

## DIMENSIONAL CHANGE CARD SORT (DCCS)

### Description of the Instrument:

- In the standard version of the DCCS task, children are required to sort first according to one dimension (e.g., color) and then according to another dimension (e.g., shape). The advance version of the DCCS adds a third sorting dimension (e.g., border vs. non-border). The standard version of the task requires that the child shift their attention to a new dimension of the card between phases (pre- and post-switch); the advance phase however requires that children shift the dimensional focus repeatedly across phase (i.e., from card to card). The standard version has been conceptualized as the simplest possible test of task-switch (Rogers & Monsell, 1995).



### Base Reference/Primary Citation:

Zelazo, P. D., Frye, D. Rapus, T. (1996). An age-related dissociation between knowing rules and using them. *Cognitive Development, 11*, 37-63. doi:10.1016/S0885-2014(96)90027-1

Zelazo, P. D. (2006). The dimensional change card sort (DCCS): A method of assessing executive function in children. *Nature Protocols, 1*, 297-301. doi: 10.1038/nprot.2006.46

Hongwanishkul, D., Happaney, K. R., Lee, W. S. C., & Zelazo, P. D. (2005). Assessment of hot and cool executive function in young children: Age-related changes and individual differences. *Developmental Neuropsychology, 28*, 617 – 644. doi: 10.1207/s15326942dn2802\_4

## DCCS MATERIALS

**Boxes:** Two black plastic recipe boxes with hole cut into the top. Boxes measure  $6\frac{3}{4}$ " in length,  $4\frac{3}{4}$ " in height, and  $4\frac{1}{2}$ " in depth. Hole on top measures 5" by 2". Velcro is put on the front and the back of the box in order to adhere the target card.

FRONT



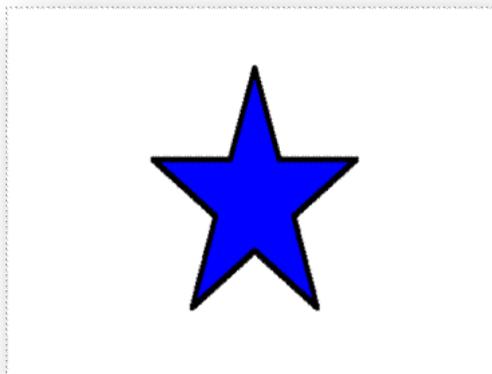
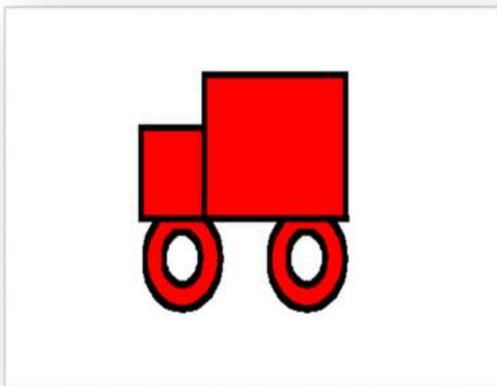
BACK



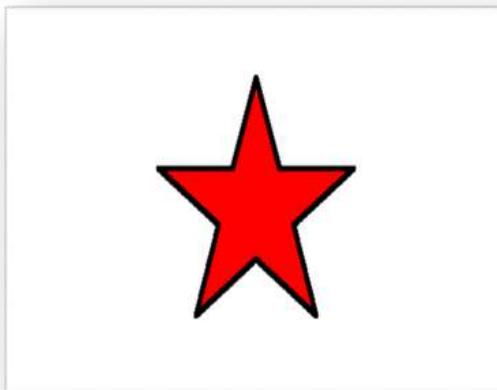
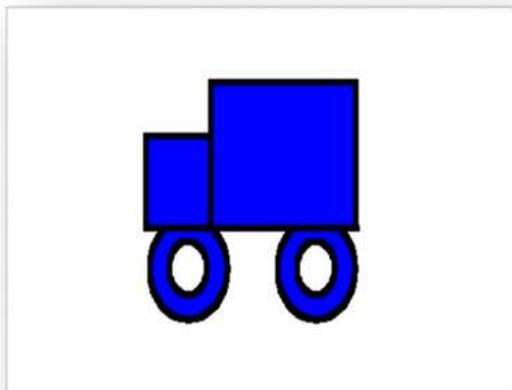
TOP



**Integrated Model Cards for Boxes:** Each card measures  $3\frac{7}{8}$ " by 4" and is laminated. Velcro is placed on the back of the card in order to place card on the box. Two cards have a red truck on a white background and 2 cards have a blue star with a white background. Note that there is no border on these cards.

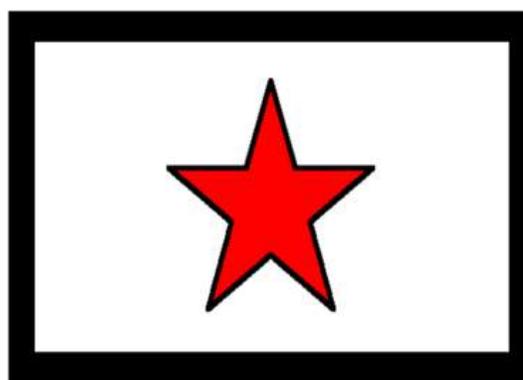
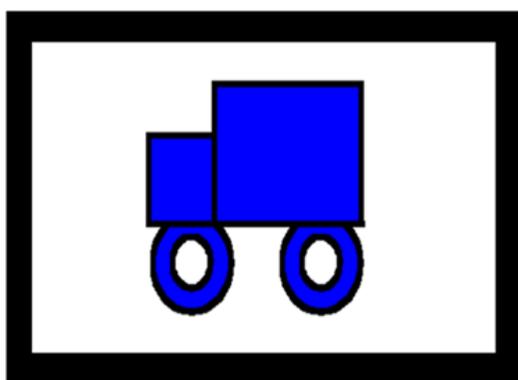


**Cards for Color Game:** For the color game there are 4 cards with a blue truck on a white background and 4 cards with a red star on a white background. Each card measures  $3\frac{7}{8}$ " by 4" and is laminated. Note that there is no border on these cards. Markings are made on the back of each card indicating its order of presentation (Blue Truck = P[ractice]1, C2, C3, C6 and Red Star = P2, C1, C4, C5).



**Cards for Shape Game:** For the shape game there are 3 cards with a blue truck on a white background and 3 cards with a red star on a white background (see images for color game). Each card measures  $3\frac{7}{8}$ " by 4" and is laminated. Note that there is no border on these cards. Markings are made on the back of each card indicating its order of presentation (Blue Truck = S1, S3, S4 and Red Star = S2, S5, S6).

**Cards for Advance Sort:** For the advance sort there are 4 cards with a blue truck on a white background with no border (see image for color game), 4 cards with a blue truck on a white background with a thick black border, 3 cards with a red star on a white background with no border (see image for color game), and 3 cards with a red star on a white background with a thick black border. Each card measures  $3\frac{7}{8}$ " by 4" and is laminated. Markings are made on the back of each card indicating its order of presentation (Blue Truck w/o Border = P.AS2, AS6, AS9, AS12; Blue Truck with Border = P.AS1, AS3, AS7, AS8; Red Star w/o Border = AS2, AS5, AS10; Red Star with Border = AS1, AS4, AS11).



## DCCS SCRIPT

Materials: 2 sorting boxes, 4 integrated model cards for boxes, 8 cards for color game, 6 cards for shape game, and 14 cards for advance sort.

Place 2 boxes on the table approximately 8" from child's edge of table and 4" apart. Make sure they are angled the same way. Cards are labeled with integrated model cards, (colored shapes on white backgrounds). Red truck on Assessors right and blue star at assessors left.

Here's a red truck and here's a blue star. Now, we're going to play a card game. This is the color game. In the color game all the blue ones go here (pointing to the box on the left) And all the red ones go here (pointing to the box on the right).

See, here's a blue one. So it goes here (place it in box on the left). If it's blue it goes here, but if it's red it goes here (pointing to boxes to identify them).

See, here's a red one. So it goes here (place it in box on the right). If it's blue it goes here, but if it's red it goes here (pointing to boxes to identify them).

Now it's your turn. So remember, if it's blue it goes here, but if it's red it goes here (pointing to boxes).

### Rule Check

Can you show me where the blue ones go in the color game?

*If Correct: Very good, that's right.*

*If Incorrect: Uh oh. Remember, in the color game, all the blue ones go here, and all the red ones go here.* (Point to appropriate boxes. Repeat question and reminder 1 more time, only then mark as incorrect & move on.)

**Response:      Correct(1)                      Incorrect(0)**

Can you show me where the red ones go in the color game?

*If Correct: Very good, that's right.*

*If Incorrect: Uh oh. Remember, in the color game, all the blue ones go here, and all the red ones go here.* (Point to appropriate boxes. Repeat question and reminder 1 more time, only then mark as incorrect & move on.)

**Response:      Correct(1)                      Incorrect(0)**

Let's try this game

### Color Test Trials

**On each trial, say: If it is a blue one, then put it here, but if it is a red one, put it here.**

- *If the child points to the box Assessor may sort the card for him/her. Do not say “okay” in response to sort. Say, “Let’s do another one,” “Let’s do it again,” etc.*
- *Point to buckets by touching the top with a finger.*
- *Do not bring out the card until the rule statement is complete.*
- *Once card has been presented, Assessor CANNOT repeat the rule.*
- *State “Here’s a \_\_\_” while simultaneously presenting the card.*
- *Hold the card above both boxes in the center (not over one box or the other).*

- |   |                  |                 |
|---|------------------|-----------------|
| 1. ( <i>red star</i> ) Here’s a red one.    | Blue ____        | <b>Red</b> ____ |
| 2. ( <i>blue truck</i> ) Here’s a blue one. | <b>Blue</b> ____ | Red ____        |
| 3. ( <i>blue truck</i> ) Here’s a blue one. | <b>Blue</b> ____ | Red ____        |
| 4. ( <i>red star</i> ) Here’s a red one.    | Blue ____        | <b>Red</b> ____ |
| 5. ( <i>red star</i> ) Here’s a red one.    | Blue ____        | <b>Red</b> ____ |
| 6. ( <i>blue truck</i> ) Here’s a blue one. | <b>Blue</b> ____ | Red ____        |

\*\*\*\*\*CONTINUE if child gets at least 5/6 correct.\*\*\*\*\*

### Card Sort – Integrated: Shape game

*Keep cards in boxes.*

Now we're going to play a new game. We're not going to play the color game anymore (*Shake head no*). We're going to play the **shape** game. In the shape game, all of the stars go here (*pointing to box on the left*) and all of the trucks go here (*pointing to box on the right*).

#### **Rule Check**

Can you show me where the stars go in the shape game?

***If Correct:*** *Very good, that's right.*

***If Incorrect:*** Uh oh. Remember, in the shape game, all the stars go here, and all the trucks go here.

(Point to appropriate boxes. Repeat question and reminder 1 more time, only then mark as incorrect & move on.)

**Response:    Correct(1)                      Incorrect(0)**

Can you show me where the trucks go in the shape game?

***If Correct:*** *Very good, that's right.*

***If Incorrect:*** Uh oh. Remember, in the shape game, all the stars go here, and all the trucks go here.

(Point to appropriate boxes. Repeat question and reminder 1 more time, only then mark as incorrect & move on.)

**Response:    Correct(1)                      Incorrect(0)**

Let's try this game!

## Shape Test Trials

**On each trial, say: If it is a star, then put it here, but if it is a truck, put it here.**

- *If the child points to the box Assessor may sort the card for him/her. Do not say “okay” in response to sort. Say, “Let’s do another one,” “Let’s do it again,” etc.*
- *Point to buckets by touching the top with a finger .*
- *Do not bring out the card until the rule statement is complete.*
- *Once card has been presented, Experimenter CANNOT repeat the rule.*
- *State “Here’s a \_\_\_” while simultaneously presenting the card.*
- *Hold the card above both boxes in the center (not over one box or the other).*

### Shape Test Trials:

- |                          |                 |                   |                    |
|--------------------------|-----------------|-------------------|--------------------|
| 1. ( <i>blue truck</i> ) | Here’s a truck. | Star _____        | <b>Truck</b> _____ |
| 2. ( <i>red star</i> )   | Here’s a star.  | <b>Star</b> _____ | Truck _____        |
| 3. ( <i>blue truck</i> ) | Here’s a truck. | Star _____        | <b>Truck</b> _____ |
| 4. ( <i>blue truck</i> ) | Here’s a truck. | Star _____        | <b>Truck</b> _____ |
| 5. ( <i>red star</i> )   | Here’s a star.  | <b>Star</b> _____ | Truck _____        |
| 6. ( <i>red star</i> )   | Here’s a star.  | <b>Star</b> _____ | Truck _____        |

\*\*\*\*\*CONTINUE if child gets at least 5/6 correct.\*\*\*\*\*

## Card Sort - Advanced

**Note: NEVER START HERE- Only after integrated level.**

Assessor is using the same target cards as in the integrated level.

Leave sorted cards in boxes.

Let's try one more game with cards!

**Say all of these rules very slowly and deliberately!**

In this game, you sometimes get cards that have a black border around it just like this one (show a blue truck card with a border. Draw your finger around the border of the card). If you see cards with a **black border**, you have to play the **color** game. In the color game, blue ones go here and red ones go here (point to respective boxes). This one's blue, so I'm going to put it right here (placing it down in the appropriate box).

But if the cards have **no black border**, like this one (show them a blue truck card without a border. (Draw your finger around the outside of a card to show that there is no border.)), you have to play the **shape** game. In the shape game, if it's a star, we put it here, but if it's a truck, we put it here (point to the respective boxes). This one's a truck, so I'm going to put it right here (place it down in the appropriate box).

**Rule Check** (Assessor is not showing a card during these checks)

So what game do you play if there is a border? (color game).

*If Correct: Very good, that's right.*

*If Incorrect: Uh oh. Remember, if there's a **border**, play the **color** game. If there is **no border**, play the **shape** game. (Repeat question and reminder 1 more time, only then mark as incorrect & move on.)*

**Response:      Correct(1)                      Incorrect(0)**

What game do you play if there is no border? (shape game).

*If Correct: Very good, that's right.*

*If Incorrect: Uh oh. Remember, if there's a **border**, play the **color** game. If there is **no border**, play the **shape** game. (Repeat question and reminder 1 more time, only then mark as incorrect & move on.)*

**Response:      Correct(1)                      Incorrect(0)**

Let's try this game!

**Advanced Trials**

**On each trial, say:** If there's a border, play the color game. If there is no border, play the shape game.

- If the child points to the box Assessor may sort the card for him/her. Do not say "okay" in response to sort. Say, "Let's do another one," "Let's do it again," etc.
- Point to buckets by touching the top with a finger .
- Do not bring out the card until the rule statement is complete.
- **Once card has been presented, Experimenter CANNOT repeat the rule.**
- State "**Here's a \_\_\_**" while simultaneously presenting the card.
- **Hold the card above both boxes in the center (not over one box or the other).**

- |   |                  |                   |
|---|------------------|-------------------|
| 1. ( <u>red star border</u> ) Here's one with a border.   | Blue ____        | <b>Red</b> ____   |
| 2. ( <u>red star</u> ) Here's one without a border.       | <b>Star</b> ____ | Truck ____        |
| 3. ( <u>blue truck border</u> ) Here's one with a border. | <b>Blue</b> ____ | Red ____          |
| 4. ( <u>red star border</u> ) Here's one with a border.   | Blue ____        | <b>Red</b> ____   |
| 5. ( <u>red star</u> ) Here's one without a border.       | <b>Star</b> ____ | Truck ____        |
| 6. ( <u>blue truck</u> ) Here's one without a border.     | Star ____        | <b>Truck</b> ____ |
| 7. ( <u>blue truck border</u> ) Here's one with a border. | <b>Blue</b> ____ | Red ____          |
| 8. ( <u>blue truck border</u> ) Here's one with a border. | <b>Blue</b> ____ | Red ____          |
| 9. ( <u>blue truck</u> ) Here's one without a border.     | Star ____        | <b>Truck</b> ____ |
| 10. ( <u>red star</u> ) Here's one without a border.      | <b>Star</b> ____ | Truck ____        |
| 11. ( <u>red star border</u> ) Here's one with a border.  | Blue ____        | <b>Red</b> ____   |
| 12. ( <u>blue truck</u> ) Here's one without a border.    | Star ____        | <b>Truck</b> ____ |

**"Great job!"** Put away all boxes & cards. **"Now we're ready for a new game."**

## DCCS RECORD FORM

### Color Game

#### Rule Check Color Game

Can you show me where the blue ones go in the color game?

**Circle Response:**  $\frac{1^{\text{st}} \text{ attempt}}{\text{Correct (1)} \quad \text{Incorrect (0)}} \quad \frac{2^{\text{nd}} \text{ attempt (if 1}^{\text{st}} \text{ incorrect)}}{\text{Correct (1)} \quad \text{Incorrect (0)}}$

Can you show me where the red ones go in the color game?

**Circle Response:**  $\frac{1^{\text{st}} \text{ attempt}}{\text{Correct (1)} \quad \text{Incorrect (0)}} \quad \frac{2^{\text{nd}} \text{ attempt (if 1}^{\text{st}} \text{ incorrect)}}{\text{Correct (1)} \quad \text{Incorrect (0)}}$

#### Color Test Trials:

1. (*red star*) Here's a red one.      Blue \_\_\_\_      **Red** \_\_\_\_
2. (*blue truck*) Here's a blue one.      **Blue** \_\_\_\_      Red \_\_\_\_
3. (*blue truck*) Here's a blue one.      **Blue** \_\_\_\_      Red \_\_\_\_
4. (*red star*) Here's a red one.      Blue \_\_\_\_      **Red** \_\_\_\_
5. (*red star*) Here's a red one.      Blue \_\_\_\_      **Red** \_\_\_\_
6. (*blue truck*) Here's a blue one.      **Blue** \_\_\_\_      Red \_\_\_\_

\*\*\*\*\*Continue if child gets at least 5/6 correct\*\*\*\*\*

**Total Color (0-6):** \_\_\_\_\_

**Pass/Fail Color (0-1):** \_\_\_\_\_  
(0 if < 5 correct, 1 if ≥ 5)

## Shape Game

### Rule Check Shape Game

Can you show me where the stars go in the shape game?

**Response:** *Correct (1)*      1<sup>st</sup> attempt      *Incorrect (0)*      *Correct (1)*      2<sup>nd</sup> attempt (if 1<sup>st</sup> incorrect)      *Incorrect (0)*

Can you show me where the trucks go in the shape game?

**Response:** *Correct (1)*      1<sup>st</sup> attempt      *Incorrect (0)*      *Correct (1)*      2<sup>nd</sup> attempt (if 1<sup>st</sup> incorrect)      *Incorrect (0)*

### Shape Test Trials

1. (*blue truck*) Here's a truck.      Star \_\_\_\_\_ Truck \_\_\_\_\_
2. (*red star*) Here's a star.      Star \_\_\_\_\_ Truck \_\_\_\_\_
3. (*blue truck*) Here's a truck.      Star \_\_\_\_\_ Truck \_\_\_\_\_
4. (*blue truck*) Here's a truck.      Star \_\_\_\_\_ Truck \_\_\_\_\_
5. (*red star*) Here's a star.      Star \_\_\_\_\_ Truck \_\_\_\_\_
6. (*red star*) Here's a star.      Star \_\_\_\_\_ Truck \_\_\_\_\_

\*\*\*\*\*Continue if child gets at least 5/6 correct\*\*\*\*\*

**Total Shape (0-6):** \_\_\_\_\_

**Pass/Fail Shape (1-2):** \_\_\_\_\_  
(1 if < 5 correct, 2 if ≥ 5)

**Advanced Sort**

**Rule Check**

So what game do you play if there is a border? (*color game*).

**Response:**  $\frac{1^{st} \text{ attempt}}{\text{Correct (1)}}$       **Incorrect (0)**       $\frac{2^{nd} \text{ attempt (if 1}^{st} \text{ incorrect)}}{\text{Correct (1)}}$       **Incorrect (0)**

What game do you play if there is no border? (*shape game*).

**Response:**  $\frac{1^{st} \text{ attempt}}{\text{Correct (1)}}$       **Incorrect (0)**       $\frac{2^{nd} \text{ attempt (if 1}^{st} \text{ incorrect)}}{\text{Correct (1)}}$       **Incorrect (0)**

- 2. (red star border) Here's one with a border.      Blue \_\_\_\_      **Red** \_\_\_\_
- 2. (red star) Here's one without a border.      **Star** \_\_\_\_      Truck \_\_\_\_
- 3. (blue truck border) Here's one with a border.      **Blue** \_\_\_\_      Red \_\_\_\_
- 4. (red star border) Here's one with a border.      Blue \_\_\_\_      **Red** \_\_\_\_
- 5. (red star) Here's one without a border.      **Star** \_\_\_\_      Truck \_\_\_\_
- 6. (blue truck) Here's one without a border.      Star \_\_\_\_      **Truck** \_\_\_\_
- 7. (blue truck border) Here's one with a border.      **Blue** \_\_\_\_      Red \_\_\_\_
- 8. (blue truck border) Here's one with a border.      **Blue** \_\_\_\_      Red \_\_\_\_
- 9. (blue truck) Here's one without a border.      Star \_\_\_\_      **Truck** \_\_\_\_
- 10. (red star) Here's one without a border.      **Star** \_\_\_\_      Truck \_\_\_\_
- 11. (red star border) Here's one with a border.      Blue \_\_\_\_      **Red** \_\_\_\_
- 12. (blue truck) Here's one without a border.      Star \_\_\_\_      **Truck** \_\_\_\_

**Total Advanced (0-12):** \_\_\_\_\_

**Pass/Fail Advanced (2-3):** \_\_\_\_\_  
 (2 if < 9 correct, 3 if ≥ 9)

## DCCS SCORING

### Each item is coded as follows:

- 0 = Incorrect sort
- 1 = Correct sort

### Final Score: Zelazo's (2006) pass/fail coding scheme

- 0 = did not pass color sort  
(Less than 5/6 items correct on color sort)
  
- 1 = pass of color sort, fail on shape sort  
(At least 5/6 items correct on color sort but less than 5/6 items correct on shape sort)
  
- 2 = pass shape sort, fail advance trials  
(At least 5/6 items correct on both color and shape sort but less than 9/12 items correct on advance/border sort)
  
- 3 = pass advance trials  
(At least 5/6 items correct on both color and shape sort and at least 9/12 items correct on advance/border sort)