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Application of the Multi-Facet Rasch Model to Validate Chief Residents Survey: A Two-Year Study

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BACKGROUND

Chief Resident (CR) selection process is described by many residency programs as a collective effort from the residency program leadership, key faculty members, and resident peers. Unfortunately, the literature does not show any established guidelines, methods, or psychometric sound instruments to aid this process. In our Pediatric Residency Program, we annually select three self-nominated residents during their PGY-2 year for the PGY-4 CR position. All applicants interview with the residency program leadership. To include the resident peer perspective, we developed a survey to capture personal and leadership characteristics of the candidates. After utilization of the results in the first implementation for the CRs selection in 2015, this instrument had its second-round validation process for the CRs selection in 2016.

PURPOSE

To compare CR candidate's characteristics and leadership qualities within and across two years and to further validate the CR peer selection instrument.

METHODS

This study utilized the Multi-Facet Rasch Model (MFRM) to analyze two-year data from the CRs peer selection surveys. Candidates' performance across two years are compared by utilizing common item equating method.

RESULTS

Four pediatric residents (Candidate 1-4) in 2015 and six pediatric residents (Candidate 5-10) in 2016 were considered for the position of CRs. The results of the Facets analysis revealed that Candidate 1 has the highest performance among all four candidates while Candidate 3 scored second best for CRs selection in 2015. In 2016, Candidate 7 scored highest while Candidate 5 is the second best. However, the second year CRs (Candidate 7, 10, 5) have relatively higher ranking when comparing all 10 candidates together (Tab1). Further analysis of the interaction between candidates and survey items showed that Candidate 5 received very low score on item 4 (Confident) and item 19 (Assertive) (Fig1/Tab2). The analysis of survey items indicated that both item 4 and item 19 are misfit in the model predictions. Among all survey items, item 18 (Ability to accept his/her own mistakes) is the hardest while the content of item 22 (Dedicated) is the easiest.

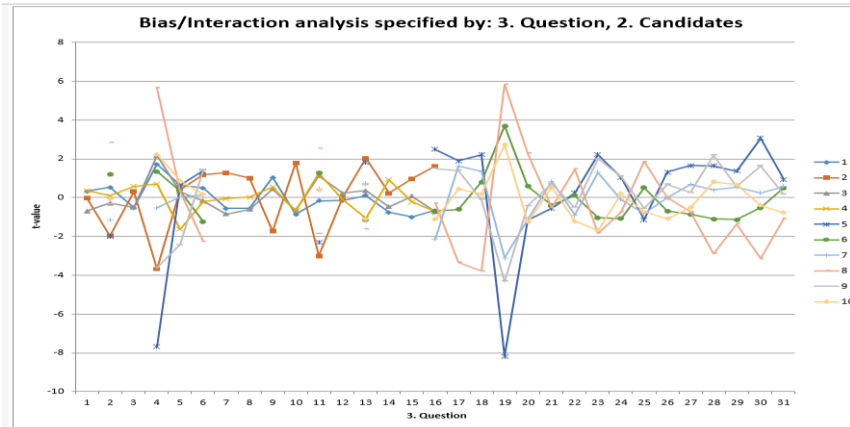
RESULTS

Table 1: Candidates' performance across two years: four candidates from 2015(subset1) and six candidates from 2016 (subset2).

Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Average	Measure	Model S.E.	Infit MnSq	Zstd	Outfit MnSq	Zstd	Estim. Discrm	Nu Candidates
3957	682	5.8	5.88	4.52	.10	.90	-1.2	1.11	.8	1.02	7 7
3936	695	5.7	5.74	3.67	.08	.91	-1.3	.84	-1.8	1.12	9 9
5251	946	5.6	5.63	3.23	.06	1.02	.3	.96	-.5	1.04	5 5
2614	474	5.5	5.59	3.08	.08	.95	-.7	.95	-.4	1.01	1 1
3803	709	5.4	5.48	2.75	.06	.96	-.6	.99	.0	1.00	10 10
2194	408	5.4	5.44	2.64	.08	.78	-3.1	.91	-.8	1.20	3 3
2689	515	5.2	5.29	2.25	.07	1.16	2.2	1.21	2.4	.83	2 2
2191	418	5.2	5.28	2.25	.08	.81	-2.9	.78	-2.7	1.23	4 4
4431	852	5.2	5.27	2.21	.05	1.33	6.0	1.31	5.7	.65	8 8
4248	829	5.1	5.23	2.11	.05	.94	-1.2	.92	-1.6	1.09	6 6
3531.4	652.8	5.4	5.48	2.87	.07	.98	-.3	1.00	.1		Mean (Count: 10)
991.7	181.2	.2	.21	.73	.01	.15	2.6	.16	2.3		S.D. (Populn)
1045.4	191.1	.2	.22	.77	.01	.16	2.7	.16	2.4		S.D. (Sample)

Model, Populn: RMSE .07 Adj (True) S.D. .73 Separation 9.87 Reliability .99
 Model, Sample: RMSE .07 Adj (True) S.D. .77 Separation 10.41 Reliability .99
 Model, Fixed (all same) chi-square: 871.5 d.f.: 9 significance (probability): .00
 Model, Random (normal) chi-square: 8.9 d.f.: 8 significance (probability): .35

Figure 1: Interaction plot between candidates and survey items.



CONCLUSION

This study demonstrated the design and validation process of a psychometric sound survey instrument in the medical field for CRs peer selection through the utility of MFRM. More importantly, the common item equating method enabled us not only to compare candidate's performance but also to assess survey items quality. The findings are promising since our surveys can differentiate candidates' performance based on their peer perceptions.

RESULTS

Table 2: Candidate's relative performance on survey items.

Questions	Candidates' Relative Performance										
	1	2	3	4	5	6	7	8	9	10	
1 Ability to work with others / relationship-building / tactfulness	0.11	0	-0.2	0.12							
2 Problem-solving	0.19	-0.54	-0.1	0.03	-0.5	0.32	-0.47	0.86	-0.12	-0.01	
3 Respectful	-0.18	0.09	-0.2	0.19							
4 Confident	0.61	-0.89	0.79	0.22	-1.7	0.34	-0.22	2.37	-1.04	0.71	
5 Enthusiastic	0.23	0.12	0.11	-0.47	0.2	0.09	0.01	0.08	-0.78	0.29	
6 Attitude towards residents	0.17	0.35	-0.1	-0.06	0.47	-0.3	0.07	-0.53	0.7	0.05	
7 Listening ability	-0.18	0.4	-0.3	-0.01							
8 Acceptance of criticism/Ability to accept his/her own mistakes	-0.17	0.29	-0.2	0.01							
9 Common sense and judgment	0.36	-0.45	0.15	0.17							
10 Diversity awareness / Open-Minded	-0.3	0.57	-0.2	-0.23							
11 Efficient / Resourceful	-0.05	-0.79	0.4	0.41	-0.6	0.34	0.22	0.74	-0.59	0.12	
12 Self-awareness	-0.05	0.01	0.08	-0.03							
13 Friendliness / Kindness / Sense of Humor	0.03	0.66	0.13	-0.31	0.68	-0.29	0.45	-0.4	0.3	-0.32	
14 Patience	-0.24	0.06	-0.2	0.29							
15 Self-Discipline	-0.34	0.32	0.03	-0.07							
16 Integrity and honesty	-0.24	0.52	-0.3	-0.22	1.2	-0.19	-0.87	-0.08	0.93	-0.35	
17 Ability to work with others / relationship-building					0.58	-0.14	1	-0.73	0.57	0.13	
18 Ability to accept his / her own mistakes					0.66	0.19	0.62	-0.84	-0.03	0.05	
19 Assertive					-1.7	1.03	-1.01	2.05	-1.2	0.89	
20 Attentive					-0.3	0.15	-0.48	0.68	-0.16	-0.37	
21 Corroborative					-0.2	-0.1	0.46	-0.13	0.3	0.17	
22 Dedicated					0.08	0.03	-0.44	0.46	-0.21	-0.37	
23 Diplomatic/Tactful					0.66	-0.24	0.59	-0.42	0.79	-0.45	
24 Fair-minded / unbiased					0.3	-0.25	-0.04	-0.18	0.43	0.06	
25 Judgment and Decision-making					-0.3	0.14	-0.37	0.55	-0.21	-0.22	
26 Listening for ideas, not just words					0.4	-0.17	0	0	0.27	-0.3	
27 Nondiscriminatory					0.56	-0.22	0.38	-0.18	0.11	-0.15	
28 Patience /tolerance					0.49	-0.25	0.17	-0.66	0.95	0.24	
29 Receptive of criticism					0.4	-0.26	0.24	-0.32	0.2	0.2	
30 Respectful / Considerate / Courteous					1.27	-0.13	0.12	-0.72	0.75	-0.12	
31 Self-awareness and Self-Discipline					0.29	0.13	0.29	-0.26	0.07	-0.22	

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