Employing Online Response Latency to Provide a More Detailed Analysis of Individual Differences in Visual Attention

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Purpose

- *Discovering manipulations that affect how children attend to complex stimuli is important because of the presence of attentional deficits that many children possess which interfere with their learning and development. One attentional impairment that can interfere with a child's development is overselective attention. Overselective attention occurs when a child demonstrates restricted attention, as the child attends to only a limited number of stimulus elements in a compound display.*

- *Past research has shown one manipulation that affects which elements of stimulus compounds are attended to is prior reinforcement history. Prior reinforcement histories for separate stimulus components were examined to determine if they controlled which features of stimulus compounds four participants attended to when the procedures were administered online at remote sites where the author was not present.*

- *Because of the increase in children diagnosed with autism, it is difficult to provide adequate services at an early age. Online programs, such as the procedures in this study, could be provided to young children in the home with parental supervision to provide attentional assessments to both identify and reduce attentional impairments.*

Method

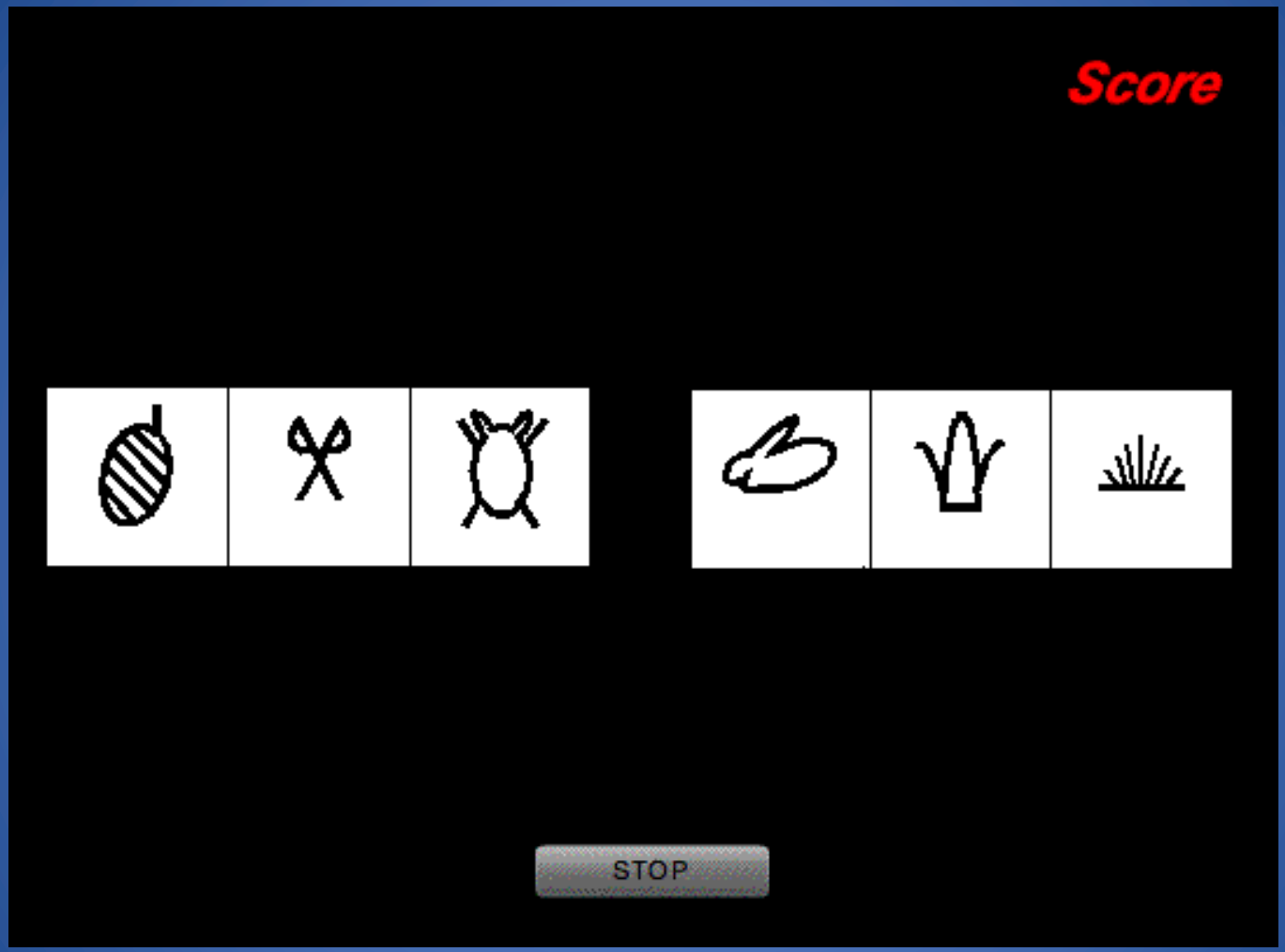
- *Two older adults and two younger adults participated in this study. The stimulus-control procedures were provided online, which were accessible from the author's website (www.ba-and-t.com). The procedures were administered automatically at remote sites.*
- *Sessions consisted of approximately 100 trials in length. A trial began when symbols appeared on two white illuminated backgrounds on the participant's screen. The trial ended when the participant selected either illuminated area. Each time the participant made a correct choice, he was reinforced with a flashing screen and a point was earned for each correct response.*
- *In the first step, each participant learned three separate visual discriminations, composed of six different symbols.*
- *The individual symbols were next combined to form a conflict compound. The conflict compound was created by keeping the prior reinforcement histories unchanged for only scissors and cane in the compound. The prior reinforcement histories were reversed for the remaining four symbols.*
- *After 90% accuracy was achieved for the conflict compound, 36 test trials were administered in which the three symbol pairs were presented 12 times each in a mixed sequence. The test was provided to determine which symbols the participant was attending to when criterion accuracy was achieved for the compound discrimination. The software also recorded which symbol the participant selected each time the conflict compound appeared on the screen.*
- *In addition to response accuracy, response latencies were also recorded. Response latency was defined as the amount of time that elapsed between the presentation of the symbols and the participant's symbol selection.*

Online Single Symbol Training

Single Symbol Training

(+)	(-)
Rabbit	Plum
Scissors	Cane
Grasses	Mule

Conflict Compound



(+)

Plum (R)

Scissors (U)

Mule (R)

(-)

Rabbit (R)

Cane (U)

Grasses (R)

Results & Discussion

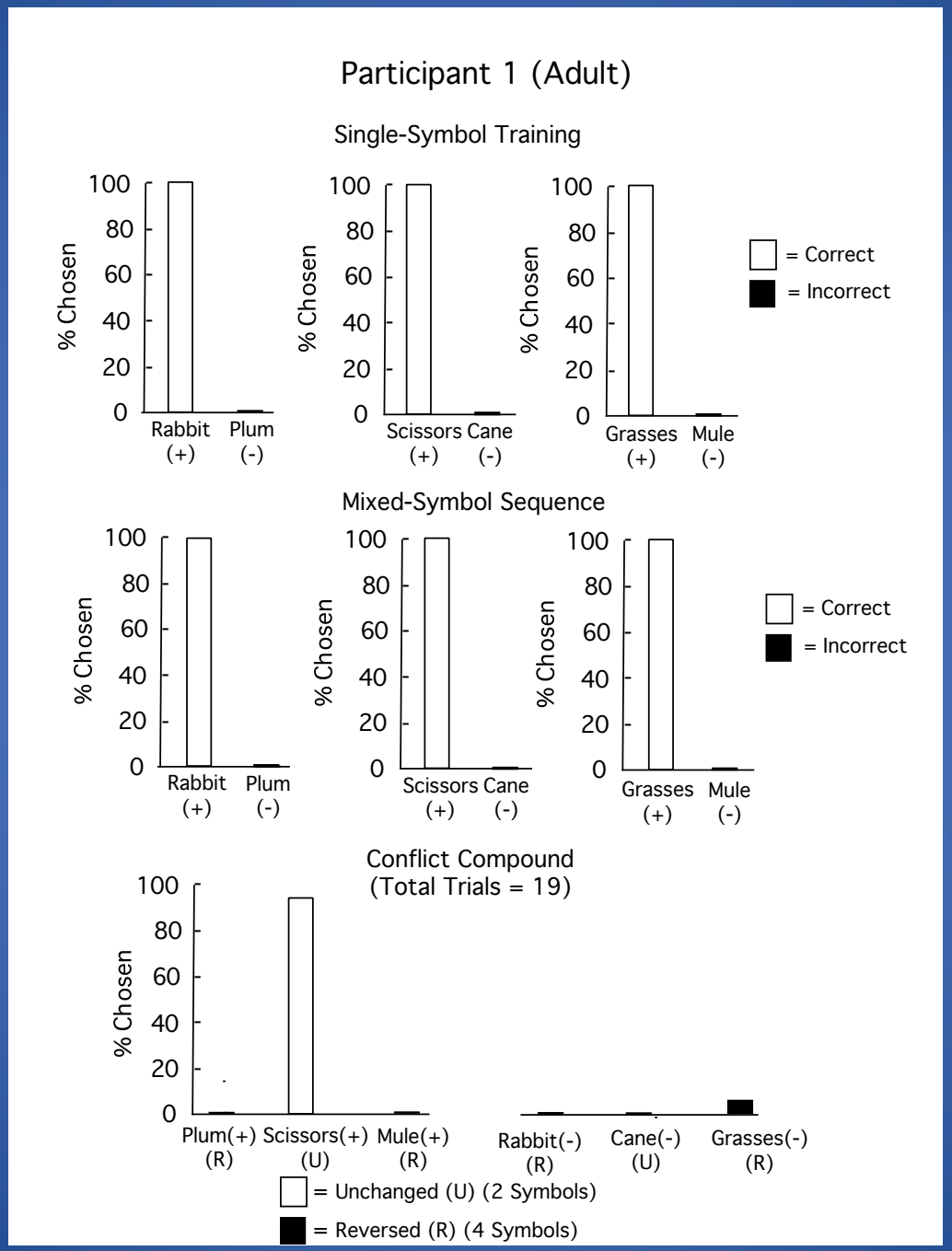
- *Establishing prior reinforcement histories for separate stimulus components was effective in determining which features of compound visual cues four participants attended to when the stimulus-control procedure was administered online at remote sites.*

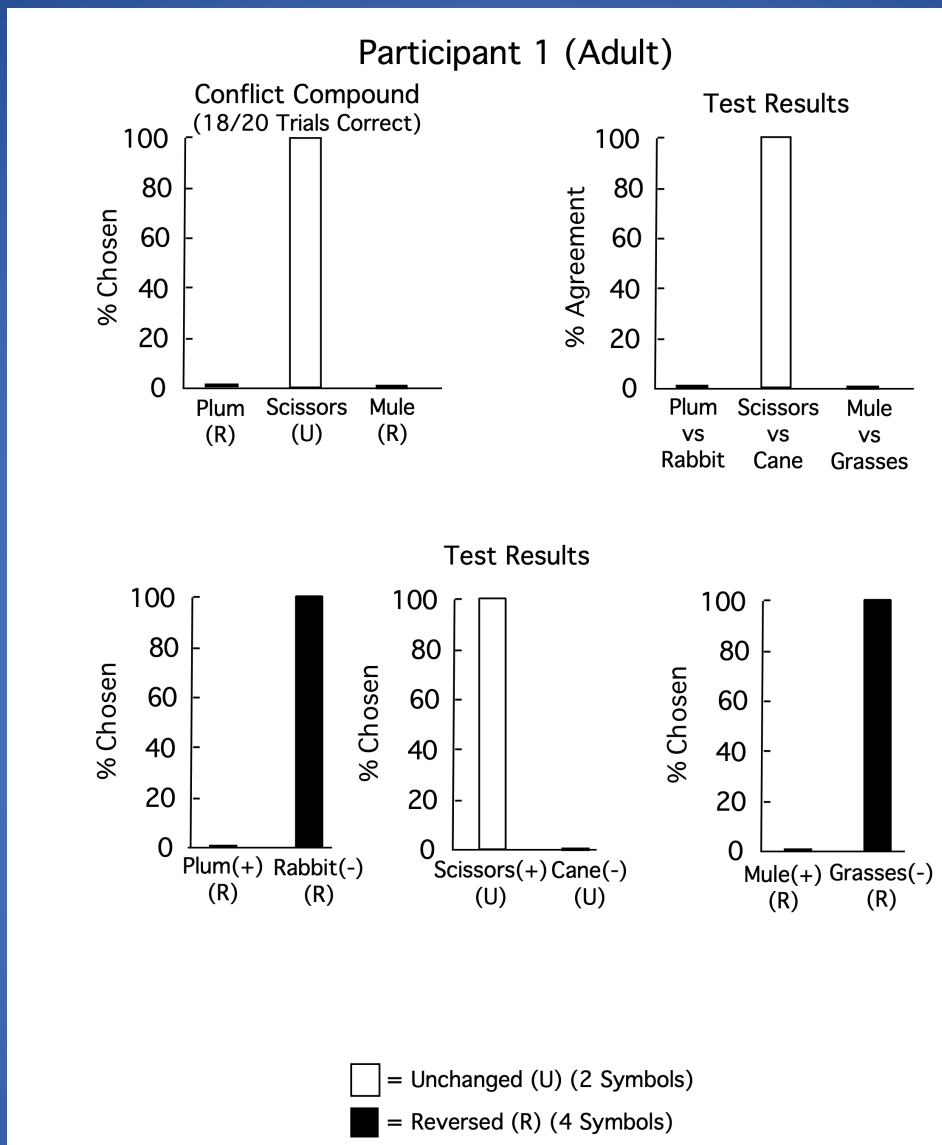
- *The response topographies and test performance of the four participants (two older and two younger adults) indicated that they selectively attended to only the symbol with an unchanged prior reinforcement history in the compound when criterion accuracy was achieved. The two symbols with a reversed prior reinforcement history in the compound were ignored.*

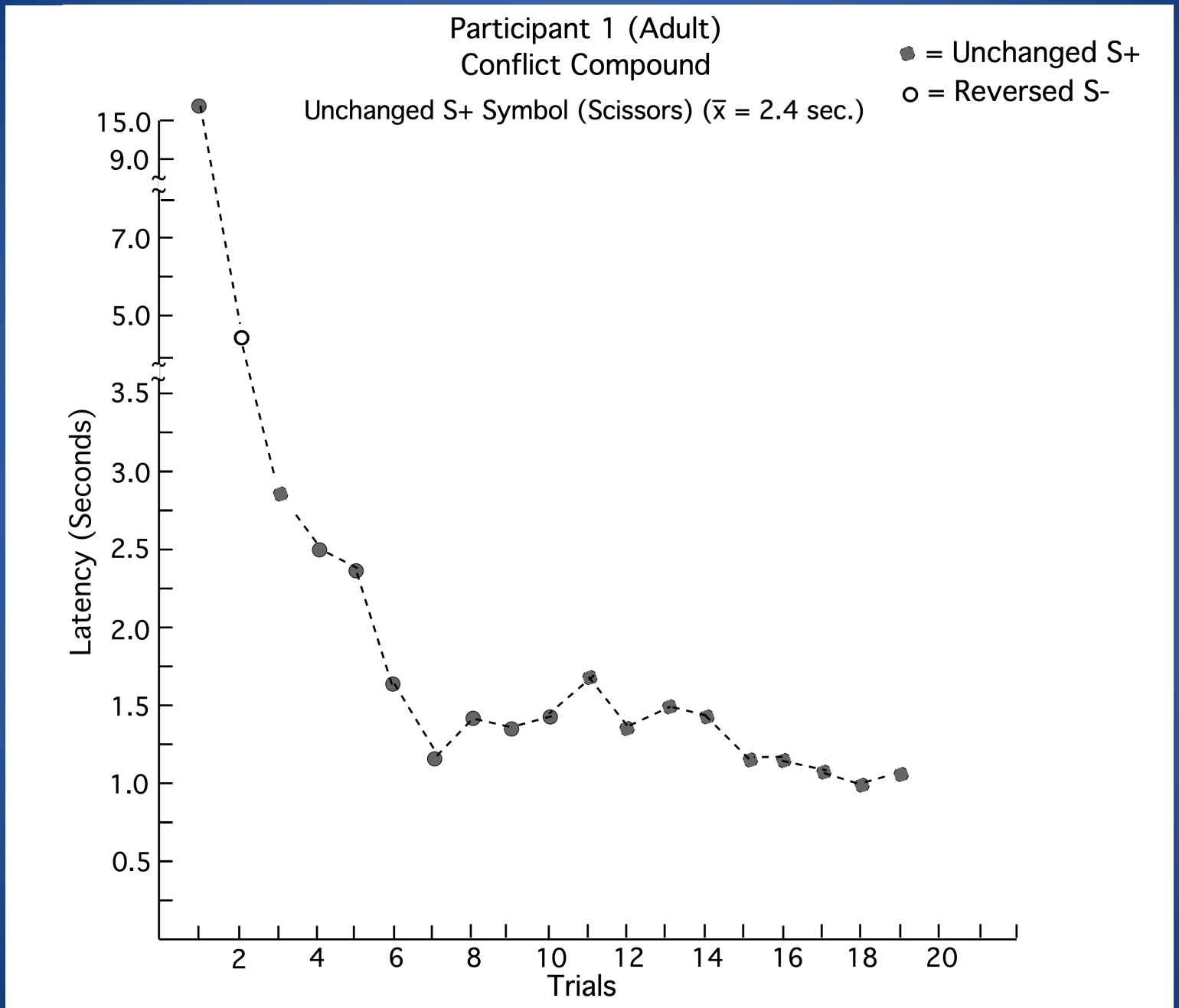
- *A loss of stimulus control for the unchanged symbol was shown for three of the participants, however, when it appeared in the conflict compound. This was because of their longer response latencies that occurred for the unchanged symbol in the conflict compound compared to when it was presented alone. Recording response latencies revealed individual differences in the extent to which the reversed symbols reduced the stimulus control of the unchanged symbol in the conflict compound.*

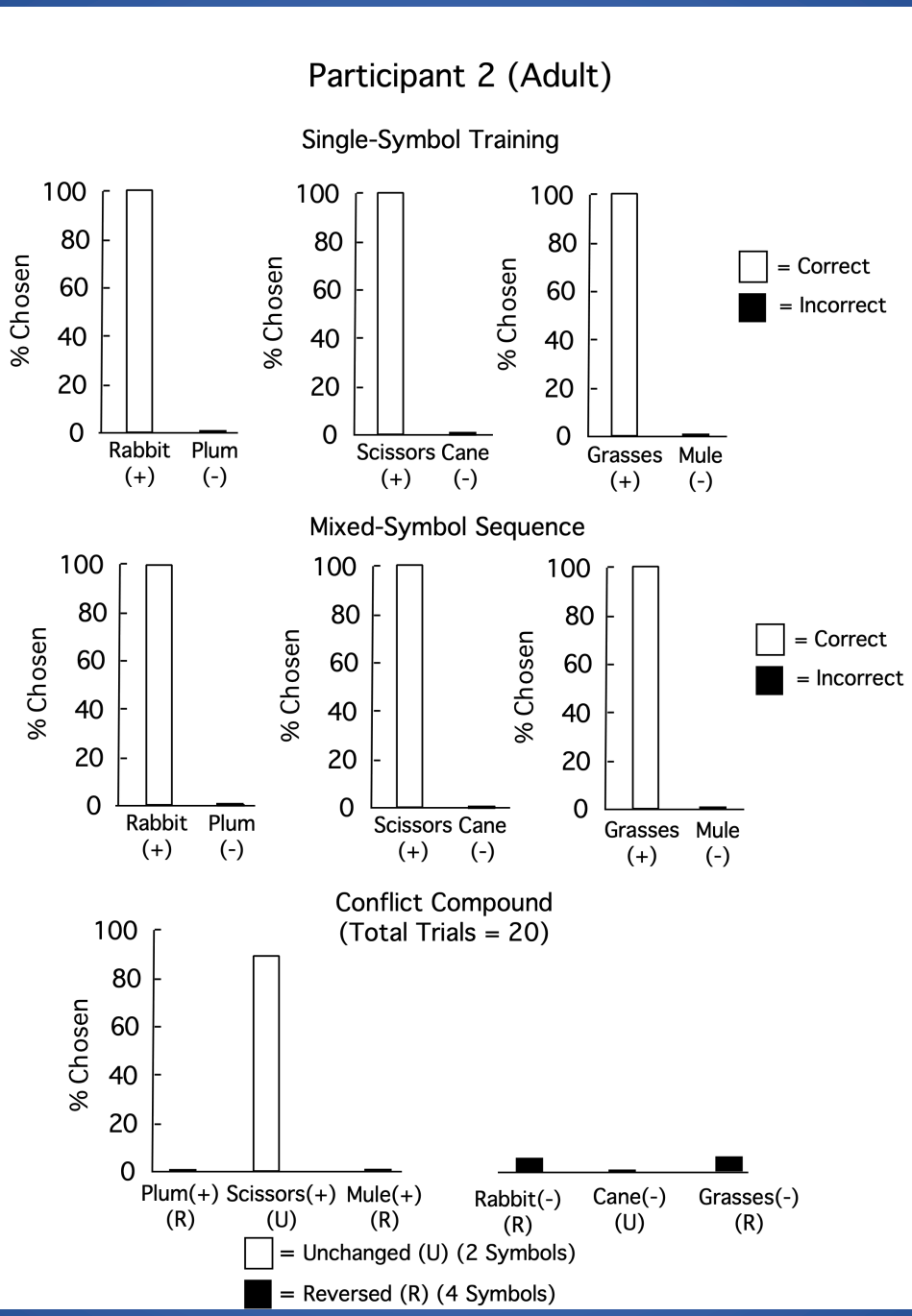
- *By recording response latency, individual differences were discovered in how quickly they shifted their attention in accordance with prior reinforcement histories. These individual differences, in contrast, were not revealed by their response accuracies or response topographies.*

- *Recording response latencies could identify attentional disorders, such as overselective attention or difficulties shifting attention, which have a higher incidence in autistic children, and which might not be revealed by other types of assessment. Recording response latencies might permit children to be identified at a younger age who are at risk for developing autism.*

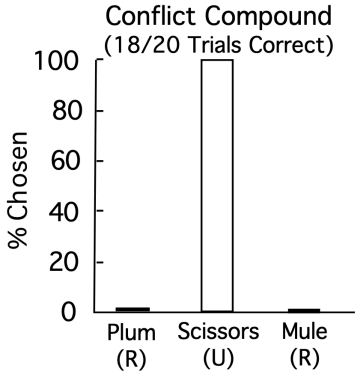

Participant 1 (Adult)
Single-Symbol Training
% Chosen
100
80
60
40
20
0
Rabbit (+)
Plum (-)
Scissors (+)
Cane (-)
Grasses (+)
Mule (-)
= Correct
= Incorrect
Mixed-Symbol Sequence
Conflict Compound
(Total Trials = 19)
Plum(+) (R)
Scissors(+) (U)
Mule(+) (R)
Rabbit(-) (R)
Cane(-) (U)
Grasses(-) (R)
= Unchanged (U) (2 Symbols)
= Reversed (R) (4 Symbols)

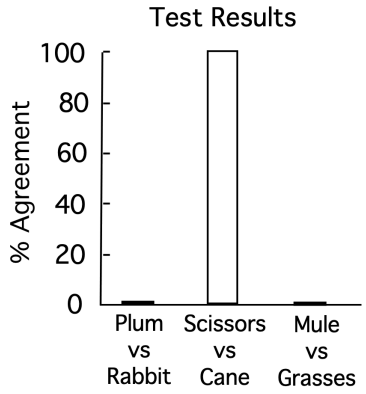

Participant 1 (Adult)
Conflict Compound
(18/20 Trials Correct)
% Chosen
100
80
60
40
20
0
Plum (R)
Scissors (U)
Mule (R)
Test Results
% Agreement
Plum vs Rabbit
Scissors vs Cane
Mule vs Grasses
Test Results
Plum(+) (R)
Rabbit(-) (R)
Scissors(+) (U)
Cane(-) (U)
Mule(+) (R)
Grasses(-) (R)
= Unchanged (U) (2 Symbols)
= Reversed (R) (4 Symbols)

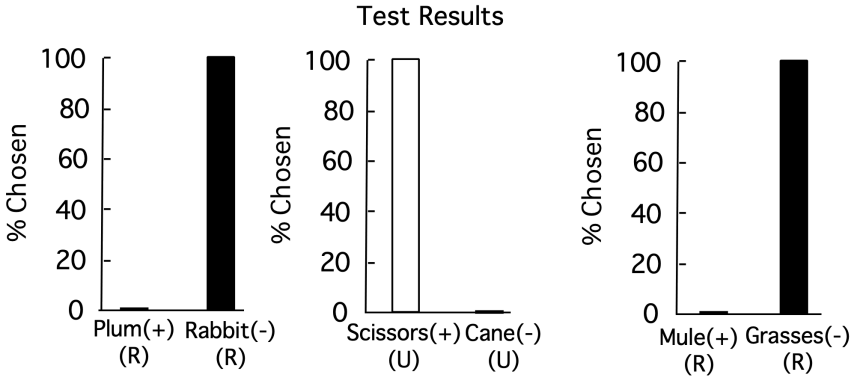

Participant 1 (Adult)
Conflict Compound
Unchanged S+ Symbol (Scissors) ($\bar{x}$ = 2.4 sec.)
= Unchanged S+
o = Reversed S-
Latency (Seconds)
15.0
9.0
7.0
5.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2
4
6
8
10
12
14
16
18
20
Trials


Participant 2 (Adult)
Single-Symbol Training
% Chosen
100
80
60
40
20
0
Rabbit (+)
Plum (-)
Scissors (+)
Cane (-)
Grasses (+)
Mule (-)
= Correct
= Incorrect
Mixed-Symbol Sequence
Conflict Compound
(Total Trials = 20)
Plum(+) (R)
Scissors(+) (U)
Mule(+) (R)
Rabbit(-) (R)
Cane(-) (U)
Grasses(-) (R)
= Unchanged (U) (2 Symbols)
= Reversed (R) (4 Symbols)

Participant 2 (Adult)

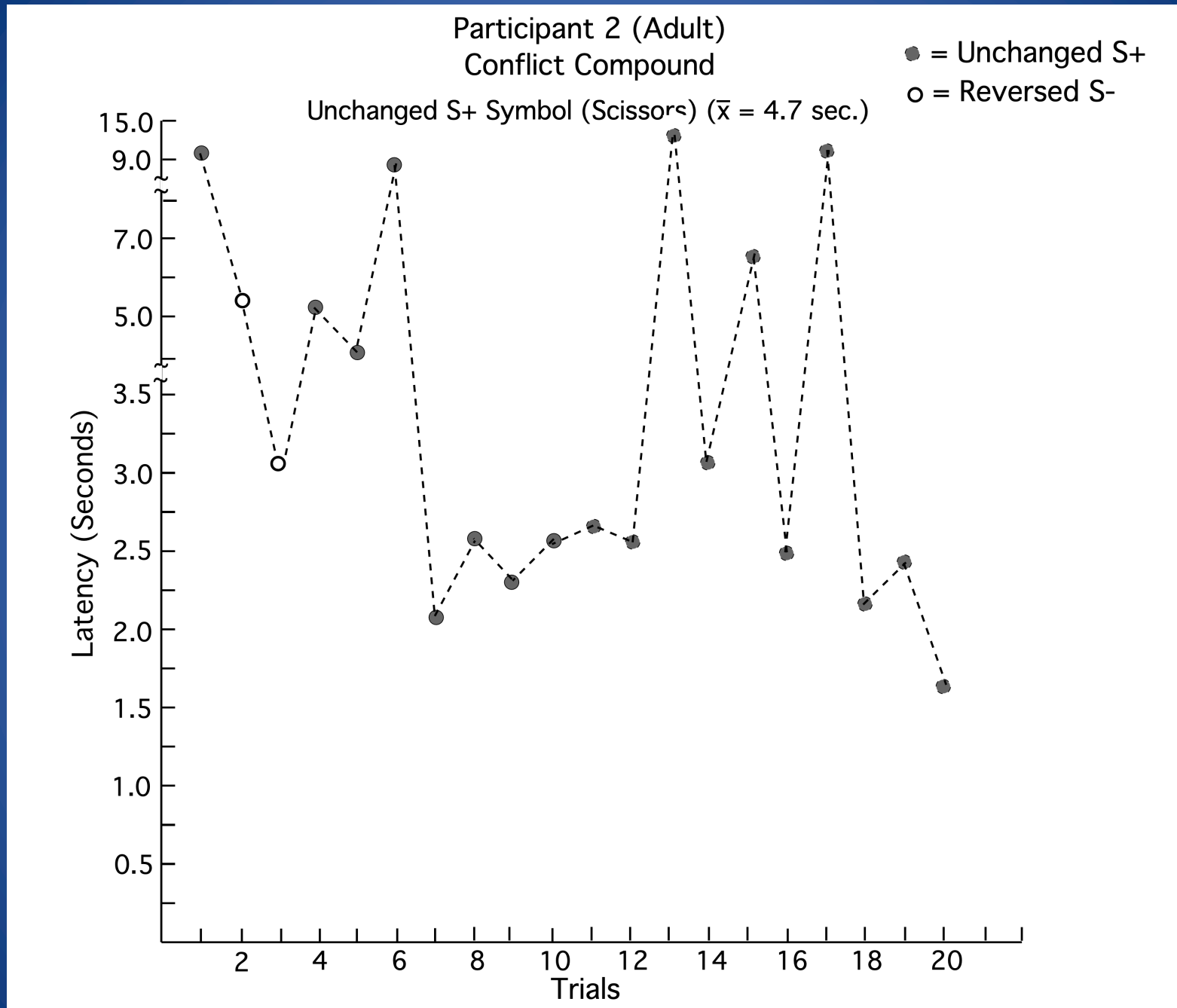


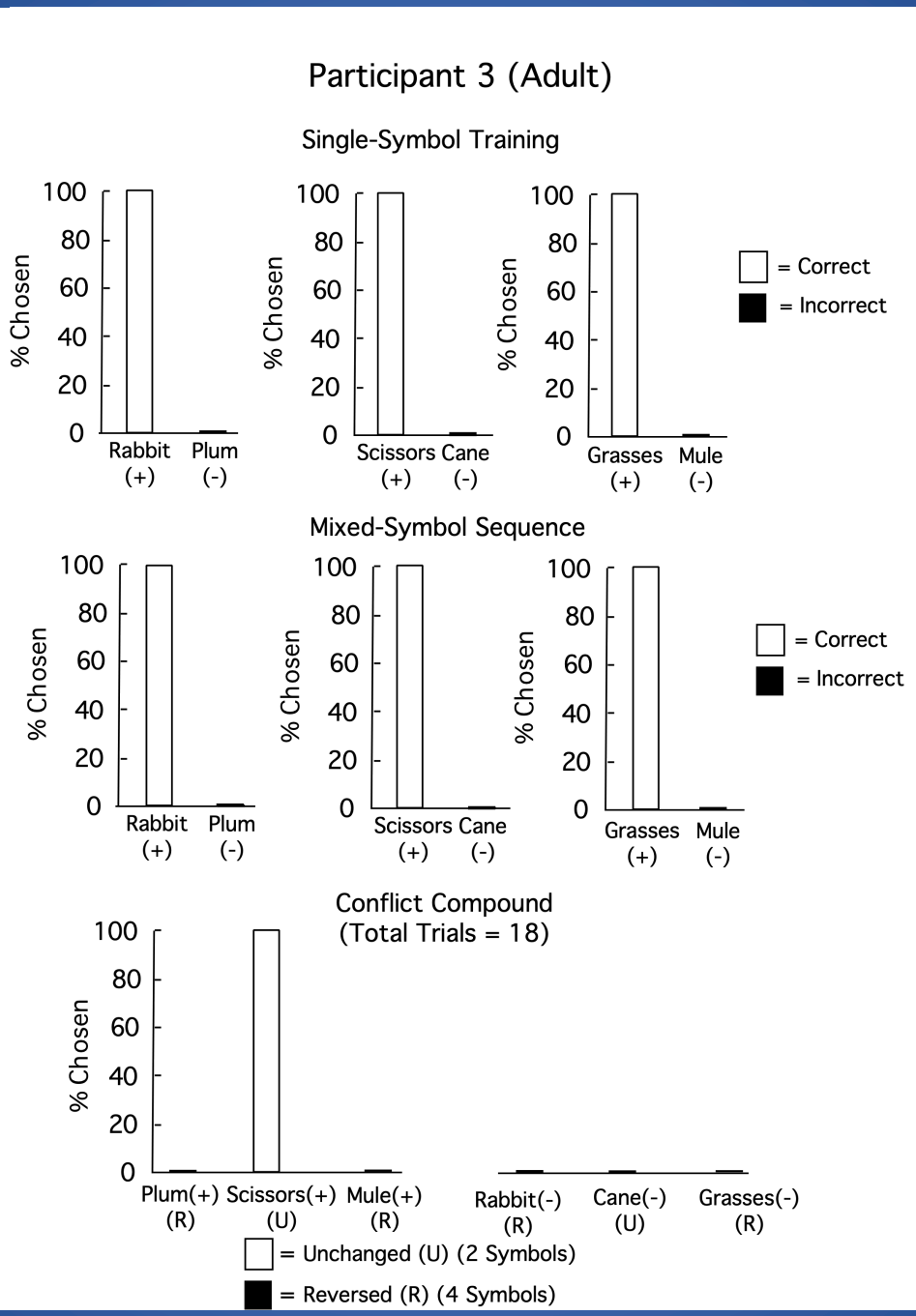




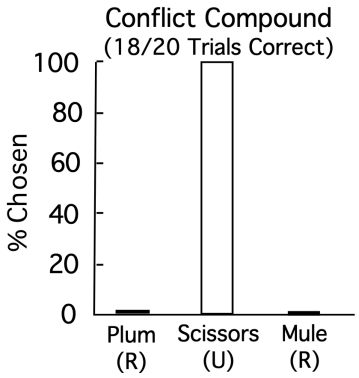
= Unchanged (U) (2 Symbols)

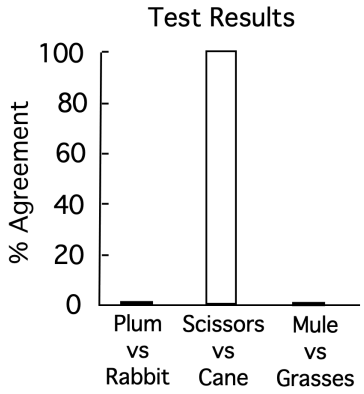
= Reversed (R) (4 Symbols)

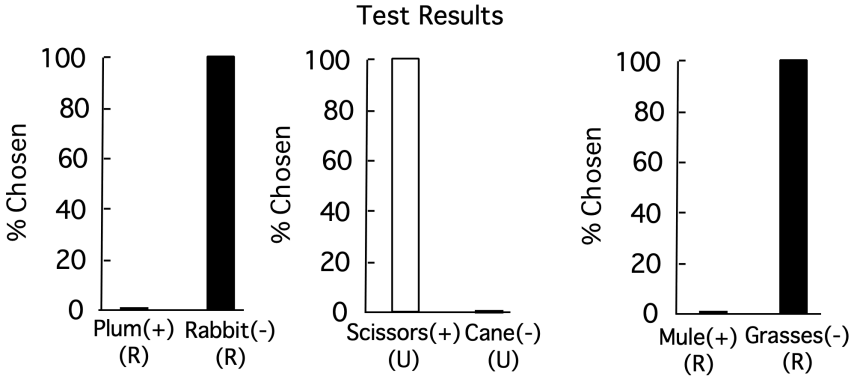

Participant 2 (Adult)
Conflict Compound
Unchanged S+ Symbol (Scissors) (x̄ = 4.7 sec.)
= Unchanged S+
= Reversed S-
Latency (Seconds)
15.0
9.0
7.0
5.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2
4
6
8
10
12
14
16
18
20
Trials


Participant 3 (Adult)
Single-Symbol Training
% Chosen
100
80
60
40
20
0
Rabbit (+)
Plum (-)
Scissors (+)
Cane (-)
Grasses (+)
Mule (-)
= Correct
= Incorrect
Mixed-Symbol Sequence
Conflict Compound
(Total Trials = 18)
Plum(+) (R)
Scissors(+) (U)
Mule(+) (R)
Rabbit(-) (R)
Cane(-) (U)
Grasses(-) (R)
= Unchanged (U) (2 Symbols)
= Reversed (R) (4 Symbols)

Participant 3 (Adult)

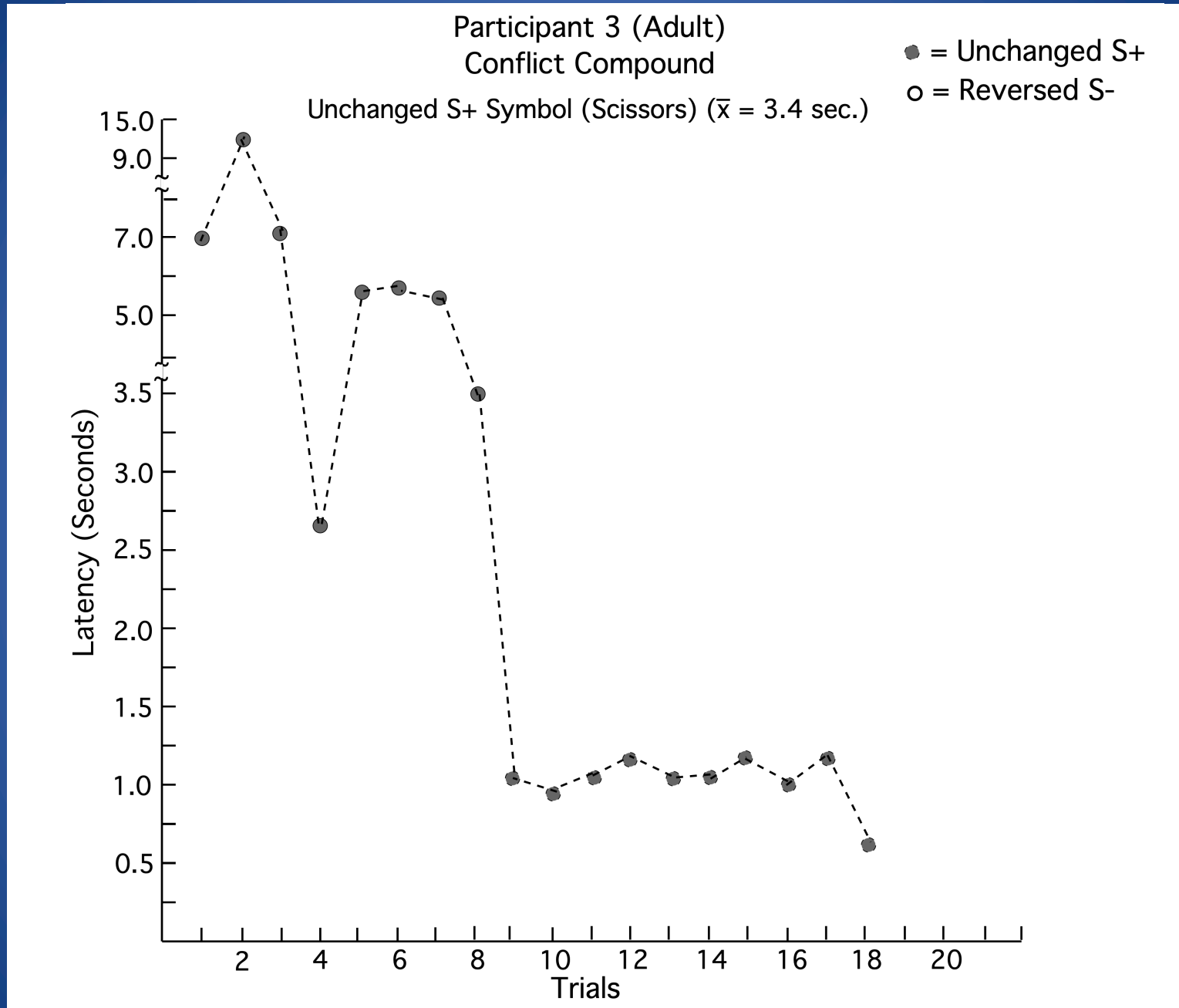


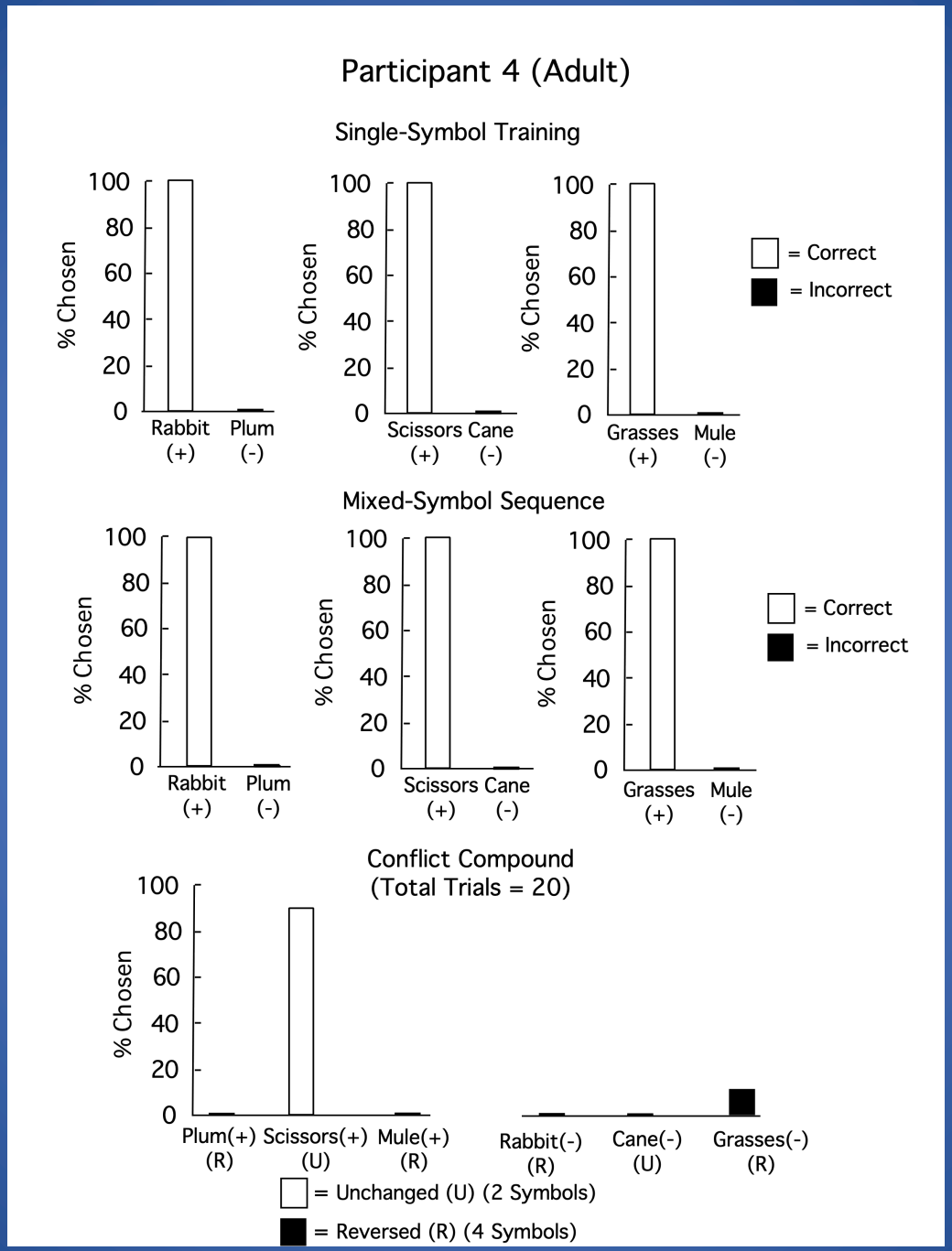




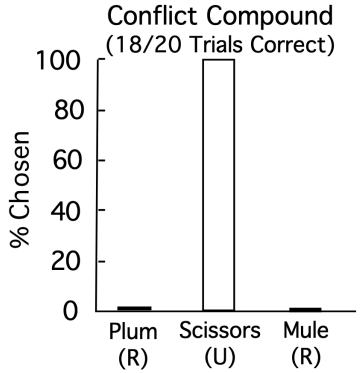
□ = Unchanged (U) (2 Symbols)

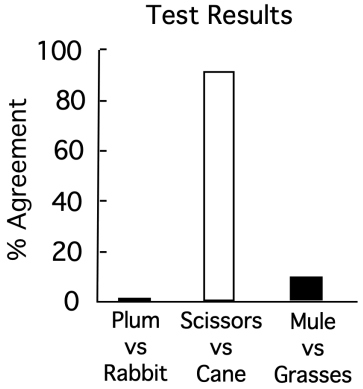
■ = Reversed (R) (4 Symbols)

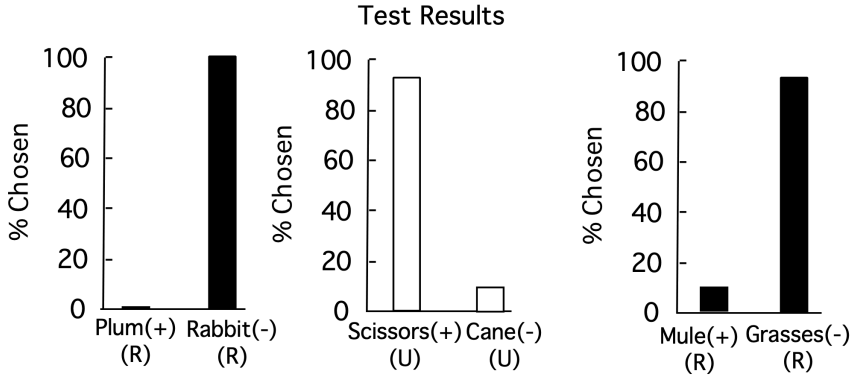

Participant 3 (Adult)
Conflict Compound
Unchanged S+ Symbol (Scissors) ($\bar{x}$ = 3.4 sec.)
= Unchanged S+
o = Reversed S-
Latency (Seconds)
15.0
9.0
7.0
5.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2
4
6
8
10
12
14
16
18
20
Trials


Participant 4 (Adult)
Single-Symbol Training
% Chosen
100
80
60
40
20
0
Rabbit (+)
Plum (-)
Scissors (+)
Cane (-)
Grasses (+)
Mule (-)
= Correct
= Incorrect
Mixed-Symbol Sequence
Conflict Compound
(Total Trials = 20)
Plum(+) (R)
Scissors(+) (U)
Mule(+) (R)
Rabbit(-) (R)
Cane(-) (U)
Grasses(-) (R)
= Unchanged (U) (2 Symbols)
= Reversed (R) (4 Symbols)

Participant 4 (Adult)

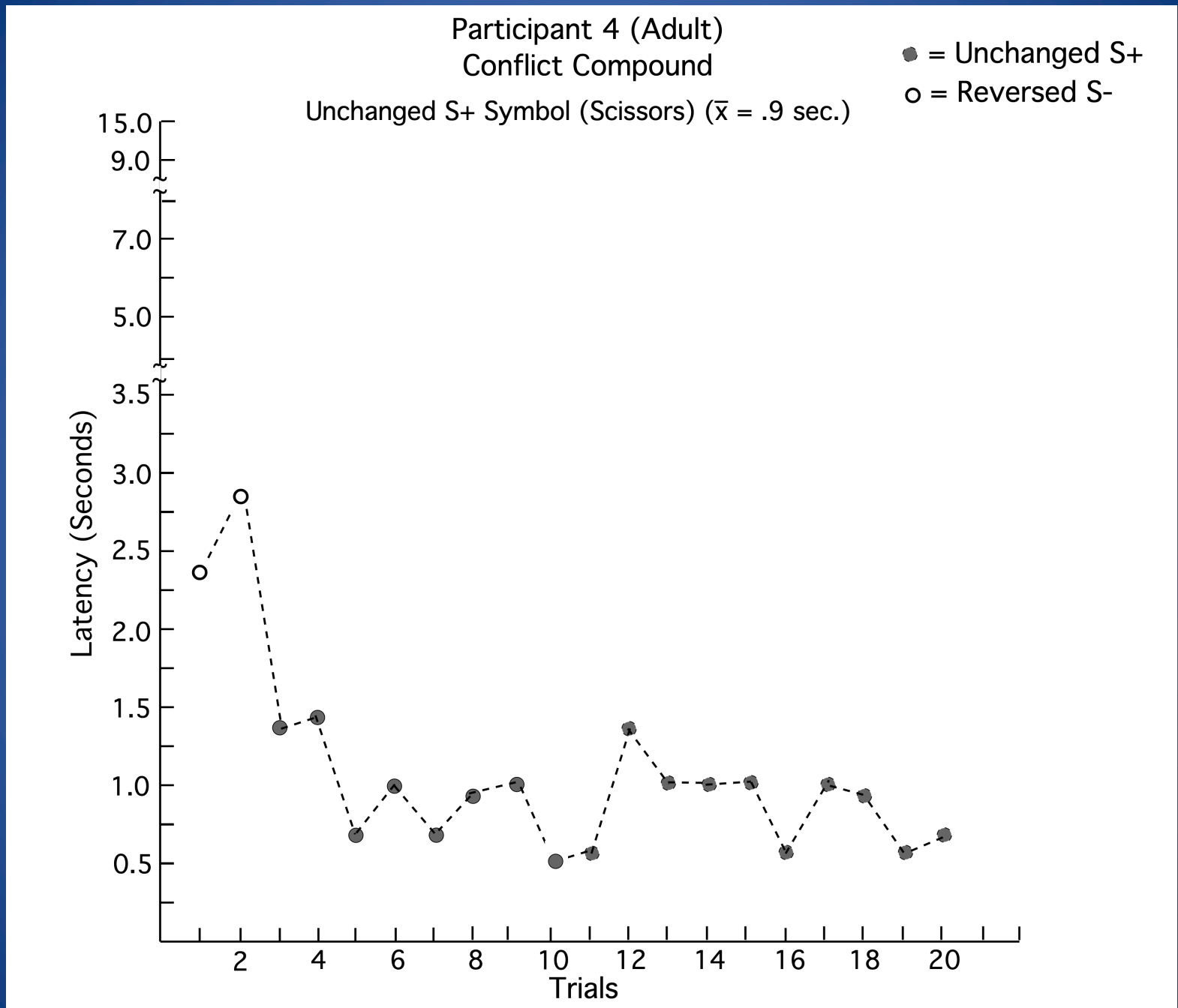






= Unchanged (U) (2 Symbols)

= Reversed (R) (4 Symbols)


Participant 4 (Adult)
Conflict Compound
Unchanged S+ Symbol (Scissors) ($\bar{x}$ = .9 sec.)
= Unchanged S+
= Reversed S-
Latency (Seconds)
15.0
9.0
7.0
5.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2
4
6
8
10
12
14
16
18
20
Trials