JDMLab
Judgment and Decision-Making Laboratory
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Psychology, Decision Making, and Education to a Circular Economy
School of Science
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DUAL-PROCESS THEORIES

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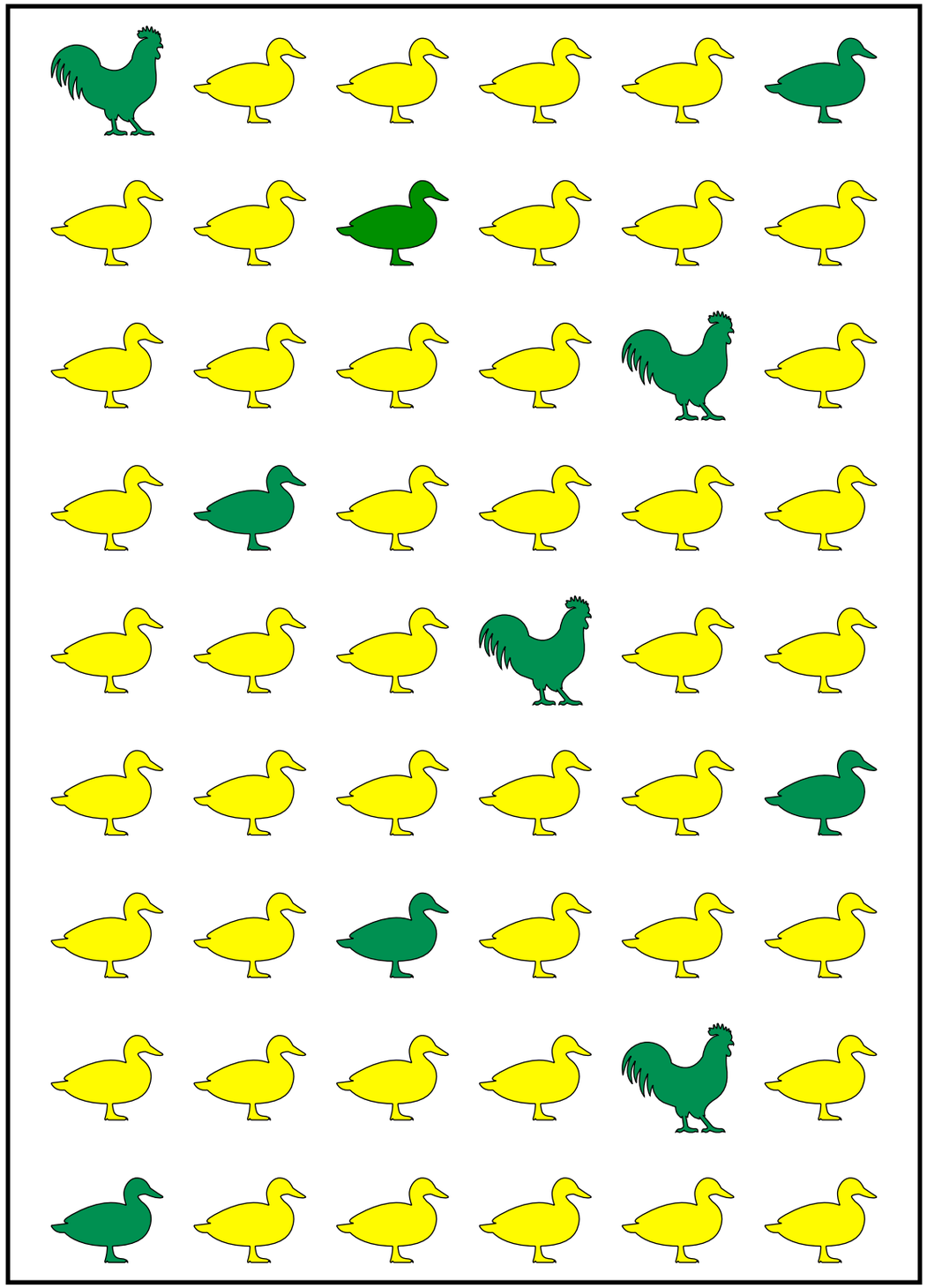

DUAL-PROCESS THEORIES

- These examples help demonstrate how our brain infers information and interpret different situations either in an intuitive or in a deliberative fashion.

  - Different authors use different labels to identify these two thinking processes, but the features of each process are usually very similar:

    - System 1 (intuitive, automatic, unconscious, irrational).
    - System 2 (deliberative, analytic, conscious, rational).

(Epstein, 1994; Sloman, 1996; Slovic et al., 2000; Stanovich, West, 2000; Kahneman, 2003; Evans, Frankish, 2009)

DUAL-PROCESS THEORIES

- System 1 (intuitive):
  - It works automatically, it is quick to reach a conclusion, does not require much cognitive effort since it does not require voluntary control.

- System 2 (analytic):
  - Works directing attention towards demanding mental activities, requires more effort and it is slower than the intuitive system. It requires voluntary action, and the employment of attention, working memory, and self control.

DUAL-PROCESS THEORIES

- The intuitive system performs:

  - Tasks that are related to innate competencies that we share with other animals.

  - Tasks that we have learnt and have become fast and automatic through practice (such as: driving or riding a bike).

DUAL-PROCESS THEORIES

- In general, the analytic system is activated when a situation requires to pay attention and a decision-makers' performance decreases as soon as he/she does not pay enough attention.

- If we rent a car in the UK, we will need to remember that they drive on the left end side of the road.

  - To behave in a way that is consistent with this rule, which is unusual, requires that we stay focused and exert effort to remember it at all times.

THE ROLE OF ATTENTION

- However, the control of attention is shared by both systems.

  - When we hear a loud noise, we automatically direct our attention towards the source or direction of the sound (automatic response).

  - Afterwards, we focus our attention on that sound to understand what has happened (deliberative response).

THE ROLE OF ATTENTION

- It is important to remember that attention is a limited resource.
  - It is not possible to pay attention to a large number of stimuli at the same time.
    - Usually, demanding mental processes compete to use the same cognitive/attentional resources and interfere with one another.

(Fonte: https://www.youtube.com/watch?v=vJG698U2Mvo)

(Fonte: https://www.youtube.com/watch?v=IGQmdoK_ZfY)

THE ROLE OF ATTENTION

- No one would ever miss the gorilla if not for the instruction to count the number of passes made by people with the white shirt...
- The task of counting the passes is difficult enough to require cognitive effort and selective attention.

- Thousands of people watched the videos and half of them did not see the gorilla the first time.
  - Many people did not believe the gorilla was actually present and thought it was added in the replay.
  - When we focus on something important we become “blind to evidence” and “blind to our own blindness”.

INTERACTION BETWEEN THE TWO SYSTEMS

- Usually, we rely on the intuitive system, while the analytic system remains inactive. This way we can save cognitive energies and spend as less energy as possible.

  - The intuitive system produces stimuli and thoughts all the time that the analytic system should assess.

  - If the analytic system accepts those intuitions then they become beliefs and voluntary actions.

  - PROBLEM!! When everything looks fine, as it happens most of the times, the analytic system accepts the conclusions coming from the intuitive system without modifying them.

  - We believe in our impressions and behave according to our desires - that's usually fine!

INTERACTION BETWEEN THE TWO SYSTEMS

- Only when the intuitive system fails to reach a plausible conclusion the analytic one steps in and assesses the situation.
    - For instance, the analytic system activates when we are asked to compute 17 x 24.

- The analytic system activates when there are events that go against our worldviews, because these are the reference points used by the intuitive system.
- Further, the analytic system is in charge of our behavior and regulates self-control when, for instance, we are about to offend someone during a discussion.

INTERACTION BETWEEN THE TWO SYSTEMS

- The interaction between the two systems is very efficient because it allows to minimize the effort and optimize decision quality.

  - The intuitive system is generally able to:
    - Have a good representation of familiar situations.
    - Can make short time predictions.

  - However, it is also prone to errors and biases.

BLUE

GREEN

RED

GREEN

BLUE

RED

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RED

BLUE

GREEN

BLUE

RED

GREEN

CONFLICT BETWEEN THE TWO SYSTEMS

- Usually we do not care about the color used to write a word, because we automatically focus on its meaning.

  - As a result, when we are asked to report the color instead of the actual word we experience a conflict.

  - The meaning of the word is elaborated automatically and interferes with the task we are asked to complete (reporting the color).

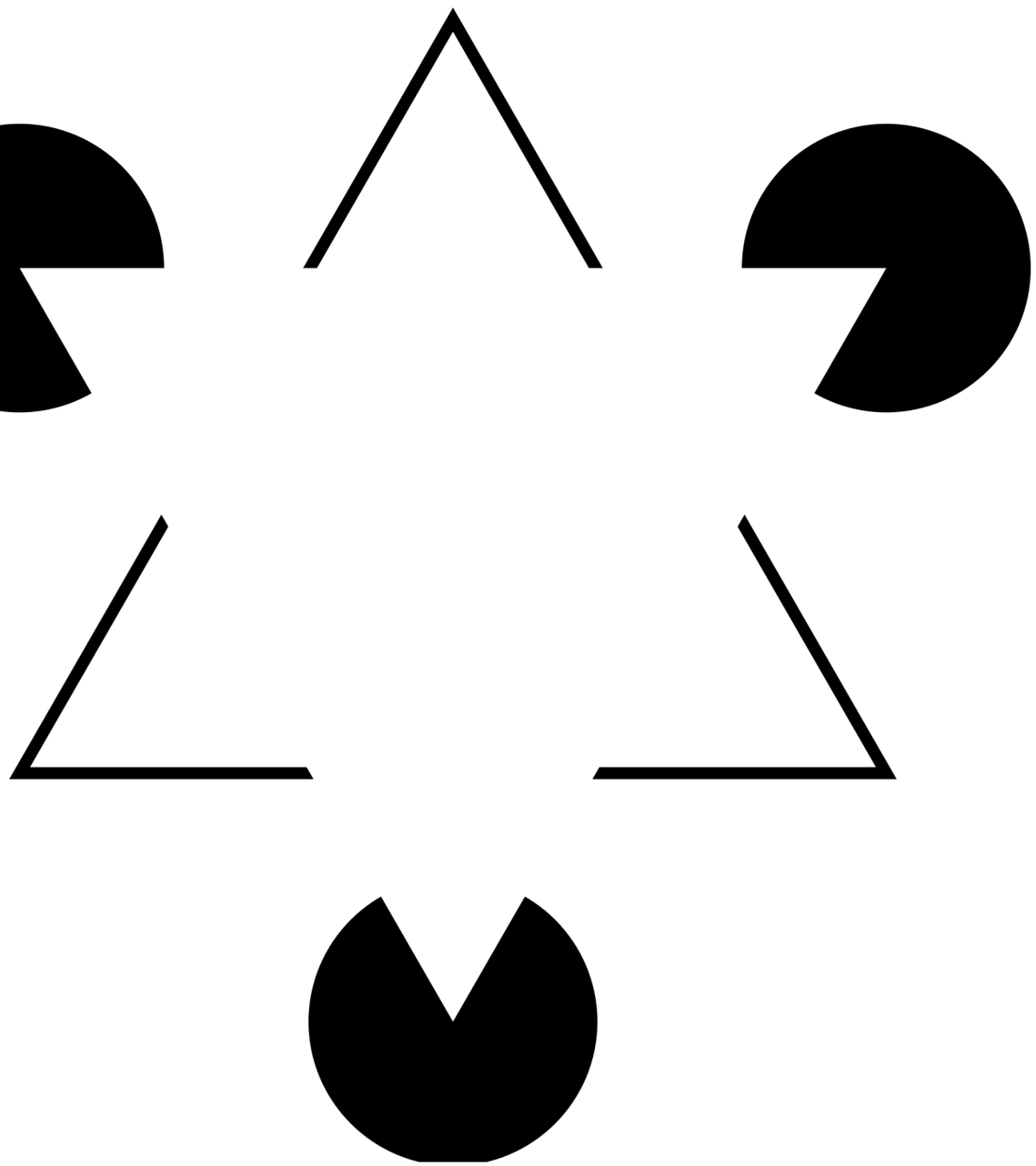
  - The analytic system has to inhibit the intuitive response and this makes the task more difficult (and our responses become slower).

INTERACTION BETWEEN THE TWO SYSTEMS

- The conflict between intuitions and analytic elaboration of information is quite frequent in our everyday life.

  - When we drive on snow, if the car starts to go sideways we need to be cool, steer on the opposite direction, and inhibit the temptation of hitting the breaks.

  - When we talk to someone we rely on the analytic system to inhibit the intuitive reaction to offend them or reveal something that we were asked not to say.



COGNITIVE ILLUSIONS

- Even when we know a preceptive illusion we have troubles not being affected by it and have to remember what the reality is.

- We may know there is no white triangle on top, but still it looks like it is there!

- If we see the young lady, we cannot see the old woman at the same time despite knowing it is there…

COGNITIVE ILLUSIONS

- These examples deal with perceptive illusions.

- However, there are also cognitive illusions, which apply to our worldviews, opinions, and beliefs rather than perceptions of the physical world.

  - Kahneman’s example of the psychotic patient.

COGNITIVE ILLUSIONS

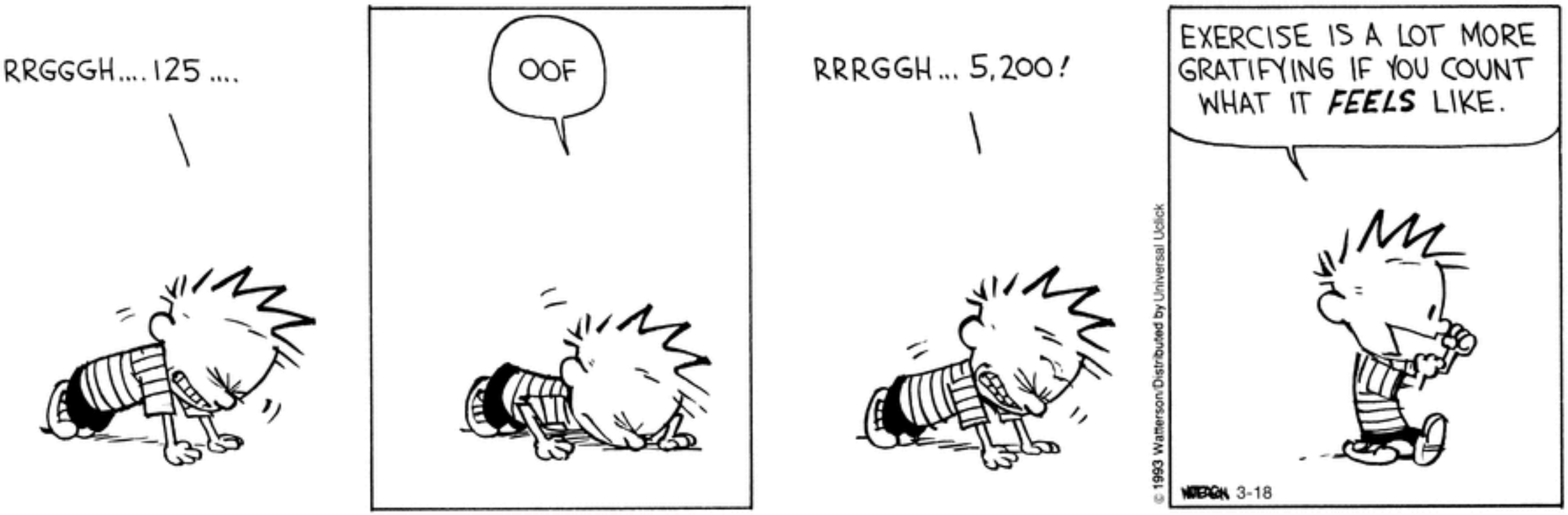
- These illusions are very difficult to prevent since the analytic system does not recognize the mistake made by the intuitive system.

  - Even when there are “hints” that we could be wrong, an error can only be avoided through a careful monitoring of the situation.

  - However, it is very hard to think carefully about every single thought or decision we face.

  - The analytic system is too slow to substitute intuition in our routine behaviors.

  - We must learn to recognize the conditions in which we risk making a mistake in order to focus and pay attention when it matters.


RRGGGH.... 125 ....
OOF
RRRGGH... 5,200!
EXERCISE IS A LOT MORE GRATIFYING IF YOU COUNT WHAT IT FEELS LIKE.
© 1993 Watterson/Distributed by Universal Uclick
WATTERSON 3-18

DUAL-PROCESS, SELF-CONTROL, EFFORT

- The analytic system allows us to direct our attention towards what we are interested in while completing a task or making a decision.

- This makes cognitive tasks an effort that consumes our mental (and physical) resources...

- The same is true for self-control, as it is easier to exert control when we are relaxed rather than tired.

DUAL-PROCESS, SELF-CONTROL, EFFORT

- When people have made a cognitive effort, they are more likely to:
  - Choose in an hedonic way.
  - Be egoistic.
  - Make sexists remarks.
  - Make superficial judgments during social interactions.

- Worrying about our performance in a specific task decreases the quality of the outcome because anxiety and thoughts interfere with working memory.

DUAL-PROCESS, SELF-CONTROL, EFFORT

- All activities that involve the analytic system also require self-control.

- Maintaining self-control is difficult and not too pleasant, therefore this opens the door to the intuitive system to step in and lead the action.

SELF-CONTROL

- Activities that require self-control:
  - Inhibit one's own emotional reactions.
  - Make decisions when there is a conflict.
  - Trying to impress other people.
  - Being nice when someone is treating us unfairly.

- Behaviors that depend on a lack of self-control:
  - Over-eating while on a diet.
  - Impulsive shopping.
  - Being aggressive when someone provokes us.
  - Obtaining unsatisfactory results in cognitive and logic tests.

A baseball and a ball cost $1.10 in total.

The bat costs $1.00 more than the ball.

How much does the ball cost?

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(The marshmallow test - Mischel & Ebbesen, 1970)

https://www.youtube.com/watch?v=QX_oy9614HQ

PRIMING

- This mental process can lead people to activate specific associations or to experience a certain emotional reaction.

  - When this process happens without people being aware of it, we call it priming. The priming effect can be induced in many different ways:

    - With a word.
    - With an image.
    - Showing a video.
    - And even with more complex tasks.

OTHER FEATURES OF THE INTUITIVE SYSTEM

- The intuitive system can create “fictitious” causal relations:

  - Thanks to its associative functioning, it is very effective at filling informative gaps and create coherent stories.

  - On many occasions, our need to find reasonable explanations leads the analytic system to trust excessively the conclusions produced by the associations upon which the intuitive system relies.

OTHER FEATURES OF THE INTUITIVE SYSTEM

- The intuitive system can create “fictitious” causal relations:

  - Nassim Taleb wrote about a financial example related to the price of U.S. bonds on the day Saddam Hussein was captured.

    - In the morning, prices were going up and Bloomberg used this headline: “U.S. bonds go up; Hussein’s capture did not reduce fear of terrorism.”

    - In the afternoon, prices went down and the headline became: “U.S. bonds falling; Hussein’s capture stimulates the purchase of risky assets.”

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OTHER FEATURES OF THE INTUITIVE SYSTEM

(From the movie: The wolf of Wall Street - 2013)

https://www.youtube.com/watch?v=bF5FL7w6tuk

OTHER FEATURES OF THE INTUITIVE SYSTEM

- Confirmation bias and focalization:

  - Asking “Is Beth a nice person?”
  - Is different from asking “Is Beth a nasty person?”

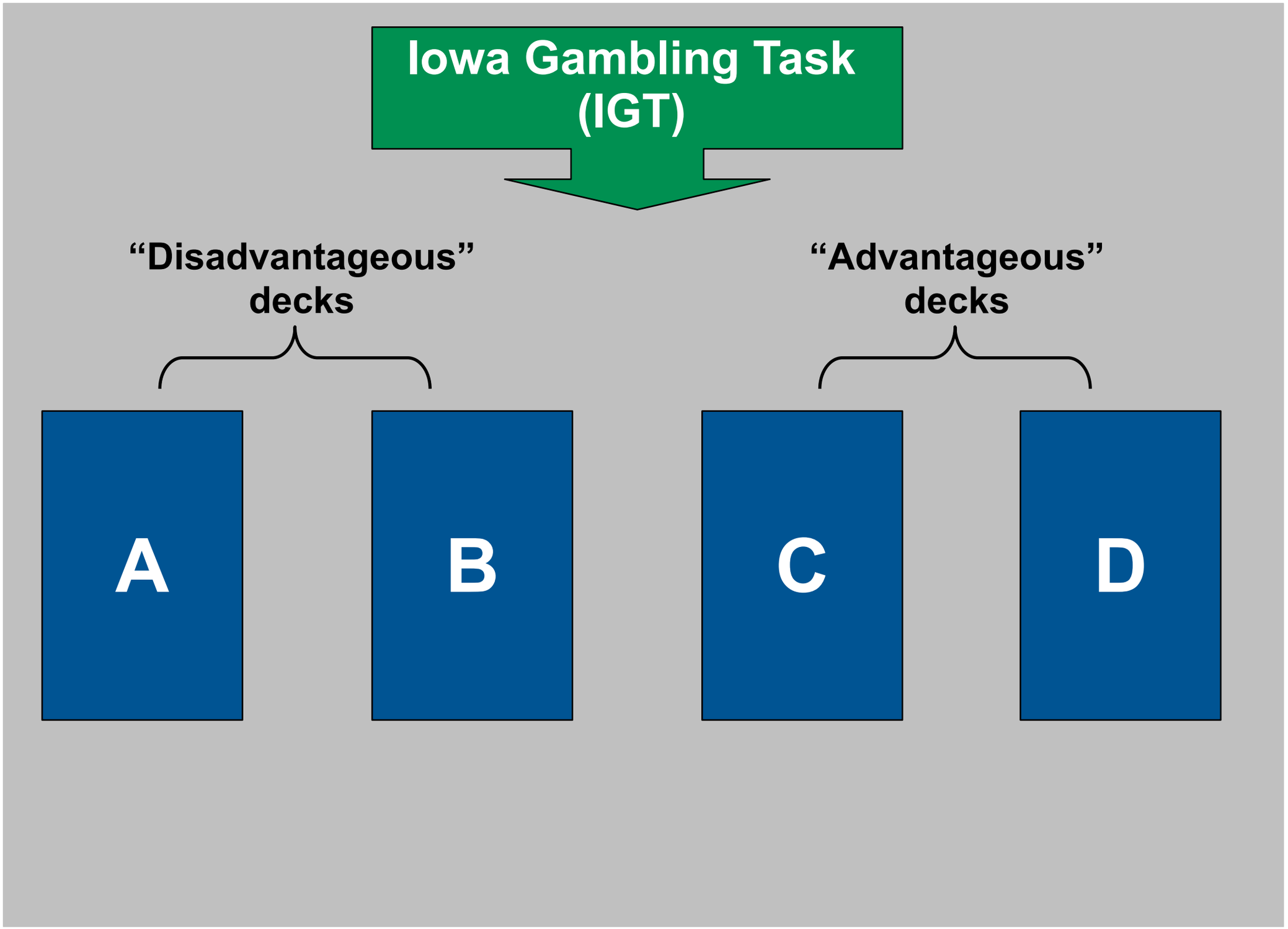
  - Depending on the question, different information about Beth will come to mind and they will make us overestimate one conclusion over the other.

  - “Is Joe Biden going to win the U.S. presidential election?”
  - “Will there be a terrorist attack in Padova over the next 3 months?”

OTHER FEATURES OF THE INTUITIVE SYSTEM

- "What I see is all there is" (WISIATI):
  - People tend to give too much importance to information that has been explicitly presented.
  - Whereas they tend to neglect information that is not presented explicitly (although they know that information already).
- The WISIATI effect produces biases like:
  - Overconfidence.
  - Framing.
  - Base rate neglect.

IMPLICIT LEARNING AND EMOTIONS



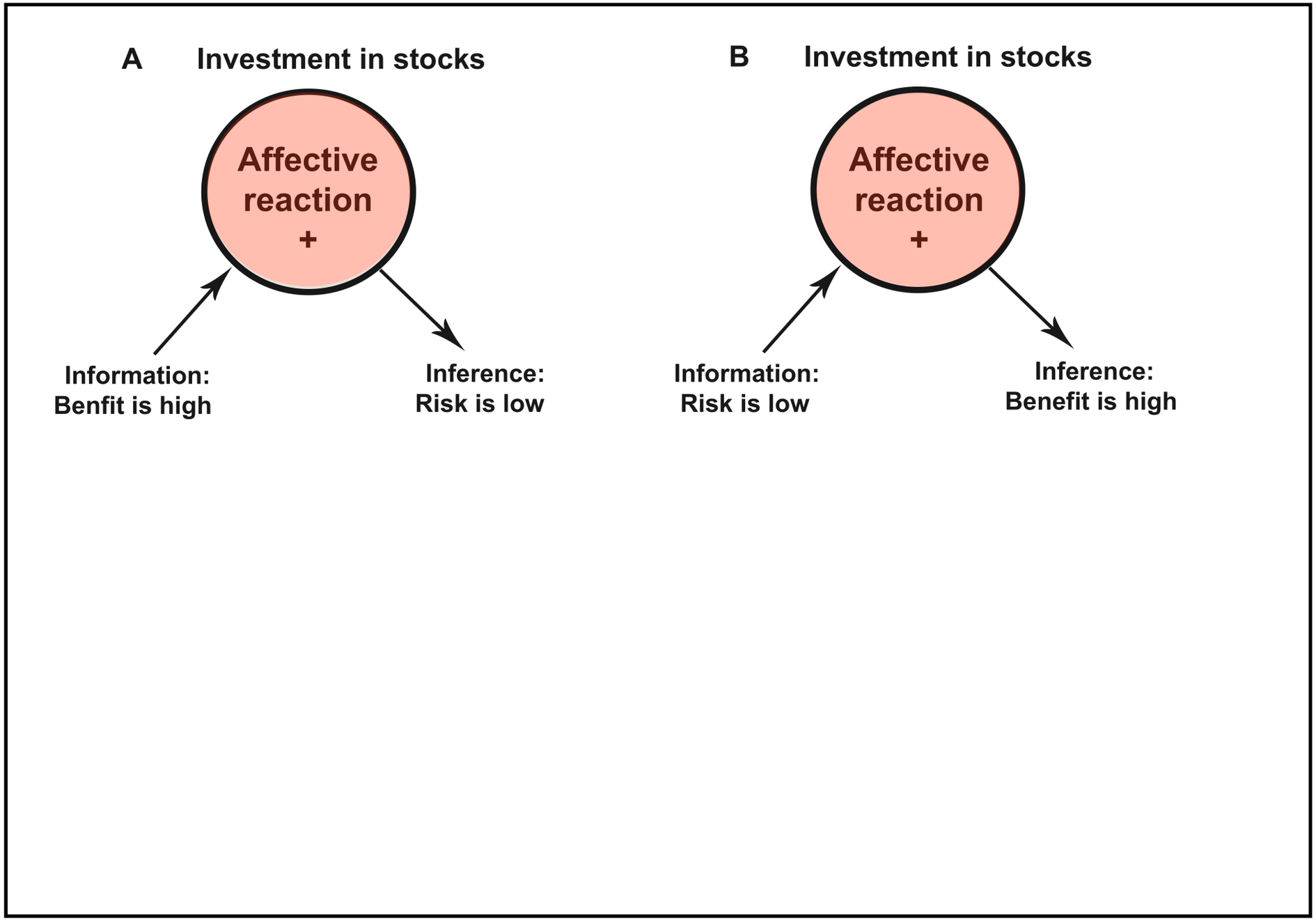
IMPLICIT LEARNING AND EMOTIONS

- In the IGT, people are asked to select 100 cards from any of the four decks.
  - Usually, after drawing about 50 cards, participants start to select cards mostly from the “advantageous” decks.
    - However, they are unable to tell explicitly which strategy is the best (which decks are offering the best results).
      - After drawing about 80 cards, participants are able to explicitly explain which decks are advantageous and why.

- Bechara and colleagues recorded skin conductance and heart beats finding that, as the task progresses, people are increasingly showing stress reactions when they are about to select a card from one of the “disadvantageous” decks.

AFFECT HEURISTIC

- The affect heuristic shows us why people perceive risk and benefit as negatively correlated (although in real world the correlation is often positive):



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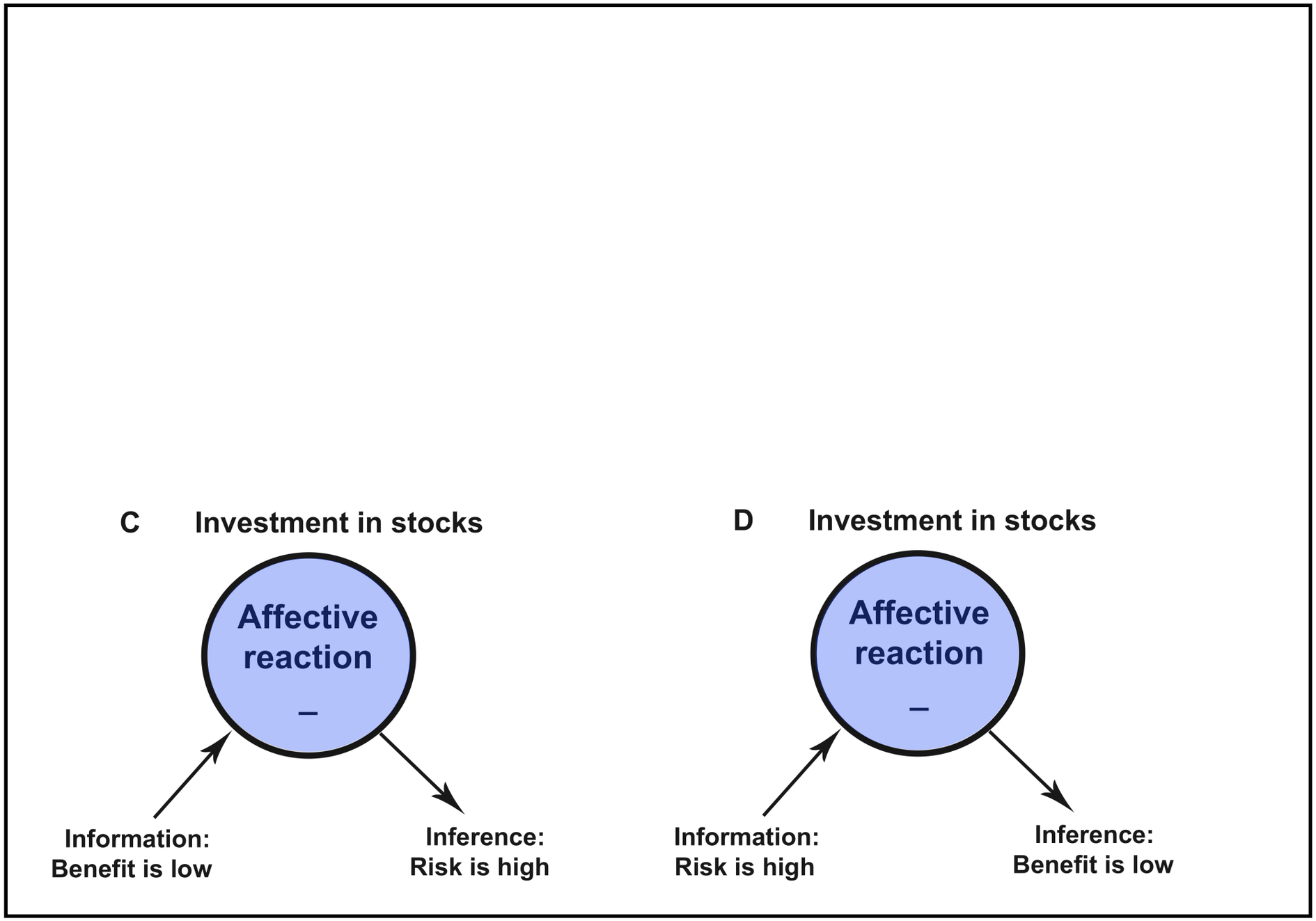

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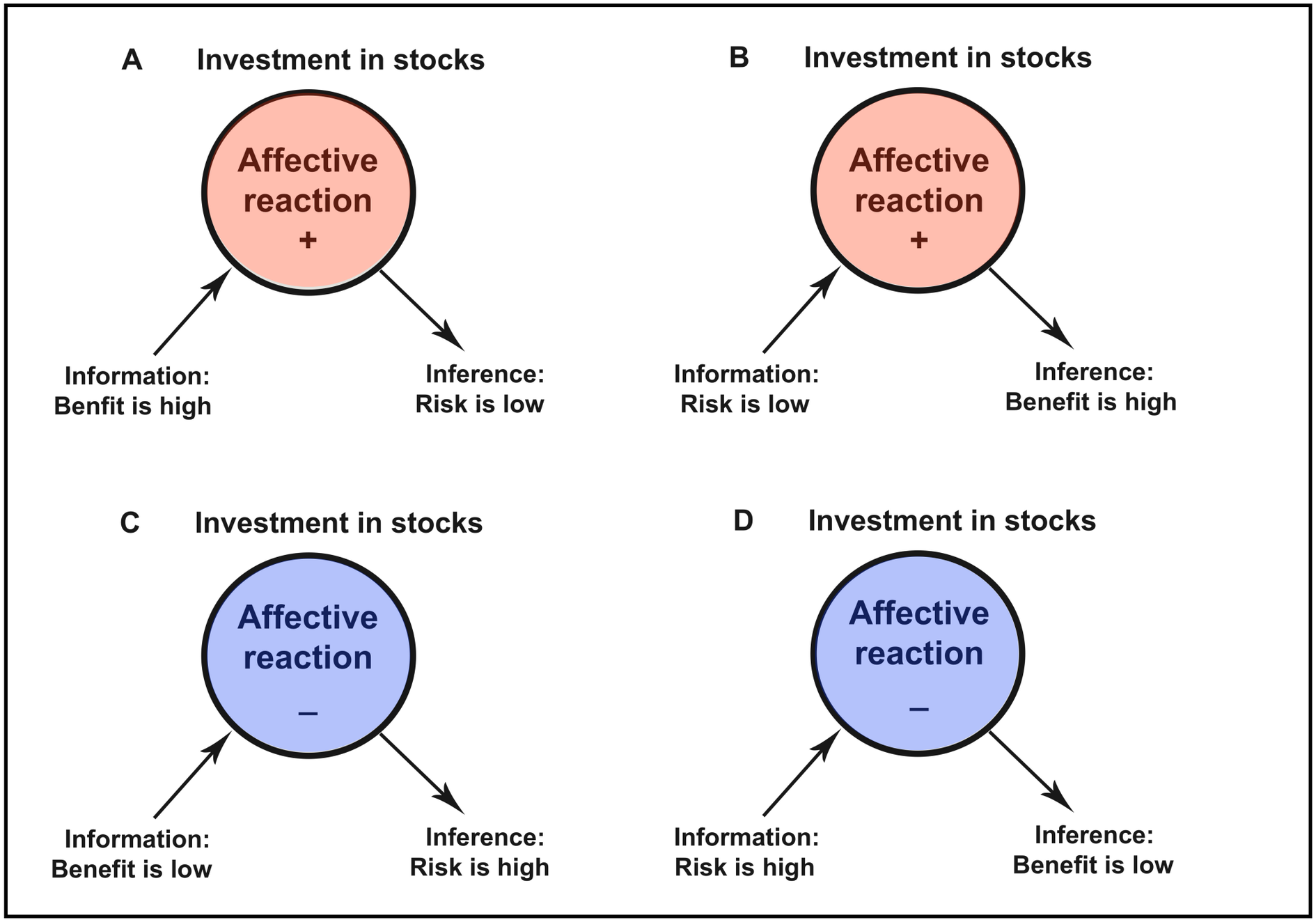

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AFFECT HEURISTIC