

**2004 Annual Report for the  
National Athletic Trainers Association Board of Certification**

**CASTLE Worldwide, Inc.  
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2004 was a pivotal year for the National Athletic Trainers Association Board of Certification (BOC) examination. The BOC conducted an in-depth analysis of the examination, different types of enhancements that it may employ, and the feasibility of computer-based testing. Central to the analysis was mission of the examination and the implications of the mission for what must be assessed. The study led the BOC to conclude that the most effective way to construct the examination is a single examination based on the combination of multiple-choice and simulation formats with the direct assessment of practical skills as part of the required curriculum. The BOC also decided to administer the examination by computer.

The move to computer-based testing has many implications for the examination. It allows for innovative questions and simulation problems, and candidates will have easier access to testing opportunities. The test will be available to candidates in many more locations than are currently available and at times that are convenient for them. Significant implications exist for the psychometric structure of the test, in that the approach to equating (which ensures that all versions, or forms, of the test are equal in difficulty) and analysis of the test may employ Item Response Theory (IRT).

Anticipating the move to IRT, during 2004 CASTLE conducted item calibration studies of all multiple-choice questions used in the 2003 and 2004, in addition to the usual studies of the performance of questions and problems (items). The purpose of such analysis is to establish the statistical character of the items as well as the probability that candidates of differing ability in athletic training will respond correctly. Conducting the analysis for 2003 and 2004 offers flexibility to the BOC as it assembles several forms of the test under the new framework.

### **The Written, Simulation, and Practical Portions of the Examination**

The BOC examination is designed to assess candidate knowledge and skill in athletic training across the many environments in which athletic trainers work. The examination includes a written, multiple-choice examination of 140 scored items, a simulation examination made up of eight scored problems, and a practical assessment that includes from eight to 11 problems in 2004. Candidates must pass each examination in order to pass. The three parts of the test are designed to examine if candidates have sufficient understanding of the principles, practices, and sciences underlying the practice of athletic training, if they exercise appropriate professional judgment, especially in emergency situations, and if they demonstrate the adequate skill in the myriad procedures and techniques.

Test development for the BOC examination involved two meetings for each of the three examinations in 2004. During the first meeting, committee members wrote and reviewed items for the examination, and then at second meeting they reviewed and assembled the 2005 forms of the examinations. The written subcommittee developed and reviewed 65 examination items while the practical subcommittee reviewed, revised and validated 15 practical problems. The simulation committee reviewed and completed 2 new problems. At the assembly meeting, the committees focused on reviewing and validating the 2005 examination versions.

## Analysis of the Examination

There are three parts of the BOC examination, and each contributes substantively to certification decisions. Information about each part is analyzed to ensure that it adheres to pertinent psychometric principles. In complying with these principles the BOC undertakes the steps to support the examination as a valid and reliable measure of knowledge and skill in athletic training.

### Reliability

Table I reports reliability coefficients for all parts of the BOC examination for the entire testing year. The reliability estimate for each examination is an measure of the consistency of scores as an assessment of competence. Internal consistency reliability is determined as the Kuder Richardson [KR(20)] coefficient and estimates the degree to which items on the test contribute consistently to candidates' scores. The standard error of measurement provides the range in which the candidate's true score (if measured in absence of any error) resides.

**Table I. Examination Reliability and Standard Error of Measurement (S.E.M)**

Form #	Written		Practical					Simulation				
	334	335	338	339	340	341	346	336	337	336	337	336
Date			Apr	Jun	Aug	Nov	Jan	Apr	Jun	Aug	Nov	Jan
Reliability (KR20)	.84	.83	.62	.75	.73	.60	.62	.89	.91	.89	.90	.90
Interrater Rel. % Agreement			.91	.85	.86	.92	.91					
Interrater Rel. Pearson's			.89	.93	.90	.90	.89					
S.E.M.	5.31	5.24	3.19	3.44	3.67	3.17	3.13	7.45	7.69	7.72	7.83	7.75

### Candidate Performance on the Examination

First-time candidates and retake candidates are combined to account for the total number of candidates taking each part of the BOC examination on all test dates during the testing year, 2004. In total, 5573 candidates took the written multiple-choice part of the examination, 4291 candidates took the practical portion of the examination, and 4754 candidates took the simulation portion of the examination. Table II reports the performance of the total candidate group on each examination.

**Table II. All Candidates Taking the Examinations**

Exam	# Candidates	# Pass	% Pass	# Fail	% Fail
Written	5573	2554	45.83%	3019	54.17%
Practical	4291	2709	63.13%	1582	36.87%
Simulation	4754	2572	54.10%	2182	45.90%

In the 2004 testing year 2855 individuals took the written (multiple-choice) examination for the first time, and 58.60% passed. 2320 first-time candidates took the practical test in 2004, with 60.65% passing on that first attempt. Of the 2897 individuals taking the simulation examination for the first time in 2004, 58.09% passed. Table III (below) reports the performance of candidates taking the examination for the first time. The table also reports the performance of candidates who qualified to take the examination by completing internship and curriculum program. Curriculum programs are approved by the Commission on Accreditation of Allied Health Education Programs. The

internship route to eligibility involves seven required courses, a supervised internship, and various other requirements. To take the examination as first-time internship candidates, applicants must have qualified prior to the beginning of the testing year, as the BOC no longer accepts completion of internship courses of study as a means of satisfying eligibility requirements.

**Table III. Candidates Taking the Examination for the First Time**

Exam	Total Sitting	Total #/% Pass	Total #/% Fail	Total Intern	Intern #/% Pass	Intern #/% Fail	Total Curric	Curric #/% Pass	Curric #/% Fail
Written	2855	1673 58.60%	1182 41.40%	1065	468 43.94%	597 56.06%	1790	1205 67.32%	585 32.68%
Practical	2320	1407 60.65%	913 39.35%	975	431 44.21%	544 55.79%	1345	976 72.57%	369 27.43%
Simulation	2897	1683 58.09%	1214 41.91%	1064	452 42.48%	612 57.52%	1833	1231 67.16%	602 32.84%

A total of 813, or 35.44% of 2294 first-time candidates passed all three components of the BOC examination on their first attempt in 2004. This outcome is consistent with previous years.

**Table IV. First Time Candidates Passing All Three Parts on First Attempt**

	Total Sitting	Total Pass	Total Pass %	Total Fail	Total Fail %
Overall	2294	813	35.44%	1481	64.56%
Internship	965	217	22.49%	748	77.51%
Curriculum	1329	596	44.85%	733	55.15%

The performance of candidates retaking the BOC examination is presented in Table V. 2718 candidates took the written (multiple-choice) portion of the BOC examination, and 32.41% of them passed. The practical portion of the examination was retaken by 1971 individuals with 66.06%, or 1302 of them, passing. 1857 candidates took the simulation portion of the examination as retake candidates during the year. 47.87% of them passed.

**Table V. Candidates Retaking the Examination**

Exam	Total Sitting	Total #/% Pass	Total #/% Fail	Total Intern	Intern #/% Pass	Intern #/% Fail	Total Curric	Curric #/% Pass	Curric #/% Fail
Written	2718	881 32.41%	1837 67.59%	1580	420 26.58%	1160 73.42%	1138	461 40.51%	677 59.49%
Practical	1971	1302 66.06%	669 33.94%	955	528 55.29%	427 44.71%	1016	774 76.18%	242 23.82%
Simulation	1857	889 47.87%	968 52.13%	1030	422 40.97%	608 59.03%	827	467 56.47%	360 43.53%

### Descriptive Statistics of Candidate Performance

Descriptive statistics for each form of the BOC examination are shown in Table VI. For the written (multiple-choice) examination, scaled scores ranged from 56 to 141 (out of 150 scale-score points) on Form 334 and 44 to 142 for form 335. Scores on the practical are reported on a scale from 0 to 50,

on which the high scores were 48, 48, 49, 45, and 47. Correspondingly, low scores on the practical were 16, 0, 13, 0, and 13. The simulation is scaled from 200 to 800, with the passing standard anchored at 500, as is the convention for certification and licensure examinations. High scores were 730, 753, 742, 744, and 727, while the low score was 200 on each form and test date. Table VI provides detail about candidate performance on each part of the BOC examination.

**Table VI. Candidate Scores**

	Written Form 334	Written Form 335
High Score	141	142
Low Score	56	44
Avg. Score – Overall	103.98	104.09
Avg. Score – Internship	100.04	100.21
Avg. Score – Curriculum	107.54	107.60
Std. Dev. – Overall	13.45	12.86

	Practical Form 338	Practical Form 339	Practical Form 340	Practical Form 341	Practical Form 346
High Score	48	48	49	45	47
Low Score	16	0	13	0	13
Avg. Score – Overall	36.92	34.02	35.91	35.14	36.25
Avg. Score – Intern.	35.24	31.15	33.32	33.73	34.26
Avg. Score – Curric.	38.34	36.21	38.12	36.62	37.55
Std. Dev. – Overall	5.18	6.87	7.07	5.02	5.08

	Simulation Form 336 April	Simulation Form 337 June	Simulation Form 336 August	Simulation Form 337 Nov.	Simulation Form 336 Jan.
High Score	730	753	742	744	727
Low Score	200	200	200	200	200
Avg. Score – Overall	500.82	500.93	500.94	500.92	500.75
Avg. Score – Intern.	468.09	470.83	478.81	473.61	469.43
Avg. Score – Curric.	523.95	526.30	519.29	526.77	519.66
Std. Dev. – Overall	98.94	98.38	98.02	98.53	99.07

The Role Delineation Study upon which the examination is based (1999) has six performance domains, or major areas of responsibility for athletic trainers. Table VII reports descriptive statistics at the domain level for the written examination, first for form 334 and then separately for form 335.

**Table VII. Domain Scores (Raw) for Written Examination Form 334 and 335**

	Form 334 - Domain 1	Form 334 - Domain 2	Form 334 - Domain 3	Form 334 - Domain 4	Form 334 - Domain 5	Form 334 - Domain 6
Number of Items	21	33	28	31	15	12
High Score	20	33	28	30	15	12
Low Score	4	8	6	5	3	2
Avg. Score – Overall	12.79	22.58	18.05	19.29	10.83	8.44
Avg. Score – Internship	12.38	21.35	17.40	18.20	10.47	8.22
Avg. Score – Curriculum	13.15	23.69	18.63	20.28	11.14	8.63
Std. Dev. – Overall	2.62	4.16	3.63	3.97	1.94	1.69

  

	Form 335 - Domain 1	Form 335 - Domain 2	Form 335 - Domain 3	Form 335 - Domain 4	Form 335 - Domain 5	Form 335 - Domain 6
Number of Items	21	33	28	31	15	12
High Score	20	33	27	31	15	12
Low Score	3	5	6	7	2	3
Avg. Score – Overall	13.27	22.51	17.90	19.26	11.38	8.77
Avg. Score – Internship	12.86	21.19	17.35	18.23	11.10	8.49
Avg. Score – Curriculum	13.64	23.70	18.40	20.19	11.63	9.03
Std. Dev. – Overall	2.46	4.29	3.13	4.00	1.86	1.59

### Conclusion

Statistics concerning the quality of the BOC examination as a measurement device indicate that the examination adheres to pertinent requirements for certification and licensure tests. Specifically, indicators of reliability and equivalence across forms for the various parts of the examination are quite strong. Likewise, statistics concerning the performance of candidates on the examination describe how the test is consistent with public protection mission of the BOC.

The BOC invests considerable energy and resources to ensure that the examination and all aspects of its development and administration are fair and of high quality. The organization implements an examination program that maintains validity and reliability as a measure of entry-level competence in the athletic training.

## Appendix A

### Summary of the Written and Practical Parts of the BOC Examination

#### Summary of Written Examination Form 334

##### Summary Table of Item Difficulty for 140 Scored Items

<i>Difficulty Ranges</i>	<i>Number of Items</i>
90-100	12
80-89.9	24
70-79.9	21
60-69.9	29
50-59.9	27
40-49.9	16
30-39.9	5
20-29.9	6
10-19.9	0
0-9.9	0

##### Summary Table of Item Discrimination for 140 Scored Items

<i>Discrimination Ranges</i>	<i>Number of Items</i>
.90-1.00	0
.80-.899	0
.70-.799	0
.60-.699	0
.50-.599	0
.40-.499	7
.30-.399	22
.20-.299	56
.10-.199	44
0-.099	9
Less than 0	2

Summary of Written Examination Form 335

Summary Table of Item Difficulty for 140 Scored Items

<i>Difficulty Ranges</i>	<i>Number of Items</i>
90-100	15
80-89.9	26
70-79.9	28
60-69.9	18
50-59.9	27
40-49.9	14
30-39.9	5
20-29.9	6
10-19.9	0
0-9.9	1

Summary Table of Item Discrimination for 140 Scored Items

<i>Discrimination Ranges</i>	<i>Number of Items</i>
.90-1.00	0
.80-.899	0
.70-.799	0
.60-.699	0
.50-.599	0
.40-.499	4
.30-.399	28
.20-.299	45
.10-.199	51
0-.099	11
Less than 0	1

Summary of Practical Examination Form 338

Summary Statistics of Candidates Performance on the Examination

	No. of Points	Low Score	High Score	Mean Score	Variance	Std Dev
Problem 1	6.50	0	6.50	4.57	2.51	1.58
Problem 2	8.50	0	8.50	6.46	2.65	1.63
Problem 3	5.50	0	5.50	4.57	2.11	1.45
Problem 4	3.25	0	3.25	2.26	0.37	0.61
Problem 5	3.25	0	3.25	2.30	0.49	0.70
Problem 6	4.50	0	4.50	3.54	0.64	0.80
Problem 7	7.00	1.5	7.00	4.77	1.20	1.10
Problem 8	7.00	0	7.00	5.29	2.00	1.41
Problem 9	4.50	0	4.50	3.65	0.78	0.88

Summary of Practical Examination Form 339

Summary Statistics of Candidates Performance on the Examination

	No. of Points	Low Score	High Score	Mean Score	Variance	Std Dev
Problem 1	6.50	0	6.50	4.54	2.64	1.62
Problem 2	8.50	0	8.50	6.29	2.85	1.69
Problem 3	5.50	0	5.50	4.34	0.70	0.84
Problem 4	7.50	0	7.50	4.70	2.15	1.47
Problem 5	4.50	0	4.50	2.81	1.04	1.02
Problem 6	5.50	0	5.50	4.59	2.09	1.45
Problem 7	7.50	0	7.50	4.83	4.43	2.10
Problem 8	4.50	0	4.50	2.42	2.03	1.42

Summary of Practical Examination Form 340

Summary Statistics of Candidates Performance on the Examination

	No. of Points	Low Score	High Score	Mean Score	Variance	Std Dev
Problem 1	5.50	0	5.50	4.50	2.45	1.56
Problem 2	3.00	0	3.00	1.97	0.46	0.68
Problem 3	3.00	0	3.00	1.47	0.52	0.72
Problem 4	8.50	0	8.50	6.31	2.47	1.57
Problem 5	3.00	0	3.00	1.96	0.71	0.84
Problem 6	8.00	0	8.00	4.78	3.32	1.82
Problem 7	3.50	0	3.50	2.07	0.87	0.93
Problem 8	3.50	0	3.50	2.33	1.20	1.10
Problem 9	3.50	0	3.50	2.18	1.06	1.03
Problem 10	3.50	0	3.50	2.65	0.95	0.97
Problem 11	5.00	0	5.00	3.18	1.13	1.06



Summary of Practical Examination Form 341

Summary Statistics of Candidates Performance on the Examination

	No. of Points	Low Score	High Score	Mean Score	Variance	Std Dev
Problem 1	4.50	0	4.50	3.18	1.31	1.15
Problem 2	8.50	0	8.50	6.25	2.57	1.60
Problem 3	5.50	0	5.50	4.52	2.06	1.44
Problem 4	2.00	0	2.00	1.32	0.29	0.54
Problem 5	5.50	0	5.50	4.37	0.73	0.85
Problem 6	5.50	0	5.50	4.50	1.19	1.09
Problem 7	3.50	0	3.50	2.69	0.68	0.82
Problem 8	3.50	0	3.50	3.39	0.26	0.51
Problem 9	3.50	0	3.50	3.20	0.58	0.79
Problem 10	3.50	0	3.50	3.31	0.40	0.64
Problem 11	4.50	0	4.50	2.89	0.95	0.97

Summary of Practical Examination Form 346

Summary Statistics of Candidates Performance on the Examination

	No. of Points	Low Score	High Score	Mean Score	Variance	Std Dev
Problem 1	6.50	0	6.50	4.59	2.80	1.67
Problem 2	8.50	0	8.50	6.53	1.96	1.40
Problem 3	5.50	0	5.50	4.71	1.66	1.29
Problem 4	3.25	0	3.25	2.15	0.46	0.68
Problem 5	3.25	0	3.25	2.23	0.59	0.77
Problem 6	4.50	0	4.50	3.42	0.71	0.84
Problem 7	7.00	0	7.00	4.97	1.19	1.09
Problem 8	7.00	0	7.00	5.87	1.84	1.36
Problem 9	4.50	0	4.50	3.54	0.83	0.91