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Title: Evaluating the Probability of Head Acceleration Events in Elite Men's and Women's Rugby Union Match-Play: The Impact of Tackle Height and Body Position

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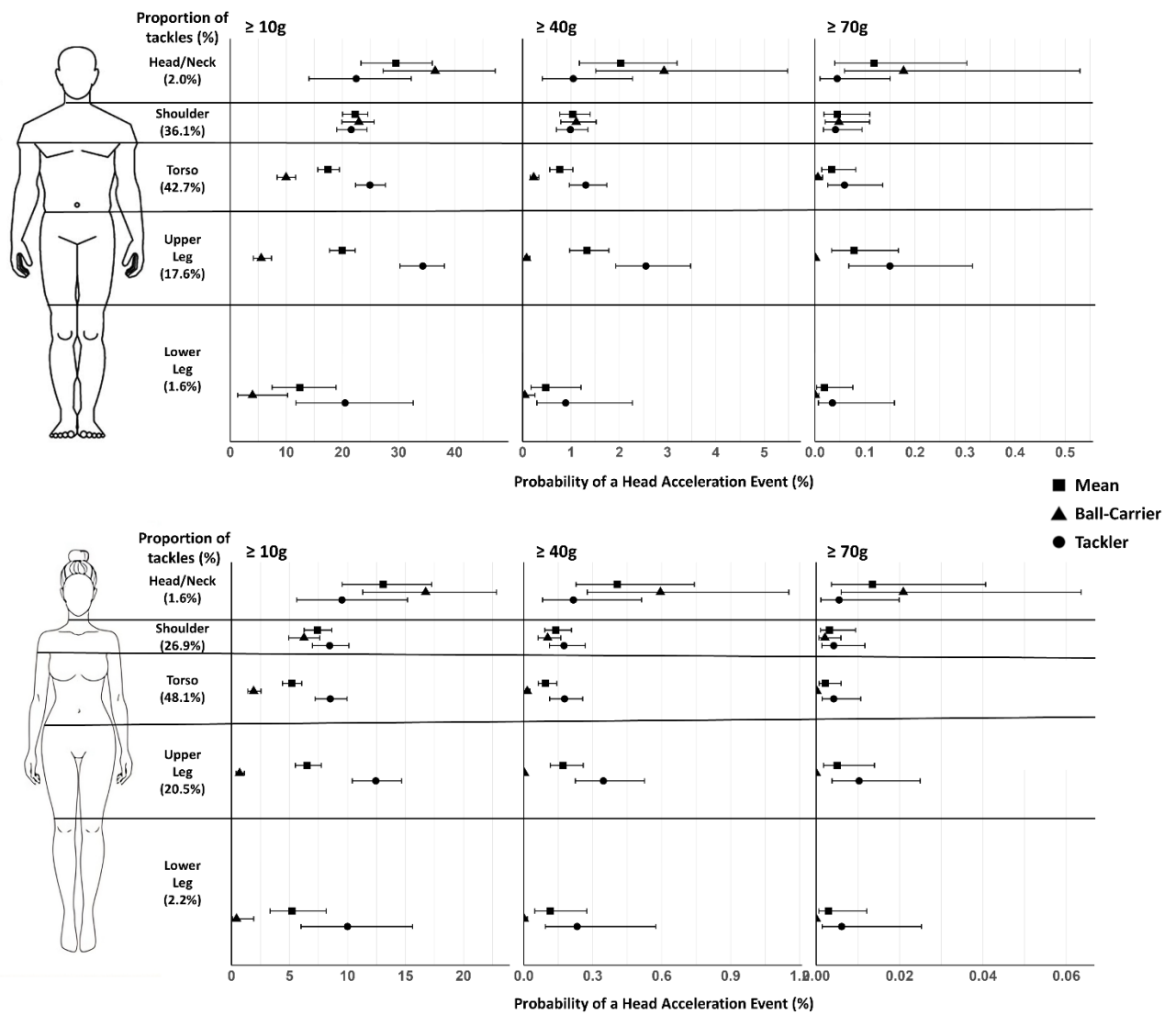
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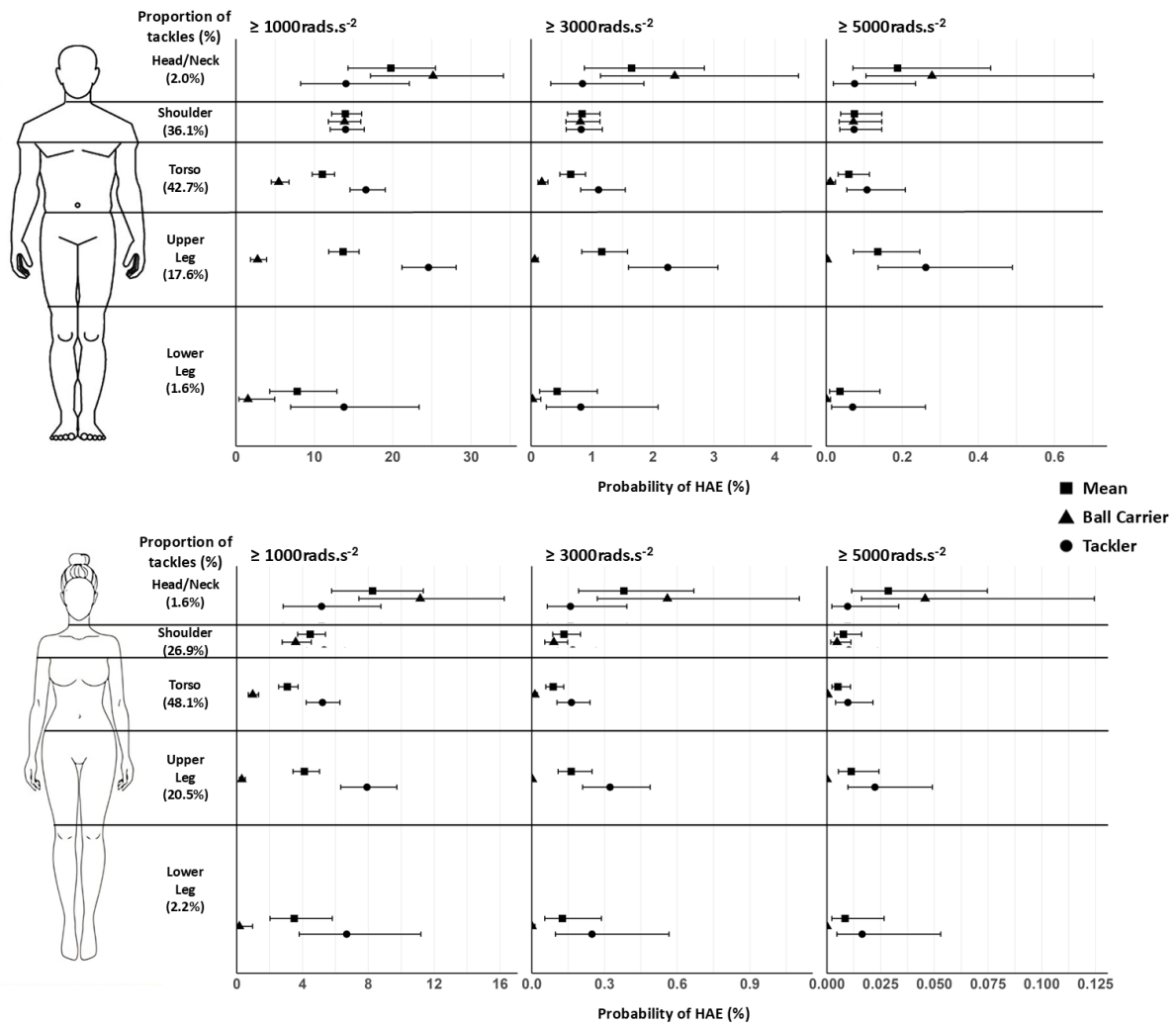
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Supplementary 1. Peak linear acceleration exceedance probabilities for men's ($\geq 10g$, $\geq 40g$ and $\geq 70g$) and women's ($\geq 10g$, $\geq 40g$ and $\geq 70g$) rugby union players by tackle height for all tackle, ball-carrier and tackler head acceleration events. Shape position indicates the median exceedance probability, with 95% confidence intervals show by the error bars. Note all x-axis are different.



Supplementary 2. Peak angular acceleration exceedance probabilities for men's ($\geq 21,000\text{rads.s}^{-2}$, $\geq 3,000\text{rads.s}^{-2}$ and $\geq 5,000\text{rads.s}^{-2}$) and women's ($\geq 1,000\text{rads.s}^{-2}$, $\geq 3,000\text{rads.s}^{-2}$ and $\geq 5,000\text{rads.s}^{-2}$) rugby union players by tackle height for all tackle, ball-carrier and tackler head acceleration events. Shape position indicates the median exceedance probability, with 95% confidence intervals show by the error bars. Note all x-axis are different.

Supplementary 3. Peak linear acceleration exceedance probabilities ($\geq 10g$, $\geq 40g$ and $\geq 70g$) for men's rugby union players by ball-carrier – tackler body position interaction for all tackle, ball-carrier and tackler head acceleration events. Large font 'Tackler' indicates the body position of the tackler, whilst the small font 'Tackler' indicates the probability of a head acceleration event occurring to the tackler for a given body position interaction. Median exceedance probabilities and 95% confidence intervals are reported.

		Tackler Body Position									
		Mean Probability			Ball-Carrier Probability			Tackler Probability			
		Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	
Ball-Carrier Body Position	≥10g	Upright	16.45% (13.56, 19.59)	19.77% (17.02, 22.73)	12.77% (10.01, 15.95)	14.61% (11.35, 18.62)	10.18% (7.77, 13.14)	3.78% (2.05, 6.38)	18.29% (14.42, 23.11)	29.52% (25.01, 34.38)	21.76% (16.75, 27.72)
		Bent at Waist	19.54% (16.33, 23.07)	22.46% (20.74, 24.15)	17.14% (14.25, 20.04)	20.44% (15.94, 25.92)	16.84% (15.11, 18.82)	6.93% (4.65, 10.08)	18.79% (14.54, 23.6)	28.22% (25.82, 30.57)	27.37% (22.63, 32.97)
		Falling/Diving	30.75% (17.97, 43.78)	13.48% (9.77, 17.90)	12.86% (7.93, 19.15)	43.51% (22.11, 65.31)	13.79% (8.80, 20.34)	8.76% (3.88, 17.24)	17.56% (6.43, 36.38)	12.96% (8.54, 19.34)	16.75% (9.50, 26.94)
	≥40g	Upright	0.70% (0.45, 1.03)	1.19% (0.84, 1.68)	0.61% (0.37, 0.97)	0.55% (0.33, 0.88)	0.29% (0.17, 0.46)	0.05% (0.02, 0.14)	0.83% (0.52, 1.35)	2.13% (1.46, 2.99)	1.16% (0.67, 1.91)
		Bent at Waist	0.95% (0.64, 1.37)	1.32% (1.03, 1.64)	0.98% (0.65, 1.42)	1.03% (0.62, 1.67)	0.72% (0.53, 0.95)	0.15% (0.07, 0.31)	0.88% (0.51, 1.44)	1.95% (1.52, 2.45)	1.84% (1.17, 2.69)
		Falling/Diving	2.94% (0.90, 7.26)	0.49% (0.27, 0.83)	0.48% (0.20, 1.13)	4.91% (1.21, 13.71)	0.50% (0.22, 1.06)	0.23% (0.05, 0.74)	0.77% (0.13, 3.38)	0.44% (0.20, 0.96)	0.70% (0.24, 1.83)
	≥70g	Upright	0.03% (0.01, 0.08)	0.08% (0.03, 0.17)	0.03% (0.01, 0.09)	0.02% (0.01, 0.07)	0.01% (0.00, 0.03)	0.00% (0.00, 0.01)	0.04% (0.01, 0.11)	0.15% (0.06, 0.32)	0.07% (0.02, 0.16)
		Bent at Waist	0.05% (0.02, 0.12)	0.08% (0.04, 0.17)	0.06% (0.02, 0.14)	0.06% (0.02, 0.15)	0.03% (0.01, 0.08)	0.00% (0.00, 0.02)	0.04% (0.02, 0.12)	0.13% (0.06, 0.27)	0.12% (0.05, 0.28)
		Falling/Diving	0.26% (0.04, 1.15)	0.02% (0.01, 0.06)	0.02% (0.00, 0.08)	0.46% (0.07, 2.25)	0.02% (0.00, 0.07)	0.01% (0.00, 0.04)	0.04% (0.00, 0.33)	0.02% (0.01, 0.06)	0.03% (0.01, 0.14)

Supplementary 4. Peak angular acceleration exceedance probabilities ($\geq 1,000 \text{rads.s}^{-2}$, $\geq 3,000 \text{rads.s}^{-2}$ and $\geq 5,000 \text{rads.s}^{-2}$) for men's rugby union players by ball-carrier – tackler body position interaction for all tackle, ball-carrier and tackler head acceleration events. Large font 'Tackler' indicates the body position of the tackler, whilst the small font 'Tackler' indicates the probability of a head acceleration event occurring to the tackler for a given body position interaction. Median exceedance probabilities and 95% confidence intervals are reported.

		Tackler Body Position									
		Mean Probability			Ball-Carrier Probability			Tackler Probability			
		Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	
Ball-Carrier Body Position	$\geq 1,000$ rads.s ⁻²	Upright	9.71% (7.70, 11.92)	13.01% (10.98, 15.16)	7.42% (5.33, 9.80)	8.19% (6.05, 11.08)	5.73% (4.23, 7.63)	1.5% (0.67, 3.06)	11.24% (8.49, 14.46)	20.13% (16.60, 24.01)	13.31% (9.75, 17.91)
		Bent at Waist	11.62% (9.38, 14.42)	13.71% (12.34, 15.25)	9.91% (7.90, 12.36)	11.54% (8.54, 15.76)	9.04% (7.69, 10.43)	3.31% (2.09, 5.08)	11.63% (8.73, 15.66)	18.42% (16.53, 20.35)	16.54% (13.00, 20.83)
		Falling/Diving	17.22% (7.85, 28.92)	7.66% (5.06, 10.87)	7.03% (3.96, 11.26)	24.46% (10.29, 44.83)	7.76% (4.62, 12.31)	4.37% (1.69, 9.87)	8.91% (2.50, 21.12)	7.24% (4.14, 11.56)	9.32% (4.62, 17.54)
	$\geq 3,000$ rads.s ⁻²	Upright	0.51% (0.32, 0.81)	0.98% (0.65, 1.45)	0.44% (0.23, 0.76)	0.38% (0.22, 0.69)	0.22% (0.12, 0.38)	0.03% (0.01, 0.09)	0.65% (0.37, 1.08)	1.74% (1.16, 2.56)	0.85% (0.47, 1.47)
		Bent at Waist	0.68% (0.42, 1.07)	0.97% (0.7, 1.31)	0.66% (0.41, 1.07)	0.68% (0.38, 1.21)	0.45% (0.30, 0.66)	0.09% (0.04, 0.19)	0.68% (0.4, 1.2)	1.47% (1.10, 2.03)	1.23% (0.74, 1.96)
		Falling/Diving	1.51% (0.39, 4.41)	0.35% (0.17, 0.68)	0.33% (0.13, 0.75)	2.46% (0.56, 8.38)	0.35% (0.15, 0.78)	0.15% (0.03, 0.52)	0.43% (0.06, 1.90)	0.32% (0.12, 0.71)	0.48% (0.14, 1.44)
	$\geq 5,000$ rads.s ⁻²	Upright	0.03% (0.01, 0.09)	0.09% (0.04, 0.20)	0.03% (0.01, 0.09)	0.02% (0.01, 0.07)	0.01% (0.00, 0.03)	0.00% (0.00, 0.01)	0.05% (0.02, 0.11)	0.17% (0.07, 0.38)	0.07% (0.02, 0.17)
		Bent at Waist	0.05% (0.02, 0.12)	0.08% (0.04, 0.18)	0.06% (0.02, 0.14)	0.05% (0.02, 0.14)	0.03% (0.01, 0.07)	0.00% (0.00, 0.01)	0.05% (0.02, 0.14)	0.14% (0.06, 0.30)	0.11% (0.04, 0.26)
		Falling/Diving	0.16% (0.02, 0.71)	0.02% (0.01, 0.07)	0.02% (0.00, 0.07)	0.26% (0.03, 1.43)	0.02% (0.01, 0.08)	0.01% (0.00, 0.05)	0.03% (0.00, 0.21)	0.02% (0.00, 0.07)	0.03% (0.01, 0.14)

Supplementary 5. Peak linear acceleration exceedance probabilities ($\geq 10g$, $\geq 40g$ and $\geq 70g$) for men's rugby union players by ball-carrier – tackler body position interaction for all tackle, ball-carrier and tackler head acceleration events. Falling/diving-upright was removed from the women's models due to limited observations resulting in Hessian matrix singularity, so no results were reported. Large font 'Tackler' indicates the body position of the tackler, whilst the small font 'Tackler' indicates the probability of a head acceleration event occurring to the tackler for a given body position interaction. Median exceedance probabilities and 95% confidence intervals are reported.

		Tackler Body Position								
		Mean Probability			Ball-Carrier Probability			Tackler Probability		
		Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving
Ball-Carrier Body Position	Upright	5.18% (3.61, 7.23)	4.63% (3.35, 6.28)	5.03% (3.87, 6.70)	4.38% (2.75, 7.00)	1.43% (0.78, 2.47)	0.65% (0.30, 1.25)	5.77% (3.78, 8.56)	7.84% (5.68, 10.69)	9.45% (7.23, 12.4)
	$\geq 10g$ Bent at Waist	5.49% (3.77, 7.74)	5.82% (4.72, 7.14)	5.53% (4.34, 7.04)	5.81% (3.61, 8.98)	3.31% (2.48, 4.39)	1.46% (0.98, 2.24)	5.11% (2.88, 8.51)	8.30% (6.79, 10.16)	9.48% (7.48, 11.86)
	Falling/Diving		2.13% (0.70, 5.84)	2.86% (1.25, 5.69)		2.91% (0.77, 8.75)	1.03% (0.19, 3.90)		0.92% (0.12, 4.5)	4.33% (1.69, 9.61)
	Upright	0.06% (0.03, 0.14)	0.07% (0.03, 0.14)	0.09% (0.04, 0.19)	0.05% (0.02, 0.13)	0.01% (0.00, 0.02)	0.00% (0.00, 0.01)	0.07% (0.03, 0.19)	0.13% (0.06, 0.27)	0.18% (0.09, 0.36)
	$\geq 40g$ Bent at Waist	0.07% (0.03, 0.17)	0.09% (0.04, 0.16)	0.10% (0.05, 0.18)	0.08% (0.03, 0.20)	0.03% (0.01, 0.06)	0.01% (0.00, 0.02)	0.06% (0.02, 0.17)	0.14% (0.08, 0.26)	0.18% (0.09, 0.34)
	Falling/Diving		0.02% (0.00, 0.10)	0.03% (0.01, 0.11)		0.02% (0.00, 0.19)	0.00% (0.00, 0.04)		0.00% (0.00, 0.06)	0.05% (0.01, 0.18)
	Upright	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)
	$\geq 70g$ Bent at Waist	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)
	Falling/Diving		0.00% (0.00, 0.00)	0.00% (0.00, 0.00)		0.00% (0.00, 0.00)	0.00% (0.00, 0.00)		0.00% (0.00, 0.00)	0.00% (0.00, 0.00)

Supplementary 6. Peak angular acceleration exceedance probabilities ($\geq 1,000 \text{rads.s}^{-2}$, $\geq 3,000 \text{rads.s}^{-2}$ and $\geq 5,000 \text{rads.s}^{-2}$) for men's rugby union players by ball-carrier – tackler body position interaction for all tackle, ball-carrier and tackler head acceleration events. Falling/diving-upright was removed from the women's models due to limited observations resulting in Hessian matrix singularity, so no results were reported. Large font 'Tackler' indicates the body position of the tackler, whilst the small font 'Tackler' indicates the probability of a head acceleration event occurring to the tackler for a given body position interaction. Median exceedance probabilities and 95% confidence intervals are reported.

		Tackler Body Position									
		Mean Probability			Ball-Carrier Probability			Tackler Probability			
		Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	Upright	Bent at Waist	Falling/Diving	
Ball-Carrier Body Position	$\geq 1,000$ rads.s ⁻²	Upright	3.74% (2.56, 5.22)	3.24% (2.32, 4.53)	3.59% (2.57, 4.77)	3.27% (1.90, 5.30)	0.89% (0.47, 1.67)	0.40% (0.20, 0.82)	4.23% (2.68, 6.44)	5.62% (4.00, 8.01)	6.83% (4.97, 9.05)
		Bent at Waist	3.74% (2.49, 5.61)	4.05% (3.16, 5.07)	3.7% (2.81, 4.85)	3.77% (2.20, 6.29)	2.17% (1.61, 2.98)	0.93% (0.59, 1.47)	3.77% (2.10, 6.43)	5.9% (4.75, 7.37)	6.53% (5.00, 8.37)
		Falling/Diving		1.19% (0.32, 3.6)	1.85% (0.84, 3.90)		1.68% (0.37, 5.91)	0.62% (0.11, 2.72)		0.57% (0.05, 3.15)	2.85% (1.12, 6.48)
	$\geq 3,000$ rads.s ⁻²	Upright	0.10% (0.04, 0.20)	0.10% (0.05, 0.19)	0.13% (0.06, 0.24)	0.08% (0.03, 0.19)	0.01% (0.00, 0.03)	0.00% (0.00, 0.01)	0.12% (0.05, 0.26)	0.19% (0.09, 0.37)	0.25% (0.12, 0.48)
		Bent at Waist	0.10% (0.04, 0.23)	0.12% (0.07, 0.22)	0.12% (0.06, 0.23)	0.10% (0.04, 0.25)	0.04% (0.02, 0.09)	0.01% (0.01, 0.03)	0.10% (0.03, 0.26)	0.2% (0.11, 0.36)	0.23% (0.13, 0.42)
		Falling/Diving		0.02% (0.00, 0.12)	0.04% (0.01, 0.15)		0.03% (0.00, 0.23)	0.01% (0.00, 0.07)		0.01% (0.00, 0.08)	0.06% (0.01, 0.28)
	$\geq 5,000$ rads.s ⁻²	Upright	0.01% (0.00, 0.03)	0.01% (0.00, 0.03)	0.01% (0.00, 0.04)	0.01% (0.00, 0.03)	0.00% (0.00, 0.00)	0.00% (0.00, 0.00)	0.01% (0.00, 0.04)	0.02% (0.01, 0.07)	0.03% (0.01, 0.08)
		Bent at Waist	0.01% (0.00, 0.04)	0.01% (0.00, 0.04)	0.01% (0.00, 0.04)	0.01% (0.00, 0.04)	0% (0.00, 0.01)	0.00% (0.00, 0.00)	0.01% (0.00, 0.04)	0.02% (0.01, 0.07)	0.02% (0.01, 0.08)
		Falling/Diving		0.00% (0.00, 0.01)	0.00% (0.00, 0.02)		0.00% (0.00, 0.03)	0.00% (0.00, 0.01)		0.00% (0.00, 0.01)	0.01% (0, 0.03)

