# Errata of the PhD Thesis 'The Effects of Gaze Control and Body Segment Recoupling on Human Gait and Foot Pressure Variability: A Modern and Evolutionary Perspective' by Emma Louise Webster

#### List of Abbreviations

• Add: MSE = Mean Square Error.

## Chapter 1

- Page 15. Written: 'The nature of the task and environment... these differences.'
  - Change to: 'The nature of the task and environment, and prior experience **may** go some way to explaining these differences.'
- Page 18. Written: 'The loss of mechanical separation of the head, trunk, and pelvis due to the motor deficits describe...' Change to: 'The loss of mechanical separation of the head, trunk, and pelvis due to the motor deficits described....'

# Chapter 3

 Page 44. Written: 'An LCD......so as to block and peripheral visual information and distractions.' Change to: 'An LCD projector (NEC NP2250) was used to project visual targets on to a curved projection screen (Beamax A-Velvet, 282 x 166cm) positioned 2m directly in front of the treadmill so as to block **any** peripheral visual information and distractions'

Page 49. Written: 'A subject was chosen at random to undergo this testing (subject 9)...trials 5 times.' Change to: 'A subject was chosen at random to undergo this testing (subject 9), and after initial collection of the first data set, the subject repeated each of the trials 4 time providing 5 data sets in total.'

- Page 49. Omission: Chapter 3.2.5 should state that a ViewPoint BSU07 USB-60x3, Arrington Research (Scottsdale, AZ, USA) sampling at 100Hz was used during repeatability testing.
- Page 50. Written: 'Results demonstrated significant overall between-subject variability in foot pressure mean square error....and indeed these were found to be insignificant (F (1, 9) = 2.72, p = 0.13) (Figure 3.4).'
  Change to: 'Results demonstrated significant overall between-subject variability in foot pressure mean square error (F (1, 9) = 20.668, p = 0.01), indicating that foot pressure variability was highly variable across subjects. Within-subject results demonstrated only minor within-subject differences in variance in foot pressure mean square error between the visual tracking types (gaze fixation = 6.427 ± 1.424 and smooth pursuit = 6.873 ± 1.424), and indeed these were found to be insignificant (F (1, 9) = 1.399, p = 0.267) (Figure 3.4).'
- Page 50. Replace Figure 3.4 with the following (note the change to the legend) :

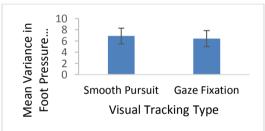


Figure 3.4: Comparison of variance in foot pressure mean square error (MSE) during object tracking using gaze fixation and smooth pursuit. **Error bars represent standard error**.

- Page 51: Written: 'However, larger within-subject differences in variance in foot pressure mean square error were seen during tracking against the blank, savannah, and forest visual scenes .... The effect of the interaction of visual tracking type and visual clutter level on variance in foot pressure mean square error was insignificant (F (2, 18) = 2.28, p = 0.57).' Change to: 'However, larger within-subject differences in variance in foot pressure mean square error were seen during tracking against the blank, savannah, and forest visual scenes (8.257 ± 1.834, 5.537 ± 1.15, and 6.156 ± 1.373 respectively), and the effect of visual clutter was found to be significant (F (2, 18) = 6.696, p = 0.007). Post-hoc pairwise comparisons following Bonferroni correction determined that the variance in foot pressure mean square error during tracking against the blank visual scene was significantly higher than when tracking against the savannah scene (p =0.04) (Figure 3.5). The effect of the interaction of visual tracking type and visual clutter level on variance in foot pressure mean square error was insignificant (F (2, 18) = 0.008, p =0.992).'
- Page 51: Replace Figure 3.5 with the following (note the change to the legend):

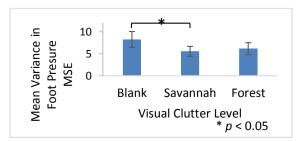
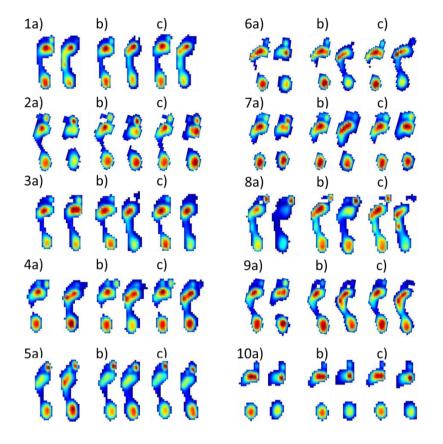


Figure 3.5: Comparison of variance in foot pressure mean square error (MSE) during object tracking across three levels of background visual clutter. **Error bars represent standard error**.

- Page 52: written: 'Figure 3.6 indicates that....to a combination of both (subjects 2 and 5-9).' Change to: 'Figure 3.6 indicates that under-heel pressure remains relatively constant, and that differences expressed in the most variable prints are under the forefoot. These differences in underfoot pressure range through a more diffuse pressure across the lateral forefoot and midfoot (seen e.g. in subjects **1**, **4** and **5**), and a shift in pressure under the medial forefoot and hallux (seen e.g. in subjects **2** and **10**) to a combination of both (subjects **3** and **6**-9).
- Page 52: Replace Figure 3.6 with the following:



- Page 53. Written: 'Variance in foot pressure mean square error (MSE) in each case demonstrated relative consistency .....when compared to the other repeats (Table 3.1).'
  Change to: 'Variance in foot pressure mean square error (MSE) in each case demonstrated relative consistency across repeats (Table 3.1).'
- Page 53: Replace Table 3.1 with the following:

SD	3.334815	5.10497	5.983843	6.998936	4.678307
Mean	13.91745	15.04616	14.84354	16.89524	12.07212
F/SP	15.03151	13.3604	10.61109	14.81343	6.355502
F/GF	12.39112	9.950841	9.334256	9.705318	15.01556
S/SP	10.72015	13.55584	13.07742	13.97671	9.901418
S/GF	10.81778	10.69958	11.23857	11.82346	9.955754
B/SP	15.07023	20.73113	22.87573	27.20952	11.48068
B/GF	19.47394	21.97918	21.92414	23.84301	19.72382
Repeat	1	2	3	4	5

• Page 53: Written: 'A repeated measures ANOVA demonstrated.... No other significant within-combination-differences were recorded (Figure 3.7).'

Change to: 'A repeated measures ANOVA demonstrated no significant within-combination differences in variance in mean foot pressure MSE across the repeats (F(4, 20) = 1.993, p = 0.190). (Figure 3.7). '

• Page 54: Replace Figure 3.7 with the following (note the change to the legend):

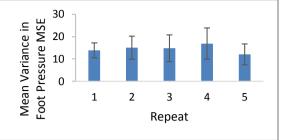
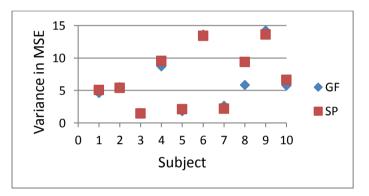


Figure 3.7: Comparison of variance in foot pressure mean square error (MSE) between repeats. Error bars represent standard error.

- Page 54: Written: 'Because of the fact that no other significant differences were observed... even with the considerable time gaps between repeats.' Remove sentences
- Page 55: Replace Figure 3.8 with the following:



## Chapter 4

- Page 65: Written 'Pupil movement data was synchronously captured......sampling at 60Hz.' Change to: 'Pupil movement data was synchronously captured.....sampling at **100Hz**.
- Page 70: Written 'Comparisons of within-subject variance in foot pressure mean square...demonstrated an insignificant effect of visual clutter level (F (2, 14) = 0.78, p = 0.48) (Figure 4.4).'
  Change to: 'Comparisons of within-subject variance in foot pressure mean square error with respect to the blank, savannah, and forest visual scenes (18.305 ± 5.406, 15.763 ± 4.033, and 14.040 ± 4.527 respectively) demonstrated an insignificant effect of visual clutter level (F (2, 14) = 2.395, p = 0.137) (Figure 4.4).'
- Page 70 replace Figure 4.4 with the following (note that the legend has also been corrected):

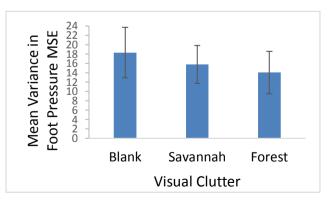


Figure 4.4: The effect of three different clutter levels on variance in foot pressure mean square error (MSE) during a dual visual-auditory task. Error bars represent standard error.

Page 71: Written 'However, the effect of auditory task did have a significant impact.....when compared to the background music task (12.62 ± 3.92) (F = (1, 7) = 17.66, p = 0.004) (Figure 4.5).'
 Change to: 'However, the effect of auditory task did have a significant impact on variance in foot pressure mean square error, with larger variability in foot pressure mean square error observed when undertaking the repeat-back language

task (19.500 ± 5.176) when compared to the background music task (12.572 ± 3.251) (F = (1, 7) = 26.844, p = 0.001) (Figure 4.5).'

• Page 71: replace Figure 4.5 with the following (note that the legend has also been corrected):

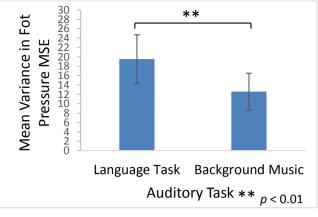


Figure 4.5: The effect of two auditory tasks on variance in foot pressure mean square error (MSE) during a dual visualauditory task. Error bars represent standard error.

- Page 71: Add: 'Results also showed a lack of any significant difference in foot pressure variability amongst activity type (F (2,7) = 0.380, p = 0.697), indicating that there was no added benefit of professional training in hand-eye sports (18.331 ± 7.533) when compared to cardiovascular sports (17.971 ± 10.653) and non-professionals (11.806 ± 4.027).' after Figure 4.5.
- Page 71: Written: 'These changes in underfoot pressure range through a more diffuse pressure.....under the medial forefoot and hallux (seen e.g. subjects 5 and 8).'
  Change to: 'These changes in underfoot pressure range through a more diffuse pressure across the lateral forefoot and midfoot (seen e.g. in subjects 1, 3, 4, 7, and 10), a shift in pressure under the medial forefoot and hallux (seen e.g. subjects 5 and 8), to a combination of both (seen e.g. in subjects 2, 6 and 9).
- Page 72: replace Figure 4.6 with the following (note that the legend has also been corrected):

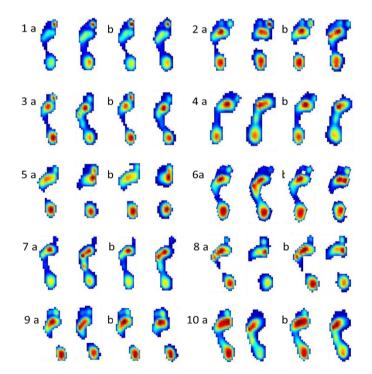


Figure 4.6: Example foot pressure records for each of the 10 subjects (1-10) during smooth pursuit tracking against the savannah scene when **completing the language task** (a) or **listening to background music** (b). The prints represented in each set are the mean (left) and the record with highest mean square error (MSE) (right).

#### Chapter 5

- Page 86, Table 5.1:
  - o Add Frontal and Sagittal to Head planes of analysis (Central Trajectory=Sternum, Distal Trajectory=Forehead).
  - For 'Shoulders' change marker number for left acromion process to 3
  - o Add Sagittal plane to Left Arm, Left Leg, Right Arm and Right Leg planes of analysis.

- Page 87: Written: 'If data collection was interrupted, for example if a reflective marker became detached from the subject, or the subject's position on the treadmill drifted, the data were rejected and recording was repeated.' Remove sentence
- Page 88: After 'This produced ten sub-samples, per condition, per subject.' Add 'In some instances subjects made nonwalking related movements, for example moving the arms to the face. In these cases the kinematic data for the corresponding 30 second interval for that subject were discounted from analysis.'
- Page 89, Legend for Figure 5.5: Written: 'G represents head yaw(1), pitch(2), and roll(3) of which head movement was analysed with respect to the right shoulder....See Table 6.1 for exact anatomical landmarks.' Change to: 'G represents head yaw(1), pitch(2), and roll(3) of which head movement was analysed with respect to the sternum and right shoulder....See Table 5.1 for exact anatomical landmarks.
- Page 90: Written: 'A repeated measures ANOVA determined that....non-braced condition (8.63 ± 1.76 and 6.46 ± 1.53 respectively). (Figure 5.6)'
- Change to: 'A repeated measures ANOVA determined that variance in foot pressure mean square error was significantly larger (F (1, 9) = 6.750, p = 0.029) during walking in the braced condition when compared to the unrestricted non-braced condition (8.568 ± 1.886 and 7.009 ± 1.584 respectively). (Figure 5.6).'
- Page 91: Replace Figure 5.6 with the following (Note change to legend):

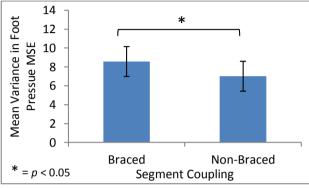


Figure 5.6: Comparison of variance in foot pressure MSE between Braced and Non-Braced conditions. **Error bars** represent standard error.

- Page 91: Written: 'These changes in underfoot pressure....to a combination of both (subjects 3, 5, and 10).'
- Change to: 'These changes in underfoot pressure range through a more diffuse pressure across the lateral forefoot and midfoot (seen e.g. in subjects 2, 6 and 8), a shift in pressure under the medial forefoot and hallux (seen e.g. in subjects 4 and 5), to a combination of both (subjects 1, 3, 7 and 10).'
- Page 92: Replace Figure 5.7 with the following (note that the legend has also been corrected):

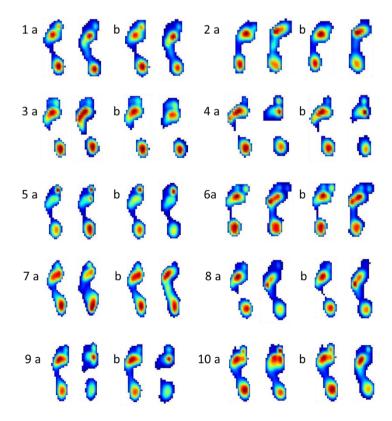
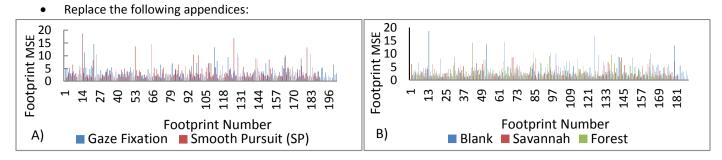


Figure 5.7: Visual comparison of foot pressure records for all subjects (1-10) in **Braced** (a) and **Non-Braced** (b) conditions. In each case the mean foot pressure record (left) is compared with the most varied foot pressure record (right)

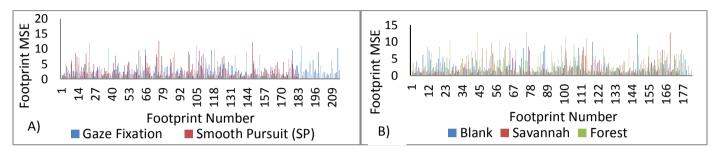
- Page 92: Written: 'The maximum range of head pitch (°) was significantly lower (F (1, 8) = 6.51, p = 0.03) in the braced ...when compared to the non-braced control (12.91 ± 0.92).'
  Change to: 'The maximum range of head pitch (°) was significantly lower (F (1, 8) = 5.973, p = 0.04) in the braced condition when compared to the non-braced condition (10.257 ± 0.843 and 14.136 ± 2.248 respectively). The maximum range of shoulder rotation (°) was also significantly reduced (F (1, 7) =7.27, p = 0.031) in the braced condition (10.784 ± 0.965) when compared to the non-braced control (12.397 ± 0.915).'
- Page 93: Written: 'In this case, the maximum range of right thigh swing (°) was significantly increased...The effect of the interaction between bracing and gender on right thigh swing was, however, insignificant (F (1, 8) = 2.15, p = 0.18). Change to: 'In this case, the maximum range of right thigh swing (°) was significantly increased (F (1, 8) = 5.795, p = 0.043) in the braced condition (26.574 ± 0.473) relative to the non-braced condition (25.957 ± 0.491). There was also a significant effect of gender (F (1, 8) = 8.216, p = 0.021), with females demonstrating a larger range of right thigh swing than ma (27.598 ± 0.658 and 24.932 ± 0.658 respectively). The effect of the interaction between bracing and gender on right thigh swing was, however, insignificant (F (1, 8) = 2.511, p = 0.152).'
- Page 94: Replace Table 5.2 with the following:

Body Segment	Mean (°) Non- Braced	Std. Error (°) Non- Braced	Mean (°) Braced	Std. Error (°) Non- Braced	Mean (°) Female	Std. Error (°) Female	Mean (°) Male	Std. Error (°) Male	Repeated Measures ANOVA					
									Brace		Gender		Gender* Brace	
									F	Р	F	P	F	Р
Head Pitch	14.136	2.248	10.257	0.843	14.275	2.123	10.117	2.123	5.973	0.040	1.919	0.203	0.233	0.642
Head Roll	9.100	1.966	7.456	1.023	9.515	3.086	7.041	2.086	2.397	0.160	0.703	0.426	1.203	0.305
Head Yaw	18.352	2.120	16.458	1.247	17.548	2.358	17.262	2.358	3.652	0.92	0.07	0.934	2.503	0.152
Shoulder Rotation	12.397	0.915	10.784	0.965	11.952	1.189	11.229	1.329	7.270	0.031	0.164	0.697	1.879	0.213
Left Arm Abduction	11.376	1.470	12.021	2.141	15.053	2.357	8.344	2.635	0.419	0.538	3.601	0.100	2.226	0.179
Left Arm Swing	31.991	2.921	33.025	2.698	36.585	3.657	28.430	4.089	0.701	0.430	2.210	0.181	0.466	0.517
Left Bottom Arm Swing	55.435	3.828	54.863	3.340	61.206	4.897	49.092	4.897	0.090	0.772	3.064	0.118	0.002	0.967
Left Top Arm Swing	24.560	2.272	24.363	2.047	25.922	2.838	23.002	3.173	0.067	0.804	0.470	0.515	0.107	0.753
Right Arm Abduction	10.227	1.240	12.778	2.104	14.625	2.310	8.380	2.310	5.188	0.052	3.655	0.092	1817	0.215
Right Arm Swing	26.630	2.349	28.184	2.310	27.316	3.216	27.498	3.216	2.361	0.163	0.002	0.969	3.476	0.099
Right Bottom Arm Swing	47.451	3.591	48.932	3.526	49.886	4.874	46.497	4.874	0.701	0.427	0.242	0.636	1.942	0.201
Right Top Arm Swing	21.006	1.500	21.641	2.228	23.769	2.575	18.699	2.575	0.179	0.683	1.938	0.201	2.436	0.153
Pelvis Rotation	10.819	0.693	9.859	1.143	11.924	1.070	8.753	1.197	0.926	0.368	3.903	0.089	0.901	0.772
Left Leg Abduction	6.832	0.269	6.722	0.396	6.878	0.435	6.676	0.486	0.361	0.567	0.096	0.766	0.247	0.634
Left Leg Swing	28.368	1.031	28.463	1.068	28.279	1.390	28.552	1.554	0.156	0.705	0.152	0.708	0.017	0.899
Left Thigh Swing	25.789	1.060	26.095	0.982	27.445	1.351	24.439	1.511	1.415	0.273	2.199	0.182	2.064	0.134
Left Shin Swing	55.409	1.576	55.147	1.527	55.898	2.191	54.658	2.191	2.786	0.134	0.160	0.700	2.737	0.137
Right Leg Abduction	7.134	0.501	7.205	0.613	6.451	0.780	7.889	0.780	0.145	0.713	1.637	0.229	2.423	0.158
Right Leg Swing	28.754	0.687	28.516	0.696	28.030	0.972	29.241	0.972	2.555	0.149	0.776	0.404	0.585	0.466
Right Thigh Swing	25.957	0.491	26.574	0.473	27.598	0.658	24.932	0.658	5.795	0.043	8.216	0.021	2.511	0.152
Right Shin Swing	56.811	1.074	56.382	1.209	58.279	1.604	54.914	1.604	2.190	0.177	2.200	0.176	0.025	0.877

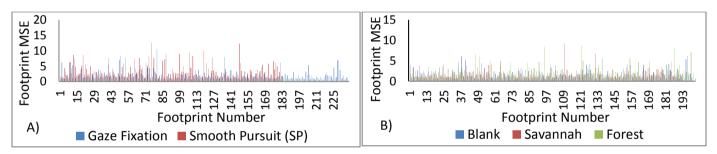
Page 98: Written: 'As studies suggest that the left leg.....appearing to be well compensated for.'
 Change to: 'As studies suggest that the left leg is usually dominant for postural stabilisation.... with the effects of bracing appearing to be well compensated for.



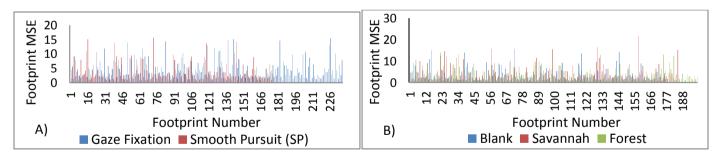
Appendix A2.11: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 1.



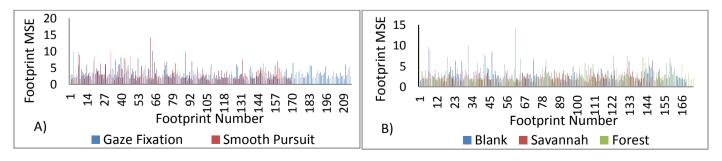
Appendix A2.12: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 2.



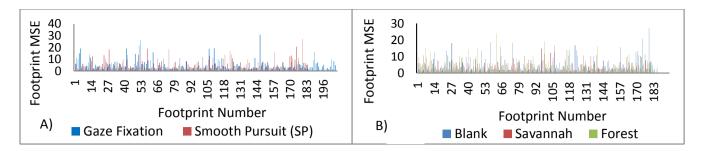
Appendix A2.13: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 3.



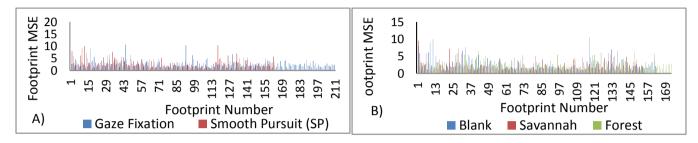
Appendix A2.14: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 4.



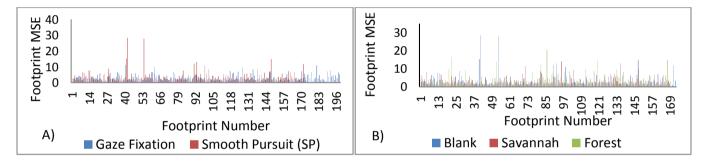
Appendix A2.15: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 5.



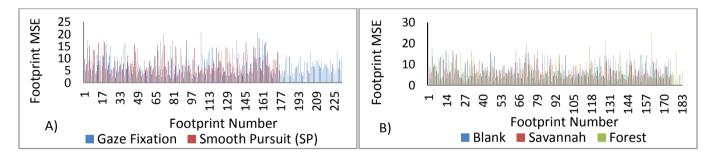
Appendix A2.16: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 6.



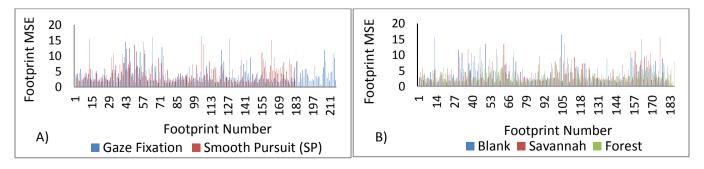
Appendix A2.17: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 7.



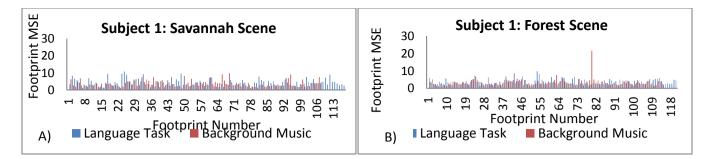
Appendix A2.18: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 8.



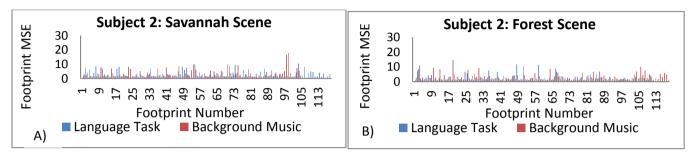
Appendix A2.19: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 9.



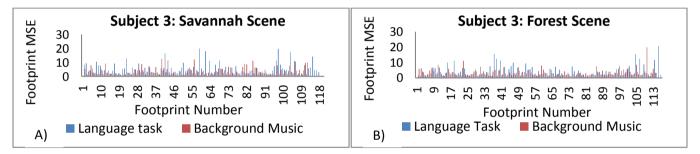
Appendix A2.20: Diagrammatic comparison of the range of foot pressure MSE during (A) Gaze fixation vs Smooth Pursuit on the blank background, and (B) Smooth Pursuit across the three backgrounds for subject 10.



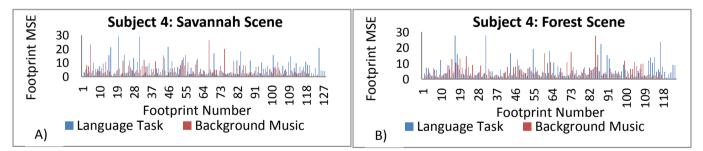
Appendix A3.11: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 1. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



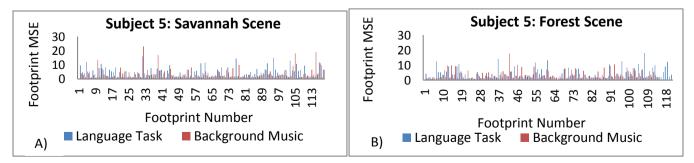
Appendix A3.11: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 2. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



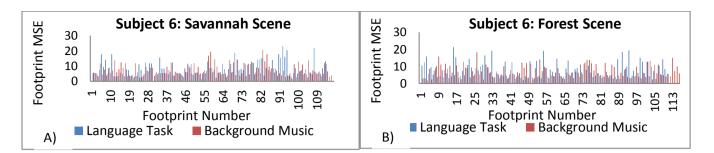
Appendix A3.12: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 3. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



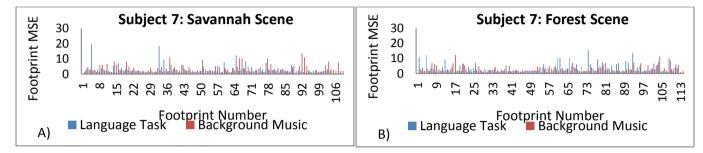
Appendix A3.14: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 4. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



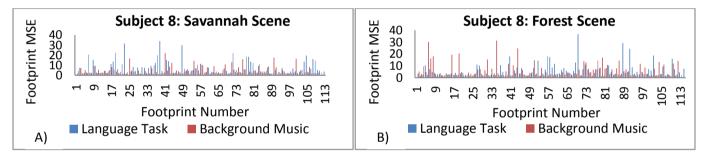
Appendix A3.15: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 5. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



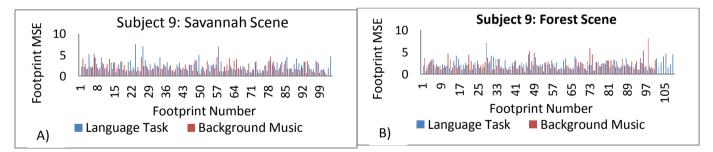
Appendix A3.16: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 6. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



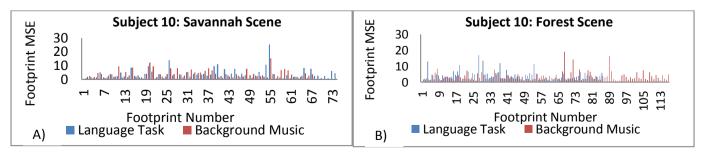
Appendix A3.17: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 7. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



Appendix A3.18: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 8. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



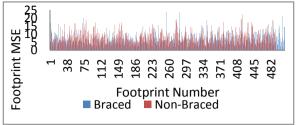
Appendix A3.19: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 9. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.



Appendix A3.20: Diagrammatic comparisons of MSE values for individual foot pressure records during each dual task condition for subject 10. A) dual tasking in the presence of the savannah scene. B) dual tasking in the presence of the forest scene.

# Appendix 4:

• Replace the following appendices (Note the change to legends):



Appendix A4.2: Diagrammatic comparisons of MSE

values for individual foot pressure records during each

Appendix A4.4: Diagrammatic comparisons of MSE

values for individual foot pressure records during each

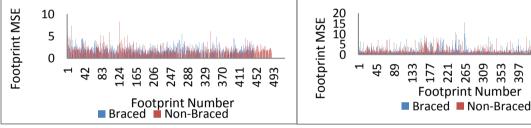
bracing condition for subject 2.

bracing condition for subject 3.

Appendix A4.1: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 1.

10 .40 Footprint MSE 69 03 60t 143 137 171 205 239 273 375 41 02 39 15  $\sim$ 153 305 343 267 38 <u>6</u> ğ Footprint Number **Footprint Number** Braced Non-Braced Braced Non-Braced

Appendix A4.3: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 3.

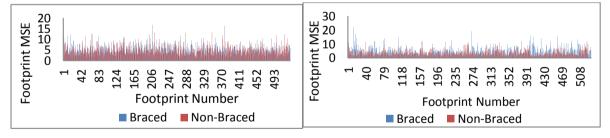


Appendix A4.5: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 5.

Appendix A4.6: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 6.

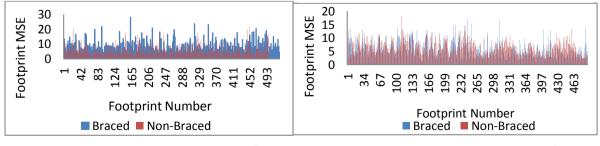
185

¥



Appendix A4.7: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 7.

Appendix A4.8: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 8.



Appendix A4.9: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 9.

Appendix A4.10: Diagrammatic comparisons of MSE values for individual foot pressure records during each **bracing** condition for subject 10.