BALANCE SYSTEM™ SD AND BIOSWAY™

NORMATIVE DATA

950-440	System, Balance SD, 115 VAC 15.6” display
950-441	System, Balance SD, 230 VAC 15.6” display
950-444	System, Balance SD, 100 VAC 15.6” display
950-450	Optional FreeSway Handles
950-460	BioSway, 15.6” display

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FN: 20-127

BALANCE SYSTEM™ SD (version 4.x) AND BIOSWAY™

This Normative Data document provides data sets for the Balance System SD and BioSway.

Additional information and resources are available upon request or directly from the Biodex website: www.biodex.com/balance.

Here, the user can find information from compliance to clinical support, and if the desired information is not found, Biodex can be contacted directly at supportservices@biodex.com.

Thank you,
Biodex Medical Systems, Inc.

Contact information

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Normative Data

The Biodex Balance system provides several sets of normative data. Normative data for balance are the average and standard deviation numbers derived from various scores in controlled studies. These data sets are separated into different population groups to give relevant norms for the patient.

Before running a test, select the appropriate normative data set for the patient and protocol. The data set validates the patient's baseline testing or, if a patient does not have a baseline test, becomes the baseline for that patient.

m-CTSIB Test

The following normative data sets are available:

- The Aggregate General Population, ages 13–85, data on CTSIB reliability and predictive score is the combined data of the other three data sets.
- The Male and Female, ages 13–18, 20-second trial normative data was collected from a population of student athletes, male and female, ages 13 through 18. The data was collected by Carolinas Medical Center, Charlotte, NC, Department of Sports Medicine & Special Events, at four special events during the summer of 2011. Data analysis was done by Raymond F. McKenna, PT, PhD, Clinical Associate Professor, Stony Brook University School of Health Technology and Management, Department of Physical Therapy, State University of New York.
- The 65–84 Male and Female Independent normative data was collected from two populations of older adults, male and female, ages 65 through 84. The data was collected by Georgia Southern University in Statesboro, GA, and Adelphi University in Garden City, NY.
- The 17–23 Male and Female NCAA Baseline normative data was collected from a population of athletes, male and female, ages 17 through 23. The data was collected by David Bica, DO, and Anthony S. Kulas, PhD, ATC, LAT, Department of Sports Medicine, the Brody School of Medicine, East Carolina University, Greenville, NC.

Table.D.1. Data Table for the m-CTSIB Normative Data Set.

Population	Sample Size	Eyes Open Firm Surface Sway Index Mean	Std Dev	Eyes Closed Firm Surface Sway Index Mean	Std Dev	Eyes Open Foam Surface Sway Index Mean	Std Dev	Eyes Closed Foam Surface Sway Index Mean	Std Dev
Male Female, Age 13–18, 20-second trial	1,500	0.48	0.39	0.66	0.38	0.75	0.31	1.87	0.27
17–23 Male Female NCAA Baseline	480	0.32	0.40	0.67	0.35	0.60	0.33	2.08	0.26
65–84 Male Female Independent	215	0.66	0.40	1.17	0.38	1.13	0.38	3.50	0.32
Aggregate Population, ages 13–84	2,195	0.44	0.48	0.80	0.44	0.79	0.43	2.41	0.38

The values in Table.D.1 are the default values for the Biodex Balance System m-CTSIB test illustrated in Figure D.1.

Figure D.1. Default Data for m-CTSIB.

Fall Risk Test

Reliability

Thirty older adults (15 men, 15 women) completed the test on two separate days. The intraclass correlation coefficient results ranged from 0.74 to 0.86 with no significant (P<.05) differences between sessions. The standard error of measurement ranged from 15.9% to 23.6%.

Table D.2. Statistics and results for two sessions (1.9 ± 0.7 day separation).

	Session 1	Session 2	ICC	Systematic Bias		SEM %
Stance Eyes	**X ± SD mm/s**	**X ± SD mm/s**		**X Change %**	**P Value**	
Self-selected Eyes Open	4.9 ± 1.8	5.1 ± 2.1	0.86	3.1	0.427	15.9
Self-selected Eyes Closed	6.9 ± 3.7	6.5 ± 3.4	0.82	-4.4	0.414	23.6
Narrow Eyes Open	6.2 ± 2.7	6.7 ± 2.6	0.74	7.6	0.192	23.3
Narrow Eyes Closed	9.1 ± 3.9	10.0 ± 5.1	0.81	6.8	0.200	21.2
X = mean; SD = standard deviation; ICC = Intraclass Correlation Coefficient; SEM = standard error of measurement						

The Fall Risk test protocol is based on research from the University of Dayton (Bigelow, et al[1]) and the University of Jyväskylä in Finland (Pajala, et al[2]). After being adopted into the Biodex Balance products as a test, a reliability study of this protocol was conducted by Bryan Riemann, PhD, and Kelsey Piersol, MSSM, of Armstrong State University[3].

[1] Bigelow, K. E., Berme, N. Development of a protocol for improving the clinical utility of posturography as a fall-risk screening tool. The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences. 2011;66A: 228–233.
[2] Pajala, S., Era, P., Koskenvuo, M., Kaprio, J., Törmäkangas, T., Rantanen, T. Force platform balance measures as predictors of indoor and outdoor falls in community-dwelling women aged 63-76 years. J Gerontol A Biol Sci Med Sci. 2008;63A:171–178.
[3] B.L. Riemann, K. Piersol, Intersession reliability of self-selected and narrow stance balance testing in older adults, Aging clinical and experimental research 29(5) (2017) 1045-1048.

Normative Data

Table D.3 displays the mean postural sway velocity of 338 subjects, separated by age group, with 1, 2, and 3 Standard Deviations. Boundary ranges for 1, 2, and 3 SD are shaded.[4]

Table D.3. Mean Postural Sway Velocity.

Postural Sway Index						Score Boundaries					
						1 SD		2 SD		3 SD	
Stance	Eyes	Age	n	Mean	SD	LB	UB	LB	UB	LB	UB
Self Select	Open	50–59	108	6.43	2.07	-9.82	-9.82	-10.49	10.49	-11.76	11.76
		60–69	108	7.98	2.10	-11.42	11.42	-12.09	12.09	-13.38	13.38
		70–79	81	9.03	2.27	-12.76	12.76	-13.48	13.48	-14.88	14.88
		>80	41	9.76	2.45	-13.78	13.78	-14.57	14.57	-16.08	16.08
	Closed	50–59	108	7.88	2.53	-12.02	12.02	-12.83	12.83	-14.39	14.39
		60–69	108	9.63	2.53	-13.77	13.77	-14.58	14.58	-16.13	16.13
		70–79	81	10.89	2.92	-15.67	15.67	-16.61	16.61	-18.40	18.40
		>80	41	11.68	3.24	-16.99	16.99	-18.03	18.03	-20.02	20.02
Narrow	Open	50–59	108	8.45	1.92	-11.60	11.60	-12.21	12.21	-13.40	13.40
		60–69	108	9.56	2.32	-13.37	13.37	-14.12	14.12	-15.55	15.55
		70–79	81	10.37	2.50	-14.47	14.47	-15.27	15.27	-16.80	16.80
		>80	41	11.43	2.67	-15.81	15.81	-16.67	16.67	-18.31	18.31
	Closed	50–59	108	10.06	2.38	-13.97	13.97	-14.74	14.74	-16.20	16.20
		60–69	108	11.62	2.78	-16.18	16.18	-17.07	17.07	-18.78	18.78
		70–79	81	12.58	3.05	-17.57	17.57	-18.55	18.55	20.42	20.42
		>80	41	14.29	3.51	-20.04	20.04	-21.17	21.17	23.32	23.32
SD = standard deviation; LB = lower boundary; UB = upper boundary											

Figure D.2 displays the Fall Risk Defaults, an implementation of **Table D.3**.

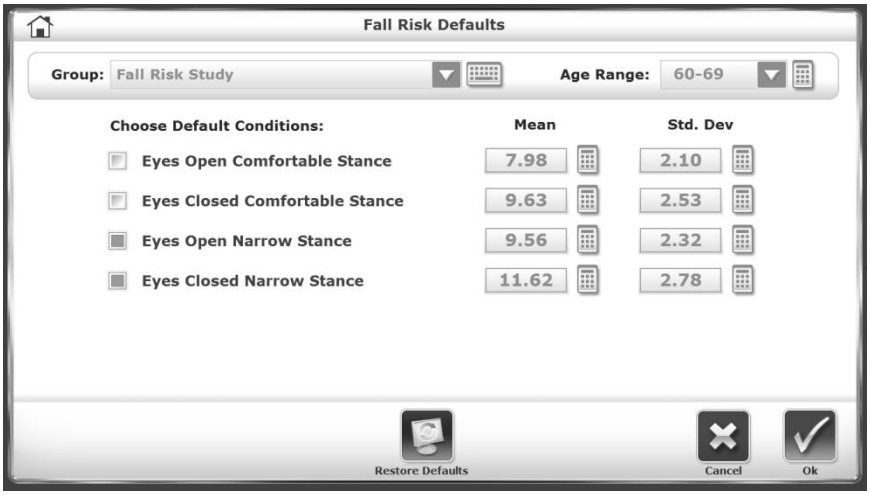

Figure D.2. Default Data for Fall Risk Test.

[4] B.L. Riemann, K. Piersol, Intersession reliability of self-selected and narrow stance balance testing in older adults, Aging clinical and experimental research 29(5) (2017) 1045-1048.

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