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Developmental normative data for the Balance Tracking System modified Clinical Test of Sensory Integration and Balance protocol

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ABSTRACT

A growing number of practitioners are implementing the Balance Tracking System (BTrackS) modified Clinical Test of Sensory Integration and Balance (mCTSIB) to evaluate the sensory sources of balance feedback used to maintain upright standing. The aim of the current study was to expand existing BTrackS mCTSIB normative databases on adults to include reference values from developmental age groups. Participants included children (age range = 5–8 years; *n* = 212), adolescents (age range = 9–12 years; *n* = 103), teenagers (age range = 13–17 years; *n* = 152), and young adults (age range = 18–29 years; *n* = 779). Testing consisted of four, 20-s trials of static standing on the BTrackS Balance Plate. Each trial systematically manipulated the relative contributions of the vision, proprioception, and vestibular sensory systems. Based on the total center of pressure path length metric from the BTrackS Assess Balance software, it was found that females generally outperformed males in all age groups and sensory conditions. Both sexes showed improvements in balance with age when comparing children and adolescents. However, only in the Standard and Proprioceptive conditions were further age-related improvements seen for the adolescent and young adult groups. The current findings provide useful information demonstrating that sensory feedback processing for balance improves at different rates during

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development. Percentile ranking ‘‘look-up” tables are also provided as a tool for practitioners performing BTrackS mCTSIB testing.

Introduction

The ability of humans to stand upright on two legs is thought to be an evolutionary adaptation that offers several advantages such as the freeing of one’s hands for tool use (Leakey, 1971). Although the maintenance of two-legged standing (i.e., balance) is often taken for granted, it is not trivial. Upright standing balance involves the complex interplay of both voluntary and involuntary movement systems as well as multiple sensory systems (Nashner et al., 1989). To this extent, it is not surprising that balance ability is refined throughout childhood and into adolescence, starting at the time most individuals learn to stand at around 1 year of age (Verbecque et al., 2016).

With respect to the sensory systems used for maintaining balance, three primary senses (i.e., proprioception, vision, and vestibulation) have been identified as being of particular significance. First, proprioception has been shown to provide sway-related balance information regarding ankle position changes in accordance with an inverted pendulum model of body dynamics (McCollum et al., 1996). Second, visual distance cues have been demonstrated to relate eye location to the surrounding environment, allowing individuals to anticipate losses of balance (Black et al., 1983). Third, the vestibular system has been found to provide feedback that serves as an important means of monitoring conflicts between an individual’s perceived and real-world head positions during balance activities (Nashner et al., 1982).

Given the substantial roles played by the proprioceptive, visual, and vestibular systems, balance assessment protocols have been developed to explore the contributions of each sense to balance ability. One widely implemented method is the modified Clinical Test of Sensory Integration and Balance (mCTSIB), a derivative of the CTSIB first described decades ago (Shumway-Cook & Horak, 1986). During the mCTSIB, the magnitude of balance disruption during standing is observed under test conditions that strategically manipulate the availability/reliability of sensory feedback sources. This is commonly accomplished by having individuals close their eyes while standing and/or place their feet on a compliant foam surface.

The Balance Tracking System (BTrackS) is a relatively low-cost, portable force plate with software that enables quick, accurate, and reliable mCTSIB assessment (Goble et al., 2021). Computerized force plates like the BTrackS were first developed more than half a century ago to sense applied forces when stood on. These forces can be used to objectively determine a key indicator of balance known as center of pressure (CoP). CoP is the weighted average of applied forces to a force plate during standing and serves as a proxy for one’s center of gravity location. Observed changes in CoP during two-legged standing provide a quantitative window into postural control and body sway characteristics. Importantly, increased CoP displacement has frequently been associated with poorer balance ability, which has been demonstrated in both individuals with high fall risk and clinical conditions that affect balance (Goble et al., 2016; Lee & Jung, 2017; Melzer et al., 2004; Morrison et al., 2016; Pajala et al., 2008; Park et al., 2014; Thapa et al., 1996).

The BTrackS mCTSIB protocol consists of four test conditions that address balance ability under different sensory circumstances. The first trial is a Standard condition, with eyes open on the firm surface of the force plate, where all three main sensory systems (i.e. proprioception, vision, and vestibular) are uncompromised. The second trial is the Proprioception condition, where the person being tested closes his or her eyes while standing on the firm surface of the plate to remove vision. This manipulation increases reliance on both the proprioceptive and vestibular systems, but it favors proprioception based on studies showing a preference for proprioceptive versus vestibular information when available (Lord et al., 1991). The third trial is the Vision condition, where the individual being tested stands on a foam cushion to reduce the reliability of proprioception. It has been shown that, in this situation, vision is the dominant uncompromised sense used over vestibular feedback (Simoneau et al., 1992). The fourth trial is the Vestibular condition, where vision is removed (i.e., eyes closed) and proprioception is rendered unreliable via a foam cushion. This manipulation induces a shift in reliance to the solely uncompromised vestibular system as the primary source of sensory information.

Two previous studies have provided critical BTrackS mCTSIB normative data from large samples of healthy adults 18 to 59 years of age (Goble et al., 2019, 2020). These data were the basis of initial percentile ranking "look-up" tables for each sensory feedback condition (i.e.. standard, proprioception, vision, and vestibular) based on participant sex and age. Indeed, this information currently serves as a key tool for practitioners to determine balance dysfunctions that might have a sensory system locus. Specifically, BTrackS mCTSIB normative data assist in the tracking of percentile ranking changes that occur alongside various balance training and/or clinical rehabilitative interventions.

Although balance-related sensory systems mature relatively early in development (Brecelj, 2003; Dayal et al., 1973; Neuringer & Jeffrey, 2003), the use of sensory feedback for standing balance does not appear to reach adult levels until late childhood, adolescence, or even teenage years (Peterson et al., 2006; Shams et al., 2020). In this case, expansion of BTrackS mCTSIB normative data across younger age groups remains necessary. The aim of the current study was to provide the first known set of BTrackS mCTSIB results for healthy children, adolescents, and teenagers from a sample large enough to support establishment of percentile rankings. It was hypothesized that clear differences in performance would exist between the age groups tested, especially when compared with young adults. It was also expected, based on previous observations (Goble & Baweja, 2018; Shams et al., 2020), that differences in mCTSIB performance would exist based on sex, with females outperforming males.

Method

Participants

This study included 1246 participants (623 males and 623 females) who self-identified as being generally healthy and 5 to 29 years of age at the time of testing. Recognizing that no consensus categorization of developmental age groupings exists, participants were nominally divided into four age categories defined as "children" (age range = 5–8 years; n = 212), "adolescents" (age range = 9–12 y ears; n = 103), "teenagers" (age range = 13–17 years; n = 152) and "young adults" (age range = 18–29 years; n = 779). Participants were recruited by convenience from the local community during testing sessions conducted at multiple sites such as health fairs, fitness gyms, religious settings, and educational institutions. Data were provided in a pre-existing, de-identified, and anonymous format, allowing non-human participant status to be obtained from the local institutional review board.

Experimental equipment

A depiction of the equipment used in this study is provided in Fig. 1. Equipment consisted of the BTrackS Balance Plate and BTrackS Assess Balance software (Balance Tracking Systems, San Diego, CA, USA). The BTrackS Balance Plate is a patented medical device that is portable, lightweight (<7 kg), and has well-established accuracy and reliability for measuring CoP data (Goble et al., 2018; O'Connor et al., 2016; Richmond et al., 2018). The BTrackS Assess Balance software ran on a laptop computer interfaced with the BTrackS Balance Plate via a universal serial port connection. During operation, the BTrackS Assess Balance software provided a structured interface for test profile creation, protocol administration, and result interpretation. For some test conditions in this study, participants stood on a lightweight, high-density foam cushion (Airex, Sins, Switzerland) placed on top of the BTrackS Balance Plate.

Fig. 1. Equipment used in this study, consisting of the Balance Tracking System (BTrackS) Balance Plate (bottom right) and BTrackS Assess Balance software running on a laptop (top left).

Experimental procedures

BTrackS mCTSIB data were collected from participants in a single session held in an isolated room with a hard floor surface and limited distractions. Prior to each testing session, the BTrackS Balance Plate surface was leveled on the hard floor using built-in height adjustable legs. Test administration was carried out according to the step-by-step prompts provided by the BTrackS Assess Balance software. To mimic typical conditions implemented by practitioners, participants were tested without shoes on, but did wear socks in most cases. No attempt was made to control variations in sock thickness or height. The following standardized instructions were given prior to each participant performing the test:

> "You are about to perform a modified Clinical Test of Sensory Integration and Balance or mCTSIB. The mCTSIB consists of four 20-second trials that measure your ability to control body sway when sensory feedback is systematically manipulated. For each trial, you will stand as still as possible on the BTrackS Balance Plate with your hands on your hips and feet shoulder width apart. You will hear a tone at the beginning and end of each trial. Your mCTSIB results will be based on the center of pressure path length from the forces you place on the BTrackS Balance Plate during standing. Sensory feedback will be manipulated by having you close your eyes or stand on foam in some conditions."

In accordance with the above instructions, participants stood for testing with feet shoulder width apart on the BTrackS Balance Plate for four consecutive 20-s testing trials (Fig. 2). Each trial began and ended with an auditory tone and had participants place their hands on their hips. The first trial (i.e., Standard condition; Fig. 2A) required participants to open their eyes while standing on the firm surface of the plate. After a short inter-trial delay (~5–10 s), the second trial (i.e., Proprioception condition; Fig. 2B) commenced, whereby participants had their eyes closed while standing on the plate's firm surface. Following the second trial, the third trial (i.e., Vision condition; Fig. 2C) and fourth trial (i.e., Vestibular condition; Fig. 2D) were completed in a similar fashion to the first and second trials, respectively. In this case, however, participants stood on a compliant foam cushion during testing, which was placed on top of the BTrackS Balance Plate. Participants' eyes were open for the third trial and were closed for the fourth trial.

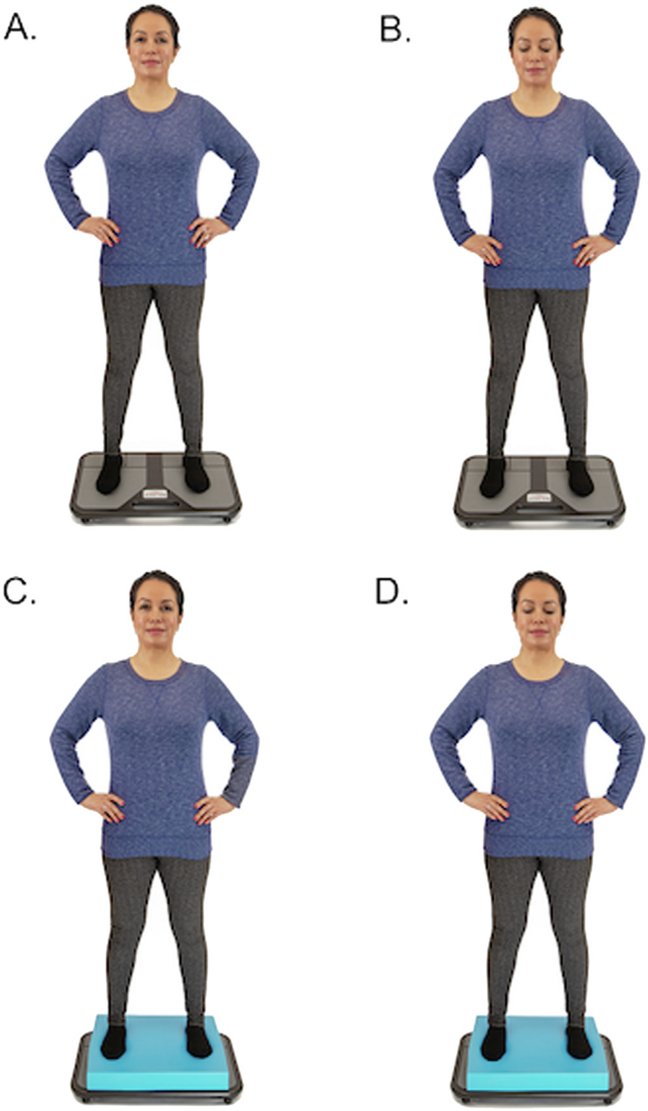

Fig. 2. The four testing conditions of the Balance Tracking System (BTrackS) modified Clinical Test of Sensory Integration and Balance (mCTSIB) protocol. Each condition required individuals to stand as still as possible on the BTrackS Balance Plate with feet shoulder width apart and hands on hips. The Standard condition (A) was performed with eyes open while standing on the firm plate surface. The Proprioception condition (B) was performed with eyes closed while standing on the firm plate surface. The Vision condition (C) and Vestibular condition (D) were performed with eyes open and closed, respectively, while standing on a compliant foam surface.

Data analysis

BTrackS mCTSIB results for each trial (i.e., sensory condition) were calculated by the BTrackS Assess Balance software and displayed on the associated computer screen. Results were based on the total CoP path length (in centimeters) during a given trial, which is the default metric provided by the BTrackS Assess Balance software. This metric is a proxy for the amount of body sway incurred and was mathematically determined by quantifying the distance between all successive CoP time points according to the following formula:

$$\text{CoP Distance } = \left[(\text{CoP}x_2 - \text{ CoP}x_1)^2 + (\text{CoP}y_2 - \text{ CoP}y_1)^2 \right]^{0.5}, \quad (1)$$

where $\text{CoP}x_2$ and $\text{CoP}x_1$ are adjacent time points in the CoPx (medial/lateral) time series and $\text{CoP}y_2$ and $\text{CoP}y_1$ are adjacent time points in the CoPy (anterior/posterior) time series. The sum of all CoP distances was then summed to get total CoP path length.

Trial results for all individuals tested were assimilated and manually transferred from the BTrackS Assess Balance software into a single database for statistical analyses. Quality inspection of the data was performed using predefined rules that determined improprieties in the testing protocol, invalid demographics, and/or testing outliers. Less than 1% of the original sample was excluded. The data were then grouped according to sex (i.e., males or females) and age (i.e., children, adolescents, teenagers, or young adults).

A separate analysis of variance (ANOVA) was conducted for each condition (i.e., Standard, Proprioception, Vision, and Vestibular) evaluating the statistical main effects and interactions between the factors sex (levels: male and female) and age group (levels: children, adolescents, teenagers, and young adults). Where significant effects were found, Tukey honest significant differences (HSD) post hoc tests were used to determine significant differences between levels of a given factor. As required for use of the general linear model, data subgroups were evaluated for normality and homogeneity. The ANOVA and Tukey tests were conducted in SPSS (IBM Corp., Armonk, NY, USA), with significance determined at the $p < .05$ level. Percentile rankings were also calculated for the 1st, 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th and 99th percentiles of each age, sex, and sensory condition according to the following formula:

$$\text{Percentile Ranking } = P/100(N + 1). \quad (2)$$

In this formula, P represents the listwise percentile rank and N represents the number of mCTSIB results in the distribution of interest.

Results

For the Standard condition (Fig. 3A), a significant sex by age interaction was found, $F(3, 1242) = 4.0$, $p < .01$, $\eta_p^2 = .01$, which superseded main effects of sex, $F(1, 1244) = 37.4$, $p < .001$, $\eta_p^2 = .03$, and age, $F(3, 1242) = 168.6$, $p < .001$, $\eta_p^2 = .30$. This interaction was such that males demonstrated larger CoP path lengths compared with females in all age groups (Tukey HSD, all comparisons at least $p < .05$) except for the teenagers, where males and females performed equally (Tukey HSD, $p > .05$). With respect to sex, females and males demonstrated improved balance performance (i.e., lower CoP path length) with age (Tukey HSD, all comparisons at least $p < .05$), although male children were not significantly different than male adolescents (Tukey HSD, $p > .05$).

Unlike the Standard condition, there was not a significant sex by age interaction, $F(3, 1242) = 2.0$, $p > .05$, $\eta_p^2 < .01$, for the Proprioception condition (Fig. 3B). Rather, only main effects of sex, $F(1, 1244) = 24.9$, $p < .001$, $\eta_p^2 = .02$, and age, $F(3, 1242) = 177.7$, $p < .001$, $\eta_p^2 = .30$, were found. Females outperformed males across all age groups, demonstrating less total CoP path length on average and, thus, increased balance ability. Both sexes were similarly affected by age, with significantly increased balance (i.e., lower total CoP path length) when comparing each successive age group with the next (Tukey HSD, all comparisons at least $p < .05$).

Visual condition results (Fig. 3C) also did not demonstrate a sex by age interaction, $F(3, 1242) = 0.2$, $p > .05$, $\eta\ \eta_p^2 < .01$, but they were associated with significant main effects of sex, $F(1, 1244 = 21.8$, $p < .001$, $\eta_p^2 = .02$, and age, $F(3, 1242) = 63.9$, $p < .001$, $\eta_p^2 = .13$. From a sex perspective, females outperformed males, with significantly lower total CoP path lengths across all age groups (Tukey HSD, all comparisons at least $p < .05$). The effect of age was less straightforward, showing that there was a significant increase in balance ability only between childhood and adolescence for both males and females (Tukey HSD, $p < .01$). Interestingly, postural sway performance was not statistically different among the adolescent, teenager, and young adult age groups (Tukey HSD, $p > .05$).

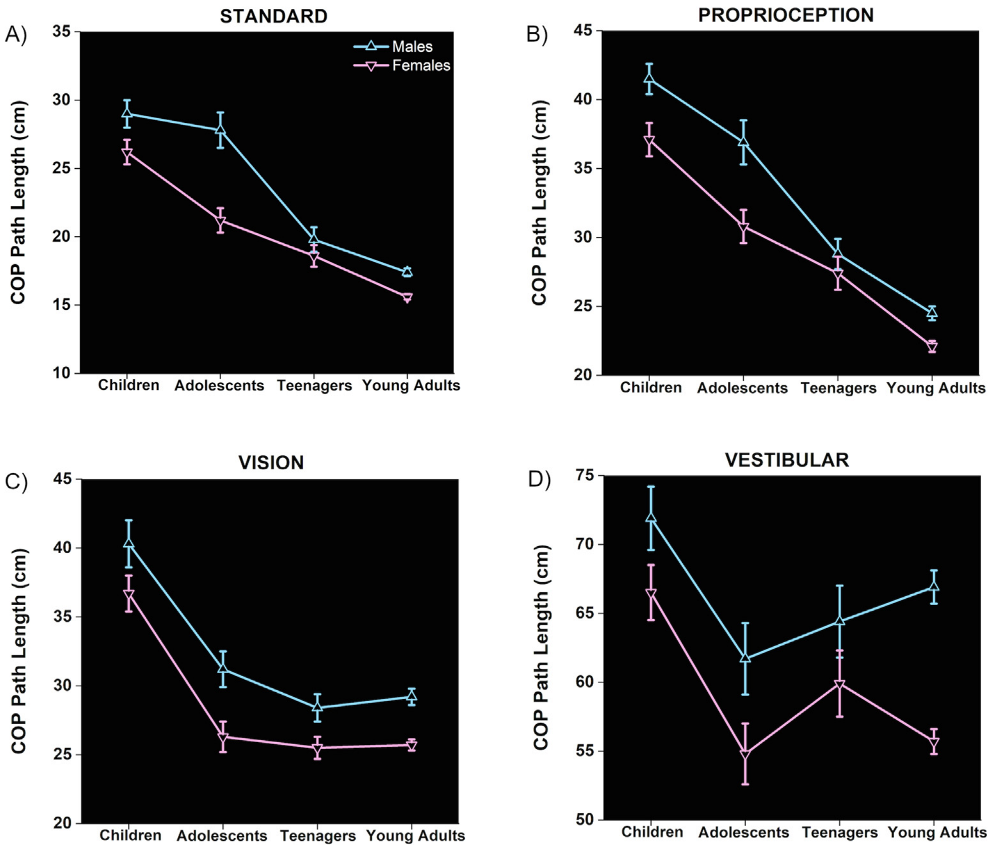

Fig. 3. Average (±*SD*) total center of pressure (CoP) path length for males (upward triangle) and females (downward triangle) in each age group (children 5–8 years, adolescents 9–12 years, teenagers 13–17 years, and young adults 18–29 years) during the Standard (A), Proprioception (B), Vision (C), and Vestibular (D) conditions of the Balance Tracking System (BTrackS) modified Clinical Test of Sensory Integration and Balance (mCTSIB).

Total CoP path length results for the Vestibular condition (Fig. 3D) did not show evidence of a sex by age interaction, $F(3, 1242) = 1.9$, $p > .05$, $\eta_p^2 < .01$, but they did indicate significant main effects of sex, $F(1, 1244) = 19.8$, $p < .001$, $\eta_p^2 = .02$, and age, $F(3, 1242) = 9.5$, $p < .001$, $\eta_p^2 = .02$. Females had significantly less postural sway than males (Tukey HSD, all comparisons at least $p < .05$) in all age groups except the teenagers (Tukey HSD, $p > .05$). For both males and females, total CoP path length was significantly higher for children compared with adolescents, teenagers, and young adults (Tukey HSD, all comparisons at least $p < .05$), although there were no significant differences among the three older age groups (Tukey HSD, $p > .05$).

Percentile rankings for males and females in each age group are provided in Tables 1 to 4. These look-up tables serve as a mechanism for sex- and age-based comparisons of future testing results relative to the individuals in this study. For example, a hypothetical 7-year-old female who performs the BTrackS mCTSIB and receives a total CoP path length result of 61 cm in the Vestibular condition would equate to the 60th percentile, according to Table 1. The interpretation of this result would be that her performance was equal to, or better than, 60% of healthy females who were of a similar age.

Table 1
Center of pressure path length (cm) percentile rankings for female and male children (5–8 years) in each modified Clinical Test of Sensory Integration and Balance (mCTSIB) condition.

Percentile ranking	Modified Clinical Test of Sensory Integration and Balance condition							
	Standard (eyes open/firm)		Proprioception (eyes closed/firm)		Vision (eyes open/foam)		Vestibular (eyes closed/foam)	
	Females	Males	Females	Males	Females	Males	Females	Males
1st	52	56	65	67	77	106	128	141
10th	40	43	59	59	55	59	94	103
20th	32	36	46	54	47	50	81	85
30th	29	34	43	48	41	45	71	80
40th	27	31	38	43	38	41	66	74
50th	25	27	34	40	34	36	63	67
60th	22	25	32	37	31	34	61	63
70th	21	23	30	35	28	30	53	58
80th	19	21	26	32	25	27	48	55
90th	16	19	23	27	22	25	44	48
99th	13	13	18	20	18	18	36	33

Table 2
Center of pressure path length (cm) percentile rankings for female and male adolescents (9–12 years) in each modified Clinical Test of Sensory Integration and Balance (mCTSIB) condition.

Percentile ranking	Modified Clinical Test of Sensory Integration and Balance condition							
	Standard (eyes open/firm)		Proprioception (eyes closed/firm)		Vision (eyes open/foam)		Vestibular (eyes closed/foam)	
	Females	Males	Females	Males	Females	Males	Females	Males
1st	38	55	49	67	44	57	81	124
10th	26	43	41	55	35	44	77	82
20th	24	37	38	51	33	40	67	73
30th	23	31	35	40	28	34	63	68
40th	23	29	32	38	26	32	57	66
50th	21	26	30	35	25	29	54	61
60th	20	24	28	31	24	27	48	55
70th	19	22	26	28	24	25	46	52
80th	16	18	24	27	21	22	42	44
90th	15	11	22	18	18	16	39	31
99th	10	10	16	17	12	14	31	28

Discussion

The current study generated needed data from children, adolescents, and teenagers that further expands the sex- and age-based normative data available to practitioners for the BTrackS mCTSIB protocol. Across sensory feedback conditions (i.e., Standard, Proprioception, Vision, and Vestibular), females generally had lower CoP path lengths than males, indicating enhanced balance ability throughout development. In contrast, the effect of age was less consistent across sensory feedback conditions, with balance improvements seen from childhood to adolescence, from adolescence to teenage years, and from teenage years to young adulthood in only the Standard and Proprioceptive conditions. In contrast, balance enhancement was exhibited only from childhood to adolescence in the Vision and Vestibular conditions. These results are codified for practitioners in the associated percentile ranking look-up tables provided.

The observation that females had less total CoP path length (i.e., better balance) than males in most age groups and sensory conditions concurs with multiple other studies, including those involving the mCTSIB (e.g., Goble et al., 2020; Moran et al., 2019). One tempting explanation of this sex-based variance is that differences in body anthropometrics between males and females, such as height and

Table 3
Center of pressure path length (cm) percentile rankings for female and male teenagers (13–17 years) in each modified Clinical Test of Sensory Integration and Balance (mCTSIB) condition.

Percentile ranking	Modified Clinical Test of Sensory Integration and Balance condition							
	Standard (eyes open/firm)		Proprioception (eyes closed/firm)		Vision (eyes open/foam)		Vestibular (eyes closed/foam)	
	Females	Males	Females	Males	Females	Males	Females	Males
1st	38	41	58	51	49	49	130	125
10th	26	31	39	41	34	39	92	96
20th	24	25	34	37	31	36	71	80
30th	22	20	31	33	29	32	62	72
40th	19	19	29	29	27	29	59	66
50th	17	17	26	27	25	27	51	60
60th	15	16	24	25	23	26	50	54
70th	14	15	21	23	21	22	47	49
80th	13	14	18	21	19	21	45	47
90th	11	11	17	13	17	16	41	33
99th	9	10	13	10	13	15	33	32

Table 4
Center of pressure path length (cm) percentile rankings for female and male young adults (18–29 years) in each modified Clinical Test of Sensory Integration and Balance (mCTSIB) condition.

Percentile ranking	Modified Clinical Test of Sensory Integration and Balance condition							
	Standard (eyes open/firm)		Proprioception (eyes closed/firm)		Vision (eyes open/foam)		Vestibular (eyes closed/foam)	
	Females	Males	Females	Males	Females	Males	Females	Males
1st	31	37	41	53	44	67	114	150
10th	21	26	32	36	36	42	79	95
20th	19	22	28	31	31	36	68	81
30th	17	19	25	28	29	33	62	73
40th	16	17	23	25	27	30	57	67
50th	15	16	21	23	25	28	53	63
60th	14	15	19	21	23	25	49	58
70th	13	14	18	19	21	22	45	54
80th	12	13	16	17	19	20	41	49
90th	10	11	14	15	16	17	36	43
99th	8	9	9	11	12	14	28	31

weight, influence balance ability. Despite this, it should be noted that previous BTrackS mCTSIB research in young adults has found that height and weight characteristics explained less than 2% of total CoP path length findings (Goble et al., 2019). Furthermore, only weak correlations were previously found between age, sex, and anthropometrics and static balance in a sample of individuals aged 7 to 18 years (Lebiedowska & Syczewska, 2000). Alternatively, it has been suggested that sex differences between developing males and females on static balance tasks might better be explained by experiential factors (Peterson et al., 2006). In this case, it has been posited that females self-select to participate in activities that require integration of sensory information such as ballet and gymnastics.

In the current study, clear improvements existed in balance performance from childhood to adolescence across all four sensory conditions. Previous studies have shown that balance improvements with age are largely a consequence of enhanced sensorimotor processing abilities rather than an artifact of changes in body size and shape associated with growth and development (Cumberworth et al., 2007; Peterson et al., 2006; Shams et al., 2020). Still, others have argued a role for developmental strength and attentional differences that might occur between males and females (Schedler et al., 2019). Interestingly, improvements from adolescence to teenage years and from teenage years to young adults were observed only in the Vision and Vestibular conditions. This result suggests that conditions where proprioception is perturbed through use of a foam pad surface might reduce the ability of a practitioner to elicit age-related differences in balance ability that exist later in development.

The current study represents the largest known set of mCTSIB normative data ever accumulated from child, adolescent, teenage, and young adult age groups. Despite this, it should be recognized that obtaining such a sizable sample necessarily required use of a multi-site approach. This methodology, although powerful, almost certainly induced some degree of external variability into the results due to environmental factors and inter-tester differences. It also fails to separate secondary influences on balance performance such as lifestyle and/or activity factors related to participation in sport or dance. On the other hand, external variation could also be viewed as a strength of the current findings given that it helps to account for real-world implementations of the BTrackS mCTSIB whereby the protocol is currently employed by thousands of practitioners worldwide.

The various sensory conditions comprising the BTrackS mCTSIB protocol are simply proxies for the respective use of proprioception, vision, and vestibular information. Indeed, although visual feedback is effectively removed through the closed eyes instruction, use of a foam pad does not achieve the same goal in terms of completely removing proprioceptive feedback. In this case, information is still available during testing from muscle spindle, joint, and cutaneous receptors regarding ankle position, although the relationship between these sensory signals and a typical firm surface is no doubt altered. Furthermore, vestibular feedback is available in all mCTSIB conditions, even if lesser used (Lord et al., 1991; Simoneau et al., 1992).

Conclusion

The BTrackS mCTSIB is an increasingly used protocol for the assessment of sensory sources of balance dysfunction. The current findings enhance the ability of practitioners to make meaningful judgments regarding the existence of sensory system-related balance abnormalities in developmental populations. Should impairment be determined, targeted intervention strategies can more effectively be deployed to achieve a positive outcome. For example, a recent study showed that 6 weeks of training using the BTrackS Target Tracking protocol significantly improved a person's functional base of support, as evidenced by performance on the BTrackS Limits of Stability test (Conner et al., 2023).

CRediT authorship contribution statement

Daniel J. Goble: Project administration, Investigation, Formal analysis, Concepualization, Writing – review & editing. **Kirstie Barnes:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Formal analysis, Conceptualization. **Josephine I. Lang:** Writing – review & editing, Writing – original draft, Project administration, Formal analysis. **Shweta Kapur:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Sophia K. Rosiek:** Writing – review & editing, Writing – original draft, Investigation. **Joshua L. Haworth:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Conceptualization.

Data availability

Data will be made available on request.

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