EXPLORING LATENT CLASSES OF EXAMINEE RESPONSE TIME: AN APPLICATION OF THE GROWTH MIXTURE MODEL ON A MEDICAL LICENSURE EXAMINATION

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ABSTRACT

CONTEXT: The COMLEX licensure examinations are balanced with expected response time across item blocks. Nevertheless, there are subsets of examinees (30%) that show a different pattern of speed across item blocks. This paper attempts to model the response pattern of this subset of examinees and offers a possible explanation for this pattern of responses. This research explores the speeded behavior of a special subset of examinees. Identify if subpopulations have different methods of speed (e.g. increase as time goes on; slow down as time goes on). Identify if the membership to a subpopulation has an impact on the total score (i.e validity).

METHODS: Apply latent class analysis methods to longitudinal response data to identify subpopulations of different response behaviors. Medical licensure examinees taking one form of the COMLEX-USA Level 3 examination (n=543) were used to estimate the response time across item blocks. Examinees were served 8 item blocks. This study uses the first 7 blocks of 50 items each for analysis.

RESULTS: Results indicate that a subset of the population exhibits a different response pattern than the general population. Membership in these latent classes did not impact examination performance.

CONCLUSIONS: Although two interesting classes emerged from the response dataset, the COMLEX examination offered enough time within each block of items for examinees to comfortably respond. The two classes, pacers and speeders, did not show any significant differences in the outcome of their final results. This indicates that examinees taking the final licensure examination to practice unsupervised medicine have developed skills and techniques (test savviness) that allows them to approach the examination in ways that are most comfortable to each examinee and attain an equivalent score.

MEASURES

Data. Data came from 534 resident test takers who are in their third year of residency. Residents have to take this examination in order to be fully licensed and be allowed to safely practice medicine. Eligible test takers were at least 18 years of age, had passed both COMLEX-USA Level-1 and COMLEX-USA Level-2. In addition, they had to be in good standing in their participating resident programs.

Examinees answered 8 blocks of items over the course of 8 hours with a lunch break in between. Within each block, 50 items were randomly delivered; each examinee received the same 50 items in random order. Because items were randomly delivered within each block, the total response time of the block was taken instead of the response time at the item level. On average, examinees took 55 minutes to respond to each block of items with the last block taking 51 minutes. The first four blocks were used for analysis.
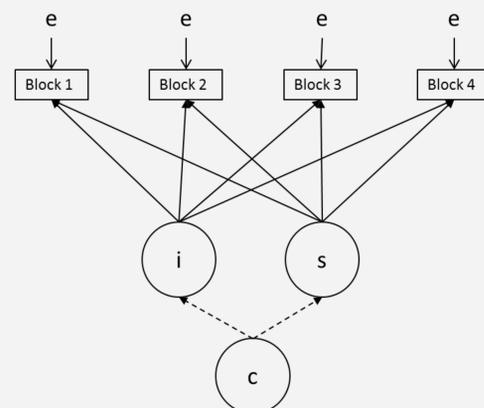

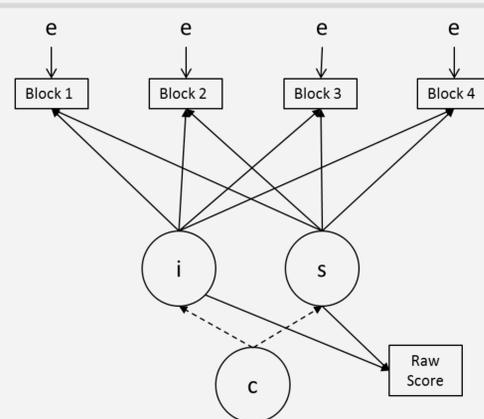Figure 1. Latent growth mixture model for item block duration.

Figure 2. Latent growth mixture model for item block duration with a total score covariate.

RESULTS

Classification Summary

Entropy		2 Class		Proportion
		c1	c2	
0.851	c1	**0.904**	0.096	0.215
	c2	0.029	**0.971**	0.784

		3 Class			
		c1	c2	c3	
0.907	c1	**0.981**	0.019	0.000	0.070
	c2	0.068	**0.912**	0.020	0.680
	c3	0.000	0.049	**0.951**	0.250

Parameter estimates for the GMM with a covariate

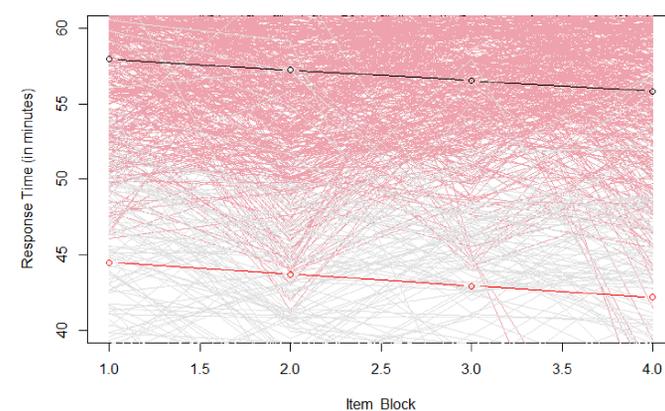|	GMM with 1 Class			GMM with 2 classes		
	M	SE	p	M	SE	p
Class 1						
Average response time (i)	55.06	0.37	0.00	**57.94**	**0.43**	**0.00**
Change over blocks (s)	-0.72	0.13	0.00	**-0.71**	**0.16**	**0.00**
i with s	-8.78	1.40	0.00	-9.24	2.08	0.00
Raw score on i	-0.67	0.16	0.00	**-1.60**	**0.85**	**0.06**
Raw score on s	1.49	0.82	0.07	**-0.43**	**2.32**	**0.85**
Class 2						
Average response time (i)	-	-	-	**44.50**	**1.09**	**0.00**
Change over blocks (s)	-	-	-	**-0.77**	**0.23**	**0.00**
i with s	-	-	-	-9.24	2.08	0.00
Raw score on i	-	-	-	**-0.57**	**0.66**	**0.39**
Raw score on s	-	-	-	**0.80**	**1.83**	**0.66**

Note. Class 1 = 79 %, class 2 = 21%

Figure 3. Average speeder response time across blocks is represented in the bold black line and individual growth curves are represented in the light red color lines. Average response for pacers across blocks is represented in the bold red line and individual growth curves are represented in the light gray color lines.
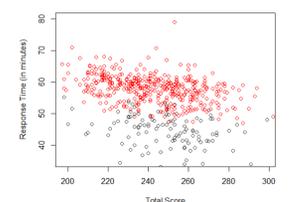

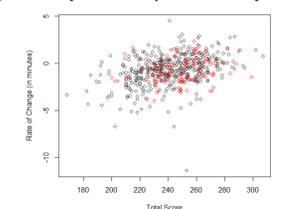Figure 4. Response time by total score separated by group.

Figure 5. Rate of change by total score, separated by group.

Summary & Conclusion

- Two distinct classes of response times emerged.
- Pacers took 55 minutes per block to answer all items.
- Speeders averaged 44 minutes per block.
- Both had a negative regression slope, meaning as examinees progressed through item blocks, they spent significantly less time answering items.
- Difference between pacers and speeders was ~ 4 seconds.
- Group differences did not impact the final raw score.