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Investigation of the Validity and Reliability of a Placement Quality Survey for Measuring Rural Student Work Integrated Learning Placement Quality

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Abstract

This study assessed the validity and reliability of the Placement Quality Survey (PQS) for measuring rural student clinical placement quality among allied health students attending rural placements. Secondly, the association of the PQS with students' choice of rural placements and rural self-efficacy was determined. Students attending 5–8-week placements completed a paper-based questionnaire and were also invited to complete it again later the same day for reliability testing. Reliability and validity were tested. Analysis of variance was used to investigate relationships between PQS items and composite scores with student discipline, venue of student placement, and rural self-efficacy. Occupational therapy, physiotherapy and speech pathology students (N = 163) participated. From the exploratory factor analysis a single factor was extracted which accounted for 62.1% of the variance. The standard one factor confirmatory factor analysis demonstrated reasonable fit but with the addition of a covariance term provided a good fit. Increased preference for rural placements was demonstrated for eight out of nine nine-item PQS items. Rural self-efficacy increased quality ratings, supporting construct validity. The Cronbach's alpha indicated a high level of internal consistency. All item-to-item correlations indicated a high level of consistency. Test-retest Pearson's correlations and intraclass correlation coefficients of repeatability indicated the reliability of the scale over time. This study validated the PQS in a sample of rural allied-health students. The results provided support for reliability. The study addresses the critical need for placement quality data to improve allied health students' experiences and learning outcomes on placements and encourage systematic quality improvement processes.

Keywords: ***health education; placements; placement quality measures; quality; validation studies***

Introduction

Placement of students is a key element of medical and allied health student pre-registration courses, developing and refining clinical and work-ready skills (Davenport *et al.*, 2018; Hills *et al.*, 2019; McCall *et al.*, 2009; van der Zwet *et al.*, 2011) and is demanded by professional bodies (Australian Health Practitioner Regulation Agency, 2019). Students' choice of rural placements (Walters *et al.*, 2016), their perception of their ability to practice rurally (Isaac *et al.*, 2018) and well-supported rural clinical placements all promote students' intentions to practice rurally (Deaville & Grant, 2011; King *et al.*, 2016; Smith, Cross, *et al.*, 2018; Smith, Sutton *et al.*, 2018), and

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therefore play their part in addressing the urgent challenges of rural clinician recruitment and retention (Health Workforce Australia, 2011; Wakerman & Humphreys, 2013; Wakerman & Humphreys, 2019).

Measuring the quality of these student placements is integral to continuous quality improvement, providing an evidence-base to guide decisions about, for example, the most efficient and effective models of clinical education to invest in, preparing students prior to placement, and supervisor development programs. However, there have been few systematic efforts to assess quality of clinical placements (McAllister *et al.*, 2010; McAllister *et al.*, 2018; Nolte *et al.*, 2011; Siggins Miller Consultants, 2012); rather, a range of factors related to quality has been identified (Cusick *et al.*, 2014; Siggins Miller Consultants, 2012). For example, the Best Practice in Clinical Learning Environments (BPCLE) framework provides a model of practice for medicine, nursing and allied health clinical learning environments capturing features that support clinical placement experience (Darcy Associates, 2012). Cusick and colleagues conducted an international review of the clinical education and supervision literature, revealing a limited evidence base for innovation and evaluation in clinical education and no standardised measure for evaluation of clinical placement quality. They suggested that measures based on the BPCLE framework with the addition of measures of supervision might be an effective approach to developing quality measures (Cusick *et al.*, 2014). To our knowledge, only one instrument which systematically and robustly measures quality in allied health has been developed and published (McAllister *et al.*, 2018).

The Work Integrated Learning team at the University of Sydney set out to develop an instrument to measure placement quality in urban settings. They developed a suite of measures based on the BPCLE domains and added a question about the quality of supervision. The Placement Quality Survey (PQS) was developed for use by varoius stakeholders including external placement supervisors, worksite managers and clinical academics. This allows for student data to be triangulated with that of other stakeholders regarding quality of placements. Unlike other measures, this suite of measures is multidisciplinary and accounts for different stakeholder perspectives to allow for a more holistic set of quality outcomes to be measured from placements. This suite includes measures that allow for feedback from each stakeholder, thus maximising opportunities for quality improvement of the student learning experience (McAllister *et al.*, 2018). McAllister and colleagues undertook a modified Delphi process, focus groups and surveys to develop a tool to measure placement quality and used exploratory factor analyses (EFA) to validate the tool. The authors found broad agreement on the elements that measure the quality of clinical placements amongst dentistry, medicine and pharmacy students. The tool was valid and reliable with EFA showing one component accounting for 58.5% of the variance of survey data (McAllister *et al.*, 2018).

There appears to be a lack of validated and reliable tools to assess the quality of placements for allied health students in rural settings. Therefore, this article builds on the survey developed by McAllister and colleagues (the PQS) by validating and testing the reliability of the survey for rural placements focussing on non-traditional community-based work-ready placements for allied health students (Longman *et al.*, 2020). This may inform quality assurance and placement development in rural settings. Only the students' PQS was used at this point to reduce the burden of survey completion on time-poor rural clinical supervisors and worksite managers. Students' level of preference for rural placements (Walters *et al.*, 2016) and their own perceptions of their ability to practice rurally (Isaac *et al.*, 2018) were also investigated to validate the tool still further.

This study aimed to assess:

(1) the validity and reliability of the PQS for measuring rural student clinical placement quality among allied health students undertaking rural non-traditional community-based work-ready placements;
(2) the association of the PQS with students' preference for rural placements and rural self-efficacy.

Methods

Study design and recruitment

The study was a cross-sectional survey. Participants were occupational therapy, speech pathology and physiotherapy students from the University of Sydney undertaking a 5–8-week rural placement in New South Wales in non-traditional settings (schools, community health centres and aged care facilities). Recruitment involved a member of the research team approaching students face to face during the final week of their placement to explain the study, provide a participant information sheet, answer questions and invite participation (stressing the voluntary nature of participation). Completion of the paper-based questionnaire was taken to indicate consent to participation in the study. Recruitment took place between February and December 2018. The study was approved by the University of Sydney Human Research Ethics Committee (2015/466).

Data collection

Students who completed the questionnaire (which took around ten minutes to complete) were also invited to answer seven questions again later on the same day for reliability testing. It was not possible to do the retesting two days later as the students were not available on campus. It was also not practical to conduct the survey in the last week before finishing their placements because 20% of their total placement time for those on five-week placements remained to be completed.

Measures

Placement Quality Survey (PQS): The initial seven-item survey consisted of seven main questions focussing on: the quality of the placement; the fit between placement site and supervision with the students' learning needs; quality of supervision; quality of the learning environment in the placement site; the level of communication between the university and placement site; the organisational culture of learning of the placement site; and finally, the level of teaching reflecting best practice (McAllister, 2016). Ratings scales ranged from 1, representing 'extremely poor', to 7, representing 'exceptional' scores.

Specific supervisory items: To enable continuous improvement of placements, two questions pertaining to the specific supervision model employed at the rural campus were added – autonomy and work readiness. Firstly, students were asked to rate "*the extent to which you improved your ability to work autonomously due to the model of supervision you experienced during this placement*". Secondly, students were asked to rate "*the model of supervision on this placement in terms of increasing your work readiness*" Both questions also required rating between 1 and 7. These two items were added to construct a nine-item survey to establish whether this would improve the validity of the PQS in a rural setting.

Student coordinators' support: Student coordination staff requested that the research team also ask the students to rate on a scale of 1–7 their satisfaction with "*UCRH staff involvement and support before and during your placement*". This item is not part of the seven- and nine-item PQS validation analyses but is reported for information purposes.

Rural factors: In addition, two additional questions focussed on rural factors: choice of rural placement (Walters *et al.*, 2016) and rural self-efficacy (Isaac *et al.*, 2018) were added. Choice of rural placement was measured on four levels with decreasing level of choice: "*Yes, I chose to do a rural placement*", "*I was required to do a rural placement but was keen to do it anyway*", "*No, I didn't choose but I did not mind going*", and "*No, I didn't choose and I preferred not to go*". Rural self-efficacy was measured by asking students to rate on a scale of 1–5 how much they agreed with the following statement: "*I have a strong positive feeling when I think of working in a rural setting*". This is the positive emotional arousal item of the rural self-efficacy scale (Isaac *et al.*, 2015) and may approximate rural self-efficacy (Isaac *et al.*, 2018).

Statistical analyses

Analyses were conducted using SAS® 9.4. (https://support.sas.com/). Simple descriptive statistics were provided of student characteristics and the responses of the Clinical Placement Quality items (Table 1).

Validity

Firstly, an Exploratory Factor Analysis (EFA) was conducted to duplicate the methods used in the McAllister article (McAllister *et al.*, 2018) to assess the degree to which the seven items in the PQS sufficiently explained the underlying construct of rural clinical placements. The Bartlett's Test of Sphericity (SAS Institute, 2020) was used to determine whether the data were suitable for factor analyses. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (Statistics How To, 2020) was used to determine sample adequacy, with a score above 0.60 being acceptable for sample adequacy. A single factor was extracted, with an Eigenvalue >1 indicating a single factor as being acceptable and the total variance of the items explaining the one-dimensional factor was calculated. The EFA component loadings were compared with the urban study. Following EFA, a Confirmatory Factor Analysis (CFA) was conducted to verify the single factor structure from the PQS constructed using an urban student sample. This allowed for testing the hypothesis that a relationship existed between the seven items and their underlying latent construct of clinical placement quality among rural students. The SAS CALIS Procedure was used to conduct a single factor CFA, which used the Weighted Least Squares (WLS) methodology to account for the categorical (and non-normal) nature of the 7 point response scale as recommended by Kline (2015). The standard maximum likelihood estimation method (ML) can result in a model chi-square being too high, resulting

in rejecting true models (Kline, 2015). Modification indices were therefore used to indicate changes to improve model fit.

Individual items and composite scores were examined for their association with a number of salient pre-determined outcome measures to measure construct validity. Our hypothesis was that students who preferred a rural placement would be more likely to assign higher scores for placement quality measures than other students. A chi-square test for linear trend was used to measure this for individual PQS items. Similarly, students with a higher score on rural self-efficacy were expected to assign higher scores to the individual and composite placement quality measures. One-way analysis of variance was conducted using the PQS seven-item composite measure with the rural self-efficacy score. Four levels of rural self-efficacy were used instead of five because the lowest two (1–2) levels were combined due to lack of numbers on the composite score for placement quality (n = 157). Polynomial contrasts were fitted to assess the linearity of the response.

As it was perceived that the PQS supervision item may not have captured the quality of rural supervision models adequately, the factor analyses procedure was repeated adding the two new rural supervision-specific items to assess if adding these items yielded similar results (the nine-item PQS).

Reliability

Reliability was measured in two ways:

(1) Cronbach's Alpha and Pearson correlation coefficients were calculated to demonstrate internal consistency/scale reliability. This measured how well the items were related to each other as a group. Cronbach's alpha was compared with the urban study;
(2) Test-retest reliability was assessed by asking the students to complete the measure again several hours after completing it the first time and after a busy day of education. Bivariate correlation (Pearson's correlation) was conducted to assess the relative reliability of the seven-item and nine-item survey over time. A correlation coefficient of more than 0.7 needed to be achieved for each survey item paired over time. The Pearson's correlations were compared with the urban study. Additionally, intra-class correlation coefficients (ICC) scores were calculated for the seven-item and nine-item PQS with scores above 0.7 again suggesting relative reliability over time. The nine-item PQS included the two extra supervisory model questions.

Sample size

The PQS consisted of seven items. To allow for a sufficient sample size, we required a minimum of ten cases per survey item for the EFA (Hair *et al.*, 1998) and ten cases per estimated parameter for the CFA (Kline, 2015). We therefore aimed to recruit 140 students. Test-retest reliability was conducted among the first 68 students due to time limitations.

Results

Sample description and students' ratings

A total of 163 students completed the survey, a response rate of 88%. Table 1 shows that the majority of students studied physiotherapy (50.9%), were in the second year of a Masters degree (59.5%), and had strong positive feelings when thinking of working in a rural setting (62.5%, scores of 4 and 5). The majority did not choose a rural placement but 36.6% did not mind going; however 15.5% preferred not to go.

Table 2 and Table 4 show that students' ratings and mean scores of the quality of the placement were generally high across all dimensions. The highest mean scores were found for staff involvement and support before and during students' placement (5.61) and students being able to work autonomously (5.57). The lowest mean score was found for organisational culture of learning at the site of students' clinical placement (4.27).

There was no significant difference between disciplines (Table 4) in relation to overall placement ratings and quality of placements for eight out of ten placement quality items ($p > 0.05$). There was a significant difference between disciplines in relation to work-readiness ($p = 0.041$; item 5) and rural staff support ($p = 0.005$, item 9). Neither item was not part of the seven-item PQS survey.

Types of placements included schools, aged care and community health centres. There were significant differences between type of placements (Table 4) in relation to overall placement ratings and the way students rated the quality of their placements for five out of ten placement quality items ($p > 0.05$). Specifically, placements in schools rated lower on learning needs (ANOVA $p = 0.048$), supervision (ANOVA $p = 0.004$), learning environment (ANOVA $p = 0.014$), rural staff support (ANOVA $p = 0.022$) and clinical practice knowledge (ANOVA $p = 0.015$).

Table 1: Students' characteristics, rural self-efficacy and rural placement control of choice 2018, *N* = 163

	n	**%**
Degree		
Physio	83	50.9
Occupational Therapy	32	19.6
Speech	48	29.4
Year		
2nd	3	1.2
3rd	38	23.3
4th	26	16.0
1st Masters	0	0.0
2nd Masters	97	59.5
I have a strong positive feeling when I think of working in a rural setting (rural self-efficacy)[a]		
Strongly disagree	1	0.6
2	13	8.1
3	46	28.8
4	63	39.4
Strongly agree	37	23.1
Did you choose to do a rural placement?[b]		
Yes I chose to do a rural placement	42	26.1
I was required to do a rural placement but was keen to do it anyway	35	21.7
No, I didn't choose but I did not mind going	59	36.6
No, I didn't choose and I preferred not to go	25	15.5

[a] Missing $n = 3$. [b] Missing $n = 2$.

Validity testing seven-item and nine-item PQS

Step 1: Exploratory Factor Analyses

Seven-item: Exploratory Factor Analysis was conducted to assess the relative contribution of the PQS used in a rural setting and this confirmed the validity of the survey as one single component for measuring the quality of placements (Table 3). Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin Measure of Sampling adequacy were satisfied. A single factor with eigenvalue greater than 1 was extracted accounting for 62.1% of the variance. The strongest two components were learning environment (loading of 0.85) followed by learning needs (loading of 0.84), where all other items head loading ranging from 0.74 to 0.79. These loadings were very similar to the urban placement EFA (see Table 3).

Nine-item: The additional item of 'work ready' was consistent with the loading range of the seven-item scale (0.70) but 'autonomous' demonstrated a somewhat lower loading (0.66). In order to compare the relative contribution of the nine-item instrument compared to the seven-item PQS, in a similar manner, a single factor was accounting for 57.8% of the variance compared to 62.1% for the original seven-item tool.

Table 2: Students' ratings of the quality of the placement, 2018, *N* = 163

Overall, how would you rate:	Extremely poor	2	3	4	5	6	Exceptional
	%	%	%	%	%	%	%
• the **quality** of this placement	0.0	1.0	5.5	12.9	41.1	30.7	9.2
• the fit between the placement site and supervision you received and your **learning needs**? (miss=1)	0.0	3.7	8.0	16.0	34.0	25.9	12.3
• the quality of **supervision** you received	0.0	2.5	9.2	10.4	27.0	32.5	18.4
• the quality of the **learning environment** in the workplace?	0.0	3.0	6.7	17.2	35.6	28.8	9.8
• the level of **communication** between the UCRH and the site of your clinical placement?	0.6	2.5	6.1	17.8	30.1	28.2	14.7
• the **organisational culture** of learning at the site of your clinical placement? (miss=2)	1.9	3.1	10.6	14.9	32.3	27.3	9.9
• the extent to which you improved your ability to work **autonomously** due to the model of supervision you experienced during this placement	0.0	0.6	3.7	7.4	26.4	40.5	21.5
• the model of supervision on this placement in terms of increasing your **work readiness**?	0.0	1.8	1.8	13.5	28.8	40.5	14.1
• **UCRH staff involvement and support** before and during your placement? (miss=1)	0.0	0.6	3.7	11.7	24.1	32.7	27.2
• Based on your knowledge, was the suite of practice skills and clinical reasoning you were taught **best practice clinical practice** and knowledge?	1.2	1.2	5.5	12.9	27.6	38.7	12.9

Table 3: Component Matrix for the single component of the 7-item and 9-item PQS from Exploratory Factor Analysis (2018, *n* = 160) compared to urban placements[a]

Overall, how would you rate:	Rural 7-item	Rural 9-item	Urban 7-item[a]
• the quality of this placement?	0.74	0.76	0.79
• the fit between the placement site and supervision you received and your learning needs?	0.84	0.83	0.81
• the quality of supervision you received?	0.78	0.76	0.79
• the quality of the learning environment in the workplace?	0.85	0.85	0.83
• the level of communication between the UCRH and the site of your clinical placement?	0.77	0.75	0.67
• the organisational culture of learning at the site of your clinical placement?	0.79	0.76	0.74
• based on your knowledge, was the suite of practice skills and clinical reasoning you were taught best practice clinical practice and knowledge?	0.74	0.71	0.72
• the extent to which you improved your ability to work autonomously due to the model of supervision you experienced during this placement?		0.66	
• the model of supervision on this placement in terms of increasing your work readiness?		0.76	

[a] McAllister *et al*., 2018

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Table 4: Students' ratings of the quality of the placement overall and the associations between discipline, site type and students' mean ratings of the quality of the placement (2018, *n* = 160).

Overall, how would you rate:								Discipline				Site type			
	Item no	Mean	*SD*[1]	*SE* of mean	Q1[2]	Median	Q1[3]	PT *n* = 82	OT *n* = 32	Speech *n* = 46	*p*-value[4]	Aged care *n* = 80	Schools *n* = 26	Community Health *n* = 10	*p*-value[4]
• the **quality** of this placement	1	5.22	1.02	.081	5.0	5.0	6.0	5.26	5.38	5.04	0.332	5.18	5.15	5.00	0.881
• the fit between the placement site and supervision you received and your **learning needs**?	2	5.06	1.25	.099	4.0	5.0	6.0	5.09	5.22	4.89	0.503	5.10	4.42	5.00	0.048
• the quality of **supervision** you received	3	5.32	1.30	.102	5.0	5.5	6.0	5.29	5.38	5.33	0.954	5.40	4.54	5.80	0.004
• the quality of the **learning environment** in the workplace?	6	5.10	1.13	.089	4.0	5.0	6.0	5.00	4.94	5.39	0.112	4.99	4.81	6.00	0.014
• the level of **communication** between the UCRH and the site of your clinical placement?	7	5.19	1.24	.098	4.0	5.0	6.0	5.27	4.91	5.23	0.346	5.17	4.69	5.40	0.192
• the **organisational culture** of learning at the site of your clinical placement?	8	4.94	1.36	.107	4.0	5.0	6.0	4.91	4.66	5.20	0.217	4.80	4.62	5.60	0.174
• the extent to which you improved your ability to work **autonomously** due to the model of supervision you experienced during this placement	4	5.66	1.05	.083	5.0	6.0	6.0	5.62	5.66	5.72	0.886	5.63	5.81	6.00	0.492
• the model of supervision on this placement in terms of increasing your **work readiness**?	5	5.44	1.07	.084	5.0	6.0	6.0	5.24	5.75	5.59	0.041	5.28	5.54	5.90	0.189
• **UCRH staff involvement and support** before and during your placement?	9	5.67	1.13	.090	5.0	6.0	7.0	5.95	5.39	5.37	0.005	5.85	5.16	5.40	0.022
• Based on your knowledge, was the suite of practice skills and clinical reasoning you were taught **best practice clinical practice** and knowledge?	10	5.30	1.21	.096	5.0	6.0	6.0	5.30	5.03	5.48	0.278	5.26	4.62	5.90	0.015
PQS Total Score 7 item[5]	-	36.13	6.70	0.53	32.0	37.0	40.0	-	-	-	-	-	-	-	-
PQS Total Score 9 item[6]	-	47.23	8.07	0.638	42.3	48.0	52.8	-	-	-	-	-	-	-	-

[1] Standard deviation. [2] 25th percentile. [3] 75th percentile. [4] ANOVA. [5] PQS total score 7 item based on: item numbers:1+2+3+6+7+8+10. [6] PQS total score 9 item based on: item numbers:1+2+3+6+7+8+10+4+5

Step 2: Confirmatory Factor Analysis

Seven-item: Two CFA models were fitted (Table 5) where Model 1 was the usual one-factor CFA and Model 2 was Model 1 with an additional covariance between Fit and Supervision due to the higher correlation between the two variables (0.777) (see Appendix A – Table A.1). The model fit was significantly improved with the addition of the covariance parameter with all measures of fit such as chi-square difference=11.21 on 1 *df* $p < 0.001$; the model chi-square statistic became non-significant ($p = 0.062$); the *SRMR* of 0.058 was less than 0.10 which indicated a good fit; the *RMSEA* (Root Mean Square Error of Approximation) reduced to below 0.08 which suggested reasonable approximation of fit (where <= 0.05 indicates close fit); a lower *RMSEA* 90% bound of 0 indicated a better fit although an upper 90% bound >0.10 does not. In summary, the standard one factor CFA demonstrated reasonable fit but with the addition of a covariance term provided an improved fit on most goodness-of-fit measures.

Table 5: Results of Single construct Confirmatory Factor Analysis modelling – seven-item

		Model 1			Model 2		
Parameter		Unstand-ardized	*SE*	Standard-ized	Unstand-ardized	SE	Standard-ized
Loadings from F1							
Quality	λ1	0.659	0.092	0.681	0.712	0.083	0.713
Fit	λ2	1.007	0.083	0.886	1.000		0.814
Supervision	λ3	0.959	0.098	0.821	0.906	0.057	0.725
Learning Environment	λ4	0.890	0.063	0.848	0.947	0.072	0.858
Communication	λ5	0.855	0.073	0.802	0.904	0.089	0.788
Organisational Culture	λ6	1.000		0.791	1.037	0.086	0.794
Best Practice	λ7	0.774	0.079	0.681	0.855	0.078	0.695
Variances/Co-variances							
Latent variable F1	Phi1	1.109	0.174		1.021	0.149	
Quality	Var 1	0.556	0.071		0.501	0.075	
Fit	Var 2	0.309	0.050		0.520	0.078	
Supervision	Var 3	0.492	0.074		0.756	0.105	
Learning Environment	Var 4	0.343	0.045		0.328	0.047	
Communication	Var 5	0.449	0.069		0.517	0.073	
Organisational Culture	Var 6	0.664	0.107		0.642	0.107	
Best Practice	Var 7	0.766	0.111		0.800	0.111	
Covar Fit ↔Supervision	Cov 23				0.275	0.080	
		Model 1			Model 2		
Measures of fit							
Model chi-square		32.78			21.57		
Model chi-square *df*		14			13		
Probability Model chi-square		0.003			0.062		
Model chi-square/*df* ratio		2.34			1.66		
RMR		0.124			0.091		
SRMR		0.078			0.058		
GFI		0.922			0.948		
Adjust *GFI*		0.843			0.889		
RMSEA (90%CI)		0.092 (0.051–0.133)			0.064 (0–0.111)		
AIC		60.78			51.57		
Bentler CFI		0.852			0.932		

Key: *df* – degrees of freedom; *RMR* – root mean square residual; *SRMR* – Standardized Root Mean Square Residual; *GFI* – Goodness of fit; *RMSEA* – Root Mean Square Error of Approximation; *AIC* – Akaike information criterion.

Nine-item: The CFA analyses is presented in Appendix A Table A.2. Three CFA models were fitted where Model 1 was the usual 1 factor CFA and Model 2 was Model 1 with an additional covariance

between Fit and Supervision due to the higher correlation (0.777) and Model 3 with an additional covariance between the two additional items of Autonomous and Work Ready. The model fit was significantly improved with the addition of each of the covariance parameters with all measures of fit. Model 3 indicated the best fit over a range of measures. Thus the nine item one factor CFA demonstrated a good fit with the addition of two covariance terms (Appendix A Table A.3a and Table A.3b).

Table 6: Associations between choice of placement and students' ratings of the quality of the placement and rural self-efficacy: mean ratings (2018, *n* = 160)

Overall, how would you rate:	Yes, I chose to do a rural placement	I was required to do a rural placement but was keen to do it anyway	No, I didn't choose but I did not mind going	No, I didn't choose and I preferred not to go	*p*-value for linear trend
	n = 42	*n* = 33	*n* = 59/58	*n* = 24	
• the **quality** of this placement?	5.67	5.30	5.15	4.50	<0.001
• the fit between the placement site and supervision you received and your **learning needs**?	5.64	5.18	4.86	4.29	<0.001
• the quality of **supervision** you received?	5.79	5.36	5.15	4.92	0.007
• the quality of the **learning environment** in the workplace?	5.55	5.12	4.90	4.71	0.003
• the level of **communication** between the UCRH and the site of your clinical placement?	5.55	5.46	4.98	4.75	0.005
• the **organisational culture** of learning at the site of your clinical placement?	5.43	4.97	4.76	4.54	0.008
• Based on your knowledge, was the suite of practice skills and clinical reasoning you were taught **best practice clinical practice** and knowledge?	5.67	5.36	5.05	5.17	0.062
• the extent to which you improved your ability to work **autonomously** due to the model of supervision you experienced during this placement?	6.07	5.76	5.51	5.17	<0.001
• the model of supervision on this placement in terms of increasing your **work readiness**?	5.81	5.42	5.31	5.17	0.017
• **UCRH staff involvement and support** before and during your placement? (*n* = 158)	6.14	5.88	5.48	5.04	<0.001
• I have a strong positive feeling when I think of working in a rural setting (rating: 1–5) **(rural self-efficacy)** (*n* = 158)	4.19	3.97	3.59	3.17	<0.001

1 ANOVA

Step 3: Construct validity

Choice of rural placement
Table 6 demonstrates that for all but one item a significant difference existed between students' ability to control their choice of rural placement and their ratings of the quality of their placements. The more control a student had, the higher their ratings were. This is displayed through a statistically significant linear trend from analysis of variance analyses for all items except for best clinical practice, although this almost reached statistical significance ($p = 0.062$). Choosing a rural placement always resulted in a significantly higher rating (p ranged from $p < 0.001$ to $p = 0.024$) than preferring not to go for all quality attributes except for best clinical practice ($p = 0.126$) using specified contrasts.

Our hypothesis was confirmed that students who preferred a rural placement would be more likely to score higher on placement quality measures than other students. Table 6 also shows that the higher a student's preference was to go on a rural placement, the higher their rural self-efficacy score was.

Rural self-efficacy: Table 7 shows that in the ANOVA for both the seven- and nine-item PQS composite, the rural self-efficacy factor was significant ($F_{3,153} = 13.796$, $p < 0.001$ and $F_{3,153} = 13.533$, $p < 0.001$ respectively) with a significant linear component $p < 0.001$ for both. Thus, students who scored higher on rural self-efficacy also had higher placement quality scores on both the seven- and nine-item PQS. Our hypothesis was confirmed, that students with a higher score on rural self-efficacy scored higher on the individual and composite placement quality measures.

Table 7: Rural self-efficacy ("*I have a strong positive feeling when I think of working in a rural setting (rating: 1–5)*" estimated marginal means, *SE* and 95% CI for placement quality survey

	7-item PQS			9-item PQS		
Rural self-efficacy level	Mean	*SE*	95% CI	Mean	*SE*	95% CI
1–2	4.388	0.228	3.937–4.838	4.508	0.214	4.084–4.932
3	4.719	0.127	4.468–4.970	4.843	0.120	4.607–5.080
4	5.379	0.109	5.164–5.595	5.452	0.103	5.249–5.655
5	5.683	0.140	5.406–5.961	5.730	0.132	5.469–5.990

Reliability testing
Step 1: Internal consistency
Seven-item: Internal consistency or scale reliability was assessed for the seven items of the PQS (Table 8). The Cronbach's alpha was 0.896, which indicated a high level of consistency (>0.70) and was maximised with the inclusion of all seven items. Our Cronbach's alpha was very similar to the urban study (0.87) (McAllister *et al.*, 2018). This suggests a robust structure. The Pearson correlations for the upper diagonal item-to-item correlation matrix between the seven items and the item-to-total correlations are presented in Table 8. All item-to-item correlations were greater than 0.3 with a range of 0.419 to 0.777 and item-to-total correlations greater than 0.5, ranging from 0.640 to 0.784, all of which endorsed a high level of consistency.

Table 8: Item-to-Item Pearson's correlations and Item-to-Total correlations for the 7 items of the PQS (*n* = 160)

	Fit	Supervision	Learning	Communication	Culture	Best Practice	7-item-Total		9-item-Total
Quality	0.592	0.466	0.599	0.537	0.477	0.420	0.640		
Fit		0.777	0.629	0.505	0.532	0.557	0.763		
Supervision			0.602	0.419	0.469	0.563	0.683		
Learning Environment				0.628	0.657	0.562	0.784		
Communica-tion					0.629	0.492	0.685		
Culture						0.531	0.705		
Best Practice							0.646		
Autonomy									0.562
Work ready									0.686

Nine-item: The Cronbach's alpha was 0.907, which indicated a high level of consistency (>0.70) and was maximised with the inclusion of all 9 items. This Cronbach's alpha score was higher than the seven-item PQS (0.896).

The Pearson correlations for the item-to-item correlation of the additional two items with the original seven items are presented in Appendix A, Table A.2, and the Pearson correlations with the item-to-total correlations are presented in Table 8. The additional items had all item-to-item correlations greater than 0.3; however, the item Autonomous had lower correlations with some of the original items (0.320–0.531) than any of the seven item-to-item correlations (minimum 0.419 between supervision and communication [Table 8]). All item-to-total correlations were greater than 0.5 and, again, Autonomous was the lowest.

Step 2 Test-retest reliability
Bivariate correlation (Pearson's correlation) was conducted to assess the *relative* reliability of the seven-item and nine-item PQS over time (Table 9). All seven items of the survey and the nine-item construct coefficients scored above 0.7, indicating the reliability of the scale over time. ICC scores for the seven-item and nine-item construct were also all above 0.7 suggesting again relative reliability overtime.

Table 9: Test-retest correlations for the Placement Quality Survey (*n* = 160), staff support and rural self-efficacy and choice compared to urban placements[a]

	Rural			Urban[a]		Intraclass Correlation					
	n	Pearson correl-ation	*p*-value	Pearson correl-ation	*p*-value	ICC	95% CI Lower bound	95% CI Upper bound	*F*-test	df	*p*-value
Quality	66	0.866	<0.001	0.85	<0.001	0.861	0.783	0.912	13.374	65	<0.001
Fit	66	0.884	<0.001	0.85	<0.001	0.884	0.818	0.927	16.257	65	<0.001
Supervision	66	0.826	<0.001	0.58	<0.001	0.828	0.734	0.891	10.633	65	<0.001
Learning Environment	66	0.721	<0.001	0.74	<0.001	0.713	0.572	0.814	5.979	65	<0.001
Communication	66	0.851	<0.001	0.69	<0.001	0.851	0.768	0.906	12.445	65	<0.001
Culture	65	0.768	<0.001	0.55	0.003	0.767	0.645	0.851	7.583	64	<0.001
Best Practice	65	0.799*	<0.001	0.54	0.004	0.794	0.684	0.869	8.716	64	<0.001
Autonomy	66	0.861	<0.001			0.857	0.776	0.910	12.944	65	<0.001
Work readiness	66	0.773	<0.001			0.765	0.644	0.849	7.516	65	<0.001
Staff support	65	0.671	<0.001			0.664	0.503	0.780	4.951	64	<0.001
Rural efficacy	63	0.839	<0.001			-	-	-	-	-	<0.001
Rural Choice	63	0.993	<0.001			-	-	-	-	-	<0.001

[a] McAllister *et al.*, 2018

Discussion

Exploratory and confirmatory factor analysis was conducted to assess the relative contribution of the PQS used in a rural setting and confirmed the validity of the PQS as one single component for measuring the quality of placements. Our EFA, test-retest and Cronbach's alpha findings were similar to those reported by McAllister *et al.* (2018) who validated the survey among students on urban placements. The decision was made to conduct an EFA in the rural sample because of the difference in rural and urban placements. Additionally, our study had a response rate of 88% compared to the urban study rate of 27%, suggesting that the low response rate may have led to different factor loadings. However, it was encouraging to see that the results were very similar, indicating that the survey is potentially a robust tool. Increased preference for rural placements and rural self-efficacy increased quality ratings, supporting construct validity. Construct validity was established by correlating the PQS with choice of placement and rural self-efficacy. We can argue from the pattern of correlations that the PQS is associated with both variables in theoretically predictable ways. Additionally, reliability in terms of both internal consistency and repeatability was also satisfactory.
The addition of the two supervisory items was considered useful in the rural setting as part of quality assurance techniques for the rural campus to continue to inform improvement of the quality of rural placements. Although 'autonomy' during rural placements scored slightly lower than the other quality

placement items, the results were valid and reliable, supporting inclusion of the item, as it gives extra information about the quality of the placement. Work-readiness and enhancing students' capacity to work autonomously are increasingly required skills for entering the workforce by industry (Winterton & Turner, 2019). Therefore these two items could be used as measures of work-readiness and autonomy by clinical education teams. A recent study (Winterton & Turner, 2019) critically evaluating existing opinions about graduates and work-readiness concluded that current education is poorly aligned with labour market needs. The study highlighted the need to find consensus between different stakeholder perspectives on graduate workforce readiness and make sure that stakeholders collaborate to improve graduate transition to the labour market, but noted this must be context-specific. The PQS may assist in this area by improving placement quality.

A robust linear trend was also clearly visible when students reported strong positive feelings when thinking of working in a rural setting leading to higher quality ratings, which in turn may promote students' intentions to practice rurally (Isaac *et al.*, 2018; King *et al.*, 2016).

Whilst not surprising, the results also confirm that students who had more choice about rural placement preference scored higher on their quality ratings. This is important because we know that a better experience is linked to intention to practising rurally in the future (Smith, Sutton *et al.*, 2018; Walters *et al.*, 2016). Rural clinical schools can use this information to measure both the quality of clinical placements and the intention to practice rurally, so they can check whether placement quality is linked to intention to practice rurally in their own clinical schools. Some would argue that only allocating students to rural placements that want to do a rural placement could be a potential selection criterion for allied health students to attend rural training. However, this raises the possibility that students who did not consider doing a rural placement may miss out on learning about the option of working in rural areas. Additionally, because our placements were short placements (4–8 weeks). This may not hold for longer-term placements.

Limitations

Rural self-efficacy was evaluated by including only one question of the rural self-efficacy scale (Isaac *et al.*, 2015; Isaac *et al*., 2018), which has not been validated as a stand-alone item, but our survey needed to be brief.

The study was conducted among a group of allied health students from one rural area and self-reporting may have biased the results. The short time-frame to conduct the test-retest results may also have impacted the study results.

The two additional items relate specifically to the non-traditional model of supervision for these particular community-based work-ready placements (aimed at improving work-readiness and increasing students' skills and capacity to work autonomously) and may therefore not be applicable to more traditional placements. However, it may be time to begin conversations about making all students work-ready and autonomous.

Conclusion

This study enhanced measures of quality in clinical placements and validated an existing placement quality survey in a sample of rural allied health students. The results provided support for the reliability (both for internal consistency and repeatability), construct and factorial validity of the PQS. The study addresses the critical need for placement quality data to improve allied health students' experiences and learning outcomes on placements and the use of systematic quality-improvement processes in placements.

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Ethical approval

University of Sydney Human Research Ethics Committee (2015/466).

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APPENDIX A

Table A.1: Item-to-Item correlations and Item-to-Total correlations for the 7 items of the Placement Quality Survey (*n* = 160).

	Fit	Supervision	Learning	Communication	Culture	Best Practice	Item-Total PQS (7-item)
Quality	0.592	0.466	0.599	0.537	0.477	0.420	0.640
Fit		0.777	0.629	0.505	0.532	0.557	0.763
Supervision			0.602	0.419	0.469	0.563	0.683
Learning Environment				0.628	0.657	0.562	0.784
Communication					0.629	0.492	0.685
Culture						0.531	0.705
Best Practice							0.646

Table A.2: Item-to-Item correlations and Item-to-Total correlations additional two items with the original 7 items of the Placement Quality Survey (*n* = 160)

	Autonomous	Work ready
Quality	0.531	0.557
Fit	0.457	0.565
Supervision	0.402	0.502
Learning Environment	0.509	0.584
Communication	0.342	0.468
Culture	0.354	0.464
Best Practice	0.320	0.450
Autonomous	1.000	0.638
Work Ready	0.638	1.000
Item-to-Total	0.562	0.686

Table A.3a: Fit statistics for the three Single construct Confirmatory Factor Analysis models – 9 items

	Model 1	Model 2	Model 3
Measures of fit			
Model chi-square	75.8	59.7	39.6
Model chi-square *df*	27	26	25
Prob Model chi-square	<0.001	0.0002	0.032
Model chi-square/*df* ratio	2.81	2.30	1.58
RMR	0.267	0.174	0.095
SRMR	0.205	0.133	0.065
Goodness of Fit Index	0.878	0.904	0.936
Adjust *GFI*	0.796	0.833	0.885
RMSEA	0.107	0.090	0.061
RMSEA 90%CI	0.079–0.135	0.060–0.121	0.018–0.095
AIC	111.8	97.7	79.6
Bentler CFI	0.680	0.779	0.904

Key: *df* – degrees of freedom; *RMR* – root mean square residual; *SRMR* – Standardized Root Mean Square Residual; *GFI* – Goodness of fit; *RMSEA* – Root Mean Square Error of Approximation; *AIC* – Akaike information criterion

Table A.3b: Results of Single construct Confirmatory Factor Analysis modelling - Model 3 parameters for the 9-item CFA with two additional covariance terms

Parameter		Unstandardised	*SE*	Standardised
Loadings from F1				
Quality	λ1	0.812	0.065	0.773
Fit	λ2	1.000		0.792
Supervision	λ3	0.911	0.054	0.709
Learning Environment	λ4	1.031	0.069	0.881
Communication	λ5	1.008	0.088	0.800
Organisational Culture	λ6	1.065	0.083	0.800
Best Practice	λ7	0.843	0.069	0.705
Autonomous	λ8	0.652	0.084	0.636
Work Ready	λ9	0.755	0.074	0.704
Variances/Covariances				
Latent variable F1	Phi1	0.921	0.126	
Quality	Var 1	0.408	0.049	
Fit	Var 2	0.547	0.066	
Supervision	Var 3	0.755	0.090	
Learning Environment	Var 4	0.282	0.044	
Communication	Var 5	0.528	0.063	
Organisational Culture	Var 6	0.588	0.091	
Best Practice	Var 7	0.660	0.093	
Autonomous	Var 8	0.575	0.067	
Work Ready	Var 9	0.534	0.068	
Covar Fit ↔Supervision	Cov 23	0.303	0.069	
Covar Autonomous↔Work Ready	Cov 89	0.228	0.050	