

# Facilitated versus Independent Check-in Model Performance Comparison: Symbol Relations and Motor Symbol Sequencing Cognitive Programs

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The Arrowsmith Program offers a range of cognitive programs which utilize the neuroplastic nature of the brain to enhance cognitive functioning.

The cognitive programs are delivered in several models to meet the needs of the participants. The delivery models all involve working with an Arrowsmith Facilitator, from an in-person classroom or a virtual online classroom to an Independent online Check-in model. The first two models involve working with a Facilitator present for the entire session, either in-person or online, whereas the Independent Check-in model involves the participant working independently on the cognitive program with a Facilitator Check-in session every two weeks.

A comparison study was done on the exercise performance of the participants in the Facilitated model (Facilitated group includes in-person and online virtual classroom models) and the Independent Check-in model (Independent Check-in group that works independently online and meets with a Facilitator once every two weeks).

## **1.0 Symbol Relations**

### **1.1 Participants**

Facilitated group: 482 individuals with an average age of 18.6 and a standard deviation of  $\pm 11.6$  years.

Independent Check-in group: 149 individuals with an average age of 33.8 and a standard deviation of  $\pm 18.4$  years.

See Table 1.1 for details.

### **1.2 Cognitive Exercise – Symbol Relations**

This exercise has 10 levels of increasing complexity, each with multiple sublevels. The exercise is performed through a web-based application that records the performance in real time. The frequency of the data collection is not dependent on the frequency of the check-ins between the participants and their Facilitator.

### **1.3 Performance Measures**

The performance measures used for comparisons were the average number of days worked per level, the average number of minutes per level, the average number of sublevels worked on per level, the average number of masteries per level, and the mastery percentage. The mastery percentage (can be thought of as the mastery rate) was defined as 100% times the number of sublevels mastered divided by the number of sublevels worked on.

### **1.4 Results**

Both groups (Facilitated and Independent Check-in) spent nearly identical average number of days for each of the levels, with nearly identical standard deviations in the distributions. Both groups also worked for nearly identical numbers of minutes per level.

Both groups worked on nearly identical numbers of sublevels for each of the levels. The Independent Check-in group's average is slightly higher but both values are within each other's standard deviations, and the difference is not significant.

The Independent Check-in group had a higher average mastery percentage or mastery rate compared to the Facilitated group. This difference was significant.

See Tables 1.2 and 1.3 for details.

### **1.5 Conclusion**

No significant differences were found between the amount of effort that the participants in the two groups spent on the Symbol Relations exercise. The Independent Check-in group did achieve a higher mastery rate (mastery percentage) than the Facilitated group. The reasons for this difference require more data and further investigation. Note: the participants in the Independent Check-in group were significantly older than the Facilitated group.

## **2.0 Motor Symbol Sequencing**

There are two exercises for this cognitive function, Tracing and Word.

### **2.1.1 Motor Symbol Sequencing – Tracing Exercise**

#### **2.1.2 Participants**

Facilitated group: 736 participants with an average age of 12.5 and a standard deviation of  $\pm 4.8$  years.

Independent Check-in group: 53 participants with an average age of 13.2 and a standard deviation of  $\pm 7.1$  years.

See Table 2.1 for details.

#### **2.1.3 Cognitive Exercise**

The Tracing exercise has 13 levels of increasing complexity. The participants work with pen and paper and record the number of units completed per day. The teacher monitors the quality of the work and when it reaches the required accuracy, records that the level has been mastered and then assigns the next level.

#### **2.1.4 Performance Measures**

The data used in this comparison is taken from the first 6 levels since there were not enough results from either group at the higher levels for meaningful analysis. The measures used were the averages of the number of units worked and the mastery percentage (mastery rate) per level defined as 100% times the number of levels mastered divided by the number of levels worked on.

#### **2.1.5 Results**

The comparison shows that the Facilitated group averaged fewer units per level than the Independent Check-in group. The differences between the groups were not significant. The Facilitated group also showed a higher mastery percentage (mastery rate) than the Independent Check-in group; however, given the variance is large for both groups, the difference is not significant.

See Table 2.2 for details.

### **2.2.1 Motor Symbol Sequencing – Word Exercise**

#### **2.2.2 Participants**

Facilitated group: 1249 participants with an average age of 13.2 and a standard deviation of  $\pm 4.8$  years.

Independent Check-in group: 96 participants with an average age of 14.9 and a standard deviation of  $\pm 7.9$  years.

See Table 2.1 for details.

#### **2.2.3 Cognitive Exercise**

The Word exercise has 8 levels of increasing complexity, and each level has multiple sublevels. Participants work with pen and paper and record the number of units completed per day. The teacher monitors the quality of the work and when it reaches the required accuracy, records that the mastery criteria has been met and assigns either a new sublevel, or the next level.

#### **2.2.4 Performance Measures**

The data used in this comparison was taken from the first 2 levels since there was not enough data at the higher levels from both groups for meaningful analysis. The measures used were the average number of units worked on and the mastery percentage (mastery rate) per level defined as 100% times the number of sublevels mastered divided by the number of sublevels worked on.

#### **2.2.5 Results**

The comparison shows that the Facilitated group averaged more units per level than the Independent Check-in group. The Facilitated group also on average worked on more sublevels than the Independent Check-in group. The differences between the groups were not significant. The average percentage mastery (mastery rate) per level for the Facilitated group was also higher than for the Independent Check-in group; however, given the variance is large for both groups, the difference is not significant.

See Table 2.3 for details.

## 2.3 Conclusion

These results show that the amount of work per level and the percentage mastery (mastery rate) per level for the Motor Symbol Sequencing exercises for the two groups are similar.

### Summary

The comparisons of the effort spent, and the success rates achieved, for the participants in the Arrowsmith Program delivery models, Facilitated (In-Person and Online Virtual Classroom) and Independent Check-in (Online), indicate that each group showed positive progress. The only significant difference was the higher average mastery percentage (mastery rate) for the Independent Check-in participants on the Symbol Relations cognitive exercise which might be accounted for by the significantly older age of this group.

The data demonstrates that both delivery models are leading to positive outcomes for the participants. Information on these outcomes is here:

[Research](#)

As the Independent Check-in delivery model is expanded to address more cognitive areas, further comparison studies will be performed.

## Appendix: Data Tables

These tables give the details of the observed performances by the Facilitated and Independent Check-in groups for the three cognitive exercises.

**Table 1.1 Symbol Relations Participant Ages (Years)**

	<b>N</b>	<b>Average</b>	<b>Std. Dev.</b>
<b>Facilitated</b>	482	18.6	11.6
<b>Independent Check-in</b>	149	33.8	18.4

**Table 1.2 Symbol Relations Effort Data**

	<b>Cases</b>	<b>Days</b>		<b>Minutes/Level</b>	
		<b>Average</b>	<b>Std. Dev.</b>	<b>Average</b>	<b>Std. Dev.</b>
<b>Facilitated</b>	1579	35.09	37.81	275.44	360.18
<b>Independent Check-in</b>	519	35.73	33.75	271.76	454.64

**Table 1.3 Symbol Relations Mastery Data**

	<b>Sublevels</b>		<b>Masteries</b>		<b>% Mastered</b>	
	<b>Average</b>	<b>Std. Dev.</b>	<b>Average</b>	<b>Std. Dev.</b>	<b>Average</b>	<b>Std. Dev.</b>
<b>Facilitated</b>	4.26	1.36	3.61	1.68	84.58	0.69
<b>Independent Check-in</b>	4.74	0.78	4.53	1.09	95.57	1.13

**Table 2.1 MSS Participant Ages (Years)**

	Tracing			Word		
	N	Average	Std. Dev.	N	Average	Std. Dev.
<b>Facilitated</b>	736	12.5	4.8	1249	13.2	4.8
<b>Independent Check-in</b>	53	13.2	7.1	96	14.9	7.9

**Table 2.2 Tracing Exercise Effort and Mastery Comparisons**

	Avg. Units	Std. Dev.	Avg % Mastered	Std. Dev.
<b>Facilitated</b>	378.6	466.1	65.6	9.72
<b>Independent Check-in</b>	490.6	540.0	56.5	9.62

**Table 2.3 Word Exercise Effort and Mastery Comparisons**

	Avg Units	Std. Dev.	Avg Sublevels	Std. Dev.	Avg % Mastered	Std. Dev.
<b>Facilitated</b>	2133.0	1528.5	12.5	7.1	95.0	15.9
<b>Independent Check-in</b>	2041.5	2069.9	10.8	5.6	87.9	24.6