eyberg & Ross, 1978). Yet research has found that strengths-based assessment approaches are preferred by Māori families (Kersten et al., 2016). An over-reliance on non-Indigenous measurement tools and conceptual approaches to evaluate tamariki Māori risks them being inappropriately evaluated, potentially resulting in them missing out on opportunities for intervention or support that they should be able to access (D'Souza et al., 2017; Kersten et al., 2016). Having appropriate reliable and valid Māori measurement tools is therefore critical in not only reflecting Māori children's cultural backgrounds, but also in providing rich and accurate information about Māori children's development. Such information is a crucial component in the evaluation of kaupapa Māori early years immersion initiatives, which are increasingly recognised as culturally-appropriate and efficacious interventions in Aotearoa.

The current feasibility study, He Piki Raukura, sought to address the lack of Māori measurement tools by taking the four Māori child behaviour constructs of interest – tuakiri, whānauranga, manawaroa and piripono – that had been previously elucidated (Tamati et al., 2021a), and testing them in a cohort of young Māori children attending a kaupapa Māori immersion early years setting. In this, the first of our pair of papers on this overall study, we have described the development of these novel strengths-based Māori child behaviour measurement tools. We then tested the psychometric properties of these measures to determine whether they could reliably assess Māori children's behaviour and also if the measures were meaningful and appropriate to whānau.

We found that the novel measurement tools were internally reliable and concurrently valid. There was strong inter-rater reliability among the video raters. The psychometric properties of the MCBQ-W, MCBQ-K and MCBRS compared favourably with other known measures of young children's behaviour (Corrigan, 2002; Goodman, 2001; Horwood et al., 2011). In our study,

internal consistency for the ratings of the four Māori constructs were strong, which shows that our measurement tools have a similar level of internal consistency to other commonly used tools that provide internally consistent measures of developmental constructs (D'Souza et al., 2017; Ezpeleta, Granero, de la Osa, Penelo, & Domenech, 2013; Gouley, Brotman, Huang, & Shrout, 2008; Horwood et al., 2011; Sturrock & Gray, 2013).

The strong correlations between the scores for the four Māori developmental constructs indicated that the constructs were relatively similar on a statistical level. That is, a child with a high score on one of the constructs was likely to have a high score on the other constructs, particularly whānauranga. This finding could be due to the small number of study participants, suggesting the need for further research using larger cohorts and the use of statistical techniques such as factor analysis. It could also reflect the developmental stage of the children. When we accounted for age, the association between the constructs reduced. Moreover, the Māori constructs are both relational in nature (that is the behaviours were often displayed when children were interacting with each other or with an adult) and conceptually distinct, having been identified through a culturally-grounded construct development process (Tamati et al., 2021a). Also, the child observation tasks intentionally focused on interactions with others. This demonstrates a different worldview approach to that of Western science, which seeks to factor out relationality, rather than embrace it (Kim, Yang, & Hwang, 2006). For example, relatedness is regarded as the 'ultimate premise' of the worldview of Indigenous peoples in Australia (Martin, 2005). Māori researchers, too, argue the importance of relationality, such as whanaungatanga (relationships) and whakapapa (genealogical links with ancestors), atua (Māori deities) and the natural world from a Māori worldview (Bishop, Ladwig, & Berryman, 2014; Macfarlane, Blampied, & Macfarlane, 2011; Rameka, 2011; Wilson-Tukaki & Davis, 2011).

The strong positive correlation between the kaitiaki ratings and the child behaviour observations suggests that the kaitiaki ratings essentially captured a child's behaviour in a similar way as the child behaviour observations. The weaker relationship between some of the whānau scores and the child behaviour ratings shows the whānau ratings provided a slightly different perspective to the child behaviour observations and kaitiaki scores. This is consistent with other findings that show differences in parent and teacher rating of child behaviour (Gao, Paterson, Carter, Iusitini, & Sundborn, 2011; Sargisson, Stanley, & Hayward, 2016), which are often attributed to contextual differences between home and the educational setting, as well as personal and cultural expectations for child behaviour (Gao et al., 2011). In educational and child development literature, teacher and parent views are often sought to examine possible causes or contexts of behaviour, to carry out a whole measurement approach and to explore possible interventions. It is common for parent ratings to be different to that of teachers. Parents see more breadth of their tamariki, across different contexts. Teachers see more of tamariki within the educational setting. Therefore, while different respondents have different insights and perspectives, this does not mean there is no coherence of the factors that are being measured. Rather, it indicates there are different perspectives about a child. This suggests that multiple sources of information provide a more holistic perspective (Gao et al., 2011; Lynne Lane, Stanton-Chapman, Roorbach Jamison, & Phillips, 2007; Sargisson et al., 2016); Sargisson, Stanley, & Hayward, 2016). This diverse information is helpful in fully recognising and building on a child's strengths, skills and abilities, which is a key aim of this research.

For future research, the MCBQ-W and child behaviour observations (MCBRS) were found to be the best combination of measures to use. However, if conducting child behaviour observations is not possible, our findings suggest that the whānau and kaitiaki questionnaires are still reliable to use. A useful process in this feasibility study was the refinement of the original long-form of the questionnaire. This involved removal of some items to reduce repetition and provide greater clarity. For future research, the short-form questionnaire will be quicker to complete, while maintaining the same reliability as the long-form.

We noted a reduction in the correlations between the whānau and kaitiaki ratings and the child behaviour observations at T3 (and somewhat at T4). This may be due to a change of kaitiaki at T3. While the internal reliabilities for all ratings remained consistently strong throughout data collection, the weaker correlations at certain timepoints, indicate the importance of having multiple data collection points (Poulton, Moffitt, & Silva, 2015). In doing so, we were able to better understand potential anomalies, while also identifying relevant factors when conducting research in 'real world' settings.

Based on our review of the literature, we believe this is the first time that child behaviour measurement tools have been created that are grounded in an Indigenous kaupapa Māori worldview. Additionally, these measures have been shown to be psychometrically reliable and valid, meaning they can accurately assess a child in relation to the four constructs of importance to Māori (Tamati et al., 2021a). Therefore, for the first time, researchers in Aotearoa have a reliable set of child behaviour measures from a Māori Indigenous worldview. This means that Māori children can be evaluated or assessed according to their own cultural background.

Importantly, the measures that we created are intentionally strengths-based. The evaluation of Indigenous children has traditionally often been from a deficit-based lens (Dender & Stagnitti, 2011; Fforde, Bamblett, Lovett, Gorringe, & Fogarty, 2013; Rubie-Davies & Peterson, 2016). With a strengths-based approach, we contend that it is still possible to identify children who need help or support, as the rating will show development to the level of a construct. Further, a strengths-based approach aligns with an increasing trend in psychology to move away from deficit approaches to children's development (Craven et al., 2016; Fenton, Walsh, Wong, & Cumming, 2015; Fogarty, Lovell, Langenberg, & Heron, 2018). This not only helps address issues of negative bias toward Māori children (Blank et al., 2016; Pihama et al., 2004), it could also encourage the building of children's strengths and the evaluation of

positive interventions. Having reliable and valid strengths-based, kaupapa Māori measures (Elder et al., 2017; Kersten et al., 2016) of development in young Māori children is crucial, which we have been able to demonstrate with our study.

There are wider positive implications of the potential application of these new measures. The process of assessing young children's development can potentially serve as an evaluation of the quality of their early learning environment and personal contexts to support the development of strengths-based child behaviours. These measures, therefore, can potentially contribute to better ways of evaluating existing kaupapa Māori early years and whānau programmes and interventions (Hond-Flavell, Ratima, Tamati, Korewha, & Edwards, 2017; Ministry of Education, 2013, 2018; Munford, Sanders, Maden, & Maden, 2007; Theodore et al., 2019). These future findings will also help inform government policy and investment, including decisions on when and how prevention and intervention programmes are implemented, as well as for whom (Elder et al., 2017; Harwood et al., 2012; McClintock et al., 2011; Theodore et al., 2019; Treasury New Zealand, 2017).

Strengths and Limitations

The main limitation of this study was its small cohort size (28 children) involving a single Māori early years setting. However, the focus on one cohort of tamariki was intentional in order to carry out the necessarily deep methodological, cultural and practical groundwork, to pilot the measurement tools. The study also required commitment by whānau, kaitiaki and the research staff, as well as generosity of the tamariki. Conducting this type of developmental work across multiple sites, we believe would not have been possible without a high level of trust between all those involved at the centre. Although the number of participants was small, there was sustained whānau involvement throughout the duration of the study. This was assisted by the existing high trust between whānau and the researchers, which it is argued facilitates collaborative inquiry (Cram & Kennedy, 2010).

Strengths of this study include the application of a kaupapa Māori approach to developing Māori child behaviour constructs and measurement tools. These newly created constructs and measurement tools are positioned within a strengths-based framework and they can be used by both whānau and kaitiaki. This is helpful in the context of Aotearoa, as non-deficit assessment approaches are preferred by Māori families (Kersten et al., 2016). Our interface approach to the quantification of Indigenous child development constructs is also a strength of the study. Methodologically, we created child behaviour measurement tools from an Ao Māori perspective. In keeping with our interface approach (Edwards, 2010), we also utilised widely used psychometric processes to test these measures. In this way, the research has drawn from the strengths of mātauranga Māori and Western science knowledge systems to generate new knowledge and about measurement of Māori developmental constructs.

Concluding Comments

We hope that our research process will be a useful model to other groups of kaupapa Māori researchers and Māori communities seeking to build an evidence-base around their own programmes using our measures of the four Māori constructs or to develop measures that tap into constructs of meaning to them. The development of Māori measurement tools like this can enable Māori communities to test psychometrically sound measures and their relationship to positive life outcomes. In an accompanying paper (Tamati et al., 2021c), we examine changes over time based on the data collected, to test whether our measurement tools can detect meaningful change in the four constructs over 10 months, during a school year.

We are mindful that this is a feasibility study, so future work is needed with larger cohorts of tamariki Māori to continue validating our measures. There is exciting potential to trial these measures in other Māori and possibly other Indigenous contexts. We remain hopeful that this research will offer alternative, more authentic and robust approaches to working with Māori children and whānau to improve their life outcomes.

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Māori Glossary

Ao Māori	Māori world; Māori worldview
Aotearoa	Indigenous name for New Zealand
He Piki Raukura	One of the projects of Te Kōpae Piripono's longitudinal research, that focusses on Māori child behavioural constructs
Hapū	sub-tribe
Hariru	handshake
Hongi	Māori cultural greeting
Iwi	tribe
Kai	food
Kai ahiahi	afternoon tea
Kai ata	morning tea
Kaitiaki	teacher at Te Kōpae Piripono
Kapa Haka	Māori cultural form of dance
Kaupapa	purpose, objective, topic, philosophy
Kaupapa Māori	Māori philosophical framework
Kopa kai	dining room
Kopa mahi	classroom
Kōpae	shortened name of Te Kōpae Piripono (Taranaki-based Māori immersion early childhood centre)
Kōrero	speak; speaking
Manawaroa	the notion of having courage in adversity, persisting despite difficulty and a positive outlook
Mātauranga Māori	Māori Indigenous knowledge systems
Mihi	greeting; speech of acknowledgement
Parihaka	historic Māori settlement south of New Plymouth, NZ
Piripono	the notion of having integrity, commitment and responsibility for a shared kaupapa/purpose
Pōwhiri	ceremonial Māori welcome
Tamariki	children
Tamariki Māori	Māori children
Taranaki	a region in the west of the North Island; a tribe
Te Kōpae Piripono	Taranaki-based Māori immersion early years and whānau initiative
Te Kura Mai i Tawhiti	the name given to Te Kōpae Piripono's longitudinal research programme
Te Pou Tiringa	governing board of Te Kōpae Piripono
Te reo Māori	Māori language
Toroa	giant albatross
Tikanga Māori	Māori process, customs,
Tuakiri	the notion of a secure local Māori identity
Waiata	song; singing
Wānanga	Māori cultural process of knowledge generation and learning
Whakapapa	genealogy; genealogical connection
Whānau	family, usually encompassing wider membership than the nuclear family
Whāriki	mat
Whānauranga	the notion of feeling and acting, as a member of a whānau/community