

Orientation and Mobility (O&M) Efficiency of Persons with Visual Impairment (PVI) in Cameroon Under Varied Circumstances

Suh Ngwa (PhD)

Specialization: Visual Impairment, Degree Program: Special Education, Lecturer, University of Bamenda, Cameroon, Department of Curriculum and Pedagogy

Abstract: There are many hypotheses concerning persons with visual impairment. For instance, people generally suppose that “the other senses of PVI are stronger, PVI are less distracted than others, over use of eyesight increases the prognosis of vision loss, PVI are more distrustful, visual impairment is contagious, reading braille with the fingers can only be done by PVI, PVI can distinguish paper money just by touch,” etc., just to mention a few. While some of these suppositions have been empirically investigated and clarified, some of them still remain ambiguous. The objective of this research was to empirically verify three of these presumptions, which are more prevalent amongst PVI themselves in Cameroon, namely:

- Holding an umbrella under rain impedes PVI orientation and mobility (O&M) efficiency when they are using just the white cane, even if the rain does not hamper their hearing.
- Wearing a cap while moving with just the white cane, even when it does not hamper hearing, impedes the O&M efficiency of PVI.
- Walking fast reduces the O&M efficiency of PVI, when they are using just the white cane.

It is expected that just holding an umbrella under rain, or wearing a cap while moving with the aid of the white cane, should not affect the O&M efficiency of PVI; while others argue that moving slightly faster instead causes PVI to move in a straight line and should thus be encouraged. It is necessary for such presuppositions to be empirically investigated and either confirmed or nullified in order not to bother if PVI are holding an umbrella under the rain, walking fast, or wearing a cap while moving, with the aid of a white cane, or if these practices should be discouraged.

Key Words: Persons with Visual Impairment (PVI), Orientation and Mobility (O&M), White Cane, Profoundly Visually Impaired, Efficiency Rating Scale.

Research Process

The research consisted of 5 tests and utilized a sample of 97 persons who were all profoundly visually impaired. Test 1 involved all the PVI walking a distance of two miles (approximately three kilometers) using only the white cane for assistance, each on their own, on a familiar road, with a moderate number of pedestrians and traffic, without wearing a cap or holding an umbrella, and at their normal walking pace, given a time limit of 30 minutes. Their O&M efficiencies were recorded based on how steady they walked, their ability to avoid obstacles, and ability to navigate to their destination. This is the standard method used by O&M specialists in Cameroon to measure the O&M efficiency of PVI.

Test 2 involved performing the same exercise, this time holding an umbrella under moderately heavy rain, which could not hamper their hearing.

Test 3 involved doing the same exercise, but this time, walking slightly faster, given a maximum time of twenty minutes.

Test 4 was no different, the only alteration being using a different conversant road.

Test 5 was as before, only this time, they all wore either a cap, hat or hood, making sure that their hearing was not hampered.

The results from these tests are presented in Tables at the end of this paper. The calculations are done using Microsoft office excel 2010 and the critical value calculator android app. Excel may be archaic but it is still quite competent for statistical measurements.

The O&M efficiency rating scale is as follows:

- ✓ Any score below 50% (0.5) is considered a failed score, and anything above this is considered a pass score.
- ✓ From 50% to 54% (0.5-0.54) is considered average.
- ✓ From 55% to 59% (0.55-0.59) is considered as plus average.
- ✓ From 60% to 69% (0.6-0.69) is considered as good.
- ✓ From 70% to 79% (0.7-0.79) is considered as better.
- ✓ From 80% to 89% (0.8-0.89) is considered best.
- ✓ Anything above 89% (90% and above) or 0.9 and higher is considered as superb.

(This rating scale is derived from the Integrated School for the Blind, Kumbo, Cameroon).

It is important to note that O&M specialists strive to instill a best or superb O&M efficiency in PVI, and at worst, an efficiency of good.

At this point, it is necessary to spell out certain concepts used in this study.

A cap refers to anything worn on the head, such as a face cap, a hat or a hood.

Moderate rainfall is the quantity of rain used in this study. It refers to when the **precipitation rate is between 2.5 mm (0.098 in) – 7.6 mm (0.30 in) or 10 mm (0.39 in) per hour**. This precipitation rate was chosen because it does not usually hamper hearing significantly.

Normal walking pace refers to average walking speed. For most people, this is walking at a speed of 3 to 4 miles (4 to 5 kilometers) per hour. However, other factors such as the individual's health may cause this to differ.

Moderate traffic refers to car speeds of about 15miles (about 20 kilometers) per hour. This amount of traffic was chosen rather than stand still traffic (5miles [about 6.5 km] or less per hour), or heavy traffic (about 10miles [about 13 km] per hour), because O&M specialists usually train PVI to navigate in moderate traffic since it is assumed that the traffic will not slow down just because of the PVI.

Also, certain assumptions need to be made:

- The R^2 coefficient of the combined steady movement, ability to avoid obstacles and graceful navigation to destination is significant, at least, up to 0.85% of O&M efficiency. As this was not the focus of the study, the research did not try to prove this. However, this comprises one of the many pre-established causal correlations such as: income is a strong determinant of expenditure, or house size is a major determinant of house price, which do not need to be proven every time. For those who are not very mathematics savvy, this simply means that adding up the steadiness with which PVI move, with their ability to avoid obstacles, and the smoothness with which they navigate to their destinations, makes up a lot of their O&M efficiency, even if there are other factors involved. Thus, these 3 factors can be used to measure their O&M efficiency.

- The number of PVI required to validate a test is 49 (that is, half the sample). At least, half the sample should be able to complete the test.
- The O&M efficiency rating to be considered is from good to superb. This is because O&M specialists strive for at least an efficiency of “good” as acceptable for a PVI to move without any other assistance than the white cane. Thus, even though the average and above average efficiency ratings constitute a pass, they will not be considered in this study.

Results of the Study

(Refer to Tables 1 - 5) below

The following statistics can be drawn from the test results:

- ✓ The total percentage pass for Test 1 was 100%. That is (Total number of PVI who passed with 50% and above divided by the sample population (97), multiplied by 100).
- ✓ The total percentage pass for Test 2 was 97.94%.
- ✓ The total percentage fail for Test 2 was 2.06%.
- ✓ The total percentage pass for Test 3 was 100%.
- ✓ The total percentage pass for Test 4 was 100%.
- ✓ The total percentage pass for Test 5 was 97.94%.
- ✓ The total percentage fail for Test 5 was 2.06%.

Interpretation of Results

The interpretations from the statistics of the tests are as follows:

- All PVI can move efficiently with the white cane without holding an umbrella under the rain, walking fast or wearing a cap.
- While holding an umbrella, all PVI can still move under the rain.
- While walking slightly faster, only a negligible number of PVI cannot complete the journey (2 out of 97).
- While wearing a cap, only a negligible number of PVI cannot complete the journey (2 out of 97).
- Thus, for a gross majority of PVI using just the white cane, it does not really matter whether they walk with an umbrella under the rain, or walk fast, or walk with a cap on.

However, the data can be analyzed further:

More Detailed Interpretation of Results

Focusing on Table 6, Number of PVI in the Levels of Efficiency, considering the efficiency interval from good to superb (row 9):

- The high frequencies of test 1 (84) and test 4 (90) implies that the majority of PVI satisfactorily walk without umbrellas, at their normal pace and without wearing a cap. Even though, quite a good number of them (76, 60 and 71) of them still passed tests 2, 3 and 5 reasonably. Thus, as earlier interpreted, many PVI can still walk holding an umbrella, walking fast or wearing a cap.

However, narrowing the efficiency intervals only to best and superb (row 10):

- It is seen that PVI can only attain these high efficiencies when walking without holding an umbrella, without walking fast or wearing a cap. This is identified because 49 and 55 of them passed tests 1 and 4 respectively. Caution should be observed that even though Test 2 is passed by 19 persons, Test 3 is passed by 17 persons and test 5 is passed by 40 people, at least an average number of 49 people, that is, half of the sample population are required to pass the test for the premise to be positive.

- Thus, since a satisfactory number of PVI could not obtain the best and superb rating, this study concludes that PVI should not be expected to accomplish the two uppermost levels of O&M efficiencies while holding an umbrella, walking fast or wearing a cap.

Final Interpretation of Results

Focusing on Table 7, 90% Probability of Each Test, it is revealed that:

- In 90% of the cases, PVI moving at normal walking speed, without an umbrella or wearing a cap will have a minimum O&M efficiency of better (0.7 - 0.79) and a maximum O&M efficiency of best (0.8 - 0.89) as seen in “rows 2 and 5, column 7”.
- In 90% of the cases, PVI moving at normal walking speed, with an umbrella under the rain, will have a minimum O&M efficiency of Good (0.6 - 0.69) and a maximum O&M efficiency of better (0.7 - 0.79) as seen in “row 3, column 7”.
- In 90% of the cases, PVI moving fast will have both a minimum and maximum O&M efficiency of good (0.6 - 0.69) as seen in “row 4, column 7”.
- In 90% of the cases, PVI moving at normal walking speed and wearing a cap will have a minimum O&M efficiency of good (0.6 - 0.69) and a maximum O&M efficiency of better (0.7 - 0.79) as seen in “row 6, column 7”
- Thus, 90% of the time, PVI can only obtain the O&M best efficiency level with the white cane without holding an umbrella under the rain, without walking fast, or without wearing a cap.

Conclusion

Based on the data presented and the results derived, this study concludes that even though a majority of PVI can still walk while holding an umbrella or walking fast, or even wearing a cap, it is preferable for PVI to move at normal walking speed, without an umbrella or without wearing a cap to attain best O&M efficiencies.

Limitations of the Research

As is the case with most studies, there are always things which could have been done better.

- A larger sample would have been preferable. This study utilized a sample of 97 participants. Larger samples are always preferable in majority of studies because they give more reliable results that can be replicated.
- More tests could have been done. This study consisted of 5 tests, in which 1 of the tests was repeated once, to ensure reliability. More tests are always preferable in most studies to ensure more reliability and replicability of the results.
- Also, the study is contextually limited. The tests were conducted on roads without good pedestrian paths. This was because a majority of roads in Cameroon do not have good pedestrian paths.

Suggestions for Further Research

This study overwhelmingly proved that for some reason, just holding an umbrella under the rain or wearing a cap reduces the O&M efficiency of PVI. Thus, maybe just covering the head somehow affects the brain. This may be a topic for future studies.

Also, the O&M efficiencies while using an umbrella were obtained while the PVI were walking under the rain. Thus, studies need to be done to find out their O&M efficiencies when using an umbrella under the sun.

TABLE 1: RESULTS OF TEST 1 (O&M EFFICIENCY OF PVI WALKING WITH THE WHITE CANE, WITHOUT HOLDING AN UMBRELLA, WALKING FAST, OR WEARING A CAP)

Participants	Steady Movement	Accuracy in Movement	Prompt Identification of Directions	Total
PVI01	0.45	0.13	0.31	0.89
PVI02	0.35	0.13	0.18	0.66
PVI03	0.22	0.25	0.51	0.98
PVI04	0.18	0.08	0.36	0.62
PVI05	0.26	0.18	0.46	0.9
PVI06	0.41	0.28	0.26	0.95
PVI07	0.14	0.14	0.38	0.66
PVI08	0.33	0.14	0.38	0.85
PVI09	0.39	0.12	0.47	0.98
PVI10	0.29	0.11	0.29	0.69
PVI11	0.33	0.16	0.47	0.96
PVI12	0.34	0.15	0.39	0.88
PVI13	0.19	0.12	0.3	0.61
PVI14	0.21	0.13	0.63	0.97
PVI15	0.36	0.12	0.38	0.86
PVI16	0.18	0.18	0.31	0.67
PVI17	0.39	0.25	0.34	0.98
PVI18	0.4	0.11	0.17	0.68
PVI19	0.19	0.16	0.28	0.63
PVI20	0.26	0.18	0.1	0.54
PVI21	0.1	0.16	0.36	0.62
PVI22	0.37	0.17	0.41	0.95
PVI23	0.26	0.19	0.16	0.61
PVI24	0.3	0.24	0.42	0.96
PVI25	0.24	0.09	0.27	0.6
PVI26	0.41	0.14	0.43	0.98
PVI27	0.36	0.09	0.22	0.67
PVI28	0.41	0.3	0.25	0.96
PVI29	0.28	0.16	0.2	0.64
PVI30	0.28	0.19	0.24	0.71
PVI31	0.43	0.13	0.41	0.97
PVI32	0.25	0.11	0.37	0.73
PVI33	0.27	0.15	0.31	0.73
PVI34	0.17	0.12	0.29	0.58
PVI35	0.43	0.18	0.37	0.98
PVI36	0.33	0.05	0.41	0.79
PVI37	0.39	0.2	0.36	0.95
PVI38	0.39	0.21	0.23	0.83
PVI39	0.31	0.16	0.27	0.74
PVI40	0.39	0.09	0.49	0.97
PVI41	0.36	0.27	0.17	0.8
PVI42	0.24	0.12	0.19	0.55
PVI43	0.48	0.13	0.29	0.9
PVI44	0.27	0.16	0.33	0.76
PVI45	0.37	0.17	0.37	0.91
PVI46	0.38	0.17	0.35	0.9

PVI47	0.21	0.13	0.22	0.56
PVI48	0.4	0.16	0.4	0.96
PVI49	0.32	0.24	0.38	0.94
PVI50	0.31	0.18	0.29	0.78
PVI51	0.37	0.18	0.39	0.94
PVI52	0.56	0.18	0.18	0.92
PVI53	0.39	0.18	0.17	0.74
PVI54	0.2	0.17	0.55	0.92
PVI55	0.19	0.18	0.36	0.73
PVI56	0.35	0.16	0.41	0.92
PVI57	0.15	0.06	0.38	0.59
PVI58	0.29	0.16	0.5	0.95
PVI59	0.4	0.13	0.19	0.72
PVI60	0.44	0.23	0.24	0.91
PVI61	0.46	0.17	0.16	0.79
PVI62	0.36	0.21	0.41	0.98
PVI63	0.35	0.11	0.32	0.78
PVI64	0.33	0.27	0.33	0.93
PVI65	0.29	0.13	0.29	0.71
PVI66	0.37	0.19	0.38	0.94
PVI67	0.23	0.1	0.37	0.7
PVI68	0.28	0.18	0.51	0.97
PVI69	0.33	0.15	0.25	0.73
PVI70	0.47	0.17	0.24	0.88
PVI71	0.25	0.08	0.17	0.5
PVI72	0.41	0.11	0.43	0.95
PVI73	0.38	0.2	0.18	0.76
PVI74	0.36	0.2	0.37	0.93
PVI75	0.37	0.16	0.39	0.92
PVI76	0.29	0.15	0.15	0.59
PVI77	0.27	0.2	0.44	0.91
PVI78	0.19	0.19	0.17	0.55
PVI79	0.38	0.17	0.39	0.94
PVI80	0.29	0.18	0.24	0.71
PVI81	0.11	0.15	0.26	0.52
PVI82	0.47	0.19	0.26	0.92
PVI83	0.43	0.15	0.21	0.79
PVI84	0.23	0.18	0.13	0.54
PVI85	0.46	0.16	0.32	0.94
PVI86	0.12	0.2	0.24	0.56
PVI87	0.29	0.16	0.32	0.77
PVI88	0.42	0.13	0.31	0.86
PVI89	0.28	0.11	0.16	0.55
PVI90	0.34	0.12	0.27	0.73
PVI91	0.45	0.15	0.28	0.88
PVI92	0.22	0.16	0.19	0.57
PVI93	0.48	0.1	0.34	0.92
PVI94	0.22	0.11	0.37	0.7
PVI95	0.27	0.11	0.46	0.84
PVI96	0.28	0.14	0.35	0.77
PVI97	0.29	0.15	0.47	0.91

KEY: Sum= Steady Movement + Accuracy in Movement + Prompt

Identification of Directions

TABLE 2: RESULTS OF TEST 2 (O&M EFFICIENCY OF PVI WALKING WITH THE WHITE CANE WHILE HOLDING AN UMBRELLA)

Participants	Steady Movement	Accuracy in Movement	Prompt Identification of Directions	Sum
PVI01	0.41	0.36	0.11	0.88
PVI02	0.3	0.3	0.34	0.94
PVI03	0.23	0.31	0.23	0.77
PVI04	0.24	0.18	0.12	0.54
PVI05	0.18	0.27	0.3	0.75
PVI06	0.24	0.27	0.21	0.72
PVI07	0.26	0.44	0.23	0.93
PVI08	0.19	0.23	0.32	0.74
PVI09	0.18	0.29	0.28	0.75
PVI10	0.26	0.17	0.11	0.54
PVI11	0.23	0.34	0.16	0.73
PVI12	0.21	0.37	0.21	0.79
PVI13	0.29	0.23	0.44	0.96
PVI14	0.25	0.17	0.16	0.58
PVI15	0.31	0.26	0.21	0.78
PVI16	0.21	0.24	0.26	0.71
PVI17	0.28	0.32	0.32	0.92
PVI18	0.21	0.38	0.11	0.7
PVI19	0.28	0.17	0.26	0.71
PVI20	0.16	0.17	0.23	0.56
PVI21	0.38	0.19	0.34	0.91
PVI22	0.22	0.26	0.23	0.71
PVI23	0.16	0.19	0.38	0.73
PVI24	0.25	0.31	0.41	0.97
PVI25	0.21	0.26	0.15	0.62
PVI26	0.28	0.23	0.25	0.76
PVI27	0.15	0.4	0.21	0.76
PVI28	0.23	0.33	0.11	0.67
PVI29	0.24	0.31	0.1	0.65
PVI30	0.28	0.24	0.27	0.79
PVI31	0.17	0.25	0.35	0.77
PVI32	0.23	0.18	0.23	0.64
PVI33	0.16	0.19	0.2	0.55
PVI34	0.31	0.21	0.2	0.72
PVI35	0.32	0.17	0.14	0.63
PVI36	0.23	0.37	0.14	0.74
PVI37	0.26	0.33	0.12	0.71
PVI38	0.19	0.21	0.19	0.59
PVI39	0.19	0.15	0.29	0.63
PVI40	0.24	0.21	0.32	0.77
PVI41	0.29	0.33	0.11	0.73
PVI42	0.18	0.26	0.07	0.51
PVI43	0.18	0.16	0.16	0.5
PVI44	0.21	0.23	0.29	0.73

PVI45	0.18	0.17	0.26	0.61
PVI46	0.21	0.27	0.31	0.79
PVI47	0.27	0.24	0.27	0.78
PVI48	0.23	0.19	0.19	0.61
PVI49	0.15	0.18	0.26	0.59
PVI50	0.17	0.23	0.28	0.68
PVI51	0.34	0.17	0.25	0.76
PVI52	0.28	0.23	0.08	0.59
PVI53	0.16	0.19	0.25	0.6
PVI54	0.21	0.28	0.09	0.58
PVI55	0.19	0.14	0.24	0.57
PVI56	0.18	0.21	0.39	0.78
PVI57	0.15	0.18	0.34	0.67
PVI58	0.28	0.19	0.16	0.63
PVI59	0.24	0.21	0.13	0.58
PVI60	0.21	0.19	0.17	0.57
PVI61	0.17	0.19	0.36	0.72
PVI62	0.15	0.17	0.36	0.68
PVI63	0.21	0.24	0.06	0.51
PVI64	0.27	0.38	0.15	0.8
PVI65	0.17	0.18	0.2	0.55
PVI66	0.21	0.25	0.25	0.71
PVI67	0.18	0.14	0.34	0.66
PVI68	0.17	0.19	0.21	0.57
PVI69	0.22	0.37	0.25	0.84
PVI70	0.17	0.28	0.19	0.64
PVI71	0.33	0.23	0.17	0.73
PVI72	0.24	0.22	0.12	0.58
PVI73	0.36	0.31	0.14	0.81
PVI74	0.21	0.24	0.21	0.66
PVI75	0.26	0.28	0.29	0.83
PVI76	0.27	0.24	0.2	0.71
PVI77	0.17	0.18	0.14	0.49
PVI78	0.18	0.16	0.22	0.56
PVI79	0.21	0.25	0.41	0.87
PVI80	0.18	0.15	0.31	0.64
PVI81	0.29	0.28	0.19	0.76
PVI82	0.26	0.25	0.31	0.82
PVI83	0.29	0.24	0.08	0.61
PVI84	0.31	0.35	0.32	0.98
PVI85	0.24	0.27	0.38	0.89
PVI86	0.29	0.21	0.25	0.75
PVI87	0.21	0.19	0.54	0.94
PVI88	0.14	0.18	0.15	0.47
PVI89	0.19	0.17	0.29	0.65
PVI90	0.3	0.25	0.23	0.78
PVI91	0.32	0.3	0.32	0.94
PVI92	0.29	0.24	0.15	0.68
PVI93	0.27	0.21	0.25	0.73
PVI94	0.32	0.33	0.3	0.95
PVI95	0.24	0.23	0.3	0.77

PVI96	0.13	0.23	0.3	0.66
PVI97	0.27	0.24	0.46	0.97

KEY: Sum= Steady Movement + Accuracy in Movement + Prompt

Identification of Directions

TABLE 3: RESULTS OF TEST 3 (O&M EFFICIENCY OF PVI WALKING FAST WITH THE WHITE CANE)

Participants	Steady Movement	Accuracy in Movement	Prompt Identification of Directions	Sum
PVI01	0.22	0.19	0.23	0.64
PVI02	0.07	0.25	0.23	0.55
PVI03	0.37	0.14	0.19	0.7
PVI04	0.11	0.28	0.2	0.59
PVI05	0.24	0.18	0.24	0.66
PVI06	0.22	0.24	0.15	0.61
PVI07	0.16	0.25	0.17	0.58
PVI08	0.22	0.23	0.31	0.76
PVI09	0.2	0.26	0.21	0.67
PVI10	0.14	0.18	0.23	0.55
PVI11	0.2	0.38	0.25	0.83
PVI12	0.13	0.26	0.21	0.6
PVI13	0.26	0.15	0.18	0.59
PVI14	0.24	0.19	0.32	0.75
PVI15	0.13	0.19	0.23	0.55
PVI16	0.18	0.21	0.17	0.56
PVI17	0.2	0.35	0.32	0.87
PVI18	0.15	0.28	0.26	0.69
PVI19	0.24	0.14	0.17	0.55
PVI20	0.2	0.21	0.16	0.57
PVI21	0.26	0.37	0.32	0.95
PVI22	0.14	0.24	0.21	0.59
PVI23	0.3	0.19	0.14	0.63
PVI24	0.14	0.34	0.34	0.82
PVI25	0.23	0.19	0.15	0.57
PVI26	0.15	0.24	0.2	0.59
PVI27	0.21	0.14	0.19	0.54
PVI28	0.12	0.25	0.19	0.56
PVI29	0.18	0.21	0.24	0.63
PVI30	0.38	0.25	0.21	0.84
PVI31	0.19	0.26	0.21	0.66
PVI32	0.2	0.19	0.16	0.55
PVI33	0.29	0.24	0.15	0.68
PVI34	0.12	0.32	0.34	0.78
PVI35	0.15	0.19	0.17	0.51
PVI36	0.22	0.19	0.18	0.59
PVI37	0.28	0.45	0.25	0.98
PVI38	0.17	0.24	0.19	0.6
PVI39	0.22	0.32	0.34	0.88
PVI40	0.07	0.23	0.26	0.56
PVI41	0.12	0.21	0.17	0.5
PVI42	0.34	0.19	0.14	0.67

PVI43	0.16	0.17	0.21	0.54
PVI44	0.21	0.19	0.19	0.59
PVI45	0.2	0.2	0.22	0.62
PVI46	0.17	0.34	0.3	0.81
PVI47	0.25	0.2	0.18	0.63
PVI48	0.19	0.19	0.18	0.56
PVI49	0.22	0.28	0.24	0.74
PVI50	0.13	0.23	0.16	0.52
PVI51	0.22	0.24	0.23	0.69
PVI52	0.27	0.35	0.3	0.92
PVI53	0.23	0.14	0.15	0.52
PVI54	0.17	0.23	0.21	0.61
PVI55	0.2	0.37	0.28	0.85
PVI56	0.2	0.18	0.17	0.55
PVI57	0.1	0.19	0.21	0.5
PVI58	0.19	0.32	0.26	0.77
PVI59	0.2	0.17	0.24	0.61
PVI60	0.15	0.18	0.25	0.58
PVI61	0.37	0.31	0.28	0.96
PVI62	0.23	0.24	0.2	0.67
PVI63	0.19	0.23	0.24	0.66
PVI64	0.18	0.21	0.2	0.59
PVI65	0.23	0.29	0.21	0.73
PVI66	0.3	0.19	0.19	0.68
PVI67	0.23	0.21	0.23	0.67
PVI68	0.23	0.15	0.19	0.57
PVI69	0.13	0.21	0.29	0.63
PVI70	0.2	0.24	0.29	0.73
PVI71	0.25	0.19	0.18	0.62
PVI72	0.08	0.29	0.24	0.61
PVI73	0.21	0.19	0.15	0.55
PVI74	0.26	0.33	0.31	0.9
PVI75	0.27	0.2	0.18	0.65
PVI76	0.2	0.31	0.29	0.8
PVI77	0.13	0.32	0.23	0.68
PVI78	0.23	0.14	0.19	0.56
PVI79	0.3	0.19	0.17	0.66
PVI80	0.25	0.21	0.19	0.65
PVI81	0.32	0.23	0.18	0.73
PVI82	0.05	0.19	0.29	0.53
PVI83	0.12	0.18	0.24	0.54
PVI84	0.38	0.19	0.18	0.75
PVI85	0.29	0.36	0.24	0.89
PVI86	0.08	0.24	0.19	0.51
PVI87	0.21	0.29	0.21	0.71
PVI88	0.31	0.31	0.29	0.91
PVI89	0.2	0.24	0.2	0.64
PVI90	0.23	0.26	0.21	0.7
PVI91	0.29	0.32	0.28	0.89
PVI92	0.18	0.19	0.16	0.53
PVI93	0.22	0.29	0.28	0.79

PVI94	0.18	0.15	0.17	0.5
PVI95	0.31	0.32	0.34	0.97
PVI96	0.12	0.19	0.23	0.54
PVI97	0.34	0.22	0.21	0.77

KEY: Sum= Steady Movement + Accuracy in Movement + Prompt

Identification of Directions

TABLE 4: RESULTS OF TEST 4 (O&M EFFICIENCY OF PVI WALKING WITH THE WHITE CANE, WITHOUT HOLDING AN UMBRELLA, WALKING FAST, OR WEARING A CAP)

Participants	Steady Movement	Accuracy in Movement	Prompt Identification of Directions	Sum
PVI01	0.17	0.16	0.21	0.54
PVI02	21	-20.54	0.21	0.67
PVI03	0.32	0.33	0.32	0.97
PVI04	0.24	0.17	0.18	0.59
PVI05	0.32	0.22	0.3	0.84
PVI06	0.4	0.21	0.34	0.95
PVI07	0.3	0.32	0.28	0.9
PVI08	0.2	0.15	0.24	0.59
PVI09	0.25	0.26	0.34	0.85
PVI10	0.19	0.18	0.31	0.68
PVI11	0.29	0.31	0.32	0.92
PVI12	0.18	0.17	0.24	0.59
PVI13	0.24	0.26	0.31	0.81
PVI14	0.25	0.17	0.26	0.68
PVI15	0.23	0.35	0.24	0.82
PVI16	0.31	0.31	0.36	0.98
PVI17	0.2	0.22	0.15	0.57
PVI18	0.21	0.34	0.23	0.78
PVI19	0.24	0.32	0.28	0.84
PVI20	0.28	0.22	0.24	0.74
PVI21	0.29	0.34	0.31	0.94
PVI22	0.19	0.36	0.21	0.76
PVI23	0.24	0.25	0.38	0.87
PVI24	0.24	0.16	0.32	0.72
PVI25	0.37	0.29	0.32	0.98
PVI26	0.37	0.26	0.24	0.87
PVI27	0.21	0.35	0.21	0.77
PVI28	0.19	0.3	0.24	0.73
PVI29	0.38	0.22	0.24	0.84
PVI30	0.34	0.18	0.24	0.76
PVI31	0.18	0.16	0.29	0.63
PVI32	0.25	0.28	0.39	0.92
PVI33	0.31	0.24	0.26	0.81
PVI34	0.26	0.2	0.28	0.74
PVI35	0.23	0.17	0.25	0.65
PVI36	0.27	0.3	0.26	0.83
PVI37	0.34	0.32	0.29	0.95
PVI38	0.24	0.22	0.25	0.71
PVI39	0.32	0.29	0.19	0.8

PVI40	0.23	0.35	0.21	0.79
PVI41	0.21	0.36	0.34	0.91
PVI42	0.35	0.24	0.27	0.86
PVI43	0.25	0.21	0.27	0.73
PVI44	0.17	0.2	0.28	0.65
PVI45	0.35	0.26	0.27	0.88
PVI46	0.38	0.32	0.26	0.96
PVI47	0.23	0.33	0.19	0.75
PVI48	0.24	0.25	0.21	0.7
PVI49	0.27	0.14	0.26	0.67
PVI50	0.32	0.24	0.29	0.85
PVI51	0.34	0.28	0.36	0.98
PVI52	0.24	0.25	0.28	0.77
PVI53	0.29	0.17	0.25	0.71
PVI54	0.36	0.18	0.27	0.81
PVI55	0.21	0.17	0.23	0.61
PVI56	0.29	0.43	0.18	0.9
PVI57	0.25	0.11	0.24	0.6
PVI58	0.32	0.25	0.25	0.82
PVI59	0.2	0.16	0.27	0.63
PVI60	0.18	0.3	0.27	0.75
PVI61	0.21	0.29	0.35	0.85
PVI62	0.3	0.31	0.31	0.92
PVI63	0.29	0.33	0.27	0.89
PVI64	0.18	0.15	0.27	0.6
PVI65		0.45	0.43	0.88
PVI66	0.28	0.19	0.31	0.78
PVI67	0.32	0.27	0.34	0.93
PVI68	0.42	0.22	0.23	0.87
PVI69	0.45	0.21	0.2	0.86
PVI70	0.22	0.16	0.38	0.76
PVI71	0.23	0.23	0.45	0.91
PVI72	0.32	0.32	0.21	0.85
PVI73	0.23	0.19	0.27	0.69
PVI74	0.27	0.27	0.26	0.8
PVI75	0.34	0.17	0.3	0.81
PVI76	0.23	0.2	0.5	0.93
PVI77	0.31	0.18	0.23	0.72
PVI78	0.23	0.39	0.23	0.85
PVI79	0.31	0.18	0.32	0.81
PVI80	0.32	0.2	0.27	0.79
PVI81	0.23	0.19	0.23	0.65
PVI82	0.28	0.36	0.31	0.95
PVI83	0.34	0.34	0.21	0.89
PVI84	0.42	0.19	0.23	0.84
PVI85	0.25	0.2	0.52	0.97
PVI86	0.23	0.4	0.25	0.88
PVI87	0.24	0.23	0.24	0.71
PVI88	0.33	0.3	0.34	0.97
PVI89	0.19	0.22	0.17	0.58
PVI90	0.34	0.24	0.27	0.85

PVI91	0.26	0.32	0.34	0.92
PVI92	0.34	0.24	0.25	0.83
PVI93	0.24	0.19	0.23	0.66
PVI94	0.31	0.33	0.26	0.9
PVI95	0.27	0.07	0.21	0.55
PVI96	0.31	0.31	0.3	0.92
PVI97	0.32	0.25	0.27	0.84

KEY: Sum= Steady Movement + Accuracy in Movement + Prompt

Identification of Directions

TABLE 5: RESULTS OF TEST 5 (O&M EFFICIENCY OF PVI WEARING A CAP AND WALKING WITH THE WHITE CANE)

Participants	Steady Movement	Accuracy in Movement	Prompt Identification of Directions	Sum
PVI01	0.4	0.11	0.25	0.76
PVI02	0.31	0.11	0.16	0.58
PVI03	0.18	0.21	0.45	0.84
PVI04	0.16	0.08	0.33	0.57
PVI05	0.23	0.16	0.41	0.8
PVI06	0.35	0.25	0.23	0.83
PVI07	0.13	0.1	0.33	0.56
PVI08	0.31	0.14	0.33	0.78
PVI09	0.34	0.09	0.41	0.84
PVI10	0.27	0.1	0.22	0.59
PVI11	0.28	0.14	0.39	0.81
PVI12	0.31	0.13	0.3	0.74
PVI13	0.18	0.12	0.29	0.59
PVI14	0.24	0.18	0.55	0.97
PVI15	0.32	0.1	0.31	0.73
PVI16	0.15	0.17	0.26	0.58
PVI17	0.31	0.23	0.29	0.83
PVI18	0.32	0.09	0.15	0.56
PVI19	0.18	0.14	0.25	0.57
PVI20	0.24	0.17	0.1	0.51
PVI21	0.1	0.14	0.34	0.58
PVI22	0.34	0.15	0.35	0.84
PVI23	0.22	0.17	0.16	0.55
PVI24	0.27	0.23	0.36	0.86
PVI25	0.21	0.08	0.22	0.51
PVI26	0.39	0.11	0.37	0.87
PVI27	0.31	0.07	0.19	0.57
PVI28	0.36	0.27	0.21	0.84
PVI29	0.24	0.16	0.18	0.58
PVI30	0.26	0.18	0.22	0.66
PVI31	0.37	0.11	0.37	0.85
PVI32	0.24	0.12	0.33	0.69
PVI33	0.2	0.18	0.29	0.67
PVI34	0.15	0.11	0.26	0.52
PVI35	0.37	0.15	0.35	0.87
PVI36	0.29	0.04	0.34	0.67

PVI37	0.37	0.18	0.32	0.87
PVI38	0.35	0.17	0.19	0.71
PVI39	0.27	0.12	0.23	0.62
PVI40	0.34	0.08	0.41	0.83
PVI41	0.35	0.26	0.16	0.77
PVI42	0.24	0.11	0.18	0.53
PVI43	0.45	0.12	0.28	0.85
PVI44	0.24	0.13	0.3	0.67
PVI45	0.31	0.15	0.35	0.81
PVI46	0.37	0.16	0.33	0.86
PVI47	0.19	0.12	0.21	0.52
PVI48	0.36	0.14	0.39	0.89
PVI49	0.3	0.23	0.35	0.88
PVI50	0.26	0.15	0.22	0.63
PVI51	0.33	0.17	0.36	0.86
PVI52	0.49	0.17	0.15	0.81
PVI53	0.36	0.17	0.15	0.68
PVI54	0.2	0.14	0.5	0.84
PVI55	0.18	0.17	0.33	0.68
PVI56	0.34	0.13	0.38	0.85
PVI57	0.13	0.06	0.34	0.53
PVI58	0.24	0.15	0.43	0.82
PVI59	0.36	0.13	0.19	0.68
PVI60	0.4	0.21	0.22	0.83
PVI61	0.36	0.14	0.15	0.65
PVI62	0.31	0.18	0.38	0.87
PVI63	0.32	0.11	0.26	0.69
PVI64	0.26	0.23	0.31	0.8
PVI65	0.26	0.12	0.24	0.62
PVI66	0.31	0.17	0.35	0.83
PVI67	0.23	0.1	0.34	0.67
PVI68	0.25	0.16	0.41	0.82
PVI69	0.29	0.14	0.24	0.67
PVI70	0.37	0.15	0.22	0.74
PVI71	0.22	0.08	0.16	0.46
PVI72	0.32	0.1	0.4	0.82
PVI73	0.32	0.2	0.16	0.68
PVI74	0.31	0.19	0.35	0.85
PVI75	0.34	0.13	0.36	0.83
PVI76	0.24	0.15	0.14	0.53
PVI77	0.27	0.18	0.39	0.84
PVI78	0.19	#REF!	0.17	0.55
PVI79	0.31	0.16	0.36	0.83
PVI80	0.27	0.18	0.22	0.67
PVI81	0.11	0.15	0.24	0.5
PVI82	0.43	0.19	0.25	0.87
PVI83	0.32	0.14	0.2	0.66
PVI84	0.2	0.18	0.11	0.49
PVI85	0.4	0.16	0.3	0.86
PVI86	0.12	0.2	0.21	0.53
PVI87	0.28	0.15	0.26	0.69

PVI88	0.34	0.12	0.29	0.75
PVI89	0.24	0.11	0.16	0.51
PVI90	0.27	0.11	0.25	0.63
PVI91	0.37	0.15	0.26	0.78
PVI92	0.22	0.14	0.18	0.54
PVI93	0.43	0.1	0.34	0.87
PVI94	0.22	0.11	0.35	0.68
PVI95	0.27	#REF!	0.46	0.84
PVI96	0.25	0.13	0.26	0.64
PVI97	0.27	0.13	0.4	0.8

KEY: Sum= Steady Movement + Accuracy in Movement + Prompt

Identification of Directions

TABLE 6: Number of PVI in Levels of Efficiency

O&M Efficiencies	Test 1	Test 2	Test 3	Test 4	Test 5
Superb	39	11	7	23	1
Best	10	8	10	32	39
Better	22	36	14	21	9
Good	13	21	29	14	22
Plus Average	9	14	24	6	13
Average	4	5	13	1	11
Fail	0	2	0	0	2
Good-Superb	84	76	60	90	71
Best-Superb	49	19	17	55	40

KEY: The figures represent the number of PVI who attained the level of efficiency

TABLE 7: 90% Probability of Each Test

Means (Sum Tests)	Standard Errors	Z Statistic (90% CI)	Margin of Errors	90% CI Left	90% CI Right	Efficiency Intervals
0.80	0.01	1.64	0.02	0.77	0.82	Better-Best
0.71	0.01		0.02	0.69	0.73	Good-Better
0.67	0.01		0.02	0.65	0.69	Good
0.80	0.01		0.02	0.78	0.82	Better-Best
0.71	0.01		0.02	0.69	0.74	Good-Better

KEY: CI = Confidence Interval (the probability of getting a level of efficiency from a test, expressed as a percentage).

References

1. Arndt K. (2011), "Practice Perspectives--Highlighting Information on Deaf-Blindness for College Students Who Are Deaf-Blind" *National Consortium on Deaf-Blindness, 2011*.
2. Emerson S., Wall C., Anne L. (2006), "Orientation and Mobility Content for Children and Youths: A Delphi Approach Pilot Study" *Journal of Visual Impairment & Blindness, 2006*
3. Everson J. (1995), "Transition Services for Youths Who Are Deaf-Blind: A Best Practices Guide for Educators" *Retrieved from www.eric.ed.gov*
4. Danene W., (2018), "Teaching Science through Inquiry Based Field Experiences Using Orientation and Mobility" *Journal of Science Education for Students with Disabilities, 2018*

5. Franklin B. (1976), "Inservice Training Program for Teachers and Aides of Deaf-Blind Children" Retrieved from www.eric.ed.gov
6. Gense D., Gense M. (1999), "The Importance of Orientation and Mobility Skills for Students Who Are Deaf-Blind" *DB-LINK Fact Sheet*
7. Gense D., Gense M. (2004), "The Importance of Orientation and Mobility Skills for Students Who Are Deaf-Blind. Revised" *National Information Clearinghouse on Children Who Are Deaf-Blind, 2004*
8. Huebner K., Mary E., And Others (1995), "Hand in Hand: Selected Reprints And Annotated Bibliography on Working with Students Who Are Deaf-Blind" Retrieved from www.eric.ed.gov
9. Idawati D., Masitoh S., Bachri B., (2020), "Application of Learning Mobility Orientation on Social Skill of Blind Children" *Journal of Education and Learning, 2020*
10. Janet G. (1971), "Child Development Project; Phase III, 1970-71: Narrative Evaluation" Retrieved from www.google.com.
11. Lahav O., Schloerb D., Srinivasan W., Mandayam A, (2015), "Virtual Environments for People Who Are Visually Impaired Integrated into an Orientation and Mobility Program" *Journal of Visual Impairment & Blindness, 2015*
12. Lord F; and Others (1966), "Identification of Orientation and Mobility Skills Relating to Developmental Tasks for Young Blind Children" Retrieved from www.google.com
13. Schuck L., Emerson R., Wall K., Dae S., Nelson N. (2018), "An Approach to Using Orientation and Mobility (O&M) Variables from the Second National Longitudinal Transition Study" *Journal of Visual Impairment & Blindness, 2018*
14. Szabo J., Panikkar R. (2017), "Bridging the Gap between Physical Therapy and Orientation and Mobility in Schools: Using a Collaborative Team Approach for Students with Visual Impairments" *Journal of Visual Impairment & Blindness*
15. Wiedel J., Groves P (1969), "Tactual Mapping: Design, Reproduction, Reading and Interpretation. Final Report." Retrieved from www.eric.ed.gov